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AC Variable Speed Drive

LSLV-S300 Series

User's Manual

0.4~75 kW[200V] 0.4~220 kW[400V]





A Safety Instructions

- Read this manual carefully before installing, wiring, operating, servicing or inspecting this equipment
- Keep this manual within easy reach for quick reference.



This operation manual is intended for users with basic knowledge of electricity and electric devices.

- * S300 is the series name of the LSLV-S300.
- * The software of this product may be revised for better functionality or performance. If you find any deviation from this user manual, check out the latest version on our website below.

(https://www.ls-electric.com)

Safety Information

Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, property damage, personal injury, or even death.

Safety symbols in this manual

A Hazard

Indicates an imminently hazardous situation that, if not avoided, will result in severe injury or even death.

A Warning

Indicates a potentially hazardous situation that, if not avoided, could result in injury or even death.

① Caution

Indicates a potentially hazardous situation that, if not avoided, could result in minor injury or property damage.

Safety Information

A Hazard

- Never remove the product cover or touch the internal printed circuit board (PCB) or any contact points when the power is on. Also, do not start the product when the cover is open. This may cause an electrical shock due to the exposure of high-voltage terminals or the charging area.
- Even if the power is off, do not open the cover unless it is absolutely necessary, like for the wiring operation or for a regular inspection. Opening the cover may still cause an electrical shock, even after the power is blocked, because the product has been charged for a long period of time.
- Before opening the cover to start working, wait at least 10 minutes after the power is disconnected and check that the DC voltage of the product has been discharged using a tester. Otherwise, it may cause an electrical shock and result in personal injury or even death.
- Supply earthing system: TT, TN, not suitable for corner-earthed systems

Warning

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- Make sure to install a ground connection between the equipment and the motor for safe use. Otherwise, it may cause an electrical shock and result in personal injury or even death.
- Do not turn on the power if the product is damaged or faulty. If you find that the product is faulty, disconnect the power supply and have the product professionally repaired.
- The inverter becomes hot during operation. Avoid touching the inverter until it has cooled to avoid burns. Avoid touching the inverter until it has cooled to avoid burns.
- Do not allow foreign objects such as screws, metals, water, or oil to get inside the product. It can cause damage or a fire.
- Do not operate the switch with wet hands. Otherwise, it may cause an electrical shock and result in personal injury or even death.

① Caution

- Do not disassemble or change the inside of the product at your own discretion. This may result in failure or malfunction, causing worker injury or product damage. Also, products disassembled or changed at your own discretion will not be entitled to the product warranty.
- Do not use the inverter for single-phase motor operation, as it has been designed for three-phase motor operation. Using a single-phase motor may damage the motor.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in an electric shock.

Note

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. LSLV-S300 is suitable for use in a circuit capable of delivering not more than 100kA RMS at the drive's maximum rated voltage, depending on the selected MCCB. RMS symmetrical amperes for recommended MCCB are the following table.

Remarque

Le courant maximum de court-circuit présumé autorisé au connecteur d'alimentation électrique est défini dans la norme IEC 60439-1 comme égal à 100 kA. Selon le MCCB sélectionné, la série LSLV-S300 peut être utilisée sur des circuits pouvant fournir un courant RMS symétrique de 100 kA maximum en ampères à la tension nominale maximale du variateur. Le tableau suivant indique le MCCB recommandé selon le courant RMS symétrique en ampères.

| Working Voltage | UTE100 (E/N) | UTS' | 150 (N/H/L) | UTS250 (N | /H/L) | UTS400 (N/H/L) |
|-----------------|--------------|--------------|-------------|-----------|-------|-----------------|
| 240V(50/60Hz) | 50/65kA | 65/100/150kA | | 65/100/15 | 0kA | 65/100/150kA |
| 480V(50/60Hz) | 25/35kA | 35/65/100kA | | 35/65/10 | OkA | 35/65/100kA |
| | | | | | | |
| Working Voltage | UTS600 (N/H/ | L) | UTS800 | (N/H/L) | UTS | S1200 (N/H/P/L) |
| 240V(50/60Hz) | 65/100/150kA | | 65/100 | /150kA | 50 | /100/65/150kA |
| 480V(50/60Hz) | 35/65/100kA | ٩ | 35/65/ | 100kA | 35 | 5/65/50/100kA |

| Working Voltage | ABS33c | ABS53c | ABS63c | ABS103c | ABS203c | ABS403c |
|-----------------|--------|--------|--------|---------|---------|---------|
| 240V(50/60Hz) | 30kA | 35kA | 35kA | 85kA | 85kA | 75kA |
| 480V(50/60Hz) | 7.5kA | 10kA | 10kA | 26kA | 26kA | 35kA |

Quick Reference Table

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The table below is a summary of situations that users encounter frequently while using the product. Refer to the following to search for information more easily and quickly:

| Situation | Ref. |
|---|--------------|
| What are the recommended wiring lengths? | <u>p.36</u> |
| What are the factory default settings for multi-function terminals DI1 to DI8? | <u>p.40</u> |
| I want to install a frequency meter on the analog terminal. | <u>p.43</u> |
| I want to change the inverter's operation frequency using a potentiometer. | p.94 |
| I want to operate the inverter using a multi-step speed configuration. | <u>p.105</u> |
| I want to configure the inverter to start operating as soon as the power source is applied. | <u>p.117</u> |
| I want to apply PID control to my system. | <u>p.180</u> |
| The motor is too noisy. | <u>p.228</u> |
| The motor is too hot. | <u>p.388</u> |
| The inverter is too hot. | <u>p.405</u> |
| I want to check the changed parameters only. | <u>p.519</u> |
| Can I check the current of the motor in Smart Operator? | <u>p.520</u> |
| I found something unusual in the product or motor. | <u>p.707</u> |
| The cooling fan does not work. | <u>p.716</u> |
| I want to know how to store the inverter when it is not in use. | <u>p.722</u> |

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1 Preparing the Installation

This chapter provides details on product identification, part names, correct installation, and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

1.1 Product Identification

The S300 inverter is manufactured in a range of product groups based on motor capacity and power source specifications. Product name and specifications are detailed on the rating plate. Check the product specification before installing the product and make sure that it is suitable for the intended use. For more detailed product specifications, refer to **16.2 Product Specification Details**.

Note

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Open the packaging and check the product name and check the product for defects. If the product is found to be faulty, contact your supplier.



[Image 1. Product Rating Plate]

2 **LS**ELECTRIC
1.2 Check the Part Names

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See the assembly diagram below for the part names. Refer to the following images, as detailed images may vary according to product groups. Refer to <u>4.1 Description of</u> <u>the Inverter Status Indicator LED</u> for instructions on the LED status light in the front of the inverter.

200 V Class 0.4-4 kW / 400 V Class 0.4-4 kW

LSLV0004S300-4 / LSLV0008S300-4 / LSLV0015S300-4 / LSLV0022S300-4 / LSLV0040S300-4 LSLV0004S300-2 / LSLV0008S300-2 / LSLV0015S300-2 / LSLV0022S300-2 / LSLV0040S300-2



[Image 2. 200 V class 0.4-4 kW / 400 V class 0.4-4 kW Assembly Diagram]

3

200 V Class 5.5-7.5 kW / 400 V Class 5.5-7.5 kW

LSLV0055S300-2 / LSLV0075S300-2 LSLV0055S300-4 / LSLV0075S300-4



: Front Cover Bolted Joint



200 V Class 11 kW / 400 V Class 11-15 kW

LSLV0110S300-2 LSLV0110S300-4 / LSLV0150S300-4

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: Front Cover Bolted Joint

[Image 4. 200 V Class 11 kW / 400 V Class 11-15 kW Assembly Diagram]

200 V Class 15-18.5 kW / 400 V Class 18.5-22 kW

LSLV0150S300-2 / LSLV0185S300-2 LSLV0185S300-4 / LSLV0220S300-4



: Front Cover Bolted Joint



200 V Class 22 kW / 400 V Class 30~37 kW

LSLV0220S300-2 LSLV0300S300-4 / LSLV0370S300-4

Г



[Image 6. 200 V Class 22 kW / 400 V Class 30-37 kW Assembly Diagram]

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200 V Class 30 kW / 400 V Class 45 kW

LSLV0300S300-2 LSLV0450S300-4



: Front Cover Bolted Joint



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[Image 8. 200 V Class 37-45 kW / 400 V Class 55-75 kW Assembly Diagram]

400 V Class 90-110 kW

LSLV0900S300-4 / LSLV1100S300-4



: Front Cover Bolted Joint



Preparing the Installation



: Front Cover Bolted Joint

Г

[Image 10. 200 V Class 55-75 kW / 400 V Class 132-160 kW Assembly Diagram]

400 V Class 185-220 kW

LSLV1850S300-4 / LSLV2200S300-4



1.3 Installation Considerations

Inverters are composed of various precise electronic parts, and therefore the installation environment can significantly impact the lifespan and reliability of the product. The table below details the ideal operation and installation conditions for the inverter.

| Items | Description | | | | |
|---------------------------|--|--|--|--|--|
| | Where there is no ice or frost, | | | | |
| | -10~50℃ on heavy duty | | | | |
| Ambient temperature* | -10~40℃ on normal duty | | | | |
| | The conduit option requires 1.5%/°C current derating when it is over 30°C on normal duty and when it is over 40°C on heavy duty. | | | | |
| Ambient humidity | Less than 95% relative humidity (no condensation) | | | | |
| Storage temperature | -20~65°C | | | | |
| Environmental factors | Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 2 Environment). | | | | |
| Altitude | Maximum of 1,000 m above sea level (1000-2000 m, 1%/100 m derating) | | | | |
| Vibration | Less than 9.8 m/sec² (1.0 G) | | | | |
| Air Pressure | 70~106kPa | | | | |
| Installation Method | Wall-mount type or flange options | | | | |
| Turning on the Inverter | Overvoltage category III | | | | |
| Length of Output Wiring** | Within 100 m | | | | |

Table 1. Inverter Installation Environment

Г

* The ambient temperature is the temperature measured at a point 5 cm from the surface of the inverter.

** The maximum allowed carrier frequency per wiring length is as follows (contact the customer center if the wiring exceeds 100 m):

Table 2. Maximum Allowed Carrier Frequency per Wiring Length

| Wiring Length Between Inverter and Motor | 50 m or shorter | 100 m or shorter | Longer than 100m |
|---|-----------------|------------------|------------------|
| Allowed Carrier Frequency | 15 kHz or lower | 5 kHz or lower | 3 kHz or lower |



٦



() Caution

Do not allow the ambient temperature to exceed the allowable range while operating the inverter.

1.4 Selecting the Installation Location

When selecting an installation location, consider the following points:

- The location must be free from vibration, and the inverter must be installed on a wall that can support the inverter's weight.
- The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate.



[Image 13. Selection Criteria for Installation Location]

• Make sure that sufficient air circulation is provided around the product. When installing the product inside the panel, carefully consider the position of the product's cooling fan and the ventilation louver. The product must be placed so that the cooling fan can discharge heat satisfactorily during the operation.

1.5 Wire Selection

Make sure to use wires that are appropriate for the use and specifications of each I/O and control circuit for safe and reliable operation of the product. Refer to the following information to assist you with cable selection:

() Caution

- Select the thickest possible cable for I/O wiring to ensure that the percentage of voltage drop does not exceed 2%.
- Use copper cables rated for 600 V and 75 °C or above for I/O wiring.
- Use copper cables rated for 300 V and 75 °C for control terminal wiring.

1.5.1 Ground Wire Specifications

| Model | | Ground | | Ground Model | | Model | Ground | | | |
|------------|-----|--------|------|--------------|-----|-------|--------|--|--|--|
| | mm² | AWG | Bolt | | mm² | AWG | Bolt | | | |
| 0004S300-2 | 1.5 | 18 | M4 | 0004S300-4 | 1.5 | 20 | M4 | | | |
| 0008S300-2 | 1.5 | 14 | M4 | 0008S300-4 | 1.5 | 18 | M4 | | | |
| 0015S300-2 | 1.5 | 12 | M4 | 0015S300-4 | 1.5 | 14 | M4 | | | |
| 0022S300-2 | 1.5 | 10 | M4 | 0022S300-4 | 1.5 | 14 | M4 | | | |
| 0040S300-2 | 2.5 | 10 | M4 | 0040S300-4 | 1.5 | 12 | M4 | | | |
| 0055S300-2 | 4 | 8 | M4 | 0055S300-4 | 1.5 | 10 | M4 | | | |
| 0075S300-2 | 10 | 6 | M4 | 0075S300-4 | 4 | 8 | M4 | | | |
| 0110S300-2 | 16 | 4 | M4 | 0110S300-4 | 4 | 8 | M4 | | | |
| 0150S300-2 | 16 | 4 | M4 | 0150S300-4 | 6 | 6 | M4 | | | |
| 0185S300-2 | 16 | 4 | M4 | 0185S300-4 | 10 | 6 | M4 | | | |
| 0220S300-2 | 25 | 3 | M5 | 0220S300-4 | 16 | 4 | M4 | | | |
| 0300S300-2 | 35 | 1 | M8 | 0300S300-4 | 16 | 4 | M5 | | | |
| 0370S300-2 | 50 | 1/0 | M8 | 0370S300-4 | 16 | 4 | M5 | | | |
| 0450S300-2 | 70 | 3/0 | M8 | 0450S300-4 | 25 | 3 | M8 | | | |
| 0550S300-2 | 95 | 3/0 | M12 | 0550S300-4 | 35 | 1 | M8 | | | |
| 0750S300-2 | 120 | 250 | M12 | 0750S300-4 | 50 | 1/0 | M8 | | | |
| | | | | 0900S300-4 | 70 | 2/0 | M8 | | | |
| | | | | 1100S300-4 | 95 | 3/0 | M8 | | | |

Table 3. Ground Wire Specifications per Model

| Model | | Ground | | Model | | Ground | |
|-------|-----|--------|------|------------|-----|--------|------|
| | mm² | AWG | Bolt | | mm² | AWG | Bolt |
| | | | | 1320S300-4 | 120 | 4/0 | M12 |
| | | | | 1600S300-4 | 150 | 300 | M12 |
| | | | | 1850S300-4 | 185 | 350 | M12 |
| | | | | 2200S300-4 | 240 | 500 | M12 |

1.5.2 Power I/O Cable Specifications

| Table 4. | I/O | Wiring | Specifications | per | Model |
|----------|-----|--------|-----------------------|-----|-------|
|----------|-----|--------|-----------------------|-----|-------|

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| | | Power Terminal Wiring | | | | | | | | |
|-------------------|-------|-----------------------|-------|-------|-------|-------|------------------------------------|-----------|-------|-----------|
| | mı | n² (AW | ′G) | | AWG | | Lug Specifications ¹ | | Bolt | |
| Model LSLV□□□□ | R/S/T | P/N | U/V/W | R/S/T | P/N | U/V/W | R/S/T/U/V/W | P/N | R/S/T | P/N/U/V/W |
| 0004S300-2 | 1.5 | 1.5 | 1.5 | 20.0 | 18.0 | 18.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0008\$300-2 | 1.5 | 1.5 | 1.5 | 16.0 | 14.0 | 14.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0015S300-2 | 1.5 | 1.5 | 1.5 | 14.0 | 12.0 | 12.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0022\$300-2 | 1.5 | 2.5 | 2.5 | 12.0 | 10.0 | 10.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0040S300-2 | 2.5 | 4.0 | 4.0 | 10.0 | 10.0 | 10.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0055\$300-2 | 4.0 | 6.0 | 6.0 | 8.0 | 8.0 | 8.0 | 0102-xx04 | 0102-xx04 | M4 | M4 |
| 0075S300-2 | 10.0 | 10.0 | 10.0 | 8.0 | 6.0 | 6.0 | 0103-xx04 | 0103-xx04 | M4 | M4 |
| 0110S300-2 | 16.0 | 16.0 | 16.0 | 6.0 | 4.0 | 4.0 | 0104-xx05 | 0104-xx05 | M5 | M5 |
| 0150S300-2 | 25.0 | 25.0 | 25.0 | 4.0 | 3.0 | 3.0 | 0105-xx05 | 0105-xx05 | M5 | M5 |
| 0185S300-2 | 25.0 | 35.0 | 35.0 | 3.0 | 2.0 | 2.0 | 0105-xx05 | 0105-xx05 | M5 | M5 |
| 0220S300-2 | 50.0 | 70.0 | 50.0 | 1.0 | 2/0 | 1/0 | 0108-xx06 | 0108-xx06 | M6 | M6 |
| 0300\$300-2 | 70.0 | 95.0 | 70.0 | 2/0 | 3/0 | 2/0 | 0109-xx08 | 0109-xx08 | M8 | M8 |
| 0370S300-2 | 95.0 | 120.0 | 95.0 | 3/0 | 250.0 | 4/0 | 0112-xx08 | 0112-xx08 | M8 | M8 |
| 0450S300-2 | 120.0 | 185.0 | 150.0 | 250.0 | 350.0 | 300.0 | 0114-xx08 | 0114-xx08 | M8 | M8 |
| 0550S300-2 | 95x2 | 120x2 | 95x2 | 3/0x2 | 250x2 | 4/0x2 | 0112-xx08 | 0112-xx08 | M12 | M12 |

¹ American Wire Gauge (AWG) applicable lug (based on Dong-a Bestech) PPNO

| | Power Terminal Wiring | | | | | | | | | |
|-------------------|-----------------------|--------|-------|-------|-------|-------|----------------|---------------------------|-------|-----------|
| | mr | m² (AW | 'G) | | AWG | | Lı Specific | ug ations ¹ | Be | olt |
| Model LSLV□□□□ | R/S/T | P/N | U/V/W | R/S/T | P/N | U/V/W | R/S/T/U/V/W | P/N | R/S/T | P/N/U/V/W |
| 0750S300-2 | 120x2 | 180x2 | 120x2 | 250x2 | 350x2 | 250x2 | 0114-xx08 | 0114-xx08 | M12 | M12 |
| 0004S300-4 | 1.5 | 1.5 | 1.5 | 22.0 | 22.0 | 20.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0008S300-4 | 1.5 | 1.5 | 1.5 | 20.0 | 18.0 | 18.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0015S300-4 | 1.5 | 1.5 | 1.5 | 18.0 | 14.0 | 14.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0022S300-4 | 1.5 | 1.5 | 1.5 | 16.0 | 14.0 | 14.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0040S300-4 | 1.5 | 1.5 | 1.5 | 14.0 | 12.0 | 12.0 | 0102-xx04 | 0102-xx04 | M3.5 | M3.5 |
| 0055S300-4 | 2.5 | 2.5 | 2.5 | 12.0 | 10.0 | 10.0 | 0102-xx04 | 0102-xx04 | M4 | M4 |
| 0075S300-4 | 4.0 | 4.0 | 4.0 | 10.0 | 8.0 | 8.0 | 0102-xx04 | 0102-xx04 | M4 | M4 |
| 0110S300-4 | 6.0 | 6.0 | 6.0 | 8.0 | 8.0 | 8.0 | 0102-xx04 | 0102-xx04 | M4 | M4 |
| 0150S300-4 | 10.0 | 10.0 | 10.0 | 8.0 | 6.0 | 8.0 | 0103-xx04 | 0103-xx04 | M4 | M4 |
| 0185S300-4 | 10.0 | 16.0 | 10.0 | 6.0 | 6.0 | 6.0 | 0104-xx05 | 0104-xx05 | M5 | M5 |
| 0220S300-4 | 16.0 | 25.0 | 16.0 | 4.0 | 4.0 | 4.0 | 0104-xx05 | 0104-xx05 | M5 | M5 |
| 0300\$300-4 | 25.0 | 35.0 | 25.0 | 3.0 | 2.0 | 3.0 | 0105-xx05 | 0107-xx05 | M5 | M6 |
| 0370S300-4 | 35.0 | 50.0 | 35.0 | 2.0 | 1.0 | 2.0 | 0105-xx05 | 0107-xx05 | M5 | M6 |
| 0450S300-4 | 50.0 | 70.0 | 50.0 | 1.0 | 2/0 | 1/0 | 0108-xx08 | 0108-xx08 | M8 | M8 |
| 0550S300-4 | 70.0 | 95.0 | 70.0 | 2/0 | 4/0 | 3/0 | 0111-xx08 | 0111-xx08 | M8 | M8 |
| 0750S300-4 | 95.0 | 120.0 | 95.0 | 4/0 | 250.0 | 4/0 | 0112-xx08 | 0112-xx08 | M8 | M8 |
| 0900S300-4 | 70x2 | 70x2 | 70x2 | 2/0x2 | 3/0x2 | 2/0x2 | 0109-xx08 | 0109-xx08 | M8 | M8 |
| 1100S300-4 | 95x2 | 95x2 | 95x2 | 3/0x2 | 4/0x2 | 3/0x2 | 0110-xx08 | 0110-xx08 | M8 | M8 |
| 1320S300-4 | 120x2 | 150x2 | 120x2 | 4/0x2 | 300x2 | 250x2 | 0113-xx12 | 0113-xx12 | M12 | M12 |
| 1600S300-4 | 150x2 | 185x2 | 150x2 | 300x2 | 500x2 | 300x2 | 0114-xx12 | 0114-xx12 | M12 | M12 |
| 1850S300-4 | 185x2 | 240x2 | 185x2 | 350x2 | 500x2 | 400x2 | 0117-xx12 | 0117-xx12 | M12 | M12 |
| 2200S300-4 | 185x2 | 240x2 | 185x2 | 350x2 | 500x2 | 400x2 | 0117-xx12 | 0117-xx12 | M12 | M12 |

1.5.3 Signal (Control) Cable Specifications

Table 5. Control Wiring Specifications by Terminal

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| Torminala | Wire gauge ² | | | |
|--|-------------------------|-------|--|--|
| Terrinidis | mm² | AWG | | |
| VR+, VR-, AI1, AI2, AI3, TI, TO, AO1, AO2, EPI, 5G | 0.33~1.25 | 16~22 | | |
| DI1~DI8, CM, DP, DG | 0.33~2.0 | 14~22 | | |
| DA1, DB1, DC1, DA2, DC2, DQ3, EG | 0.33~2.0 | 14~22 | | |
| SP, SA, SB | 0.33~2.0 | 14~22 | | |
| S+, S-, 5G | 0.75 | 18 | | |

² Use shielded twisted pair cables (recommended).

2 Installing the Product

This chapter describes the physical and electrical installation methods, including mounting and wiring the product. Refer to the flowchart and basic configuration diagram provided below to understand the procedures and installation methods to be followed to install the product correctly.

Installation Flowchart

The flowchart lists the sequence to be followed during installation. Install the product following the flowchart and check the operation status. For more information on each step, refer to the pages below.



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Basic configuration diagram

The following illustration shows the basic system configuration. Use the diagram as a reference when configuring the system by connecting the product with peripheral devices. Ensure that the product has a suitable rating for the configuration and that all the required peripherals and optional devices (brake units, reactors, noise filters, etc.) are available. For more details on the product's rated input and output specifications, refer to <u>16.1 Input and Output Specifications</u>. For more details on available peripheral devices, refer to <u>16.4 Peripheral Devices</u>.



① Caution

- Note that the illustration in this user manual may represent the product with the cover open or the circuit breaker removed for explanation. When operating the inverter, make sure to follow the instructions in the user manual after fully installing the necessary parts, such as the cover and circuit breaker.
- Do not start or stop the inverter with a magnetic contactor. This may cause damage to the inverter.
- Install additional safety devices, such as emergency brakes. In the event that control is difficult as a result of product failure, dangerous situations may occur.
- High levels of current draw while powering on can affect the system. Ensure that correctly rated circuit breakers are installed to operate safely when powering on.
- It is necessary to use a reactor if improvement to the power factor is required, if the wiring length is less than 10 meters, or if the input voltage capacity is large (600 kVA or more, and the power supply capacity is 10 times or more than the inverter capacity). Ensure that the reactor's capacity and rating are taken into consideration when selecting it (refer to <u>16.4.2 AC Input Fuse and Reactor Specifications</u>).

2.1 Mounting on the Wall or within the Panel

Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel capable of supporting the installation, and check the inverter's mounting bracket dimensions (refer to **<u>16.3.1 External Dimensions</u>**).

- 1 Draw a horizontal line using a level on the wall or inside the panel where you want to install the inverter, and accurately mark the locations of the mounting bolts on the horizontal line.
- 2 Use a drill to pierce two mounting holes at the installation location, and install the mounting bolts. Do not fully tighten the bolts at this time. Fully tighten the mounting bolts after the inverter has been mounted.



[Image 2. Fixing mounting bolts (top)]

3 Mount the inverter on a wall or inside a panel using two mounting bolts. Tighten the upper mounting bolts, then install two lower mounting bolts and tighten them to mount the inverter. Ensure that the inverter is placed flat on the mounting surface and that the installation surface can securely support the weight of the inverter.



[Image 3. Fixing mounting bolts (bottom)]

Note

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The quantity and dimensions of the mounting brackets vary based on the frame size. Refer to **16.3.1 External Dimensions** for detailed information about your model.

() Caution

- Always support the inverter by using the metal frames when moving it. Do not transport the inverter by lifting it with the inverter's covers or plastic surfaces. The inverter may tip over if the covers break, resulting in injury or damage to the product.
- Use a transport method that is suitable for the weight of the product. Some highcapacity inverters may be too heavy for one person to carry. Use an adequate number of people and transport tools to safely move the product.
- Do not install the inverter on the floor or mount it sideways against a wall. The inverter must be installed vertically, on a wall or inside a panel, with its rear flat on the mounting surface and at least 10 cm from the floor.



2.2 Wiring

Open the front cover, remove the wiring brackets and control terminal cover, and then install the ground connection as specified. Complete the cable connections by connecting an appropriately rated cable to the terminals on the power and control terminal blocks. Read the following information carefully before making wiring connections to the inverter: All warning instructions must be followed.

① Caution

- Install the inverter before carrying out wiring connections. Refer to <u>1.3 Installation</u> <u>Considerations</u> and <u>1.4 Selecting the Installation Location</u> for details.
- Ensure that no small metal debris, such as wire cut-offs or screws, remain inside the inverter. Metal debris and screws in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the cables to disconnect and cause a short circuit or inverter failure. Refer to <u>16.5 Terminal Screw Specifications</u> for torque specifications.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in an electric shock.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that any voltage drop does not exceed 2%.
- Use copper cables rated at 600 V, 75°C for power terminal wiring.
- Use copper cables rated at 300 V, 75°C for control terminal wiring.
- Be sure that the display screen of the Smart Operator as well as the charging indicator are turned off before changing the wiring due to a problem while operating. As soon as the power is turned off, be careful to avoid electric shock, as the capacitor in the inverter is charged with a high voltage.

2.2.1 Step 1 Front Cover Disassembly

For power terminal and control terminal wiring, the front cover and the wiring bracket must be disassembled in order. Disassemble each front cover and wiring bracket in the following order.

Note

Depending on the product family, the number of bolts on the front cover and the location and shape of the wiring bracket may vary. Refer to **<u>1.2 Check the Part Names</u>** for details.

- 1 Unscrew the fixing bolts on the front cover and disassemble it.
 - Disassemble the fixing bolts of the front terminal cover on 400 V products with a capacity of 185 220 kW.



[Image 5. Front cover disassembly]

2 While holding both ends of the wiring bracket pressed inward, disassemble the wiring bracket.

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[Image 6. Wiring bracket disassembly]

• Disassemble the bolts of the Power Cover on 400 V products with a capacity of 185 - 220 kW. The front terminal cover serves as a bracket on products in this capacity that do not have wiring brackets.



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2.2.2 Step 2 Ground Connection

Disassemble the front cover(s) and the wiring bracket. Then, follow the instructions below to install the ground connection for the inverter.

- 1 Connect the prepared ground wire to the ground ((=)) terminal on the bottom of the inverter.
 - Refer to <u>1.5 Wire Selection</u> to find the appropriate cable specification for your installation.



[Image 8. Ground terminal connection]

2 Connect the other ends of the ground cables to the supply earth (ground) terminal.

Note

- 200 V products require Class 3 grounding. Resistance to the ground must be less than 100 $\Omega.$
- 400 V products require Special Class 3 grounding. Resistance to the ground must be less than 10 $\Omega.$

A Warning

Make sure to install a ground connection between the equipment and the motor for safe use. Otherwise, it may cause an electrical shock and result in personal injury or even death.

2.2.3 Step 3 Power Terminal Wiring

The following illustration shows the terminal layout and connection configuration on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the selected cables meet or exceed the specifications in **<u>1.5 Wire Selection</u>** before installing them.

① Caution

- Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfunctions.
- Use copper wires only with 600V, 75°C rating for the power terminal wiring, and 300V, 75°C rating for the control terminal wiring.
- Power supply wirings must be connected to the R, S, and T terminals. Connecting them to the U, V, W terminals causes internal damages to the inverter. Motor should be connected to the U, V, and W Terminals. Arrangement of the phase sequence is not necessary.

① Attention

- Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements.
- Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 75 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 °C pour le câblage de la borne de commande.
- Les câblages de l'alimentation électrique doivent être connectés aux bornes R, S et T. Leur connexion aux bornes U, V et W provoque des dommages internes à l'onduleur. Le moteur doit être raccordé aux bornes U, V et W. L'arrangement de l'ordre de phase n'est pas nécessaire.

Product Installation



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Power Terminal Labels and Descriptions

 Table 1. Power terminal configuration

| No. | Terminal Labels | Name | Description |
|-----|---------------------|----------------------------|---|
| 0 | R(L1), S(L2), T(L3) | AC power input terminal | Mains supply AC power connections. |
| 9 | P(+) | + DC link terminal | DC voltage (+) terminal. Connects DC (+) when using DC as inverter power. |
| 4 | N(-) | - DC link terminal | DC voltage (-) terminal. Connects DC (-) when using DC as inverter power. |
| 3 | B1, B2 | Brake resistor terminal | Connects the brake resistor. |
| 4 | U, V, W | Motor output terminal | Connects a 3-phase induction motor. |

200 V Class 0.4-4kW / 400V Class 0.4-4kW

LSLV0004S300-4 / LSLV0008S300-4 / LSLV0015S300-4 / LSLV0022S300-4 / LSLV0040S300-4 LSLV0004S300-2 / LSLV0008S300-2 / LSLV0015S300-2 / LSLV0022S300-2 /

LSLV0040S300-2



[Image 10. 200V Class 0.4-4kW / 400V Class 0.4-4kW Power Terminals]

200V Class 5.5-7.5kW

LSLV0055S300-2 / LSLV0075S300-2



[Image 11. 200V Class 5.5-7.5kW Power Terminals]

400V Class 5.5-7.5kW

LSLV0055S300-4 / LSLV0075S300-4



[Image 12. 400V Class 5.5-7.5kW Power Terminals]

200V Class 11kW

LSLV0110S300-2



[Image 13. 200V Class 11kW Power Terminals]

400V Class 11-15kW

LSLV0110S300-4 / LSLV0150S300-4



[Image 14. 400V Class 11-15kW Power Terminals]

200V Class 15-18.5kW

LSLV0150S300-2 / LSLV0185S300-2

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[Image 15. 200V Class 15-18.5kW Power Terminals]

400V Class 18.5-22kW

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LSLV0185S300-4 / LSLV0220S300-4



[Image 16. 400V Class 18.5-22kW Power Terminals]

200V Class 22kW / 400V Class 30-37kW

LSLV0220S300-2



[Image 17. 200V Class 22kW / 400V Class 30-37kW Power Terminals]

400V Class 30-37kW

LSLV0300S300-4 / LSLV0370S300-4



200V Class 30-45kW / 400V Class 45-75kW

LSLV0300S300-2/LSLV0370S300-2/LSLV0450S300-2 LSLV0450S300-4/LSLV0550S300-4 / LSLV0750S300-4



[Image 19. 200V Class 30-45kW / 400V Class 45-75kW Power Terminals]

400V Class 90-110kW

LSLV0900S300-4 / LSLV1100S300-4



[Image 20. 400V Class 90-110kW Power Terminals]

200V Class 55-75kW / 400V Class 132-160kW

LSLV0550S300-2 / LSLV0750S300-2 LSLV1320S300-4 / LSLV1600S300-4



[Image 21. 200V Class 55-75kW / 400V Class 132-160kW Power Terminals]

400V Class 185-220kW

LSLV1850S300-4 / LSLV2200S300-4



[Image 22. 400V Class 185-220kW Power Terminals]

Note

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The location of the power terminal labels may vary according to the product family.

A Warning

Do not connect power to the inverter until the installation has been fully completed and the inverter is ready to be operated. Otherwise, it may cause an electrical shock and result in personal injury or even death.

() Caution

- Connect the input power wiring of the inverter to the R/S/T terminals and the output wiring to the motor to the U/V/W terminals. The product may be damaged if it is connected in reverse.
- To use DC input to operate the inverter, connect the DC input terminals to P (+) and N (-).
- Use insulated ring lugs when connecting cables to R/S/T and U/V/W terminals.
- The inverter's power terminal connections can cause harmonics that may interfere with other communication devices located near the inverter. To reduce interference the installation of noise filters or line filters may be required.
- Do not connect advanced-phase capacitors, surge killers, or radio noise filters to the output side of the product. There is a possibility that a trip may occur or the connected device may be damaged.
- Do not connect a magnetic contactor to the wiring on the output side of the product (motor side). There is a possibility that a trip may occur or the product may be damaged.

Note

- Do not use 3 core cables when connecting a remotely located motor with the inverter.
- Make sure that the total cable length does not exceed 100 m. For wire lengths greater than 100 m, please contact customer service.
- Long cable runs can cause reduced motor torque in low-frequency applications due to voltage drop. Long cable runs also increase a circuit's susceptibility to stray capacitance and may trigger over-current protection devices or result in a malfunction of equipment connected to the inverter. Voltage drop is calculated by using the following formula:

Voltage Drop (V) = $\left[\sqrt{3} \text{ X cable resistance (M}\Omega/m) \text{ X cable length (m) X current (A)}\right] / 1000$

• Use cables with the largest possible cross-sectional area to ensure that voltage drop is minimized over long cable runs. Lowering the carrier frequency and installing a micro surge filter may also help to reduce voltage drop.

| Wiring Length Between Inverter and Motor | 50 m or shorter | 100 m or shorter | Longer than 100m |
|---|-----------------|------------------|------------------|
| Allowed Carrier Frequency | 15 kHz or lower | 5 kHz or lower | 3 kHz or lower |

2.2.4 Step 4 Control Terminal Wiring

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Below is a diagram showing the layout and connection configuration of the control circuit. Refer to the detailed information and install the control circuit wiring. Ensure that the cables selected meet or exceed the specifications in **<u>1.5 Wire Selection</u>** before installing them.



[Image 23. Control terminal]

Table 2. Safety terminal configuration

| Category | Terminal Labels | Name | Description |
|----------------------|-----------------|------------------------------|--|
| | SP | Safety power output terminal | DC 24 V, 25 mA or less |
| Safety | SA | Safety input A terminal | Based on the input signal from outside, it blocks the output. |
| signal ^{´1} | SB | Safety input B | If both SA and SB are connected to SP: Normal operation |
| | | terminal | If either SA or SB is disconnected from the SP: Block product output |

¹ Three safety terminals are connected by short bars when shipped from the factory.



Input/Output control terminal wiring diagram

[Image 24. Input/Output control terminal wiring]


[Image 25. IO board switch]

Table 3. Dip switch configuration

| Switch labels | Description | Factory value (Default) |
|------------------|--|----------------------------------|
| SW1 | NPN/PNP setting switch (Left: NPN, Right: PNP) | Left: NPN |
| SW2 | IO1/VO1 terminal setting switch (Left: IO1, Right: VO1) | Right: VO1 |
| SW3 | IO2/VO2 terminal setting switch (Left: IO2, Right: VO2) | Right: VO2 |
| SW4 | I1, I2, I3, PTC ON/V1, V2, V3 PTC OFF terminal selection switch (Left: I1, I2, I3, PTC ON, Right: V1, V2, V3, PTC OFF) | Right: V1, V2, V3, PTC OFF |

- DI1~DI8: Digital Input 1-8
- DP: Digital Power 24 V Output, Max 150 mA
- DG: Digital Ground
- CM: Digital Input Common
- DA1, DC1, DB1: Digital Relay1 Output
- DA2, DC2: Digital Relay2 Output
- DQ3, EG: Digital Open Collector Output
- EPI: Power Supply Input (for external power supply)
- 5G: Analog Ground
- AO1, AO2: Analog Output 1, 2
- AI1, AI2, AI3: Analog Input 1, 2, 3
- PTC: Positive Temperature Coefficient thermistor

 VR+, VR-: Analog ± Voltage Reference, output voltage ±10 V, Maximum current output 20 mA ٦

- TO: Pulse Train Output
- TI: Pulse Train Input

Table 4. Input/communication terminal configuration

| Category | Terminal Labels | Name | Description |
|-----------------------------|--------------------|--|--|
| Terminal input selection | DI1~DI8 | Digital input Terminals 1-8 | Configurable for digital input terminals. The factory default is as follows: • DI1: FX • DI2: RX • DI3: BX • DI4: External Trip-1 • DI5: Speed-L • DI6: Speed-M • DI7: Speed-H • DI8: JOG |
| | СМ | Common terminal | Common terminal for digital input terminals. |
| Analog input | VR+ | Analog positive (+) voltage reference terminal | Power supply for analog reference. Output Voltage: 10V Maximum Current Output: 20mA Potentiometer: 1~10kΩ |
| | VR- | Analog negative (-) voltage reference terminal | Power supply for analog reference. Output Voltage: -10V Maximum Current Output: 20mA Potentiometer: 1~10kΩ |

| Category | Terminal Labels | Name | Description | |
|--------------------------|--------------------|--|--|--|
| Category Analog input | Terminal Labels | Name Analog voltage/ current input terminal (switch selection) | Description Depending on the setting of the switch (SW4), it can be used as either a voltage or current input. Al3 can be used as PTC sensor input. Factory default is V1, 2, and 3. SW4 PTC ON PTC ON I3 I2 V2 I1 V1 PTC ON I2 V2 V1 V1, I2, I3 V1 V1, I1, I2, I3 V1 V1, I2, 3 V1 V1, I2, 3 I1 V1 V1, I2, 3 II V1 V1, I2, 3 II V1 Select the appropriate terminal block by setting the switch (SW4) to V1, 2, 3. Depending on the setting of the analog input mode, the following voltage ranges can be | |
| | | | Depending on the setting of the analog input mode, the following voltage ranges can be used. | |
| | | | • Onipolar: 0.00 - 10 V • Bipolar: -10.00 - 10 V | |
| | | | | |
| | | | [When inputting PTC] Connect the PTC sensor to the Al3 input terminal and select the PTC ON switch (SW4). | |

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| Category | ry Terminal Name | | Description | | |
|-------------------------|------------------|--|---|--|--|
| Analog input | AI1~AI3 | Analog voltage/ current input terminal (switch selection) | [Note] Remove SW4 dip switch seal tape It is shipped with seal tape attached for SW4 dip switch protection (factory default: Analog voltage input). Remove the seal tape to change the switch settings, as shown in the following illustration. Using the cut-out corner of the switch mold, the seal tape can be easily removed. [Image 27. Remove SW4 switch seal tape] | | |
| | ΤI | Pulse train input terminal | Set it to 0.00-32.00 kHz and enter it. • Low Level: 0~1.2V • High Level: 2.0~12V(Duty 30~70%) | | |
| | 5G | Analog common terminal | Analog ground common terminal. (It differs from the CM common terminal.) | | |
| External power input | EPI | External power input terminal | By connecting external power to the EPI terminal and 5G ground, it can be utilized as backup power for the control unit. It is possible to use the Smart Operator, communication options, and some of the controller's features. Precautions: Do not connect external power to DP/DG terminals. The DP/DG terminal is for internal power or service power. Input power: 24V(21.6~26.4V), 0.5A | | |
| RS-485 communication | S+/S- | RS-485 signal input terminal | Used to send or receive RS-485 signals. Refer to <u>10 Using Built-in Communication</u> <u>Features</u> for more details. It is used with 5G ground. | | |

Output Terminal Labels and Descriptions

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| Category | Terminal Labels | Name | Description | | | |
|------------------|--------------------|---|--|--|--|--|
| Analog output | AO1~AO2 | Analog voltage/current Output terminal (switch selection) | Depending on the selection of the switch (SW2, SW3), it can be used as either a voltage or current output. Factory default is VO1, VO2. SW2 SW3 IO1 VO1 IO2 VO2 [Image 28. Factory default setting for analog output terminal (SW2, 3 switch)] [When voltage is selected] Select the appropriate terminal block by selecting the switch (SW2, SW3) to VO1, VO2. Depending on the setting of the analog output mode, the following voltage ranges can be used. • Unipolar: 0.00 - 10 V • Bipolar: -10.00 - 10 V [When current is selected] Select the appropriate terminal block by selecting the switch (SW2, SW3) to IO1, IO2. If the analog output mode is set to "Current," the following current ranges can be used. • Output current: 4.00~20.00mA • External resistor connection: 249Ω | | | |
| Analog | то | Pulse train output terminal | It outputs 0.00-32.00 kHz. (Duty around 50%) Low Level: 1 V or less High Level: 12V | | | |
| output | 5G | Analog common terminal | Analog ground common terminal. | | | |

| Category | Terminal Labels | Name | Description | |
|-------------------------|--------------------|--|--|--|
| Digital power | DP | Digital power output terminal | Digital service power. DC 24 V (21.6 - 26.4 V), 150 mA or less Precautions: Do not connect with the CM (digital common terminal). | |
| | DG | Digital ground terminal | External 24 V common terminal. | |
| Terminal output DA2, | DA1, DC1, DB1 | Digital multifunction output relay 1 terminal (A, B terminal) (parameter DO1) | It outputs a signal or multifunction signal in other situations, including when the product protection function is activated. N.O.: AC 250 V 2 A or less, DC 30 V 3 A or less N.C.: AC 250 V 1 A or less, DC 30 V 1 A or less Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection) | |
| | DA2, DC2 | Digital multifunction output relay 2 terminal (A terminal) (parameter DO2) | N.O.: AC 250 V 2 A or less, DC 30 V 3 A or less N.C.: AC 250 V 1 A or less, DC 30 V 1 A or less Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) | |
| | DQ3, EG | Digital multifunction open collector output terminal (parameter DO3) | It selects and outputs one of the multifunction output signals. | |

Note

- Ensure that the total cable length does not exceed 50 m.
- Ensure that the length of any safety-related wiring does not exceed 30 m.
- Ensure that the wiring length when using Smart Operator does not exceed 3 m. There may be a signal error if the wiring length exceeds 3 m.
- Use ferrite material to block electromagnetic waves emitted from analog and digital signals.
- Be sure to apply the cable ties no closer than 15 cm from the inverter when using cables with cable ties. This provides sufficient access to fully close the front cover.

2.2.5 Step 5 PNP/ NPN Mode Selection

The product supports both NPN (Sink) and PNP (Source) modes for sequence inputs at the terminal. Select an appropriate mode to suit requirements using the NPN/PNP selection switch (SW1) on the control board. The NPN/PNP selection switch (SW1) is set to NPN mode when shipped from the factory. Refer to the following information for detailed applications.

NPN mode (Sink)

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Select NPN using the PNP/NPN selection switch (SW1). The CM terminal is an input signal common terminal, and DP/DG is an internal power supply terminal.

If you are using an external 24 V source, connect the - terminal of the external power supply to the DI1-DI8 terminals, and connect the + terminal to the CM terminal.



[Image 29. NPN mode]

PNP mode (Source)

Select PNP using the PNP/NPN selection switch (SW1). The CM terminal is an input signal common terminal, and DP/DG is an internal power supply terminal.

If you are using the internal power supply in PNP mode, connect the external circuit to DI and DP.



[Image 30. PNP mode (internal power)]

If you are using the PNP mode with an external power supply, connect the external circuit to DI and CM, and connect the (-) terminal of the external power supply to CM.



[Image 31. PNP mode (external power)]

2.2.6 Step 6 Enabling and Disabling EMC filter and Varistor (VAR) Ground

The EMC filter and varistor (VAR) ground of the product can be enabled or disabled. EMC filter and VAR ground feature are set to On by factory default. The use of an EMC filter may increase leakage current at the expense of reducing airborne noise generated by the product. Use an EMC filter and VAR ground if a symmetrical ground scheme is used. Refer to the EMC filter and VAR ground conditions table below if you are using any other asymmetrical ground power, such as corner ground, midpoint ground, or non-ground power.

| Model name LSLV□□□□ | Symmetrical ground power | Corner ground power, midpoint ground power | Non-ground power |
|------------------------|--------------------------|--|--------------------|
| 0004S300-2 | Enable EMC filter | Disable EMC filter | Disable EMC filter |
| ~0220S300-2 | Enable VAR ground | Disable VAR ground | Disable VAR ground |
| 0300S300-2 | Enable EMC filter | Disable EMC filter | Disable EMC filter |
| ~0750S300-2 | Enable VAR ground | Enable VAR ground | Disable VAR ground |
| 0004S300-4 | Enable EMC filter | Disable EMC filter | Disable EMC filter |
| ~0370S300-4 | Enable VAR ground | Disable VAR ground | Disable VAR ground |
| 0450S300-4 | Enable EMC filter | Disable EMC filter | Disable EMC filter |
| ~2200S300-4 | Enable VAR ground | Enable VAR ground | Disable VAR ground |

Table 5. EMC filters and VAR ground conditions

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Table 6. Ground Power Structure

| | Ground power | | | | |
|--------------------------------|-------------------------|-----------------------------|--|--|--|
| Symmetrical ground power | $PE^{PE} = \frac{1}{2}$ | Corner ground power | R(L1) R(L1) S(L2) T(L3) PE | | |
| Non-ground power | R(L1) | Midpoint ground power | R(L1) PE S(L2) T(L3) | | |
| LSELECTRIC 47 | | | | | |

Enabling and disabling the EMC filter and VAR ground varies depending on the inverter capacity. Refer to the following description of inverter capacity.

200 V level 0.4 - 22 kW / 400 V level 0.4 - 37 kW

The EMC filter and VAR ground terminal are located on the terminal block in models with corresponding capacities. One screw is used to enable and disable the EMC filter and VAR ground. Therefore, the EMC filter and the VAR ground cannot be disabled separately. If you are enabling the EMC filter and VAR ground, install the screw in the upper hole, and if you are disabling the EMC filter and VAR ground, install the screw in the lower hole, as shown in the below illustration.



[Image 32. 200 V level 0.4 - 22 kW / 400 V level 0.4 - 37 kW model EMC filter, VAR ground]

200 V level 30 - 75 kW / 400 V level 45 - 220 kW

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The EMC filter and VAR ground terminal are located on the upper-left side of the inverter, not on the terminal block in models with corresponding capacities. Each screw is used to enable and disable the EMC filter and VAR ground. Accordingly, the EMC filter and VAR ground may be fixed with screws or removed, as shown in the following illustration. When the EMC filter or VAR grounding screw is tightened, the EMC filter or VAR grounding is enabled, and when the screw is removed, the EMC filter or VAR ground will be disabled.



[Image 33. 200 V level 30 - 75 kW / 400 V level 45 - 220 kW model EMC filter, VAR ground]

2.2.7 Step 7 Reassembling the Wiring Bracket and the Front Cover

After completing the wiring and basic configurations, reassemble the wiring bracket and the front cover. Note that the assembly procedure may vary according to the product group or frame size of the product.

2.3 Post-Installation Checklist

After completing the installation, check the items in the following table to make sure that the inverter has been safely and correctly installed.

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| Situation | Details | Ref. | Check |
|-------------------------|--|--------------|-------|
| Installation | Is the installation location appropriate? | p.13 | |
| location/I/O voltage | Is the inverter's rated output sufficient to supply the equipment? (Derating is applied in specific conditions.) | <u>p.723</u> | |
| | Is a circuit breaker installed on the input side of the inverter? | <u>p.21</u> | |
| | Is the circuit breaker correctly rated? | <u>p.744</u> | |
| | Are the power source cables correctly connected to the input terminals of the inverter? (Caution: connecting the power source to the U/V/W terminals may damage the inverter.) | <u>p.29</u> | |
| | Are the motor output cables connected in the correct phase order? (Caution: Motors will rotate in the reverse direction if the phase cables are not wired in the correct order.) | <u>p.29</u> | |
| Power Terminal | Are the cables used in the power terminal connections correctly rated? | <u>p.16</u> | |
| Wiring | Is the inverter grounded correctly? | p.28 | |
| winig | Are the power terminal screws and the ground terminal screws tightened to their specified torques? | <u>p.29</u> | |
| | Are the overload protection circuits installed correctly on the motors (if multiple motors are being run using one inverter)? | - | |
| | Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)? | <u>p.21</u> | |
| | Are advanced-phase capacitors, surge protection, and electromagnetic interference filters installed correctly? (These devices MUST not be installed on the output side of the inverter.) | <u>p.36</u> | |

| Situation | Details | Ref. | Check |
|----------------------------|---|--------------|-------|
| | Are shielded twisted pair (STP) cables used for control terminal wiring? | - | |
| | Is the shielding of the STP wiring properly grounded? | - | |
| | If 3-wire operation is required, are the multifunction input terminals defined prior to the installation of the control wiring connections? | <u>p.37</u> | |
| | Is the shielding of the STP wiring properly grounded? | - | |
| | Are the control cables properly wired? | <u>p.37</u> | |
| | Are the control terminal screws tightened to their specified torques? | - | |
| Control Terminal Wiring | Is the total cable length of all control wiring less than 50 m? | <u>p.44</u> | |
| - | Is the total length of safety wiring less than 30 m? | <u>p.44</u> | |
| | Are there any debris or screws left inside the inverter? | <u>p.25</u> | |
| | Are any cables contacting adjacent terminals, creating a potential short circuit risk? | - | |
| | Are the control terminal connections separated from the power terminal connections? | - | |
| | Have the capacitors been replaced if they have been in use for more than 2 years? | <u>p.427</u> | |
| | Has a fuse been installed for the power source? | p.744 | |
| | Are the connections to the motor separated from other connections? | - | |

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3 Operation Sequence and Testing

In order to maximize motor performance and operate the normal protection function, various motor information must be set. Set in the following sequence based on the motor control mode you want to use:



3.1 Setting Up Motor Rating Plate Information

Enter the information displayed on the motor rating plate. Motor rating plate information is used for motor control, protective operation, and others. Enter the motor type in MOT1 and MOT2-04 (Motor Type) and the motor capacity in MOT1 and MOT2-21 (Motor Capacity). If there is no capacity setting option for the motor, select the closest higher capacity to the motor's actual capacity. After that, enter the remaining rating plate information. For items that are not entered, apply default values based on motor capacity.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial value | Unit |
|---------------|------|--------------------|-----------|--------------------|---------------|------------------|------|
| MOT1, MOT2 | 04 | Motor Type | 0 | Induction Motor | 0~1 | 0 | - |
| | 21 | Motor Capacity | 2 | 0.75kW | 0~27 | 3 | - |
| | 23 | Base Frequency | 60.00 | | 30.00~590.00 | 60.00 | Hz |
| | 24 | Rated Speed | 1710 | | 900~24000 | 1750 | rpm |
| | 25 | Number of Poles | 4 | | 2~100 | 4 | - |
| | 26 | Rated Current | 3.4 | | 1.0~1000 | 6.4 | Α |
| | 27 | Rated Voltage | | 0 | 0 or 180-480 | 0 | V |
| | 28 | Efficiency | | 74 | 70~100 | 80 | % |
| | 35 | No-load Current | | 1.7 | 0.5~1000.0 | 2.6 | A |

Example of motor rating plate information settings

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Details of motor rating plate information settings

| Code and Functions | Description | | | | |
|----------------------------------|---|---|--|--|--|
| | Set the type of the motor connected to motors can be selected: | the inverter. The following | | | |
| MOT1, MOT2-04 | Item | Functionality | | | |
| wotor type | 0 Induction Motor | Induction motor | | | |
| | 1 Perm Magnet Motor | Permanent magnet motor | | | |
| MOT1, MOT2-21 Motor Capacity | Set the capacity of the motor connected the motor capacity, the default value of if the value is changed. | d to the inverter. According to the related parameter changes | | | |
| MOT1, MOT2-23 Base Frequency | Enter the base frequency of the motor is the inverter's output frequency when Refer to the motor's rating plate to set t | rating plate. A base frequency running at its rated voltage. his parameter value. | | | |
| MOT1, MOT2-24 Rated Speed | Enter the rated speed of the motor ratir | ng plate. | | | |
| MOT1, MOT2-25 Number of Poles | Enter the number of poles on the motor rating plate. | | | | |
| MOT1, MOT2-26 Rated Current | Enter the rated current of the motor rating plate. | | | | |
| | Enter the rated voltage of the motor rating plate. Set the motor voltage if the input power and the motor voltage specifications differ. | | | | |
| MOT1 MOT2 27 | • The output voltage can be maintained at the set value if the set voltage is lower than the input power supply voltage above the base frequency. | | | | |
| Rated Voltage | • A voltage smaller than the input power supply voltage is output if the set voltage is higher than the input power supply voltage above the base frequency. | | | | |
| | d by the input power voltage e is set to 0 above the base | | | | |
| MOT1, MOT2-28 Efficiency | Enter the efficiency of the motor rating plate. | | | | |
| MOT1, MOT2-35 No-load Current | Enter the no-load current of the motor rating plate. Only induction motors are affected by this, and if it is not specified on the rating plate, use the default value that changes when the motor capacity is set or enter the value displayed on the Smart Operator's initial screen when operating at the base frequency with no load. | | | | |

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3.2 Setting Control and Operation Method

Select the appropriate operating mode for your system.

Example of setting control and operation method

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial value | Unit |
|-------|------|-------------------|-----------|-----|---------------|------------------|------|
| MOT1, | 05 | Control Mode | 0 | V/F | 0~4 | 0 | - |
| MOT2 | 08 | Torque Control En | 0 | No | 0~1 | 0 | - |

Details of setting the control and operation method

| Code and Functions | Description | | | | | |
|-------------------------------------|-------------|---------------------|---|--|--|--|
| | Set | the motor cor | ntrol method. | | | |
| | | ltem | Functionality | | | |
| | 0 V/F | | Operates in a V/F control mode (open loop control where voltage size is determined by operating frequency). Refer to 6.1 Induction Motor V/F Control for details. | | | |
| MOT1, MOT2-05 Control Mode | 1 | Slip Comp. | It is a control mode that compensates for slip during induction motor V/F control operation without position/ speed sensors. It can only be set when the induction motor type is selected. Refer to <u>3.4 Auto Tuning</u> and perform tuning in advance. Refer to <u>6.1.4 Slip Compensation Operation</u> for details. | | | |
| | 2 | V/F PG | This is a control mode that compensates for slip during induction motor V/F control operation with position/speed sensors. It can only be set when the induction motor type is selected. | | | |
| | 3 | Sensorless | Operates in vector control mode without position/speed sensors. Refer to <u>3.4 Auto Tuning</u> and perform tuning in advance. As there is no position/speed sensor, the control may be unstable at low speeds (less than 1/120 of the base frequency for induction motors and 1/20 of the base frequency for synchronous motors). | | | |
| | 4 | Vector ¹ | Operates in vector control mode with position/speed sensors. Refer to <u>3.4 Auto Tuning</u> and perform tuning in advance. | | | |

¹ Configurable only when MOT1-05 is selected.

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| Code and Functions | Description | | | | | |
|---------------------------------|--------------------|--|--|--|--|--|
| | Set (Ser Com | Set the operation method when operating in vector control mode (Sensorless, Vector). It is disabled when V/F control mode (V/F, Slip Comp., V/F PG) is selected. | | | | |
| | | ltem | Functionality | | | |
| MOT1, | 0 | No | Set to speed control mode. The speed control function controls the motor to maintain the set speed. | | | |
| MOT2-08 Torque Control En | 1 | Yes | Perform torque control. The torque control function controls the motor to maintain the torque value set. When the load torque is balanced with the output torque, the rotational speed of the motor remains constant. Therefore, during torque control, the rotational speed of the motor is determined by the magnitude and direction of the output torque, as well as the load torque. The torque control can only be selected in the sensorless or vector control modes for induction motors. | | | |

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3.3 Setting the Encoder

It is a method used to control the rotor by measuring the position/speed of the rotor with a position/speed sensor. Once the encoder has been wired according to the manual for the encoder option card, set the encoder parameters.

| now to set encouers | How | to | set | encoders |
|---------------------|-----|----|-----|----------|
|---------------------|-----|----|-----|----------|

| Group | Code | LCD Display | Set Value | | Setting Range | Initial value | Unit |
|--------------------|------|--------------------|-----------|-------|---------------|------------------|------|
| | 02 | Enc Monitor[Hz] | | - | - | - | Hz |
| | 10 | Auto Elving Stort | 0 | No | 0~1 | 1 | - |
| ENC 12 13 16 | | Auto Flying Start | 1 | Yes | 0~1 | I | |
| | 11 | Enc Output Phase | 0 | (A+B) | 0~1 | 0 | - |
| | 12 | Resolution/Pulse | 1024 | | 10~4096 | 1024 | - |
| | 13 | Enc LPF Gain | 3 | | 0~10000 | 3 | msec |
| | 16 | Wire Check Trip En | 1 | Yes | 0~1 | 0 | - |
| | 17 | Wire Check Time | 10 | | 1~100 | 10 | sec |
| | 18 | Enc Pulse Chk Time | | 1000 | 500~5000 | 1000 | msec |

Details of encoder settings

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| Code and Functions | Description | | | | |
|---|---|---|---|--|--|
| ENC-2 Enc Monitor[Hz], ENC-3 Enc Monitor[rpm] | The disp | encoder outp layed in Hz o | out is converted into motor rotation speed and or rpm. | | |
| ENC-10 Auto Flying Start | If set to 1 (Yes), the motor will start from the current motor speed without going through the starting sequence (dwell, brake, Start Mode, etc.) if the motor is rotating when the operation starts, and it will accelerate or decelerate to the target frequency. If set to 0 (No), the motor will start from zero speed and follow the starting sequence. | | | | |
| | Set the direction of the encoder output pulse. | | | | |
| ENC-11 Enc | ltem | | Functionality | | |
| Output Phase | 0 | (A + B) | Forward Operation | | |
| | 1 | -(A + B) | Reverse Operation | | |
| ENC-12 Resolution/Pulse | Ente | er the numbe | r of output pulses per revolution of the encoder. | | |
| ENC-13 Enc LPF Gain | Set AIN- | the time cons ·04, 19, 34 (A | stant of the encoder pulse low-pass filter. Refer to N1-3 LPF Gain) in 8.2.4 Filter . | | |
| ENC-16 Wire Check Trip En ENC-17 Wire Check Time | Che lf yo | Check the wiring of the line-drive type encoder. If you are using a line-drive encoder, set ENC-16 to 1 (yes). | | | |
| ENC-18 Enc Pulse Chk Time | It is 0 Hz is re | the minimum z. When there garded as 0 | pulse period that determines the encoder speed as e is no pulse signal for more than this time period, it Hz. | | |

3.4 Auto Tuning

You can measure motor parameters automatically. Additionally, you can test the operation of the encoder if the encoder option card is connected to the inverter's main body. Measured motor parameters are used for auto torque boost, sensorless vector control, and vector control, among others. The parameters required for control mode are tuned if 1 (Auto Tuning) is selected in BAS-20 (Auto Tuning). After applying power to the inverter, the first auto tuning performs inverter tuning, which is a longer process (up to about 20 minutes). Refer to <u>3.1 Setting Up Motor Rating Plate Information</u> and check the item before performing this function.

Example of auto tuning settings

| Group | Code | LCD Display | Set Value | | Setting Range | Initial value | Unit |
|-------|------|-------------|-----------|----------------|---------------|------------------|------|
| | | | 0 | None | | | |
| BAS | 20 | Auto Tuning | 1 | Auto Tuning | 0~1 | 0 | - |

① Caution

- Ensure that auto tuning is performed after the motor has stopped.
- Before you run auto tuning, check the motor rating pole number, rated slip, rated current, rated voltage, and efficiency on the motor's rating plate and enter the data. Default values will be used for items not entered.

Auto tuning results – Induction motor

| Group | Code | LCD Display | Result value | | | | |
|---------------------------------|------|------------------------|--|--|--|--|--|
| | 35 | No-load Current | | | | | |
| 36 MOT1, 37 MOT2 38 39 | 36 | Stator Resistance | | | | | |
| | 37 | Leakage Inductance | The auto tuning result value is displayed. | | | | |
| | 38 | Stator Inductance | | | | | |
| | 39 | Rotor TimeConstance | | | | | |

Auto tuning results – Synchronous motor

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| Group | Code | LCD Display | Result value | | | |
|---------------------|------|-------------------|---|--|--|--|
| | 36 | Stator Resistance | | | | |
| MOT1, 40 MOT2 42 | 40 | q-axis Inductance | The oute tuning result value is displayed | | | |
| | 41 | d-axis Inductance | - The auto turning result value is displayed. | | | |
| | 42 | PM Rotor Flux | | | | |

Auto Tuning Parameter Setting Details

| Code and Functions | | Description | | | | |
|-----------------------|----------------|------------------|---|--|--|--|
| PAS 20 | lf you 20 m | If you press the | | | | |
| | | ltem | Functionality | | | |
| | 0 | None | Auto tuning is not enabled. If auto tuning is enabled, this will indicate that auto tuning is complete. | | | |
| Auto Tuning | 1 | Auto Tuning | Start auto tuning to measure all required parameters. As the motor is not rotating while the parameters are measured, the parameters are not affected when the load is connected to the motor spindle. However, when measuring parameters, do not rotate the motor spindle on the load side. | | | |

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3.5 Basic No-Load Test

After installing the product and checking the checklist, follow the instructions below to test the inverter.

Refer to <u>4.3 How to Use the Smart Operator</u> and <u>5 Learning Basic Functions</u> for basic information regarding parameter changes, such as setting the operation command source, setting the target frequency, and setting the acceleration/ deceleration time.

- **1** Activate the power supply for the inverter. Check if the LED status indicator is illuminated.
- 2 Select the command source. For command source settings, see <u>5.2 Operation</u> <u>Command Settings</u>.
 - The command source can be easily set with the Easy Start On function when using the Smart Operator. For the Easy Start On function, see <u>12.1.2 Parameter</u> Easy Start (Easy Start On).
- 3 Set a frequency reference, and then check the following:
 - Whether the frequency value changes if the voltage input value is changed when the frequency is set to one of AI1/2/3 and when the analog voltage/current input terminal setting switch is selected as voltage
 - Whether the frequency value changes if the current input value is changed when the frequency is set to one of AI1/2/3 and when the analog voltage/current input terminal setting switch is selected as current
- **4** Set the acceleration (DRV-05 Acc Time) and deceleration (DRV-06 Dec Time) times.
- **5** Start the motor and check the following:
 - Ensure that the motor rotates in the correct direction. If the motor is rotating in the reverse direction, refer to the following details:
 - Ensure that the motor accelerates and decelerates according to the set times and that the motor speed reaches the frequency reference.

Note

If the forward command (Fx) is on, the motor should rotate counterclockwise when viewed from the load side of the motor. If the motor rotates in the reverse direction, switch the cables at the U and V terminals.

Remarque

Si la commande avant (Fx) est activée, le moteur doit tourner dans le sens anti-horaire si on le regarde côté charge du moteur. Si le moteur tourne dans le sens inverse, inverser les câbles aux bornes U et V.

Check the motor's rotational direction

- 1 Set DRV-10 (1st Command Source) of the drive group (DRV) to 0 (Keypad) with the Smart Operator.
- 2 Set DRV-01 (Command Frequency) of the drive group (DRV) to an arbitrary target frequency with the Smart Operator.
- **3** Press the FWD key of the Smart Operator. The forward operation will start.
- **4** Observe that the motor's axis rotates counterclockwise (forward direction), as shown in the following illustration.



[Image 1. Check motor's rotational direction]

① Caution

- Check the parameter settings before running the inverter. Parameter settings may have to be adjusted depending on the load.
- Do not supply the inverter with an input voltage that exceeds the rated voltage of the equipment. This may cause damage to the inverter.
- Make sure that the motor does not exceed its rated operating range. Inverters can easily increase the rotation speed of motors, so you should check the motor's rated operating range before maximizing the rotation speed.

4 Learning to Perform Basic Operations

This chapter describes the Smart Operator's composition and operation method, as well as the function groups used for inverter operation and the basic operation method using the Smart Operator. Before proceeding with actual use, familiarize yourself with the various functions of the inverter, such as setting, changing frequency or input voltage, and issuing operating instructions, in order to learn the correct basic operating method.

4.1 Description of the Inverter Status Indicator LED

Refer to the following table for a detailed description of the functions of the inverter's status indicator LED. For a description of the Smart Operator's status LEDs, refer to **4.2.2 Description of the Status Indicator LED**.

Note

The location of the inverter status LEDs may vary according to the product family. Refer to **<u>1.2 Check the Part Names</u>** for details.



[Image 1. Inverter status LED]

Table 1. Inverter body LED

| Classification | Name | Inverter status | Color | Display method |
|----------------|-------|---------------------------------------|-------|------------------------------|
| Power display | POWER | Turning on the Inverter | Green | Always on |
| Operation | | Normal | Green | 1.4-second interval flashing |
| status display | RUN | Trip | Red | 0.2-second interval flashing |
| | | · · · · · · · · · · · · · · · · · · · | | |

4.2 Description of the Smart Operator's Composition and Functions

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Refer to the following illustration and table to identify the part names and functions of the Smart Operator.



[Image 2. Front part of the Smart Operator] [Image 3. Rear part of the Smart Operator]

| Table 2. | Composition | of the Smar | t Operator's | parts |
|----------|-------------|-------------|--------------|-------|
|----------|-------------|-------------|--------------|-------|

| No. | Name | Description |
|-----|---|--|
| 0 | LCD screen | You can check the function settings and operation status. Refer to <u>4.2.3 LCD Screen Composition</u> for details. |
| 0 | Control panel (input key) and status display lamp | You can set various inverter functions, give operation commands by changing the frequency or input voltage, and determine the current situation through the status display lamp. Refer to <u>4.2.1 Description of Operation Key Functions</u> and <u>4.2.3 LCD Screen Composition</u> for details. |
| 6 | USB Port | You can use the Smart Operator as a USB memory device by connecting it to a computer. |
| 4 | RJ45 communication port | The Smart Operator is connected to the main body of the inverter through this port. |
| 6 | Battery cover | This is the Smart Operator's battery cover. Battery type: CR2032 One battery is provided with your purchase. For details on installing (replacing) the battery, refer to <u>Installing</u> (replacing) the Smart Operator battery. |

Note

Installing (replacing) the Smart Operator battery

When the Smart Operator is shipped, the battery (CR2032) is already installed. Please follow the steps below when installing (replacing) the battery for the first time or when the battery is low and needs to be replaced.

- 1 Use the snap hook to separate the Smart Operator from the product. Be careful not to pull too hard since there is a communication line connecting the Smart Operator to the product.
- **2** Using a flathead (-) screwdriver or coin, remove the battery cover by turning it in the opening direction.



[Image 4. Battery cover removal]

- **3** When using the battery for the first time or using the RTC option, remove the insulation strip attached to the battery.
 - If the battery insulation strip is not removed and power is supplied to the inverter, the **Date Time Reset** message will be displayed.



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Note

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4 Remove the old battery and install the new one in the correct orientation when replacing an old battery.



[Image 6. Battery replacement]

5 Using a flathead (-) screwdriver or coin, close the battery cover by turning it in the closing direction.



[Image 7. Battery cover combination]

6 In order to install the Smart Operator, raise it to the installation position and press the snap hook until it clicks into place.

4.2.1 Description of Operation Key Functions

Refer to the following table for descriptions of the functions for each key.

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Table 3. Smart Operator operation key

| Classification | Display | Function name | Functionality |
|----------------|------------|------------------------------------|---|
| | ESC | Cancel (ESC) key | In editing mode, if you press the Cancel ESC key before pressing the Program key, the previously saved data will be retained. Press to navigate to the first code of a group when moving codes within a group. |
| | MULTI | Multifunction (MULTI) key | Local/Remote, Keypad Jog, and Favorite codes can be registered depending on the settings. Refer to <u>12.1.1 Setting Mode</u> <u>Parameters</u> for detailed setting method. |
| | MODE | MODE key | Displays the Menu screen. |
| Кеу | ENTER | Program (ENTER) key | By pressing once in the parameter code that can be set, the parameter code enters an editing state, and by pressing again after editing, the modified data will be saved. |
| | | Up arrow key/ Down arrow key | Used when moving codes or editing data values. |
| | | Left arrow key/ Right arrow key | Navigates between groups. Moves the cursor in editing mode. |
| | REV | Reverse operation (REV) key | Operates in the reverse direction. |
| | STOP/RESET | STOP key | Stops the inverter or resets the trip. |
| | FWD | Forward operation (FWD) key | Operates in the forward direction. |

4.2.2 Description of the Status Indicator LED

Refer to the following table for a detailed description of the Smart Operator's status indicator LED. For a description of the status indicator LED located on the front of the inverter body, refer to **4.1 Description of the Inverter Status Indicator LED**.

| Classification | Name | Inverter status | Color | Display method |
|--|-------------------------|----------------------|--------|------------------------------|
| | Status LED | Trip | Red | 0.5-second interval flashing |
| Inverter | | Warning | Yellow | 0.5-second interval flashing |
| status display | | In operation | Green | Always on |
| | | Tuning | White | 0.5-second interval flashing |
| Operation direction status display | Forward/ reverse LED | Accelerating | Green | 0.5-second interval flashing |
| | | Decelerating | Green | 0.5-second interval flashing |
| | | At constant speed | Green | Always on |
| | | Operation stopped. | - | Off |

Table 4. Smart Operator LED

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4.2.3 LCD Screen Composition

The following illustration shows the composition of the Smart Operator screen. The Smart Operator displays Monitor mode as the initial screen when it is turned on.

The screen consists of upper/lower status bars and detailed items between them. Depending on the mode (menu), the composition of the screen may differ. Refer to **4.2.4 Menu (mode) and Screen** for details.

Note

The Smart Operator displays Monitor mode as the initial screen when it is turned on. Depending on the mode (menu), the composition of the screen may differ. Refer to **4.2.4 Menu (mode) and Screen** for details about the screen in Monitor mode.



4.2.4 Menu (mode) and Screen

The S300 series inverter consists of six modes, as follows: Each mode has function items appropriate for its characteristics, and in the case of parameter mode, functions necessary for the operation of the inverter are displayed as group units.

- Monitor: Monitor mode
- Parameter: Parameter configuration mode
- Favorite: Favorite mode
- Fault: Trip mode
- · Setting: Configuration mode
- Wizard: Wizard mode (Easy Start)

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the desired mode using the direction keys ($\boxed{2}/\boxed{2}/\cancel{2}$), and press the A key to navigate to the corresponding screen.



[Image 9. Menu screen]

4.2.4.1 Monitor mode

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In Monitor mode, information about the inverter's operation is displayed. You can set the frequency, display the operating frequency, monitor the output current and voltage, etc.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Monitor** mode using the direction keys ($(\bigcirc /(\bigcirc /(\bigcirc))$), and press the (A) key to navigate to the Monitor mode screen.

The Monitor mode is composed of the following:



[Image 10. Monitor mode screen]

Table 5. Monitor mode screen composition

| No. | Screen name | Display | Description |
|-----|--------------|----------|------------------------|
| | | MONITOR | Monitor mode |
| | | PARAM | Parameter mode |
| 0 | Mode display | PARAM E | Parameter editing mode |
| | | FAVORITE | Favorite mode |
| | | FAVOR.E | Favorite editing mode |
| | | ALERT | Alert mode |
| | | HISTORY | Alert history mode |
| | | SETTING | Configuration mode |
| | | WIZARD | Wizard mode |

| No. | Screen name | Display | Description |
|-----|--------------------------------|-------------|-------------------------------|
| | | К | Smart Operator |
| | | T1 | Fx/Rx-1 |
| | | T2 | Fx/Rx-2 |
| | | 3W | 3-Wire |
| | Operation | R | RS-485 built-in communication |
| | source | 0 | Option |
| | | U | USB |
| | | KJ | Smart Operator jog |
| | | TJ | Terminal jog |
| | | US | User Sequence |
| | | K | Smart Operator |
| 2 | Frequency command source | A1, A2 , A3 | Analog A1, A2, A3 |
| | | Р | Pulse |
| | | UD | Up/Down |
| | | R | 485 built-in communication |
| | | U | USB |
| | | 0 | Option |
| | | US | User Sequence |
| | | X1, X2, X3 | Extension option analog |
| | | PS | Position Control |
| | | J | Jog |
| | | PI | PID |
| | | 1~15 | Multistep speed 1-15 |
| | | R | Remote Mode |
| 0 | Multifunction | L | Local Mode |
| 5 | key setting | J | Smart Operator jog |
| | | F | Favorite Register/Delete |

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| No. | Screen name | Display | Description |
|-----|---|-------------------------------|--|
| | | STOP | Stopped |
| | | FWD | Forward operation |
| | | REV | Reverse operation |
| | | TRIP | Trip |
| | | WARN | Warning |
| | | STL | Stall |
| • | Inverter | SPS | Speed search |
| 4 | operation state | OSS | S/W overcurrent suppression |
| | | OSH | H/W overcurrent suppression |
| | | TUNE | Tuning |
| | | FIRE | Fire Mode |
| | | SLP | PID Operation Sleep Mode |
| | | DC | DC Braking |
| | | KEB | KEB operation |
| 6 | Continuous monitoring display items | Frequency (default) | Refer to 12.2.2 Monitoring Item Settings for Top Status Bar. |
| 6 | Display items | MONITOR1 (default) | Monitor 1, monitor 2, monitor gauge, monitor graph display (press ()) key in Monitor mode to change monitor screen type) |
| | | V/F | V/F control mode |
| | | Slip Comp. | Slip Compensation control mode |
| 1 | Control mode | V/F PG | V/F PG control mode |
| • | uispiay | Sensorless | Sensorless Vector control mode |
| | | Vector | Sensored Vector control mode |
| 8 | | [S] | Speed control mode |
| | Operation mode | [T] | Torque control mode |
| | display | [P] | Position control mode |
| 9 | Current time display | Hour:minute | Current time |
| 0 | Control motor | MOT1 | First motor selection |
| | display | MOT2 | Second motor selection |

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4.2.4.2 Monitor mode type

You can change the monitor screen type by pressing the $(\sqrt{2})$ key in Monitor mode.

In Setting mode, you can select the items to be displayed on each monitor. In Monitor mode, you can navigate directly to Setting mode by pressing the (1) key. Refer to **12.2.1 Item Change in Monitor Display Mode** for details.

| Monitor screen type | Description |
|------------------------|--|
| | This monitor mode displays three items. |
| | MONITOR T1/K R STOP 30.00 Hz Frequency |
| | 30.00нz |
| Monitor 1 | |
| | OLOA Output Voltage |
| | Ov |
| | V/F [S] 20:14 MOT1 |
| | This monitor mode displays six items. |
| | MONITOR T1/K R STOP 30.00 Hz |
| | Frequency 30.00 _{Hz} |
| | Output Current 0.0 A |
| Monitor 2 | Uutput Voltage 0v |
| | AC loput Volt 226. |
| | |
| | |
| | V/F [S] 20:19 MOT1 |
| Monitor gauge | This monitor mode is displayed as a gauge. |
| | MONITOR K /K R FWD 30.00 Hz Frequency |
| | |
| | 60.00 |
| | 30.00нz |
| | |

Table 6. Monitor mode type

| type | Description |
|--------------|--|
| T Y th | This monitor mode is displayed as a graph. You can set the graph display time in Setting mode as well as using the C/C key on the Smart Operator. MONITOR K /K R FWD 30.00 Hz Frequency 30.00 (min 0.00, max 60.00) 15.00 5 Min |

4.2.4.3 Parameter mode

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You can set the functions necessary for operation.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Parameter** mode using the direction key ($(\bigcirc /(\bigcirc /(\bigcirc)))$), and press the key to navigate to the Parameter mode screen.

Parameter mode is composed of the following:

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|---|
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| |
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| |
| |
| - |

[Image 11. Parameter mode screen]

| Table 7. | Parameter | mode | screen | composition |
|----------|-----------|------|--------|-------------|
|----------|-----------|------|--------|-------------|

| No. | Classification | Description |
|-----|---------------------------------------|---|
| 0 | Parameter group information | Displays the parameter group name (refer to Description of the Parameter configuration mode) |
| 2 | Parameter group details | Displays selected parameter sub-details (code number + code name + parameter value) |
| 6 | Parameter property (changed value) | Displayed when default settings are changed to other values (refer to <u>4.4 Parameter Setting</u>) |
| 4 | Parameter property (read only) | Displayed when the item is a read-only property |

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Description of the Parameter configuration mode

The Parameter configuration mode is composed of the following function groups:

 Table 8. Parameter function group

| Group name | Display | Description |
|--------------------------------------|---------|--|
| Drive Group | DRV | Configures basic parameters for inverter operation, such as target frequency and acceleration/ deceleration time. You can check information regarding jog operation settings, inverter temperature, and cooling fan information. |
| Basic function group | BAS | Configures the parameters related to DC braking, acceleration/deceleration pattern, multistep speed frequency, etc. |
| First motor group | MOT1 | Configures the basic functions related to the first motor. |
| First motor V/F control group | VF1 | Configures functions related to the first motor V/F control. |
| First motor vector control group | VEC1 | Configures functions related to the first motor vector control. |
| Second motor group | MOT2 | Configures the basic functions related to the second motor. Refer to 7.16 Second Motor Operation . |
| Second motor V/F control group | VF2 | Configures the second motor V/F control function. Refer to 7.16 Second Motor Operation . |
| Second motor vector control group | VEC2 | Configures the second motor vector control function. Refer to 7.16 Second Motor Operation . |
| Advanced function group | ADV | Configures functions related to dwell operation, frequency jump, and up/down operation. |
| Group name | Display | Description |
|-------------------------------------|--------------------------------|--|
| Application function group | APP | Configures functions related to application function activations, speed search, and kinetic energy buffering motion (KEB). |
| Input terminal function group | DIN | Configures the function of the multifunction digital input terminal. |
| Analog input terminal group | AIN | Configures the functions of the analog input terminal. |
| Output terminal group | OUT | Configures output terminal-related functions, including digital multifunctional outputs and analog outputs. |
| Process PID group | PPID | Configures functions related to PID control. |
| Protection function group | PRT | Configures motor and inverter protection functions. |
| Diagnostic function group | DIAG | Configures functions related to inverter diagnosis. |
| Built-in communication group | INTC | Configures functions related to built-in slave communication. |
| Built-in master communication group | INTM | Configures functions related to built-in master communication. (Required when using the user sequence function.) |
| USB communication group | USBC | Configures functions related to USB communication. |
| Virtual multifunction input group | VIRT | Configures functions related to the virtual multifunction input group. |
| Encoder group | ENC | Configures functions related to the encoder. (Visible when the encoder option is installed.) |
| External PID group | EPI1 EPI2 | Configures functions related to external PID control. |
| Position control group | POS1 POS2 | Configures functions related to position control. |
| User Sequence group | US USL USV USP USM | Configures functions related to user sequence. |

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4.2.4.4 Favorite mode

A user may group frequently used parameters and edit the parameter values of selected macro functions. Refer to <u>4.5 Favorites Settings</u> for details.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Favorite** mode using the direction key ($(\bigcirc/\bigcirc)/(\bigcirc/(\bigcirc))$), and press the key to navigate to the Favorite mode screen.

The Favorite mode is composed of the following:



[Image 12. Favorite mode screen]

Table 9. Favorite mode screen composition

| No. | Classification | Description |
|-----|--------------------|--|
| | | Favorite tab information When there are no parameters registered in Favorite , only the MACRO-BAS tab appears on the initial screen. |
| 0 | Tab information | FAVORITE T1/K R STOP 0.00 Hz MACRO-BAS 00. Jump Code 01. [DRV] Command Frequency 0.00 Hz 02. [DRV] Acc Time 20.00 sec 03. [DRV] Dec Time 30.00 sec |
| 0 | Jump Code | Enter the code number to go directly to the desired item (refer to 4.3.3 Navigating Directly to Different Codes (Jump Codes)) |
| | | Parameter items registered in favorites |
| | Registration | Code number + [group name] code name + parameter value |
| 3 | information | In Favorites mode, a parameter value may be modified without having to navigate to the corresponding parameter location (refer to <u>4.5 Favorites Settings</u>) |
| 70 | | |

4.2.4.5 Trip mode

When a trip occurs during operation, the type of trip, frequency of operation, current, and voltage at the time of the trip will be displayed. It is also possible to monitor the types of trips that have occurred in the past. The trip data will not be displayed if no trip has been made and there is no past trip history. Refer to <u>12.3 Trip Status</u> <u>Monitoring</u> and <u>14.1 Trip and Warning</u> for details.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Trip** mode using the direction key ($(\bigcirc /(\bigcirc /(\bigcirc)))$), and press the A key to navigate to the Trip mode screen.

Trip mode is composed of the following:







[Image 14. Screen when one trip occurred]



[Image 15. Screen when two or more trips occurred]

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Table 10. Trip mode screen composition

| No. | Classification | Description |
|-----|---|--|
| 0 | Trip type/history information tab | The information is displayed according to the type of trip or by the history tab, depending on the situation (Fault-1: last occurred trip) |
| 2 | Fault trip informationDisplays the currently occurring trip type | |
| 6 | Trip details | Displays information on output frequency, current, operation status, etc. at the time the trip occurred |

4.2.4.6 Configuration mode

You can configure the usage environment for the inverter itself, which is not related to operation functions, including setting the Smart Operator language, selecting the monitor mode environment, displaying the type of option card installed on the inverter, initializing parameters, and copying functions. Refer to <u>12 Inverter Setting Mode</u> for details.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Setting** mode using the direction key ($(\bigcirc /(\bigcirc /(\bigcirc)))$), and press the A key to navigate to the Setting mode screen.

The Setting mode is composed of the following:



[Image 16. Setting mode screen]

Table 11. Setting mode screen composition

| No. | Classification | Description |
|-----|-----------------|--|
| 0 | Tab information | Separates setting items into settings related to operation or Smart Operator operation and displays them in tabs |
| 2 | Jump Code | Enter the code number to go directly to the desired item (refer to <u>4.3.3 Navigating Directly to Different</u> <u>Codes (Jump Codes)</u>) |
| 3 | Sub-details | Displays setting tab sub-details |

4.2.4.7 Wizard mode

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This mode simplifies the complex, multistep setup process for users who are not familiar with it. It is the same mode as the Easy Start On function. Refer to <u>12.1.2</u> <u>Parameter Easy Start (Easy Start On)</u> for details.

Enter the main menu screen by pressing the $\boxed{\text{MODE}}$ key, select the **Wizard** mode using the direction keys ($(\bigcirc /(\bigcirc)/(\bigcirc)/(\bigcirc))$), and press the key to navigate to the Wizard mode screen.

The Wizard mode is composed as follows:



[Image 17. Wizard mode screen]

| Table 12 | . Wizard | mode s | creen | composition |
|----------|----------|--------|-------|-------------|
|----------|----------|--------|-------|-------------|

| No. | Classification | Description |
|-----|----------------|---|
| 0 | Title | Displays the Wizard mode title |
| 2 | Run item | Runs Wizard (refer to <u>12.1.2 Parameter Easy Start</u> (Easy Start On) |

4.3 How to Use the Smart Operator

To use the product's functions, it is necessary to select the group and code to which the function belongs with the Smart Operator and set the parameter value for each function. Refer to **<u>13 Table of Functions</u>** to find the functions you need. Check the group and code to which the function belongs and the set value (parameter) range for the function. Select the group and code using the Smart Operator, and set the parameter value according to the description below.

4.3.1 Navigating to the Main Menu (Mode) Screen

Pressing the MODE key will navigate to the main menu screen, regardless of where the screen is currently located.

Press the direction key $(\langle \rangle / \langle \rangle / \langle \rangle)$ of the Smart Operator to navigate to and select the desired mode. Enter the corresponding mode by pressing the (A) key.



[Image 18. Menu screen]

4.3.2 Navigating to Code (Function Item)

On the menu screen, press the direction key $(\bigcirc / \bigcirc / \bigcirc / \bigcirc / \bigcirc)$ to navigate to the desired mode, and press the A key to enter it.

| PARA | И К∕ | K R S | TOP 0 | .00 Hz |
|---------|--------|-------|-------|--------|
| IDRV | BAS | MOT1 | CON1 | ADV > |
| 00. Jur | np Coo | de | | |
| | | | | 9 Code |
| 01. Co | mmand | Frequ | ency | |
| | | | 0.0 | 00Hz |
| 05. Ac | c Time | | | |
| | | | 20.0 | 00 sec |
| 06. Dec | c Time | | | |
| | | | 30.0 | 00 sec |

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[Image 19. Parameter configuration group screen]

| SETTING T1/K | R STOP 0.00 Hz |
|-------------------|----------------|
| Drive Set | Operator Set |
| 00. Jump Code | |
| | 20 Code |
| 10. Drive S/W Ve | эг. |
| 0 | 1.00 |
| 19. Mori Commaria | d Edit |
| | Yes |
| 20. Anytime Para | ameter |
| | Frequency |

[Image 20. Drive Set tab screen in Setting mode]

| MONITOR | T1/K | R ST | OP | 30.00 Hz |
|-----------|--------------|--------|------|----------|
| Frequence | зу | | | |
| | | 3 | 30.1 | 00нz |
| Output Cu | urrent | t | | |
| | | | C |).0_ |
| Output Vo | oltage | | | |
| | | | | Οv |
| | • | | | |
| V/F | <u>[S] 2</u> | 0:14 | MO | T1 |
| [Image 2 | 1. Mon | itor m | ode | screen] |

[Select a parameter group or information tab]

You can select the desired parameter group or information tab by pressing the $\langle \langle I \rangle \rangle$ key.

Preparation

Navigating to function items]

- You can navigate to the desired function item by pressing the A/
- You can navigate to the first code (jump code) by pressing the ESC key.

4.3.3 Navigating Directly to Different Codes (Jump Codes)

There is a jump code input item that can be used to navigate to the code of each group in the Parameter mode and Setting mode groups. You can navigate (jump) directly to the desired code by using the Jump Code, which is the first code of a specific group in parameter mode. It allows you to move faster than pressing the \bigcirc/\bigcirc key when the code number is large. An example of navigating to code number 15 of the drive group (DRV) is shown in the following illustration.

| PARA | м К/ | K 🖪 S | TOP 0 | .00 Hz |
|--------|--------|-------|-------------|--------|
| I DRV | BAS | MOT1 | CON1 | ADV > |
| 00. Ju | mp Coo | de | | 9 Code |
| 01. Co | mmarıd | Frequ | ency 0.(| 00Hz |
| 05. Ac | c Time | ĺ. | 20.0 | 00 sec |
| 06. De | c Time | | 30.0 |)0 sec |

[Image 22. Jump Code selection screen]

[Group Selection]

- When in parameter configuration mode, press the (//) key to navigate to the drive group (DRV) and select code number 00 (pressing the <u>ESC</u>) key on a specific item navigates to code number 00).
- Press the (key.

[Image 23. Jump Code No. input screen]

[Example of entering code number 15]

- Enter the second digit (1): Press the ((/)) key from the first digit to navigate to the second digit input position, then press the
 /<> key to enter 1.
- Press the 🛃 key.

[Note]

- Current input position: A round dot symbol appears below the number.
- If the second se

4.4 Parameter Setting

You can directly change the parameters required for operation.

On the Parameter configuration mode screen, select the parameter group and items to be set, then press the key to change the items. However, items marked as in the list are read-only and cannot be edited.

The Parameter configuration change screen is composed of the following.



[Image 25. Parameter item selection screen]

| Table 13. | Parameter | mode screen | composition |
|-----------|-----------|-------------|-------------|
|-----------|-----------|-------------|-------------|

| No. | Description |
|-----|--|
| 0 | Code number and code name |
| 2 | Displays the new parameter values. Press the $\langle \langle I \rangle \rangle$ key to move to the position |
| 6 | Settable range |
| 4 | Initial value at product shipment |
| 6 | Current setting values |
| | |

An example of changing the command frequency setting value of code number 01 in the drive group (DRV) is shown in the following illustration.



- By pressing the (1/2) key, navigate to the desired position to enter a value. Then, press the (2)/(2) key to enter the desired setting value.
- Press the 🛃 key.
- Once set, you can navigate to the list of the corresponding group, and if a value other than the default value is entered,
 will be displayed on the corresponding item in the list.

4.5 Favorites Settings

4.5.1 Register/delete favorite parameters

Among the function items in each parameter mode group, this function allows you to register or delete frequently used parameters in the Favorite group. The <u>MULTI</u> key must be set to a function that allows you to register or delete favorites in order to use this function. You can enable the favorites register/delete function of <u>MULTI</u> by following the example in the below table.

| Mode | Group | Code | LCD Display | Set Value | | Setting Range | lnitial value | Unit |
|---------|--------------|------|---------------------|-----------|----------------------|------------------|------------------|------|
| Setting | Operator Set | 15 | Multi Key Select | 2 | Favorite Add/ Del | - | 0 | |

Favorite Registration

| PARAM 🛛 T1/ | KES | ΤΟΡ 0 | .00 Hz | | | | |
|-----------------------|-------|---------|--------|--|--|--|--|
| MAK1 MAK2 | DRV | BAS | MOT1 | | | | |
| 01. Command Frequency | | | | | | | |
| register to | FAV – | 01 | | | | | |
| 01 ~ 99 CODE | | | | | | | |
| FAV-01 Empty Code | | | | | | | |
| [] | | | - 41 | | | | |

[Image 27. Favorite registration screen] (if there is no parameter registered in the selected code)



[Image 28. Favorite registration screen] (If there is a parameter registered in the selected code)

Favorite deletion



[Image 29. Favorite list screen]

- Navigate to the parameter you want to register as a favorite in the Parameter mode and press the MULTI key. Navigate to the Favorite registration screen.
- By pressing the ((/)) key, navigate to the position to enter a value. Then, by pressing the <>/<> key, enter the code number of the favorites group to register the parameter.
- Press the (key. The parameter is registered as a favorite in the selected code.

[Note]

The parameters will be overwritten if there are already registered parameters for the selected code number.

 In Favorite mode, navigate to the parameter you want to delete and press the key. (It is not possible to unregister the 00-Jump Code.)

[Note]

The favorite items on the MACRO-BAS tab, which are registered by default, can only be edited and cannot be deleted.



Image 30. Confirmation screen fo deleting favorites]

 In the pop-up window asking for deletion, select YES and press the key. The parameter will be deleted from the favorites list.

4.5.2 Editing the Favorite Parameters

The parameter values registered in the favorite group can be directly edited in Favorite mode.



[Image 31. Editing screen of the favorites registration parameter value]

- Navigate to the parameter you want to delete in Favorite mode and press the key. Navigate to the parameter change screen.
- By pressing the (1/5) key, navigate to the desired position to enter a value. Then, press the (2/2) key to enter the desired setting value.
- Press the 🛃 key.
- Once set, you can navigate to the list of the corresponding group, and if a value other than the default value is entered,
 item in the displayed on the corresponding item in the list.

4.6 Macro settings

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4.6.1 Selecting macro

Similar to Favorites settings, this function allows you to easily use basic functions in each Parameter mode group by pre-registering them into a group.

| Mode | Group | Code | LCD Display | Set Value | | Set Value | | Setting Range | lnitial Value | Unit |
|---------|-----------|------|-----------------|-----------|------------------|-----------|---|------------------|------------------|------|
| | Drive Set | 47 | Macro Select | 0 | Basic | | 0 | | | |
| Setting | | | | 1 | 3-Wire | 0-2 | | _ | | |
| | | | | 2 | Up Down Drive | | | | | |

The parameters and initial values for each macro are as follows:

| Macro settings value | Group | Code | LCD Display | Initial Value |
|----------------------------|-------|------|-------------------|---------------|
| | | 02 | Command Frequency | 60.00Hz |
| | | 05 | Acc Time | 20.00sec |
| | DRV | 06 | Dec Time | 30.00sec |
| | | 10 | 1st Command Src | Fx/Rx-1 |
| | | 11 | 1st Freq Ref Src | Keypad |
| BASIC | | 01 | DI1 Define | Fx |
| | | 03 | DI2 Define | Rx |
| | | 09 | DI5 Define | Speed-L |
| | DIN | 11 | DI6 Define | Speed-M |
| | | 13 | DI7 Define | Speed-H |
| | | | 15 | DI8 Define |

| Macro settings value | Group | Code | LCD Display | Initial Value |
|----------------------------|-------|------|-------------------|---------------|
| | | 02 | Command Frequency | 60.00Hz |
| | | 05 | Acc Time | 20.00sec |
| | DRV | 06 | Dec Time | 30.00sec |
| 3\//IDE | | 10 | 1st Command Src | Fx/Rx-1 |
| JWIKE | | 11 | 1st Freq Ref Src | Keypad |
| | | 01 | DI1 Define | Fx |
| | DIN | 03 | DI2 Define | Rx |
| | | 05 | DI3 Define | 3-Wire |
| | DRV | 05 | Acc Time | 20.00sec |
| | | 06 | Dec Time | 30.00sec |
| | | 10 | 1st Command Src | Fx/Rx-1 |
| | | 11 | 1st Freq Ref Src | Up Down Drive |
| | ADV | 75 | Up/Down Mode | U/D Normal |
| UPDOWN | | 01 | DI1 Define | Fx |
| | | 03 | DI2 Define | Rx |
| | DIN | 07 | DI4 Define | Up |
| | DIN | 09 | DI5 Define | Down |
| | | 11 | DI6 Define | Up/Down Clear |
| | | 13 | DI7 Define | Up/Down Save |

4.6.2 Edit macro Parameters

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The parameter values registered in the favorite group can be directly edited in Macro mode.



parameter value]

- Navigate to the parameter you want to delete in Macro mode and press the key. Navigate to the parameter change screen.
- By pressing the ⟨⟨/⟨⟩ key, you can navigate to the position to enter a value. Then, press the <>/<> key to enter the desired setting value.
- Press the 🛃 key.
- Once set, you can navigate to the list of the corresponding group, and if a value other than the default value is entered,
 will be displayed on the corresponding item in the list.

5 Learning Basic Functions

This chapter describes the basic functions of the S300 inverter. Check the reference page in the table to see the detailed description for each of the basic features.

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| Basic Functions | Use Example | Ref. |
|--|--|--------------|
| Setting the frequency in the Smart Operator | Configures the operating frequency with the Smart Operator. | <u>p.94</u> |
| Setting frequency via analog input in the terminal block | Configures operating frequency via voltage input (AI1, AI2, and AI3) at the terminal block. | <u>p.94</u> |
| Setting the frequency via pulse input in the terminal block | Configures the operating frequency via pulse frequency input at the terminal block. | <u>p.97</u> |
| Frequency reference source configuration for RS-485 communication | Configures frequency to the upper-level controllers, such as PLCs or PCs, via communications terminals (S+/S-/5G) of the terminal block. | <u>p.97</u> |
| Frequency Hold by Analog Input | Enables the user to hold a frequency using analog inputs at terminals. | <u>p.103</u> |
| Changing the unit of speed (Hz⇔rpm) | Changes the unit of speed (Hz and rpm). | <u>p.103</u> |
| Multistep Frequency Configuration | Configures multistep frequency operations by receiving an input at the terminals defined for each step frequency. | <u>p.105</u> |
| Limiting the frequency with maximum/start frequency | Configures the frequency reference limits by defining a start frequency and a maximum frequency. | <u>p.107</u> |
| Limiting the frequency with upper and lower limits | Limits the operating frequency by configuring an upper limit and a lower limit. | <u>p.108</u> |
| Frequency jump | Configures the inverter to avoid running a motor in mechanically resonating frequencies and to reduce noise. | <u>p.109</u> |
| Command source configuration for terminal block inputs | Configures the inverter to accept inputs at the FX/RX terminals. | <u>p.111</u> |
| RS-485 Communication as a Command Input Device | Configures operation commands to the upper-level controllers, such as PLCs or PCs via communications terminals (S+/S-/5G) of the terminal block. | <u>p.114</u> |

 Table 1. Search Basic Functions

| Basic Functions | Use Example | Ref. |
|--|---|--------------|
| Forward/Reverse Rotation Prevention | Configures the inverter to limit a motor's rotation direction. | <u>p.116</u> |
| Start at power-on | Configures to accelerate instantly if the operation command is on when inverter power is supplied. | p.117 |
| Reset and restart after a trip | Configures the inverter to start operating if the operation command is on after the inverter is reset following a fault trip. | <u>p.118</u> |
| Acceleration start | Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input. | <u>p.119</u> |
| Start after DC braking | Performs DC injection braking before accelerating the motor again when the motor keeps rotating from the inertia of the load itself after the power supply to the inverter is interrupted. | <u>p.119</u> |
| Deceleration stop | Deceleration stop is a typical method used to stop a motor. The motor decelerates to 0 Hz and stops unless otherwise selected. | <u>p.121</u> |
| Stop after DC braking | Stops the motor by supplying DC power when the operating frequency is reduced to the set value while decelerating. | <u>p.122</u> |
| Free-run stop | When the Operation command is off, the inverter output turns off, and the load stops due to residual inertia. | <u>p.124</u> |
| Acc/dec time setting based on the maximum frequency | Configures the acceleration and deceleration times for a motor based on the maximum frequency. | <u>p.126</u> |
| Acc/dec time setting based on the operating frequency | Configures acceleration and deceleration times for a motor based on the time needed to reach the target frequency of the next step from the current operating frequency at a fixed speed. | <u>p.127</u> |
| Multi-stage acc/ dec time setting with multifunction terminals | Configures multistage acceleration and deceleration times for a motor with multifunction terminals. | <u>p.128</u> |
| Switching acc/dec time Frequency Settings | Enables modification of acceleration and deceleration gradients without using multistep terminals. | <u>p.129</u> |
| Acc/dec pattern settings | Configures acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns. | <u>p.130</u> |
| Acc/dec stop command settings | Stops the current acceleration or deceleration and controls motor operation at a constant speed. Multifunction terminals must be configured for this command. | <u>p.133</u> |

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5.1 Frequency Settings

5.1.1 Operating Frequency Settings

5.1.1.1 Operating Frequency Source Settings

Frequency commands for S300 are determined by the frequency command sources as follows:

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| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|------------------|----|-----------------------------|------------------|------------------|------|
| | | | 0 | Keypad | | | |
| | | | 1 | Analog Input 1 | | | |
| | | | 2 | Analog Input 2 | | | |
| | | | 3 | Analog Input 3 | | | |
| | | | 4 | Pulse Input | | | |
| | | | 5 | Up Down Drive | | | |
| DRV | 11 | 1st Freq Ref Src | 6 | Internal Comm. | 0~12 | 0 | - |
| | | | 7 | USB Comm. | | | |
| | | | 8 | Option Comm. ¹ | | | |
| | | | 9 | UserSequence | | | |
| | | | 10 | X-Analog Input ² | - | | |
| | | | 11 | X-Analog Input ² | | | |
| | | | 12 | X-Analog Input ² | | | |

¹ Configurable only when equipped with communication options

² Configurable only when equipped with extension I/O options



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[Image 1. Operating Frequency Determination Block]

5.1.1.2 Setting Operating Frequency in the Smart Operator-Direct Input

Set the frequency in the Smart Operator and press the frequency. Set the desired frequency in DRV-01 (Command Frequency, target frequency) code after choosing 0 (Keypad) in DRV-11 (1st Freq Ref Src, frequency setting method) code.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|----------------------|---|-----------|------------------|------------------|------|
| DRV | 01 | Command Frequency | | 0.00 | 0.00~60.00 | 0.00 | Hz |
| | 02 | Command Speed | | 0 | 0~1800 | 0 | rpm |
| | 11 | 1st Freq Ref Src | 0 | Keypad | - | 0 | - |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

5.1.1.3 Setting Frequency via Terminal Analog Voltage Input (Al1-Al3)

You can set the frequency by inputting the voltage from AI1-AI3 terminals (frequency setting (voltage) terminals) from the control terminal block. Voltage inputs of 0-+10 V or -10-+10 V are available. SW4 must be selected as V1-V3.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|----------------------|------------------|----------------|------------------|------------------|------|
| DRV | | 1st Freq Ref | 1 | Analog Input 1 | | 0 | - |
| | 11 | | 2 | Analog Input 2 | 1~3 | | |
| | | 010 | 3 Analog Input 3 | | | | |
| | 22 | Frequency at 100% | | 60.00 | 0.00~60.00 | 60.00 | Hz |
| | 23 | Speed at 100% | | 1800 | 0~1800 | 1800 | rpm |

| Group | Code | LCD Display | Set value | Setting Range | Initial Value | Unit |
|-------|------------|------------------------|-----------|------------------|------------------|------|
| 02 | 02 | AI1 Value ³ | - | -10.00~10.00 | - | V |
| | 02 | | - | 0.00~20.00 | - | mA |
| | 17 | AI2 Value ³ | - | -10.00~10.00 | - | V |
| AIN | | | - | 0.00~20.00 | - | mA |
| | 22 | AI3 Value ³ | - | -10.00~10.00 | - | V |
| | <u>ح</u> د | | | 0.00~20.00 | - | mA |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Setting a Frequency Reference for 0–10 V Input

Select one among 1-3 (AI1-AI3) in DRV-11 (1st Freq Ref Src, frequency setting method) code, then select 0 (Unipolar Voltage) in AI1-AI3 Type Select code from analog terminal block input group (AIN). Use the power of the external controller or VR+ terminal (analog power terminal) of the control terminal block to input voltage in AI1-AI3 terminals as the volume resistance. Refer to **8.2 Analog Input** for details.

Setting a Frequency Reference for -10–10 V Input

Select one among 1-3 (AI1-AI3) in DRV-11 (1st Freq Ref Src, frequency setting method) code, then select 1 (Bipolar Voltage) in AI1-AI3 Type Select code from analog terminal block input group (AIN).

Use the power of the external controller or VR+ and VR- terminals (analog power terminals) of the control terminal block to input voltage in Al1-Al3 terminals as the volume resistance.

Rotational direction of the motor changes according to the voltage signal code when the input voltage is between -10-+10 V.

Refer to **8.2 Analog Input** for details.

| Table 2 | Rotational | Directions | for | Different | Operation | Commands | and ' | Voltage | Innuts |
|---------|------------|-------------------|-----|-----------|-----------|----------|-------|---------|--------|
| | Rotational | Directions | | Different | operation | Communas | ana | Voltage | Inputs |

| Operation command | Input v | voltage |
|-------------------|---------|---------|
| Operation command | 0~10V | -10~0V |
| FWD | Fwd | Rev |
| REV | Rev | Fwd |

³ The units are changed according to the setting values in AIN-01, 16, and 31 (AI1-AI3 Type Select).



Reverse Output Frequency

5.1.1.4 Setting Frequency via Analog Current Input in Terminal Block

You can set the frequency by inputting current from AI1-AI3 terminals (frequency setting [current] terminals) of the control terminal block.

Current in between 0 and 20 mA is available for input. SW4 must be selected as I1-I3 current (in the direction of ON).

Inputting Current of 4-20 mA in Terminal Block

Select one among 1-3 (AI1-AI3) in DRV-11 (1st Freq Ref Src, frequency setting method) code, then select 2 (Current) in AI1-AI3 Type Select code from analog terminal block input group (AIN). Refer to **8.2 Analog Input** for details.

5.1.1.5 Setting the Frequency via Pulse Input in the Terminal Block

Set frequency by inputting pulse frequency of 0-32 kHz in the PTI terminal (pulse input terminal) of the control terminal block.

Inputting Pulse of 0-32 kHz in Terminal Block

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Select 4 (Pulse Input) in DRV-11 (1st Freq Ref Src, frequency setting method) code. Refer to **8.4 Pulse Input** for details.



[Image 2. Inputting Pulse in Terminal Block

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|---------------------|-----------|-------------|------------------|------------------|------|
| DRV | 11 | 1st Freq Ref Src | 4 | Pulse Input | - | 0 | - |

5.1.1.6 Setting Frequency with Internal Communications

Select 6 (Internal Comm.) in DRV-11 (1st Freq Ref Src), frequency setting code for the drive group (DRV). Control the inverter via communications with upper-level controllers, such as PLCs or PCs, by using S+/S-/SG terminals (RS-485 signal input terminals) of the control terminal block. Refer to <u>10 Using Built-in Communication</u> <u>Features</u> for details.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|---------------------|---|----------------|------------------|------------------|------|
| DRV | 11 | 1st Freq Ref Src | 6 | Internal Comm. | - | 0 | - |

Communication parameter addresses used to set frequency are as follows:

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|-------------------|-------|------|-------------------------|
| 0380h | Frequency command | 0.01 | Hz | Set command frequencies |

5.1.1.7 Up-Down Operation

The acceleration and deceleration can be controlled through input at the multifunction terminal block. Similar to a flowmeter, the up-down operation can be applied easily to a system that uses the upper and lower limits of the switch output signals to command acceleration or deceleration for a motor.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit | |
|--------|-----------|-----------------------|-----------------|----------------------|------------------|------------------|------|--|
| DRV | 11 | 1st Freq Ref Src | 5 Up Down Drive | | - | 0 | - | |
| | | | 0 | Up/Down Normal | | | | |
| | 75 | Up/Down Mode | 1 | Up/Down Step | 0~2 | 0 | - | |
| | | mode | 2 | Up/Down Step+Norm | | | | |
| | 70 | Up/Down | 0 | No | 0~1 | 0 | | |
| 10 | Save Mode | 1 | Yes | 0~1 | 0 | | | |
| ADV 77 | 77 | Up/Down Step Freq | 0.00 | | 0.00~60.00 | 0.00 | Hz | |
| | 78 | Up/Down Step Speed | 0 | | 0~1800 | 0 | rpm | |
| | 79 | Up/Down Save Freq | 0.00 | | 0.00~60.00 | 0.00 | Hz | |
| | 80 | Up/Down Save Speed | | 0 | 0~1800 | 0 | rpm | |
| | 01 03 | | 22 | Up | | | | |
| | 05, 07, | Dlx Define | 23 | Down | | 0 | | |
| DIN | 09, 11, | DI1~DI8) | 24 | Up/Down Clear | - | U | - | |
| 1: | 13, 15 | 13, 15 | | 25 | Up/Down Save | | | |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Up/Down Operation (Up/Down Mode) Details

Up/Down Normal

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Target frequency is accelerated or decelerated according to the input at the Up/Down terminals based on the maximum/minimum frequencies.



[Image 3. Up-Down Operation (Normal)]

Up/Down Step

It is accelerated or decelerated as much as the step frequency set in ADV-77 (Up/ Down Step Freq) or ADV-78 (Up/Down Step Speed) every positive edge according to what is input at the Up/Down terminals.





Up/Down Step+Normal

It is accelerated or decelerated as much as the step frequency set in ADV-77 (Up/ Down Step Freq) or ADV-78 (Up/Down Step Speed) every positive edge according to what is input at the Up/Down terminals. When the input is maintained for three seconds from a positive edge, it works the same as selecting Up/Down Normal.



[Image 5. Up-Down Operation (Step+ Normal)]

Up/Down Save Mode

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During a constant speed operation, the operating frequency is saved automatically in the following conditions: the operation command (Fx or Rx) is off, a fault trip occurs, or the power is off.

When the operation command is turned on again, or when the inverter regains the power source or resumes a normal operation from a fault trip, it resumes operation at the saved frequency. To delete the saved frequency, use the multifunction terminal block. Set one of the multifunction terminals to 22 (U/D Clear) and apply signals to it when stopped or at a fixed speed to delete saved frequencies in an up-down operation.



[Image 6. Up-Down Operation (Save Mode)]

5.1.2 Operating Frequency-related Functions

5.1.2.1 Selecting Operating Frequency

Operating frequency is selected and reflected as the following structure:



[Image 7. Structure of Target Frequency Determination]

5.1.2.2 Holding Operating Frequency

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When a signal is input at the terminal, among multifunction input terminals, for which Command Frequency Hold is selected, the operating frequency is held at the output value at that moment regardless of inverter operation status.

Jog operation runs on jog frequency instead of following the frequency on hold.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|---|-----------------------------|----|-----------------------|------------------|------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx:DI1~DI8) | 26 | Cmd Frequency Hold | - | 0 | - |



[Image 8. An Example of Frequency Change Due to Operating Frequency Hold]

5.1.2.3 Changing Unit of Speed

You can change the unit of speed by selecting 0 (Hz Display) or 1 (rpm Display) for DRV-32 (Hz/rpm Select), the unit of speed selection code for a drive group (DRV).

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|----------------------|-------------|-------------|-----------|------------------|------------------|------|
| עםס | DRV 32 Hz/rpm Select | 0 | Hz Display | 0.1 | 0 | | |
| DRV | | 1 | rpm Display | 0~1 | U | - | |

| | Hz | RPM | | |
|--------------------|---------------------|--------------------|--------------------|--|
| Code | Parameter Name | Code | Parameter Name | |
| DRV-01 | Command Frequency | DRV-02 | Command Speed | |
| DRV-15 | Jog Frequency | DRV-16 | Jog Speed | |
| DRV-20 | Max Frequency | DRV-21 | Maximum Speed | |
| DRV-22 | Frequency at 100% | DRV-23 | Speed at 100% | |
| BAS-08 | DC Brake Frequency | BAS-09 | DC Brake Speed | |
| BAS-31~45 | Step Frequency-1~15 | BAS-46~60 | Step Speed-1~15 | |
| MOT1-15 | Start Frequency | MOT1-16 | Start Speed | |
| VF1-02, 05, 08, 11 | User Frequency-1~4 | VF1-03, 06, 09, 12 | User Speed-1~4 | |
| VF1-79, 82, 85, 88 | Stall Frequency-1~4 | VF1-80, 83, 86, 89 | Stall Speed-1~4 | |
| VF1-27 | SlipGain SwOv Freq | VF1-28 | SlipGain SwOv Spd | |
| MOT2-01 | Command Frequency | MOT2-02 | Command Speed | |
| MOT2-15 | Start Frequency | MOT2-16 | Start Speed | |
| VF1-02, 05, 08, 11 | User Frequency-1~4 | VF1-03, 06, 09, 12 | User Speed-1~4 | |
| VF1-79, 82, 85, 88 | Stall Frequency-1~4 | VF1-80, 83, 86, 89 | Stall Speed-1~4 | |
| VF2-27 | SlipGain SwOv Freq | VF2-28 | SlipGain SwOv Spd | |
| ADV-05 | AccDwell Frequency | ADV-06 | AccDwell Speed | |
| ADV-08 | DecDwell Frequency | ADV-09 | DecDwell Speed | |
| ADV-15 | Cmd Freq Limit Lo | ADV-17 | Cmd Speed Limit Lo | |
| ADV-16 | Cmd Freq Limit Hi | ADV-18 | Cmd Speed Limit Hi | |
| ADV-21 | Jump Cmd Freq Lo1 | ADV-27 | Jump Cmd Speed Lo1 | |
| ADV-22 | Jump Cmd Freq Hi1 | ADV-28 | Jump Cmd Speed Hi1 | |
| ADV-23 | Jump Cmd Freq Lo2 | ADV-29 | Jump Cmd Speed Lo2 | |
| ADV-24 | Jump Cmd Freq Hi2 | ADV-30 | Jump Cmd Speed Hi2 | |
| ADV-25 | Jump Cmd Freq Lo3 | ADV-31 | Jump Cmd Speed Lo3 | |
| ADV-26 | Jump Cmd Freq Hi3 | ADV-27 | Jump Cmd Speed Hi3 | |
| ADV-55 | Acc Change Freq | ADV-56 | Acc Change Speed | |
| ADV-58 | Dec Change Freq | ADV-59 | Dec Change Speed | |
| ADV-77 | Up/Down Step Freq | ADV-78 | Up/Down Step Speed | |
| ADV-79 | Up/Down Save Freq | ADV-80 | Up/Down Save Speed | |
| APP-30 | RegenAvd FreqLimit | APP-31 | RegenAvd Spd Limit | |
| OUT-75 | FDT Frequency | OUT-77 | FDT Speed | |
| OUT-76 | FDT Frequency Band | OUT-78 | FDT Speed Band | |

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 Table 3. Parameters for Each Unit of Speed

| | Hz | | RPM |
|---------|--------------------|---------|-------------------|
| Code | Parameter Name | Code | Parameter Name |
| PPID-55 | Pre-PID Set Freq | PPID-56 | Pre-PID Set Spd |
| PPID-62 | Sleep Boost Freq | PPID-63 | Sleep Boost Spd |
| PPID-64 | Sleep Check Freq 1 | PPID-65 | Sleep Check Spd1 |
| PPID-70 | Sleep Check Freq 2 | PPID-71 | Sleep Check Spd2 |
| PRT-14 | Lost Preset Freq | PRT-15 | Lost Preset Speed |

* Rpm calculation shall be reflected as per the number of poles for each motor when using motors number 1 and 2

5.1.2.4 Multistep Frequency Configuration

Multifunction terminals enable multistep operation. Zero frequency uses frequency commands selected in DRV-01 (Command Frequency) or DRV-02 (Command Speed).

Input a step frequency you want to operate in no.30-45 (Step Frequency) or no.46-60 (Step Speed) of the basic functional group (BAS).

Select terminals among multifunction terminals DI1-DI8 for multistep input, then set one of the multistep functions (Speed-L, Speed-M, Speed-H, and Speed-X), respectively.

Speed-L, Speed-M, Speed-H, and Speed-X are recognized as binary codes; therefore, select frequencies set in BAS-31-45 (Step Frequency-01 to Step Frequency-15) or BAS-46-60 (Step Speed-01 to Step Speed-15) for operation.

Multifunction terminals DI5, DI6, DI7, and DI8 set as Speed-L, Speed-M, Speed-H, and Speed-X, respectively, work as follows:

DIN-20 Step DI Check Time

You can set the time to check input at the terminal block inside the inverter when you use multifunction input terminals to set multistep frequencies. For example, when you set the time to check input at the terminal block (In Check Time) as 100 msec with input at multifunction terminal DI6, it checks whether input is received at other terminal blocks. It accelerates or decelerates to the frequency of the DI6 terminal after 100 msec.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|--------------|---------|--|-----------|---------|------------------------------------|---------------------|------|
| 31~45 BAS | | Step Frequency-xx (Frequency-xx: Frequency- 01~Frequency-15 | - | | 0.00~Max Frequency ⁴ | - | Hz |
| 46~60 | 46~60 | Step Speed-xx (Speed-xx: Speed- 01~Speed-15) | | - | 0∼Maximum Speed ⁵ | - | rpm |
| | 01 03 | 12 | | Speed-L | | | |
| | 05, 07, | DIx Define | 11 | Speed-M | | 1, 2, 4, | |
| DIN | 09, 11, | 1, (DIx: DI1~DI8) | 12 | Speed-H | - | 5, 10, 11, 12, 9 | - |
| | 13, 15 | | | Speed-X | | ,, . | |
| | 20 | Step DI Check Time | | 1 | 1~60000 | 1 | msec |



[Image 9. An Example of Frequency Change Due to Multistep Frequency Settings]

- ⁴ DRV-20(Max Frequency)
- ⁵ DRV-21(Maximum Speed)

5.1.2.5 Frequency Limit

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Operating frequency settings can be limited with the maximum frequency/start frequency, upper limit, and lower limit of the frequency.

Limiting the Frequency Using the Maximum Frequency and Start Frequency

| Group | Code | LCD Display | Set value | Setting Range | Initial Value | Unit |
|---------------|------|------------------|-----------|---------------|------------------|------|
| MOT1, MOT2 | 15 | Start Frequency | 0.50 | 0.00~10.00 | 0.50 | Hz |
| MOT1, MOT2 | 16 | Start Speed | 15 | 0~300 | 15 | rpm |
| DRV | 20 | Max Frequency | 60.00 | 40.00~590.00 | 60.00 | Hz |
| DRV | 21 | Maximum Speed | 1800 | 1200~17700 | 1800 | rpm |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Limiting the Frequency Using the Maximum Frequency and Start Frequency-Setting Details

| Code and Functions | Description |
|---|--|
| MOT1, MOT2-15 Start Frequency | Configures lower limits for parameters with speed- related units (Hz or rpm). If an input frequency is |
| MOT1, MOT2-16 Start Speed | lower than the start frequency, the setting value becomes 0.00. |
| DRV-20 Max Frequency, DRV-21 Maximum Speed | Configures the upper limit and lower limit, respectively. The minimum setting value of the upper limit is the lower limit, whereas the maximum setting value of the lower limit is the upper limit. Frequencies are configurable between the upper limit and lower limit even when configured in the Smart Operator. |

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|-----|--|------------------|------|
| ADV | 14 | Cmd Freq Limit En | 1 | Yes | - | 0 | - |
| | 15 | Cmd Freq Limit Lo | 0.50 | | 0~Cmd Freq Limit Hi | 0.50 | Hz |
| | 16 | Cmd Freq Limit Hi | 60.00 | | Cmd Freq Limit Lo ~ Max Frequency ⁶ | 60.00 | Hz |
| | 17 | Cmd Speed Limit Lo | 15 | | 0~Cmd Speed Limit Hi | 15 | rpm |
| | 18 | Cmd Speed Limit Hi | 1800 | | Cmd Speed Limit Lo ~ Maximum Speed ⁷ | 1800 | rpm |

Limiting the frequency with upper and lower limits

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Limiting the Frequency Using the Upper and Lower Limits-Setting Details

| Code and Functions | Description |
|---|---|
| ADV-14 Cmd Freq Limit En | The initial setting value is 0 (No). When the setting is changed to 1 (Yes), the frequency can be set only between the lower limit (ADV-15) and the upper limit (ADV-16). |
| ADV-15 Cmd Freq Limit Lo, ADV-16 Cmd Freq Limit Hi, ADV-15 Cmd Speed Limit Lo, ADV-16 Cmd Speed Limit Hi | Configures the upper limit to all parameters for the unit of speed (Hz and rpm) excluding the base frequencies (MOT1, MOT2-23 Base Frequency). Frequency cannot be set higher than the upper limit frequency. |

① Caution

- The lower limit frequency of the inverter is the setting frequency for ADV-15 (Cmd Freq Limit Lo) when ADV-14 (Cmd Freq Limit En) is 1 (Yes), and MOT1, MOT-215 (Start Freq) when ADV-14 (Cmd Freq Limit En) is 0 (No).
- The upper limit frequency of the inverter is the setting frequency for ADV-16 (Cmd Freq Limt Hi) when ADV-14 (Cmd Freq Limt En) is 1 (Yes), and DRV-20 (Max Frequency) when ADV-14 (Cmd Freq Limt En) is 0 (No).

⁶ DRV-20(Max Frequency)

⁷ DRV-21(Maximum Speed)

Frequency Jump

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Frequency jump is used to avoid mechanical resonant frequencies. When the motor accelerates or decelerates, it passes through the frequency jump band, in which the operating frequency is not configurable.

When a frequency setting is increased, the frequency is maintained at the lower limit of the frequency jump while the frequency parameter settings (voltage, current, RS-485 communication, Smart Operator settings, etc.) are within the jump frequency band. The frequency is increased when the frequency setting value goes out of the frequency jump band.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|----|---|------------------|------|
| ADV | 20 | Jump Cmd Freq En | 0 | No | - | 0 | - |
| | 21 | Jump Cmd Freq Lo 1 | 10. | 00 | 0.00~Jump Cmd Freq Hi 1 | 10.00 | Hz |
| | 22 | Jump Cmd Freq Hi 1 | 15.00 | | Jump Cmd Freq Lo 1~ Max Frequency ⁸ | 15.00 | Hz |
| | 23 | Jump Cmd Freq Lo 2 | 20.00 | | 0.00~Jump Cmd Freq Hi 2 ⁸ | 20.00 | Hz |
| | 24 | Jump Cmd Freq Hi 2 | 25.00 | | Jump Cmd Freq Lo 2~ Max Frequency | 25.00 | Hz |
| | 25 | Jump Cmd Freq Lo 3 | 30.00 | | 0.00~Jump Cmd Freq Hi 3 | 30.00 | Hz |
| | 26 | Jump Cmd Freq Hi 3 | 35.00 | | Jump Cmd Freq Lo 3~ Max Frequency ⁸ | 35.00 | Hz |
| | 27 | Jump Cmd Speed Lo1 | 300 | | 0~Jump Cmd Speed Hi1 | 300 | rpm |
| | 28 | Jump Cmd Speed Hi1 | 450 | | Jump Cmd Speed Lo1~ Maximum Speed ⁹ | 450 | rpm |
| | 29 | Jump Cmd Speed Lo2 | 600 | | 0~ Jump Cmd Speed Hi2 | 600 | rpm |
| | 30 | Jump Cmd Speed Hi2 | 750 | | Jump Cmd Speed Lo2~ Maximum Speed ⁹ | 750 | rpm |
| ADV | 31 | Jump Cmd Speed Lo3 | 900 | | 0~ Jump Cmd Speed Hi3 | 900 | rpm |
| | 32 | Jump Cmd Speed Hi3 | 1050 | | Jump Cmd Speed Lo3~ Maximum Speed ⁹ | 1050 | rpm |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible[.]

⁸ DRV-20(Max Frequency)

⁹ DRV-21(Maximum Speed)

Basic

5.2 Operation Command Settings

5.2.1 Setting Methods of Operation Commands

Select how to configure operation commands. Built-in RS485 communication, Fieldbus, and option cards per application are available for operation commands other than basic operation using the Smart Operator or multifunction terminals.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|---|-----------------|------------------|------------------|------|
| DRV | 10 | 1st Command Source | 0 | Keypad | 0~6 | 0 | - |
| | | | 1 | Fx/Rx-1 | | | |
| | | | 2 | Fx/Rx-2 | | | |
| | | | 3 | 3-Wire | | | |
| | | | 4 | Internal Comm. | | | |
| | | | 5 | USB Comm. | | | |
| | | | 6 | Option Comm. 10 | | | |
| | | | 7 | UserSequence | | | |

5.2.1.1 Setting Operation Commands in the Smart Operator

Select how to configure operation commands. Built-in RS485 communication, Fieldbus, and option cards per application are available for operation commands other than basic operation using the Smart Operator or multifunction terminals.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|--------|------------------|------------------|------|
| DRV | 10 | 1st Command Source | 0 | Keypad | - | 0 | - |

¹⁰ Configurable only when equipped with communication options


[Image 10. An Example of Frequency Change When Inputting Operation Commands in the Smart Operator]

5.2.1.2 Terminal Block as a Command Input Device (Assigning FX/RX Terminals)

Select 1 (Fx/Rx-1) for no.10 of the drive group (DRV) to input operation commands with a multifunction terminal block. Select terminals among multifunction terminals DI1-DI8 for forward (FX) and reverse (RX) operation commands, then set the codes for the relative terminals in the terminal input group (DIN) as 1(FX) and (RX). Operation stops when the terminal set as 1 (FX) and one set as 2 (RX) turn on or off simultaneously.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|-----------------------------------|-----------------------|-----------|---------|------------------|---------------------|------|
| DRV | 10 | 1st Command Source | 1 | FX/RX-1 | - | 1 | - |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define | 1 | FX | | 1, 2, 4, | |
| | | (DIx: DI1~DI8) | 2 | RX | | 5, 10, 11, 12, 9 | - |

Assigning FX/RX Terminals–Setting Details





[Image 11. An Example of a Frequency Change When Inputting Operation Commands via a Terminal Block (Assigning FX/RX Terminals)]

5.2.1.3 Terminal Block as a Command Input Device (Run and Rotation Direction Commands)

Set no.10 of the drive group (DRV) as FX/RX-2 and use the FX terminal for operation commands and the RX terminal for rotational selections. Select terminals among multifunction terminals DI1-DI8 for forward (FX) and reverse (RX) operation commands, then set the code for the relative terminals in the terminal input group (DIN) as 1 (FX) and 2 (RX).

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|-----------------------------------|-----------------------|-----------|---------|------------------|---------------------|------|
| DRV | 10 | 1st Command Source | 2 | FX/RX-2 | - | 1 | - |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define | 1 | FX | - | 1, 2, 4, | |
| | | (DIx: DI1~DI8) | 2 | RX | | 5, 10, 11, 12, 9 | - |

Run Command and Fwd/Rev Change Command Using Multifunction Terminal – Setting Details

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| Code and Functions | Description |
|--|--|
| DRV-10 1st Command Source | Select 2 (FX/RX-2). |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Select terminals for operation commands (FX) and rotation commands (RX). |



[Image 12. An Example of a Frequency Change When Inputting Operation Commands via a Terminal Block (Assigning Command/Rotational Direction Terminals)]

5.2.1.4 Communication as a Command Input Device

To input operation commands via communication, select as per the communication type in DRV-10 (1st Command Source), the code for the operation command method of the drive group (DRV).

Use S+/S- (RS-485 signal input terminal) terminals of the control terminal block for internal communication, and use the USB port on the control board for USB communication to control the inverter. Refer to <u>10 Using Built-in Communication</u> <u>Features</u> for details.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-------------|-----------|----------------|------------------|------------------|------|
| DRV | 10 | 1st Command | 4 | Internal Comm. | | 1 | |
| | 10 | Source | 5 | USB Comm. | - | | - |

5.2.2 Local/Remote Switching Operations with Multifunction Keys in the Smart Operator

(When checking inverter operation and inspecting equipment without changing the existing parameters)

| Mode | Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-----------|-----------------|------|---------------------|---|-------------------------|------------------|------------------|------|
| Setting | Operator Set | 15 | Multi Key Select | 0 | Local/ Remote Sel | - | 0 | - |
| Parameter | DRV | 15 | Jog Frequency | | 10.00 | 0.00~ 60.00 | 10.00 | - |

① Caution

Use the local/remote switching operation only when necessary, as it may cause equipment issues such as the inverter stopping during operation.

The local/remote switching operation function using multifunction keys(MULTI) of the Smart Operator can be used to manually switch the operation mode in cases where the operating instructions are set using methods other than the Smart Operator, such as terminal blocks or communications. This function allows for verification of the inverter operation, equipment inspection, or manual operation switching in emergency situations without the need for separate parameter settings.

• **The definition of Local**: Local is a function that switches all operation commands, frequency commands, or torque commands to allow control by the Smart Operator. Therefore, it makes all operations available in the Smart Operator. Jog commands are ignored in this case. (However, it is only operable at On if the functions of the multifunction terminal are set as 18 [RUN Enable].) Operating locally is also referred to as onsite operation mode.

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- The definition of Remote: Remote is used to operate the inverter according to the preset method of operation commands and frequency commands. It works via communication if set as communication and multistep if set as multistep. Operating remotely is also referred to as remote operation mode.
- Operator Set-15 (Multi-Key Select): R will be displayed on the status bar at the top of the Smart Operator when the no. 2 Local/Remote is set. The multifunction key works as the Local/Remote function. When R is displayed on the status bar at the top of the Smart Operator, the inverter is in remote operation (Remote) mode, in which operations are based on preset parameters with no changes to the operation. When you press the multifunction key (MULT) when R is displayed on the pop-up window for the Smart Operator status, the R on the status bar at the top changes to an L, switching into onsite operation (Local) mode, enabling operation with FX operation (FWD) key and RX operation (REV) key in the Smart Operator. Press the multifunction key (MULT) again and R will be displayed again on the status bar at the top. The inverter will operate as the operation command method set in DRV-10 (1st Command Source).
- When switching from Remote to Local: The sign for commands and frequency sources on the status bar at the top changes from T1/K to K/K when switching from remote operation (Remote) mode to on-site operation (Local) mode.
- When switching from Local to Remote: The sign for commands and frequency sources on the status bar at the top changes from K/K to preset T1/K when switching from onsite operation (Local) mode to remote operation (Remote) mode. It can be switched when the inverter is operating as well. However, it works differently according to which source is set.
 - For terminal block command sources: It operates according to commands from the terminal block when switched to Remote during Local operation. That is, when reverse operation terminal (RX) is in the terminal block while the motor is running in the forward direction in Local, it runs in the reverse direction again when switched into Remote.
 - For digital command sources: Digital command sources refer to all command sources excluding terminal block sources. Those include communications, PLC, and the Smart Operator. For these digital command sources, the inverter operates in the status from the previous remote operation (Remote) mode. The target frequency is set as the current frequency source.
 - When terminal signal is input when the power turns on: When ADV-02 (Power-on Run) is set as 0 (None) with terminal signals set as FX, RX,

FWD_JOG, REV_JOG, or PRE EXCITE are input, it is operable with the Smart Operator when changed to Local, but it does not operate when changed back to Remote. This means that the motor is not operable in remote operation (Remote) mode when any one of the terminals where the above five functions are set is On when the power is on. Turn off all the above terminals after turning on the inverter when ADV-02 (Power-on Run) is set as 0 (None) to operate the motor in remote operation (Remote) mode.

• When the motor is stopped due to a trip during operation: When the motor is stopped and reset in Local due to a trip during operation, the inverter does not operate the motor when changed back to Remote while operating with the Smart Operator. It is the same when operation commands are in the terminal block. Therefore, turn off all terminals before turning on the operation command terminal again to operate the motor.

5.2.3 Functions on Operation Command

5.2.3.1 Forward/Reverse Rotation Prevention

The rotation direction of motors can be configured to have them run in only one direction. When reverse rotation is prevented, if you turn off the FX terminal and turn on the RX terminal block to avoid a reverse operation during forward operation with the terminal block, the operating frequency will decelerate down to 0 Hz and the inverter maintains operation at zero speed.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|---|-----------------|------------------|------------------|------|
| ADV | 01 | Run Prevent Select | 0 | None | | 0 | |
| | | | 1 | Forward Prevent | 0~2 | | - |
| | | | 2 | Reverse Prevent | | | |

Forward/Reverse Run Prevention Setting Details

| Code and Functions | | De | escription | | | |
|---------------------------|-------|--------------------------------|---|--|--|--|
| | Choos | Choose a direction to prevent. | | | | |
| | (| Configuration | Functionality | | | |
| ADV-01 Run Prevent Select | 0 | None | Do not set rotation prevention direction. | | | |
| | 1 | Forward Prevent | Prevents forward rotation. | | | |
| | 2 | Reverse Prevent | Prevents reverse rotation. | | | |

5.2.3.2 Immediate Run upon Power Up (Power On Run)

When the power is supplied to the inverter, it will accelerate when the operation command in the terminal block is On.

It is only valid when ADV-02 (Power-on Run) is set as Start Mode or Speed Search while no. 10 of the drive group (DRV) is set as Fx/Rx-1 or Fx/Rx-2.

If the load (fan load) is at free-run, operating the inverter at this time may cause a trip. So, set ADV-02 (Power-on Run) as Speed Search to perform speed search while running and start operation. If Start Mode is selected, it will accelerate in a normal V/F pattern without a speed search.

If this function is not selected, turn off the operation command in the terminal block, then turn it back on to start the operation.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|--------------|------------------|------------------|------|
| DRV | 10 | 1st Command Source | 1 | Fx/Rx-1 | | 1 | - |
| | 10 | | 2 | Fx/Rx-2 | - | | |
| ADV | 00 | Power-on Run | 1 | Start Mode | | 0 | - |
| | 02 | | 2 | Speed Search | | | |

① Caution

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Be cautious of safety incidents, as this function makes the motor rotate at the time of power supply.

5.2.3.3 Reset and Restart after A Trip (Reset Restart)

The inverter restarts if the operation command at the terminal block is On when the inverter is reset after a trip. When a fault trip occurs, the inverter will cut off the output and the motor will free-run. Another fault trip may be triggered if the inverter begins its operation while the motor is in a free-run state.

It works when you set PRT-05 (Reset Restart) as Start Mode or Speed Search. Autorestart delay time is configurable in PRT-07 (Retry Delay), and the inverter is reset after the time set in PRT-07 (Retry Delay) after a trip. The number of auto-restart times is configurable in PRT-06 (Retry Number), and it will restart as many times as set in PRT-06 (Retry Number) after a trip and a reset. (If another trip occurs during the restart after a reset, the number in PRT-06 (Retry Number) will count down one by one and conduct a reset and restart as many times as set. If it successfully resets and restarts after the initial trip, it does not restart again before another trip occurs. The reduced count of PRT-06 (Retry Number) from the restart after a trip is recoverable.)

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|--------------|------------------|------------------|------|
| DRV | 10 | 1st Command Source | 1 | Fx/Rx-1 | - | 1 | - |
| PRT | | | 0 | None | | 0 | |
| | 05 | Reset Restart | 1 | Start Mode | 0~2 | | - |
| | | | 2 | Speed Search | | | |
| | 06 | Retry Number | | 1 | 1~10 | 1 | - |
| | 07 | Retry Delay | | 1.0 | 0.0~60.0 | 1.0 | sec |

5.2.4 Start Settings

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Select how to start the inverter when the operation command is input.

5.2.4.1 Acceleration Start

Acceleration start is a general acceleration method. If there are no extra settings applied, the motor will accelerate directly to the target frequency when an operation command is input

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-------------|-----------|--------------|------------------|------------------|------|
| BAS | 01 | Start Mode | 0 | Acceleration | - | 0 | - |

5.2.4.2 Start after DC Braking

This start mode supplies DC voltage for a set amount of time to the motor before acceleration. If the motor continues to rotate due to its inertia load before the inverter supplies voltage, DC braking will stop the motor for acceleration.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|------------------------------|-----------|----------|------------------|------------------|------|
| BAS | 01 | Start Mode | 1 | DC Start | - | 0 | - |
| | 03 | DC-Start Time | | 1.00 | 0.01 ~60.00 | 1.00 | sec |
| | 04 | DC Start Level ¹¹ | 50 | | 1~200 | 50 | % |

¹¹ DC Start Level: The percentage to the peak of rated current of the motor e.g.) where the setting value is 60% and rated current of the motor is 30 Arms, DC output is 30×√2×0.6=25.45 A.



① Caution

The amount of DC braking required is based on the rated current of the motor. However, if the amount of DC braking is larger than the rated current of the inverter, it is restricted to that value. A large amount of DC braking or long braking time may overheat or damage the motor or cause an overload trip for the inverter. **Reduce the amount or time of DC braking in such cases**.

5.2.4.3 Speed search operation

This function restores operation command values (target frequency) without any trips, such as overvoltage or overcurrent, when operating the inverter with operation commands while the motor is free-running ¹². Refer to **7.13 Speed Search Operation** for details.

¹² You may not be able to tell if it is free-running or stopping.

5.2.5 Stop Settings

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Select how to stop the motor when a stop command is input to the inverter during operation.

5.2.5.1 Deceleration Stop

It is a general way to stop a motor in which it is decelerated down to MOT1, MOT2-17 (Stop Frequency) before stopping.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------|----------|-------------------|-----------|--------------|------------------|------------------|------|
| BAS | 02 | Stop Mode | 0 | Deceleration | - | 0 | - |
| MOT1, | 17 | Stop Frequency | | 0.00 | 0.00~ 10.00 | 0.00 | Hz |
| IVIO 12 | 18 | Stop Speed | | 0 | 0~300 | 24, 14, 0 | rpm |
| OUT | 50,52,54 | DO1~DO3 Define | 14 | Run | 0~48 | 14 | |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.





5.2.5.2 Stop after DC Braking

When the operating frequency reaches the set value (DC braking frequency) during deceleration, the inverter stops the motor by supplying DC power. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency (BAS-08 DC Brake Frequency), the inverter supplies DC voltage to the motor and stops it by DC braking.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|----------|--------------------|-----------|----------|------------------|------------------|------|
| | 02 | Stop Mode | 1 | DC Brake | - | 0 | - |
| | 05 | DC Brake BlockTime | | 0.10 | 0.00~60.00 | 0.10 | sec |
| BAS | BAS 06 D | DC Brake Time | | 1.00 | 0.01~60.00 | 1.00 | sec |
| | 07 | DC Brake Level | | 50 | 1~200 | 50 | % |
| | 08 | DC Brake Frequency | | 5.00 | 0.00~60.00 | 5.00 | Hz |

DC Braking After Stop Setting Details

| Code and Functions | Description |
|------------------------------|---|
| BAS-05 DC Brake BlockTime | Sets the time to block the inverter output before DC braking. |
| BAS-06 DC Brake Time | Sets the time for DC voltage supply to the motor. |
| BAS-07 DC Brake Level | Adjusts the amount of DC braking. The setting value is a percentage to the peak of rated current of the motor based on the rated current of the motor. e.g.) where the setting value is 60% and rated current of the motor is 30 Arms, DC output is $30 \times \sqrt{2} \times 0.6 = 25.45$ A. |
| BAS-08 DC Brake Frequency | Set the frequency to start DC braking. When the frequency is reached after the inverter starts to decelerate, DC braking starts. If the dwell frequency is set lower than the DC braking frequency, dwell operation will not work and DC braking will start instead. |



[Image 15. An Example of Stopping after DC braking]

① Caution

- The amount of DC braking required is based on the rated current of the motor. However, if the amount of DC braking is bigger than the rated current of the inverter, it is restricted to that value. A large amount of DC braking or long braking time may overheat or damage the motor or cause an overload trip for the inverter. **Reduce the amount or time of DC braking in such cases.**
- If the inertia of the load is great, or if DC braking frequency (BAS-08 DC Brake Frequency) is set too high, a fault trip may occur due to an overcurrent when the inverter supplies DC voltage to the motor. Increase time of output interruption before braking in such cases.

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Basic Functions

5.2.5.3 Free Run Stop

When the Operation command is off, the inverter output turns off, and the load stops due to residual inertia.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|-------------|--------------------------|--|------------------|------------------|------|
| BAS | 02 | Stop mode | 2 CoastStop (FreeRun) | | - | 0 | - |



[Image 16. An Example of Free Run Stop]

① Caution

Note that when there is high inertia on the motor load and the motor is operating at high speed, the load's inertia may cause the motor to continue rotating if the inverter output is blocked.

Note

Turning off operation commands during S/W overcurrent suppression, stall prevention, kinetic energy buffering operation, or regeneration avoidance will stop the motor by free run regardless of setting values for the stop.

5.2.5.4 Power Braking

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When the inverter's DC voltage rises above a specified level due to the regenerative energy of the motor, a control will be made to either adjust the deceleration gradient level or re-accelerate the motor in order to reduce the regenerative energy. Power braking can be used when short deceleration times are needed without brake resistors, or when optimum deceleration is needed without causing an over voltage fault trip.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|----------------------------|-----------------------|-----------|---------------|------------------|------------------|------|
| | 02 | Stop mode | 4 | Power Braking | - | 0 | - |
| BAS | BAS 11 PwrBrk BandWidth | | | 100 | 0~500 | 100 | % |
| | 12 | PwrBrk FluxBrkGain | | 100 | 0~200 | 100 | % |

Power Braking–Setting Details

| Code and Functions | Description |
|---------------------------|---|
| BAS-11 PwrBrk BandWidth | Sets bandwidth for the power braking controller. The bigger the inertia, the lower the value should be set in order to prevent trips. |
| BAS-12 PwrBrk FluxBrkGain | Sets the size of applied voltage for power braking. The bigger the value, the bigger the supplied voltage is, stopping the motor quickly, but it may overheat or damage the motor. |

() Caution

- Do not use power braking for loads with frequent decelerations. It may overheat or damage the motor.
- Note that if deceleration time is too short or inertia of the load is too great, an overvoltage fault trip may occur.
- Note that if a free run stop is used, the actual deceleration time can be longer than the pre-set deceleration time.

5.3 Acc/Dec Settings

5.3.1 Acc/Dec Time Settings

5.3.1.1 Acc/Dec Time Setting Based on the Maximum Frequency

Set acceleration and deceleration time with the same gradient based on the maximum frequency regardless of the operating frequency. Select 0 (Max Frequency) in the acceleration or deceleration reference frequency code, BAS-76 (Ramp Time Mode), in basic functional group (BAS) to set acceleration and deceleration times based on the maximum frequency.

Acceleration time set in no.5 of the drive group (DRV) refers to the time required for the inverter to reach the maximum frequency from 0 Hz. Likewise, deceleration time set in no.6 refers to the time required for deceleration stop to reach 0 Hz from the maximum frequency.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|----------------|-----------|---------------|------------------|------------------|------|
| | 05 | Acc Time | 20.00 | | 0.00~ 6000.00 | 20.00 | sec |
| DRV | 06 | Dec Time | 30.00 | | 0.00~ 6000.00 | 30.00 | sec |
| | 20 | Max Frequency | 60.00 | | 40.00~ 400.00 | 60.00 | Hz |
| BAS | 76 | Ramp Time Mode | 0 | Max Frequency | - | 0 | - |





5.3.1.2 Acc/Dec Time Setting Based on the Operating Frequency

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Set acceleration and deceleration times for a motor based on time needed to reach the target frequency of the next step from the current frequency operating at a fixed speed. Select 1 (Delta Frequency) in the acceleration or deceleration reference frequency code, BAS-76 (Ramp Time Mode), to set acceleration and deceleration times based on operating frequency.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|--------|------------------------------|----------------|-----------|------------------|------------------|------------------|------|
| | 05 | Acc Time | 20.00 | | 0.00~ 6000.00 | 20.00 | sec |
| 06 Dec | Dec Time | | 30.00 | 0.00~ 6000.00 | 30.00 | sec | |
| | 76 | Ramp Time Mode | 1 | Delta Frequency | - | 0 | - |
| BAS | BAS 77 Pattern UpdateBand | | | 0.3 | 0.0~1.0 | 0.3 | Hz |

Acc/Dec Times Based on the Operating Frequency-Setting Details

If acceleration time is set to 5 seconds and step-operated in 10 Hz and 30 Hz at a stop, the acceleration time is as follows:



[Image 18. Frequency Change Based on Acceleration And Deceleration Time Settings (Based on the Operating Frequency)]

If a command frequency is an analog source with subtle changes every time, acceleration and deceleration may fail. Adjust BAS-77 (Pattern UpdateBand) values in such cases for acceleration and deceleration.

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5.3.1.3 Multi-stage Acc/Dec Time Setting with Multifunction Terminals

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You can set a switch frequency for acceleration and deceleration times to change the acceleration and deceleration gradients without configuring multifunction terminals.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-----------|------------|-----------------------|-----------|--------------|---------------|------------------|------|
| | 05 | Acc Time | | 20.00 | 0.00~6000.00 | 20.00 | sec |
| DITV | 06 | Dec Time | | 30.00 | 0.00~6000.00 | 30.00 | sec |
| | 78 | Acc Time-1 | | 20.00 | 0.00~6000.00 | 20.00 | sec |
| | 79 | Dec Time-1 | | 20.00 | 0.00~6000.00 | 20.00 | sec |
| | 80 | Acc Time-2 | | 30.00 | 0.00~6000.00 | 30.00 | sec |
| | 81 | Dec Time-2 | | 30.00 | 0.00~6000.00 | 30.00 | sec |
| | 82 | Acc Time-3 | | 40.00 | 0.00~6000.00 | 40.00 | sec |
| | 83 | Dec Time-3 | | 40.00 | 0.00~6000.00 | 40.00 | sec |
| BAS 84 85 | Acc Time-4 | 50.00 | | 0.00~6000.00 | 50.00 | sec | |
| | 85 | Dec Time-4 | 50.00 | | 0.00~6000.00 | 50.00 | sec |
| | 86 | Acc Time-5 | 60.00 | | 0.00~6000.00 | 60.00 | sec |
| | 87 | Dec Time-5 | 60.00 | | 0.00~6000.00 | 60.00 | sec |
| | 88 | Acc Time-6 | | 70.00 | 0.00~6000.00 | 70.00 | sec |
| | 89 | Dec Time-6 | | 70.00 | 0.00~6000.00 | 70.00 | sec |
| | 90 | Acc Time-7 | | 80.00 | 0.00~6000.00 | 80.00 | sec |
| | 91 | Dec Time-7 | | 80.00 | 0.00~6000.00 | 80.00 | sec |
| | 01, 03, | | 14 | XCEL-L | | 124 | |
| DIN | 05, 07, | DIx Define | 15 | XCEL-M | - | 5, 10, | |
| | 13, 15 | (8טע~דוע געט) | 16 | XCEL-H | | 11, 12, 9 | |
| | 20 | Step DI Check Time | | 1 | 1~60000 | 1 | msec |

All changes to the terminal block shall be completed within the Step DI Check Time if two or more multi-stage acceleration and deceleration terminals are used.



[Image 19. Frequency Change Based on Multi-Stage Acc/Dec Time Settings]

5.3.1.4 Setting Acc/Dec Time Switch Frequency

Г

You can set a switch frequency for acceleration and deceleration times to change the acceleration and deceleration gradients without configuring multifunction terminals.

| Group | Code | LCD Display | Set value | Setting Range | Initial Value | Unit |
|-------|------|--------------------|-----------|---------------|------------------|------|
| | 05 | Acc Time | 20.00 | 0.00~6000.00 | 20.00 | sec |
| DRV | 06 | Dec Time | 30.00 | 0.00~6000.00 | 30.00 | sec |
| | 55 | Acc Change Freq | 00.00 | 0.00~60.00 | 0.00 | Hz |
| | 56 | Acc Change Speed | 0 | 0~1800 | 0 | rpm |
| | 57 | Acc Change AccTime | 20.00 | 0.00~6000.00 | 20.00 | sec |
| ADV | 58 | Dec Change Freq | 0.00 | 0.00~60.00 | 0.00 | Hz |
| | 59 | Dec Change Speed | 0 | 0~1800 | 0 | rpm |
| | 60 | Dec Change DecTime | 20.00 | 0.00~6000.00 | 20.00 | sec |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.





5.3.2 Functions on Acc/Dec

5.3.2.1 Setting Acc/Dec S-Curve Patterns

Acceleration and deceleration gradient patterns can be configured for softer acceleration and deceleration. Linear pattern features a linear increase or decrease to the output frequency at a fixed rate. An S-curve pattern, on the other hand, is used for smoother and more gradual increase or decrease such as lifting loads or elevator doors. The S-curve ratio can be adjusted in 66-71 codes of the basic functional group (BAS).

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|----|-----------------|------------------|------------------|------|
| | 66 | Acc Pattern | 1 | S-curve | - | 0 | - |
| | 67 | Acc S-Curve Start | | 40 | 1~100 | 40 | % |
| | 68 | Acc S-Curve End | 40 | | 1~100 | 40 | % |
| | 69 | Dec Pattern | 1 | S-curve | - | 0 | - |
| BAS | 70 | Dec S-Curve Start | 40 | | 1~100 | 40 | % |
| DAG | 71 | Dec S-Curve End | | 40 | 1~100 | 40 | % |
| | 76 | Domo Timo Modo | 0 | Max Frequency | 0.1 | 0 | |
| | /0 | Ramp Time Mode | 1 | Delta Frequency | 0~1 | 0 | - |
| | 77 | Pattern UpdateBand | | 0.3 | 0.0~1.0 | 0.3 | Hz |

Acc/Dec Pattern-Setting Details

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| Code and Functions | Description |
|---|--|
| BAS-67 Acc S-Curve Start | Sets the curve ratio (gradient) when starting acceleration if acceleration and deceleration pattern is set as an S-Curve. Gradient level is the ratio which gradient acceleration takes up in the section under 1/2 frequency based on the 1/2 frequency of target frequency. If the target frequency and maximum frequency are set at 60 Mz and Acc S Curve Start is act to 50% curved |
| | acceleration is conducted in between 0-15 Hz whereas linear acceleration is conducted in between 15-30 Hz when the S-curve accelerates up to 30 Hz. |
| BAS-68 Acc S-Curve End | Set the gradient level for when the operation frequency reaches the target frequency. The curve ratio is the ratio that the curve acceleration takes place within the section above the 1/2 frequency, based on the 1/2 frequency of the frequency reference. If the setting is identical to the example of BAS-67, linear acceleration is conducted in between 30-45 Hz, whereas curved acceleration is conducted before it is operated at a fixed speed in between 45-60 Hz. |
| BAS-70 Dec S-Curve Start, BAS-71 Dec S-Curve End | Sets the rate of S-curve deceleration. The setup method is the same as the ratio during acceleration. |
| BAS-77 Pattern UpdateBand | Acceleration and deceleration patterns are updated again if the command frequency changes bigger than this value. |

Acc/dec pattern settings



[Image 21. Frequency Change Based on Acc/Dec Pattern Settings]

S-Curve



[Image 22. Frequency Change When Acc/Dec Pattern Is Set as an S-Curve]

Note

The Calculation of the Actual Acc/Dec Times for S-Curve Application

- Actual acceleration time = user-configured acceleration time + user-configured acceleration time x starting gradient level/2 + user-configured acceleration time x ending gradient level/2.
- Actual deceleration time = user-configured deceleration time + user-configured deceleration time x starting gradient level/2 + user-configured deceleration time x ending gradient level/2.

① Caution

Note that actual acceleration and deceleration times become greater than user-defined acceleration and deceleration times when an S-curve is selected for their patterns.

5.3.2.2 Acc/Dec Stop Command Settings

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Multifunction input terminals can be configured to stop acceleration or deceleration and operate the inverter at a fixed speed.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|-----------|--------------|------------------|---------------------------------|------|
| DIN | 01 ,03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 17 | XCEL Stop | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |



[Image 23. Frequency Change Based on Acc/Dec Stop Command Settings]

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6 Using the Advanced Functions of the Motor

6.1 Induction Motor V/F Control

Configure the inverter's output voltages, gradient levels and output patterns to achieve a target output frequency with V/F control. The amount of torque boost used during low frequency operations can also be adjusted.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|-----------------|-----------|-----|---------------|------------------|------|
| | 05 | Control Mode | 0 | V/F | 0~5 | 0 | - |
| MOT1, MOT2 | 15 | Start Frequency | 0.50 | | 0.00~10.00 | 0.50 | Hz |
| | 16 | Start Speed | 15 | | 0~300 | 15 | rpm |
| | 23 | Base Frequency | 60.00 | | 30.00~590.00 | 60.00 | Hz |

V/F Control Common Parameters

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

V/F Operation-Setting Details

| Code and Functions | Description |
|----------------------------------|--|
| MOT1, MOT2-15 Start Frequency | Sets the start frequency. A start frequency is a frequency at which the inverter starts voltage output. Set the target frequency higher than the start frequency to start operation. |
| MOT1, MOT2-16 Start Speed | Sets the start speed. The start speed is speed at which the inverter starts voltage output. |
| MOT1, MOT2-23 Base Frequency | Sets a base frequency. A base frequency is the inverter's output frequency when running at its rated voltage. Refer to the motor's rating plate to set this parameter value. |

6.1.1 Linear V/F pattern operation

A linear V/F pattern configures the inverter to increase or decrease the output voltage at a fixed rate for different operation frequencies based on V/F characteristics. It is used for loads that require constant torque regardless of the frequency.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|----------|------|-------------|-----------|--------|------------------|------------------|------|
| VF1, VF2 | 01 | V/F Pattern | 0 | Linear | 0~3 | 0 | - |

Linear V/F Pattern Setting Details

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| Code and Functions | Description |
|---------------------------|--|
| VF1, VF2-01 VF Pattern | It is a basic pattern that applies voltage proportionate to the operating frequency of the motor. You can secure the starting torque with a torque boost if the starting torque is not big enough. |

6.1.2 Square Reduction V/F Pattern Operation

It is an operation pattern that is ideal for loads whose starting characteristics is square reduction, such as fans and pumps.

| Group | Code | LCD Display | ļ | Set value | Setting Range | Initial Value | Unit |
|----------|------|--------------|---|-----------|------------------|------------------|------|
| | 01 | V//E Dottorn | 1 | Square | 02 | 0 | |
| VFI, VFZ | 01 | v/r Pallern | 3 | Square 2 | 0~3 | 0 | - |

| Code and Functions | Description | | | | |
|-----------------------|---|--|--|--|--|
| | Select 1 (Square) or 3 (Square 2) according to the load's starting characteristics. | | | | |
| | | ltem | Functionality | | |
| | 1 | Square | The inverter produces output voltage proportional to 1.5 square of the operation frequency. | | |
| VF1, VF2-1 V/F | 3 Square 2 | | The inverter produces output voltage proportional to 2 square of the operation frequency. This setup is ideal for variable torque loads, such as fans or pumps. | | |
| Fallem | | Voltage 100% Bas [Image 1. C | Linear Square reduction frequency omparison of V/F pattern operations] | | |

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Square Reduction V/F pattern Operation - Setting Details

6.1.3 User V/F Pattern Operation

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The inverter allows users to configure to suit the V/F pattern and load characteristics of special motors.

| Group | Code | LCD Display | Set value | | Set value Setting Range | | Unit |
|------------|------|------------------|-----------|----------|---|-------|------|
| | 01 | V/F Pattern | 2 | User V/F | - | 0 | - |
| | 02 | User Frequency-1 | | 15.00 | 0.00~ User Frequency-2 | 15.00 | Hz |
| | 03 | User Speed-1 | | 450 | 0~User Speed-2 | 450 | rpm |
| | 04 | User Voltage-1 | | 25 | 0~100 | 25 | % |
| | 05 | User Frequency-2 | | 30.00 | User Frequency-1~ User Frequency-3 | 30.00 | Hz |
| | 06 | User Speed-2 | 900 | | User Speed-1~User Speed-3 | 900 | rpm |
| VF1 VF2 | 07 | User Voltage-2 | | 50 | 0~100 | 50 | % |
| VI 1, VI Z | 08 | User Frequency-3 | | 45.00 | User Frequency-2~ User Frequency-4 | 45.00 | Hz |
| | 09 | User Speed-3 | | 1350 | User Speed-2~User Speed-4 | 1350 | rpm |
| | 10 | User Voltage-3 | 75 | | 0~100 | 75 | % |
| | 11 | User Frequency-4 | | 60.00 | User Frequency-3~ Max Frequency ¹ | 60.00 | Hz |
| | 12 | User Speed-4 | 1800 | | User Speed-3~ Maximum Speed ² | 1800 | rpm |
| | 13 | User Voltage-4 | | 100 | 0~100 | 100 | % |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

¹ DRV-20(Max Frequency)

² DRV-21(Maximum Speed)

User V/F pattern Setting Details

| Code and Functions | Description |
|--|--|
| VF1, VF2-02, 05, 08, 11 User Frequency-x (Frequency-x: Frequency-1~Frequency-4) | Sets user frequencies (VF1, VF2-02, 05, 08, and 11) by selecting arbitrary frequencies in between the start frequency and maximum frequency. |
| VF1, VF2-03, 06, 09, 12 User Speed-x (Speed-x: Speed-1~Speed-4) | Sets user speed (VF1, VF2-03, 06, 09, and 12) by selecting arbitrary speed in between the start speed and maximum speed. |
| VF1, VF2-04, 07, 10, 13 | Sets corresponding voltages for user frequencies (VF1, VF2-02, 05, 08, and 11) or user speed (VF1, VF2-03, 06, 09, and 12) in user voltages (VF1, VF2-04, 07, 10, and 13), respectively. |

100% output voltage in the following image is based on the setting values of MOT1 and MOT2-27 (rated voltage). However, when MOT1 and MOT2-27 (rated voltage) are set as 0, it is based on the input voltage (DRV-30 Ref AC Input Volt).





① Caution

- When a normal induction motor is in use, care must be taken not to configure the output pattern away from a linear V/F pattern. Non-linear V/F patterns may cause insufficient motor torque or motor overheating due to over-excitation.
- User V/F pattern does not work when VF1 and VF2-31 (Torque Boost Mode) are set as manual torque boost and auto torque boost.

6.1.4 Slip Compensation Operation

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The operational characteristics of the induction motor make the difference between the output frequency of the inverter and the actual rotational frequency of the motor. The difference of the frequencies is called the slip frequency, whose size changes as per the load. You can maintain the rotational frequency of the motor by compensating the speed deviation with this feature.



[Image 3. Slip Compensation Operation]

6.1.4.1 Basic Slip Compensation

It simply compensates for the slip with information on the rating plate of the motor.

Refer to 3.1 Setting Up Motor Rating Plate Information before use.

Basic Slip Compensation Operation Settings

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|----------|------|----------------|---|-----------------|------------------|------------------|------|
| MOT1, | 04 | Motor Type | 0 | Induction Motor | - | 0 | - |
| MOT2 | 05 | Control Mode | 1 | Slip Comp. | - | 0 | - |
| VF1, VF2 | 21 | Slip Comp Mode | 0 | Basic Comp. | 0~1 | 0 | - |

6.1.4.2 Advanced Slip Compensation

You can calculate the slip with motor parameters and compensate for it more accurately than basic slip compensation.

Refer to <u>3.1 Setting Up Motor Rating Plate Information</u> and check before use and refer to <u>3.4 Auto Tuning</u> for tuning.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|----------|------|--------------------|-----------|--------------------|------------------|------------------|------|
| MOT1, | 04 | Motor Type | 0 | Induction Motor | - | 0 | - |
| WOT2 | 05 | Control Mode | 1 | Slip Comp. | - | 1 | - |
| | 21 | Slip Comp Mode | 1 | Advanced Comp. | 0~1 | 0 | - |
| - | 22 | SlipGain Mot-Low | 100 | | 0~300 | 100 | % |
| | 23 | SlipGain Mot-High | | 100 | 0~300 | 100 | % |
| | 24 | SlipGain Gen-Low | 100 | | 0~300 | 100 | % |
| VFI, VFZ | 25 | SlipGain Gen-High | 100 | | 0~300 | 100 | % |
| | 26 | SlipComp LPF Gain | 300 | | 1~10000 | 300 | msec |
| | 27 | SlipGain SwOv Freq | | 9.00 | 0.00~ 20.00 | 9.00 | Hz |
| | 28 | SlipGain SwOv Spd | | 270 | 0~600 | 270 | rpm |

Slip Compensation Operation Settings

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

| Slip Compensatio | n Operation | Setting | Details |
|------------------|-------------|---------|---------|
|------------------|-------------|---------|---------|

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| Code and Functions | Description |
|---|---|
| VF1, VF2-22 SlipGain Mot-Low, VF1, VF2-23 SlipGain Mot-High, VF1, VF2-24 SlipGain Gen-Low, VF1, VF2-25 SlipGain Gen-High | Sets gains for calculated slip compensation frequency. VF1, VF2-22 and VF1, VF2-23 set low speed and high speed gains for a reverse load. VF1, VF2-24 and VF1, VF2-25 set low speed and high speed gains for a regenerative load. Adjust gains according to load/speed as slip frequency calculated by the amount of manual or auto torque boost (select how to boost torque in VF1, VF2-31 Torque Boost Mode) may change. |
| VF1, VF2-26 SlipComp LPF Gain | Sets time constant for low-pass filter of calculated slip compensation frequency. Refer to AIN-04, 19, 34 (AI1-3 LPF Gain) in 8.2.4 Filter . |
| VF1, VF2-27 SlipGain SwOv Freq | Sets frequency where slip compensation gains for low speed and high speed are switched based on setting values for reverse and regenerative operations. |

6.2 Vector Control for Induction Motors

It controls torque instantaneously without rotational speed or feedback of the motor for precise location/speed or torque control and rapid acceleration and deceleration. The rotational speed of the motor is estimated with the internal computational algorithm of the inverter. It demonstrates a great torque at a low current compared to V/F control.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|-----------------------|--------------------|--------------------|------------------|-----------------------|------|
| | 04 | Motor Type | 0 | Induction Motor | - | 0 | - |
| MOT1. | 05 | Control Mode | 4 | Vector | - | 0 | |
| MOT2 | 08 | Torque Control En | 0 | No | 0~1 | 0 | - |
| | 51 | ACR Bandwidth | 100 | | 50~400 | 100 | % |
| | 54 | ASR Adjust Gain | 4 | | 1~10 | 4 | - |
| | 14 | Pre-Excite Time | Dependent on motor | | 0.00~ 60.00 | Dependent on motor | sec |
| | 15 | FluxCtrl Bandwidth | 100 | | 50~400 | 100 | % |
| VEC1, VEC2 | 16 | Flux Forcing | 150.0 | | 100.0~ 200.0 | 150.0 | % |
| | 18 | FluxWeak Ctrl Mode | 2 | Adjust by Volt | 0~2 | 2 | - |
| | 19 | FW Volt Ref Ratio | 95.0 | | 85.0~ 100.0 | 95.0 | % |
| | 20 | FW Control Gain | 100 | | 10~1000 | 100 | % |

Vector Control Settings

Control Gain Setting Details

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| Code and Functions | Description |
|---------------------------------------|--|
| MOT1, MOT2-08 Torque Control En | Sets the use of torque control mode. |
| MOT1, MOT2-51 ACR Bandwidth | Sets the bandwidth of an auto current regulator. The bandwidth is set in percentage, and the default, 100%, is calculated automatically. The auto current regulator is used for DC output, vector control, auto tuning, etc. |
| MOT1, MOT2-54 ASR Adjust Gain | Sets speed control gains. Overshoot decreases as the value increases, but noise may occur at high speeds, so use an appropriate value. It is not used for torque control mode. |
| VEC1, VEC2-14 Pre-Excite Time | Sets a pre-excitation time. Pre-excitation is used to start the operation after performing excitation up to the motor's rated flux. The induction motor requires exciting current to generate a rotating field. The time needed to create a field should be secured before operation as the field is created slowly compared to the current increase. Set the VEC1 and VEC2 values big to reduce the required time. It is not used when a synchronous motor is selected. |
| VEC1, VEC2-15 FluxCtrl Bandwidth | Sets the bandwidth for a flux controller. The bandwidth is set in percentage, and the default, 100%, is calculated automatically. |
| VEC1, VEC2-16 Flux Forcing | Sets the upper limit of flux current during flux control. It is used for vector control of the induction motor and is set as percentage of No Load Current. You can reduce the initial excitation time by increasing the value, but it may cause current pulsation. |
| VEC1, VEC2-18 - FluxWeak Ctrl Mode | Provides field weakening operation methods. |
| VEC1, VEC2-19 FW Volt Ref Ratio | Sets the voltage for a field weakening operation. |
| VEC1, VEC2-20 FW Control Gain | Sets the gain for a field weakening controller. |

() Caution

- Controller gains can be adjusted according to load characteristics. However, use with caution because conditions, such as motor overheating or unstable system may occur depending on the controller gain settings.
- For high-performance operation, the parameters of the motor connected to the inverter output must be measured. Use auto tuning (BAS-20 Auto Tuning) to measure the parameters before you run sensorless vector operation. To run high-performance sensorless vector control, the inverter and the motor must have the same capacity. If the motor capacity is smaller than the inverter capacity by more than two levels, control may be inaccurate. In that case, change the control mode to V/F control. In addition, when operating with sensorless vector control, do not connect multiple motors to the inverter output for operation.

6.2.1 Sensorless Vector Control for Induction Motors

Sensorless vector control is an operation to carry out vector control without using location/speed sensors but with an estimation of the motor rotational speed calculated by the inverter.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|--------------------|-----------|-----------------|------------------|------------------|------|
| MOT1, | 4 | Motor Type | 0 | Induction Motor | 0~1 | 0 | - |
| MOT2 | 5 | Control Mode | 3 | Sensorless | - | 0 | - |
| VEC1, VEC2 | 37 | IMSL SpdCompNoLoad | 5 | | 95~110 | 5 | Hz |
| | 38 | IMSL Torque Comp | 100 | | 10~500 | 100 | % |
| | 39 | IMSL Speed Comp | 100 | | 10~500 | 100 | % |
| | 40 | IMSL LSpd Trq Comp | 100 | | 10~500 | 105 | % |

Setting Sensorless Vector Control

| Code and Functions | Description |
|--|--|
| VEC1, VEC2-37 IMSL SpdCompNoLoad | Adjust the speed with these parameters if the estimated and actual speeds are different at no load. |
| VEC1, VEC2-38 IMSL Torque Comp | Adjust the torque with these parameters if the estimated and actual torque are different. |
| VEC1, VEC2-39 IMSL Speed Comp | Adjust the speed with these parameters if the estimated and actual speeds are different. |
| VEC1, VEC2-40 IMSL LSpd Trq Comp | Adjust with these parameters if it does not start at a low speed (lower than 5% of the rated speed). |

Sensorless Vector Control Operation-Setting Details

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If there is current

hunting when the load

is larged at around the

rated speed

6.2.1.1 **Sensorless Vector Control Operation Guide for Induction Motors**

| Table 1. Sensorless Vector Control Operation Guide for Induction Motors | | | | | |
|---|---------------------------------------|---|--|--|--|
| Problem | Relevant function code | Troubleshooting | | | |
| If the number of motor rotations drops due to lack of torque | VEC1, VEC2- 38 IMSL Torque Comp | If the rotational frequency drops extremely, causing its error rate to drop to more than 2% of the rated speed, increase the value in 10% increments. | | | |

Tune to reduce values.

| Table | 1. | Sensorless | Vector | Control | Operation | Guide for | Induction | Motors |
|-------|----|-------------|--------|----------|-----------|-----------|-----------|--------|
| labic | | 00113011033 | VECIUI | 00111101 | operation | Oulde IOI | mauchon | MOLDIS |

VEC1, VEC2-

38 IMSL Torque

Comp

| Problem | Relevant function code | Troubleshooting | | |
|--|--|--|--|--|
| If the error rate of the rotational frequency is more than 1% of the rated speed when there is enough torque | VEC1, VEC2- 39 IMSL Speed Comp | Change the value in 5% increments. It tilts counterclockwise as the value increases. Refer to the following for load-rotational frequency curve according to the values: | | |
| If there is not enough torque due to a load increase at a low speed (less than 5% of the rated speed) | VEC1, VEC2-40 IMSL LSpd Trq Comp | If there is not enough torque at a low speed, increase the value in 5% increments. | | |
| If it rotates in the reverse direction due to a load increase at a low speed (less than 5% of the rated speed) | VEC1, VEC2-40 IMSL LSpd Trq Comp | If it rotates in reverse direction due to a load increase at a low speed, decrease the value by 5% at a time. | | |
| If there is not enough torque at a low speed (less than 5% of the rated speed) when the load inertia is large. | MOT1, MOT2-54 ASR Adjust Gain | High load inertia makes it difficult to control from time to time. In such cases, increase the value by 1 at a time. | | |

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6.2.2 Vector Control for Induction Motors Using Location/ Speed Sensors

It is a method used to control the rotor by measuring the position/speed of the rotor with a position/speed sensor. Check the connection of the encoder (location/speed sensors) before starting an operation. Refer to <u>**3.3 Setting the Encoder**</u> for encoder settings.
| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|------------------------|--------|---------------|------|-----------------|------------------|------------------|------|
| MOT1, | 04 | Motor Type | 0 | Induction Motor | - | 0 | - |
| MOT2 05 Control Mode 2 | V/F PG | - | 0 | - | | | |
| VEC1, | 09 | Hold Time | 1.00 | | 0.00~ 60.00 | 1.00 | sec |
| VECZ | 34 | IMSD Trq Comp | | 100 | 10~500 | 0 | % |

| Vector Control for Induction Motors | Using Location/Speed Sensors |
|--|------------------------------|
|--|------------------------------|

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Vector Control Operation for Induction Motors Using Location/Speed Sensors-Setting Details

| Code and Functions | Description | | | | | | | |
|--------------------------------|---|--------------------------------------|--|--|--|--|--|--|
| | When the motor is in the deceleration stop via the stop command, conduct a continuous operation for a set time before blocking the output. | | | | | | | |
| | Output frequency | | | | | | | |
| VEC1, VEC2-9 Hold Time | Output voltage | | | | | | | |
| | Operation command | | | | | | | |
| | | VEC1, 2-09 (Hold Time) | | | | | | |
| | [Image 5. How c | loes VEC1, VEC2-9 (Hold Time) work] | | | | | | |
| VEC1, VEC2-34 IMSD Trq Comp | When the output torque of the inverter is different from the desired amount in torque mode, adjust these compensation values. Adjust these values when output current is bigger than what is required for control in speed mode as well. Excessive settings may cause a trip to the inverter. It only works for vector control that uses location and speed sensors. | | | | | | | |

6.3 Torque Control for Induction Motors

Torque control controls the motor to achieve the corresponding torque, based on preset command values. It can be used in both sensorless vector control and vector control using location/speed sensors. For vector control using location/speed sensors, check the connection of the encoder (location/speed sensors) before starting operation. Refer to **3.3 Setting the Encoder** for encoder settings.

6.3.1 Setting Torque Control for Induction Motors

Set the parameters as follows for torque control: Refer to **<u>6.6.3 Speed/Torque Switch</u>** for speed limits or speed/torque switch regarding torque control.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|-------------------|-----------|--------------------|----------------|------------------|------|
| MOT1, MOT2 | 04 | Motor Type | 0 | Induction Motor | - | 0 | - |
| | 05 | Control Mode | 4 | Vector | - | 0 | - |
| | 08 | Torque Control En | 1 | Yes | - | 0 | - |
| DRV | 03 | Command Torque | 0 | | -180.0 ~ 180.0 | 0.0 | % |
| VEC1, VEC2 | 34 | IMSD Trq Comp | | 100 | 10 ~ 500 | 100 | % |

Torque Control for Induction Motors-Setting Details

| Code and Functions | Description |
|--------------------|---|
| VEC1, VEC2-34 | When the output torque of the inverter is different from the desired amount in torque mode, adjust these compensation values. |
| IMSD Trq Comp | Excessive settings may cause a trip to the inverter. It only works for vector control that uses location and speed sensors. |

6.3.2 Setting Torque Command Sources

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Torque commands for S300 are determined by the torque command sources as follows: Torque settings are only available in torque control mode.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit | | | | | | | | | | | | | | | | | |
|-------|------|--------------------------|----------------|-------------------------------|---------------|------------------|------------|------------|------------|------------|----------------|---------------|------------|---------------------------|------------|------------|------------|------------|------------|---|----------------|------|---|--|
| | | | 0 | Keypad | | | | | | | | | | | | | | | | | | | | |
| | | | 1 | Analog Input 1 | | | | | | | | | | | | | | | | | | | | |
| | | | 2 | Analog Input 2 | | | | | | | | | | | | | | | | | | | | |
| | | 3 | Analog Input 3 | | | | | | | | | | | | | | | | | | | | | |
| | | 12 1st Torque Ref Src | 4 | Pulse Input | | | | | | | | | | | | | | | | | | | | |
| | 10 | | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 1st Torque | 5 | Internal Comm. | 0~11 | 0 | |
| DRV | 12 | | 6 | USB Drive | 0~11 | U | - | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | 7 | Option Comm. ³ | | | | | | | | | | |
| | | | | | | | | | | | 8 User Sequenc | User Sequence | | | | | | | | | | | | |
| | | | 9 | X-Analog Input 1 ⁴ | | | | | | | | | | | | | | | | | | | | |
| | | | 10 | X-Analog Input 2 ⁴ | | | | | | | | | | | | | | | | | | | | |
| | | | 11 | X-Analog Input 3 ⁴ | | | | | | | | | | | | | | | | | | | | |

6.3.2.1 Setting Torque Reference in Smart Operator-Direct Input

Set torque commands in Smart Operator and press (4) key to change torque commands. Set desired torque in DRV-03 (Command Torque) code after choosing 0 (Keypad) in DRV-12 (1st Torque Ref Src, torque command setting method) code.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|--------------------|-----------|--------|---------------|------------------|------|
| עסח | 03 | Command Torque | 0.0 | | -180.0~180.0 | 0.0 | % |
| DRV | 12 | 1st Torque Ref Src | 0 | Keypad | - | 0 | - |

⁴ Configurable only when equipped with extension I/O options

³ Configurable only when equipped with communication options

6.3.2.2 Setting Torque via Terminal Analog Voltage Input (Al1-Al3)

Set torque by inputting voltage in Al1-Al3 terminals in the control terminal block. Voltage inputs of 0-+10 V or -10-+10 V are available. SW4 must be selected as V1-V3.

| Group | Code | LCD Display | | Set value | Setting Range (Scope of Expression) | Initial Value | Unit |
|-------|------|---|---|----------------|---|------------------|------|
| | | | 1 | Analog Input 1 | | | |
| עסח | 12 | 1st Torque Ref Src | 2 | Analog Input 2 | 1~3 | 0 | - |
| DRV | | | 3 | Analog Input 3 | | | |
| | 24 | Torque at 100% | | 100.0 | 0.0~200.0 | 100.0 | % |
| | 00 | 24 Torque at 100% 02 Al1 Value ⁵ | - | | -10.00~10.00 | - | V |
| | 02 | | - | | 0.00~20.00 | - | mA |
| | 17 | | - | | -10.00~10.00 | - | V |
| AIN | 17 | AI2 Value ° | - | | 0.00~20.00 | - | mA |
| | 22 | | - | | -10.00~10.00 | - | V |
| | 32 | Als value ° | | - | 0.00~20.00 | - | mA |

Setting a Frequency Reference for 0–10 V Input

Select one among 1-3 (AI1-AI3) in DRV-12 (1st Torque Ref Src, torque setting method) code, then select 0 (Unipolar Voltage) in AI1-AI3 Type Select code from the analog terminal block input group (AIN). Use the power of the external controller or VR+ terminal (analog power terminal) of the control terminal block to input voltage in AI1-AI3 terminals as the volume resistance. Refer to **8.2 Analog Input** for details.

Setting a Frequency Reference for -10–10 V Input

Select one among 1-3 (AI1-AI3) in DRV-12 (1st Torque Ref Src, torque setting method) code, then select 1 (Bipolar Voltage) in AI1-AI3 Type Select code from the analog terminal block input group (AIN).

Use the power of the external controller or VR+ and VR- terminals (analog power terminals) of the control terminal block to input voltage in AI1-AI3 terminals as the volume resistance.

Torque direction of the motor can be changed according to the voltage signal code when input voltage in between -10-+10 V.

Refer to **8.2 Analog Input** for details.

⁵ The units are changed according to AIN-01, 16, and 31 (AI1-AI3 Type Select).

| Operation command | Input voltage | | | | |
|-------------------|---------------|--------|--|--|--|
| | 0~10V | -10~0V | | | |
| FWD | Fwd | Rev | | | |
| REV | Rev | Fwd | | | |

Table 2. Torque Directions for Different Operation Commands and Voltage Inputs

6.3.2.3 Setting frequency via analog current input in terminal block

You can set torque by inputting current from AI1-AI3 terminals (frequency setting (current) terminals) in the control terminal block.

Current in between 4 and 20 mA can be input. SW4 must be selected as I1-I3 current (in the direction of ON).

Inputting current of 4-20 mA in terminal block

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Select one among 1-3 (AI1-AI3) in DRV-12 (1st Torque Ref Src, torque setting method) code,

then select 2 (Current) in Al1-Al3 Type Select code from the analog terminal block input group (AIN). Refer to **7.3 3-Wire Operation** for details.

6.3.2.4 Setting Torque via Pulse Input in Terminal Block

Set torque by inputting pulse frequency of 0.00-32.00 kHz in TI terminal (pulse input terminal) of the control terminal block.

Inputting Pulse of 0-32 kHz in Terminal Block

Select 4 (Pulse Input) in DRV-12 (1st Torque Ref Src, torque setting method) code. Refer to **<u>8.4 Pulse Input</u>** for details.

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|--------------------|-----------|-------------|------------------|------------------|------|
| DRV | 12 | 1st Torque Ref Src | 4 | Pulse Input | - | 0 | - |

6.3.2.5 Setting Torque with Internal Communication

Select 5 (Internal Comm.) in DRV-12 (1st Torque Ref Src), the frequency setting code for the drive group (DRV). Control the inverter via communications with upper-level controllers, such as PLCs or PCs, by using S+/S-/SG terminals (RS-485 signal input terminals) of the control terminal block. Refer to <u>10 Using Built-in Communication</u> <u>Features</u> for details.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|-------|------|--------------------|-----------|----------------|------------------|------------------|------|
| DRV | 12 | 1st Torque Ref Src | 5 | Internal Comm. | - | 0 | - |

Parameters used to set torque with communications are as follows:

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|------------|-------|------|----------------|
| 0390h | Torque Ref | 0.1 | % | Command torque |

6.4 V/F Control for Synchronous Motors

Configure the inverter's output voltages, gradient levels and output patterns to achieve a target output frequency with V/F control. The amount of torque boost used during low frequency operations can also be adjusted.

V/F Control Parameters

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| Group | Code | LCD Display | Set value | | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|-----------------------|-----------|-------------------------|--------------|-------|---------------|------------------|------|
| MOT1, MOT2 | 04 | Motor Type | 1 | Perm Magnet Motor | 1 | 0 | - | | |
| | 05 | Control Mode | 0 | V/F | - | 0 | - | | |
| | 23 | Base Frequency | 60.00 | | 30.00~590.00 | 60.00 | Hz | | |
| | 54 | PM V/F HPF Gain | | 0.7 | 0.0~1.0 | 0.7 | - | | |
| | 55 | PM V/F HPF Wcut | | 1 | 0~3 | 1 | Hz | | |
| VF1, VF2 | 56 | PM V/F CurrLmtGain | 150 | | 0~200 | 150 | % | | |
| | 57 | PM V/F DC Inj Perc | 100 | | 0~150 | 100 | % | | |
| | 58 | PM V/F Idse Limit | | 70 | 0~150 | 70 | % | | |

V/F Operation-Setting Details

| Code and Functions | Description |
|-------------------------------------|--|
| MOT1, MOT2-23 Base Frequency | Sets a base frequency. A base frequency is the inverter's output frequency when running at its rated voltage. Refer to the motor's rating plate to set this parameter value. |
| V/F1, V/F2-54 PM V/F HPF Gain | Sets the gain for the PM V/F stabilization controller. Adjust these values if the motor vibrates during operation. |
| V/F1, V/F2-55 PM V/F HPF Wcut | Sets cut-off frequency of high-pass filter of PM V/F stabilization controller. Adjust these values if the motor vibrates during operation. |
| V/F1, V/F2-56 PM V/F CurrLmtGain | Sets the maximum allowed current as % of rated current of the motor. |
| V/F1, V/F2-57 PM V/F DC Inj Perc | Sets the size of DC current applied to the motor before starting it as % of rated current of the motor. |
| V/F1, V/F2-58 PM V/F Idse Limit | Sets the maximum allowed current for D-axis as % of rated current of the motor. Reduce these values when the current is too big during a no-load operation. |

6.5 Vector Control for Synchronous Motors

It controls torque for precise location/speed or torque control and rapid acceleration and deceleration. It demonstrates a large amount of torque at low current compared to V/F control.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|--------------------|-----------|-------------------------|------------------|------------------|------|
| MOT1, | 04 | Motor Type | 1 | Perm Magnet Motor | - | 0 | - |
| | 05 | Control Mode | 3 | Sensorless | - | 0 | - |
| | 51 | ACR Bandwidth | 100 | | 50~400 | 100 | % |
| MO12 | 54 | ASR Adjust Gain | 4 | | 1~10 | 4 | - |
| | 61 | IPPE Enable | 1 | Yes | 0~1 | 1 | - |
| | 62 | IPPE Volt Ref Perc | 50 | | 10~100 | 50 | % |
| | 63 | IPPE Curr Peak Per | 120 | | 10~150 | 120 | % |
| VEC1, VEC2 | 61 | PLL Z Gain | 3 | | 1~6000 | 3 | - |
| | 62 | PLL F Gain | 100 | | 1~500 | 100 | % |

Control Gain Setting Details

| Code and Functions | Description |
|----------------------------------|---|
| MOT1, MOT2-51 ACR Bandwidth | Sets the bandwidth of an auto current regulator. The bandwidth is set in percentage, and the default, 100%, is calculated automatically. The auto current regulator is used for DC output, vector control, auto tuning, etc. |
| MOT1, MOT2-54 ASR Adjust Gain | Sets speed control gains. Use appropriate values as overshoot decreases as the values get bigger, but with possible noise in the speed. It is not used for torque control mode. |
| VEC1, VEC2-62 PLL F Gain | Sets the gain for flux controllers. Adjust if the motor does not start or if it vibrates. |

() Caution

- Controller gains can be adjusted according to load characteristics. Use with caution because conditions, such as motor overheating or unstable system may occur depending on the controller gain settings.
- For high-performance operation, the parameters of the motor connected to the inverter output must be measured. Use auto tuning (BAS-20 Auto Tuning) to measure the parameters before you run sensorless vector operation. To run high-performance sensorless vector control, the inverter and the motor must have the same capacity. If the motor capacity is smaller than the inverter capacity by more than two levels, control may be inaccurate. In that case, change the control mode to V/F control. In addition, when operating with sensorless vector control, do not connect multiple motors to the inverter output for operation.

6.5.1 Initial Angle Detection

Initial angle detection is a process of matching the location of rotor and location inside the inverter when starting the motor. For synchronous motors, the absolute position of flux from the permanent magnet, that is, the absolute position of rotor must be accurate to instantaneously and precisely control torque from the motor since rotor flux occurs from the permanent magnet attached to the rotor. As it is highly important to have the absolute position, or, location information of the initial stimulus when starting the motor, it detects initial angle before starting.

| Group | Code | LCD Display Set va | | t value | Setting Range | Initial Value | Unit |
|---------------|------|--------------------|-----|---------|------------------|------------------|------|
| MOT1, MOT2 | 61 | IPPE Enable | 1 | Yes | - | 1 | - |
| | 62 | IPPE Volt Ref Perc | 50 | | 10~100 | 50 | % |
| | 63 | IPPE Curr Peak Per | 120 | | 10~150 | 120 | % |

Initial Angle Detection Settings

Initial Angle Detection-Setting Details

| Code and Functions | | Description | | | | | |
|-------------------------------------|---|--------------|---|--|--|--|--|
| | You need to figure out the initial position of the stimulus when starting the motor for vector control (including sensorless operation) over synchronous motors. | | | | | | |
| | С | onfiguration | Functionality | | | | |
| MOT1, MOT2 61 IPPE Enable | 0 No Starts by detecting position without stimulus detection. | | Starts by detecting position without initial stimulus detection. | | | | |
| | 1 | Yes | Applies pulse-type voltage according to stimulus position and detects the position of stimulus from the current that changes per location. There is a bit of noise during the initial start from voltage pulse injection. | | | | |
| MOT1, MOT2-62 IPPE Volt Ref Perc | Sets applied pulse voltage as a % of motor rating. | | | | | | |
| MOT1, MOT2-63 IPPE Curr Peak Per | Sets the maximum current that flows when applying pulse voltage as a % of motor rating. Larger values improve accuracy of detection but increase noise, while smaller values reduce noise but decrease accuracy. Extreme values may cause overcurrent trips. | | | | | | |

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6.5.2 Sensorless Vector Control Operation Settings for Synchronous Motors

Select desired motor capacity in MOT1 and MOT2-21 (Motor Capacity), then select the following codes respectively and input rating plate information of the motor. If there is no motor capacity setting, select a higher capacity that is close to the relative motor capacity.

| Code and Functions | Description |
|---------------------------------|---|
| MOT1, MOT2-21 Motor Capacity | Set the capacity of the motor connected to the inverter. According to the motor capacity, the default value of the related parameter changes if the value is changed. |
| MOT1, MOT2-23 Base Frequency | Enter the base frequency of the motor rating plate. A base frequency is the inverter's output frequency when running at its rated voltage. Refer to the motor's rating plate to set this parameter value. |

| Code and Functions | Description | | | | |
|----------------------------------|--|--|--|--|--|
| MOT1, MOT2-24 Rated Speed | Enter the rated speed of the motor rating plate. | | | | |
| MOT1, MOT2-25 Number of Poles | Enter the number of poles on the motor rating plate. | | | | |
| MOT1, MOT2-26 Rated Current | Enter the rated current of the motor rating plate. | | | | |
| | Enter the rated voltage of the motor rating plate. Set the motor voltage if the input power and the motor voltage specifications differ. | | | | |
| MOT1. MOT2-27 | • The output voltage can be maintained at the set value if the set voltage is lower than the input power supply voltage above the base frequency. | | | | |
| Rated Voltage | • A voltage smaller than the input power supply voltage is output if the set voltage is higher than the input power supply voltage above the base frequency. | | | | |
| | The output voltage size is determined by the input power voltage during V/F operation if the set voltage is set to 0 above the base frequency. | | | | |

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Refer to **<u>3.4 Auto Tuning</u>** and run auto-tune after setting motor parameters.

6.5.3 Sensorless Vector Control Operation Guide for Synchronous Motors

| Table 3. | Sensorless | Vector | Control | Operation | Guide for | Svnchronous | Motors |
|----------|------------|--------|---------|-----------|-----------|-------------|--------|
| | | | | | | • | |

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| Problem | Relevant function code | Troubleshooting |
|---|---|--|
| If there is not enough starting torque If there is motor hunting at the start If there are speed fluctuations during low-speed operation | | Reduce values by 10% |
| If you hear a "thud" right after acceleration or when stopping after deceleration | PLL F Gain | at a time. |
| If there are fluctuations during accelerated operation | | |
| If an operation fails with static auto- tuning parameters and a trip occurs | MOT1, MOT2-36 Stator Resistance, MOT1, MOT2-40 q-axis Inductance, MOT1, MOT2-41 d-axis Inductance, MOT1, MOT2-42 PM Rotor Flux | Improper static PM auto-tuning can cause starting failure from parameter errors, so use parameters from the rating plate of the motor for operation. |
| If starting after the current flows as much as torque limit settings or if it fails to start and inverter overload occurs when starting under overload If it cannot detect motor speed properly or if the current (over 150% of rating) overflows under overload (exceeding rated load) for each area of set speed | MOT1, MOT2-40 q-axis Inductance | If the Lq parameter is no longer constant under overload and decreases due to magnetic saturation, etc., reduce the values by 5% at a time. |
| If there is motor hunting or an OCT trip under a low-speed (less than 10 Hz) regenerative load | MOT1, MOT2-51 ACR Bandwidth | Reduce values by 10% at a time. |
| during high-speed operation | | |

| Problem | Relevant function code | Troubleshooting | | |
|---|----------------------------------|--|--|--|
| If speed severely hunts and rated current flows during no-load operation | | | | |
| If OCT trip occurs after applying and releasing rapid low-speed regenerative load (more than 100%) | | | | |
| If OVT occurs due to rapid acceleration/deceleration at medium-speed (more than 30 Hz) or drastic load changes | MOT1, MOT2-54 ASR Adjust Gain | Reduce values by 1 at a time. | | |
| If speed fluctuates during high- speed, overload, or normal operation | | | | |
| If OCT trip occurs after applying and releasing rapid low-speed regenerative load (more than 100%) | | | | |
| If it fails to start due to large load inertia | | Increase values by 1 at a time. | | |
| If there is a trip when starting or accelerating during free-run at over constant speed | BAS-01 Start Mode | For PM motor control, it starts after initial angle detection while stopping. Set the value as 2 (Speed Search) if you want to accelerate during a free-run. | | |

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6.5.4 Vector Control for Synchronous Motors Using Location/Speed Sensors

It is a method used to control the rotor by measuring the position/speed of the rotor with a position/speed sensor. Check the connection of the encoder (location/speed sensors) before starting an operation. Refer to **<u>3.3 Setting the Encoder</u>** for encoder settings.

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|------|--------------|---|-------------------|------------------|------------------|------|
| MOT1, | 04 | Motor Type | 1 | Perm Magnet Motor | - | 0 | - |
| MOT2 | 05 | Control Mode | 4 | Vector | - | 0 | - |

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Advancec Functions

6.6 Common Functions of Vector Control

6.6.1 Torque Limits in Speed Control

Speed control mode limits torque output. You can set both reverse and regenerative torque limits for forward and reverse operations.

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| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|-------------------|-----------|------------|------------------|------------------|------|
| BAS | 16 | Torque Limit Src | 0 | Keypad | 0~8 | 0 | |
| MOT1, MOT2 | 05 | Control Modo | 3 | Sensorless | | 0 | |
| | 05 | Control Mode | 4 | Vector | - | 0 | |
| | 08 | Torque Control En | 0 | No | 0~1 | 0 | |
| | 21 | Fwd +Torque Limit | 180.0 | | 0.0~320.0 | 180 | % |
| VEC1, VEC2 | 22 | Fwd -Torque Limit | 180.0 | | 0.0~320.0 | 180 | % |
| | 23 | Rev +Torque Limit | | 180.0 | 0.0~320.0 | 180 | % |
| | 24 | Rev -Torque Limit | 180.0 | | 0.0~320.0 | 180 | % |

Torque Limit Settings

Common Parameters for Torque Limits

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|-------------------|-------|------|------------------------------------|
| 0391h | Fwd +Torque Limit | 0.1 | % | Forward motoring torque limits |
| 0392h | Fwd -Torque Limit | 0.1 | % | Forward regenerative torque limits |
| 0393h | Rev +Torque Limit | 0.1 | % | Reverse motoring torque limits |
| 0394h | Rev -Torque Limit | 0.1 | % | Reverse regenerative torque limits |

Torque Limits-Setting Details

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| Code and Functions | Description | | | | | |
|--|----------------------------|--|---|--|--|--|
| MOT1, MOT2-05 Control Mode, MOT1, MOT2-08 Torque Control En | Torque | Torque limit is active in sensorless or vector speed control modes. | | | | |
| | Select You ca or var | Select a type to which you want to set the amount of torque limits. You can set via Smart Operator, analog input at the terminal block, or various communications. | | | | |
| | | ltem | Functionality | | | |
| | 0 | Keypad | Limits set in VEC1, VEC2-26, and 27 (TrqMode FwdFreqLmt, TrqMode RevFreqLmt) or VEC1, VEC2-28, and 29 (TrqMode Fwd SpdLmt, TrqMode Rev SpdLmt) are applied. | | | |
| BAS-16 Torque | 1 | Analog Input 1 | | | | |
| Ennicoro | 2 | Analog Input 2 | Limits apply according to the set analog | | | |
| | 3 | Analog Input 3 | | | | |
| | 4 | Pulse Input | Limits apply according to the pulse input at the terminal block. | | | |
| | 5 | Internal Comm. | | | | |
| | 6 | USB Comm. | Limits apply according to the set values | | | |
| | 7 | Option Comm. ⁶ | addresses 0391h-0394h. | | | |
| | 8 | UserSequence | | | | |

⁶ Configurable only when equipped with communication options

6.6.2 Speed Limits in Torque Control

If output torque of the motor is bigger than load torque in torque control mode, motor speed gradually increases. Operating frequency (speed) should be limited to prevent this. You cannot control torque when this function is active as speed limit is its main objective.

Torque Limit Settings

| Group | Code | LCD Display | Set value | | Setting Range | Initial Value | Unit |
|---------------|------|--------------------|-----------|------------|------------------|------------------|------|
| BAS | 17 | TrqMode SpdLmt Src | 0 | Keypad | 0~8 | 0 | |
| MOTA | 05 | Control Modo | 3 | Sensorless | 0~1 | 0 | |
| MOT1, MOT2 | 05 | Control Mode | 4 | Vector | 0~4 | | |
| | 08 | Torque Control En | 1 Yes | | 0~1 | 0 | |
| VEC1, | 26 | TrqMode FwdFreqLmt | | 60.00 | 0.00~ 60.00 | 60.00 | Hz |
| | 27 | TrqMode RevFreqLmt | | 60.00 | 0.00~ 60.00 | 60.00 | Hz |
| VEC2 | 28 | TrqMode Fwd SpdLmt | | 1800 | 0~1800 | 1800 | rpm |
| | 29 | TrqMode Rev SpdLmt | | 1800 | 0~1800 | 1800 | rpm |
| | 30 | TrqMode SpdLmtGain | | 20.0 | 1.0~100.0 | 20.0 | % |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Common Communication Parameter Addresses for Speed Limits

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|-----------------|-------|------|-------------------------|
| 038Ch | Fwd Freq Limit | 0.01 | Hz | Forward frequency limit |
| 038Dh | Rev Freq Limit | 0.01 | Hz | Reverse frequency limit |
| 0393h | Fwd Speed Limit | 0.1 | rpm | Forward speed limit |
| 0394h | Rev Speed Limit | 0.1 | rpm | Reverse speed limit |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Speed Limits-Setting Details

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| Code and Functions | Description | | | | | | |
|--|--|---|---|--|--|--|--|
| MOT1, MOT2-05 Control Mode, MOT1, MOT2-08 Torque Control En | Torque | Torque limit is active in sensorless or vector torque control modes. | | | | | |
| | Select You ca or var | Select a type to which you want to set the amount of speed limits. You can set via Smart Operator, analog input at the terminal block, or various communications. | | | | | |
| | | ltem | Functionality | | | | |
| | 0 | Keypad | Limits set in VEC1, VEC2-26, and 27 (TrqMode FwdFreqLmt, TrqMode RevFreqLmt) or VEC1, VEC2-28, and 29 (TrqMode Fwd SpdLmt, TrqMode Rev SpdLmt) are applied. | | | | |
| BAS-17 TrqMode SpdL mt Src | 1 | Analog Input 1 | | | | | |
| opullintoro | 2 | Analog Input 2 | Limits apply according to the set analog input at the terminal block. | | | | |
| | 3 | Analog Input 3 | | | | | |
| | 4 | Pulse Input | Limits apply according to the pulse input at the terminal block. | | | | |
| | 5 | Internal Comm. | | | | | |
| | 6 | USB Comm. | Limits apply according to set values in | | | | |
| | 7 | Option Comm. ⁷ | 0393h and 0394h. | | | | |
| | 8 | UserSequence | | | | | |
| VEC1, VEC2-30 TrqMode SpdLmtGain | If current speed exceeds the speed limit, torque is reduced at a fixed rate. | | | | | | |

⁷ Configurable only when equipped with communication options



6.6.3 Speed/Torque Switch

You can switch from speed mode to torque mode or from torque mode to speed mode with multi-functional input during operation.

Torque Limit Settings

| Group | Code | LCD Display | | Set value | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|----|-------------------|------------------|---------------------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 29 | Spd/Trq Change | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

When the signal on multifunctional input terminal where 29 (Spd/Trq Change) is set turns On during vector torque operation after you set MOT1-05 (Motor Type) as 4 (Vector) and MOT1 and MOT2-8 (Torque Control En) as 1 (Yes), it will switch to speed mode.

During vector speed operation, when the signal on multi-functional input terminal where 29 (Spd/Trq Change) is set turns On, it switches into vector torque mode.

7 Learning Advanced Features

7.1 Auxiliary Frequency Operation

You can use the main frequency and auxiliary frequency simultaneously for an operating frequency with various computational conditions. The main frequency is used for setting the operating frequency, whereas the auxiliary frequency is used to fine-tune during operation at the main frequency.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--|-------------------------|-----------|--------------------|------------------|---------------------------------|------|
| DRV | 35 | Auxiliary Ref Src | 1 | Analog Input 1 | 0~4 | 0 | - |
| | 36 | Auxiliary Cal Type 0 | | M+(G*A) | 0~12 | 0 | - |
| | 37 | Auxiliary Ref Gain | 100.0 | 100.0 | -200.0~ 200.0 | 100.0 | % |
| DIN | 01, 03, 05, Dlx Define 07, 09, 11, (Dlx: 13, 15 Dl1~Dl8) | | 34 | Disable Aux Ref | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Auxiliary Reference Setting Details

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| Code and Functions | Description | | | | | |
|--------------------------------|-------------|-------------------|--|--|--|--|
| | Sele | ect an input ty | pe for auxiliary frequency commands. | | | |
| | | ltem | Functionality | | | |
| | 0 | None | Auxiliary frequency reference is disabled. | | | |
| DRV-35 Auxiliary Ref Src | 1 | Analog Input 1 | Select the AI1 terminal (analog input terminal) of the control terminal block as the source of auxiliary commands. | | | |
| | 2 | Analog Input 2 | Select the AI2 terminal (analog input terminal) of the control terminal block as the source of auxiliary commands. | | | |
| | 3 | Analog Input 3 | Select the AI3 terminal (analog input terminal) of the control terminal block as the source of auxiliary commands. | | | |
| | 4 | Pulse Input | Select pulse input at the PTI terminal as the source of auxiliary commands. | | | |

| Code and Functions | Description | | | | | | |
|---|--|---|---|--|--|--|--|
| | After setting the size of the auxiliary reference gain with DRV-37 (Aux Ref Gain), you can set the reflection ratio for the main reference. Note that items 4–7 from the setting items below may result in either plus (+) or minus (-) values with just unipolar analog inputs. | | | | | | |
| | | ltem | Functionality | | | | |
| | 0 | M+(G*A) | main command value + (auxiliary gain * auxiliary value * DRV-22) | | | | |
| | 1 | M*(G*A) | main command value * (auxiliary gain * auxiliary value) | | | | |
| | 2 | M/(G*A) | main command value * (auxiliary gain * auxiliary value) | | | | |
| | 3 | M+{M*(G*A)} | main command value + (main command value * [auxiliary gain * auxiliary value]) | | | | |
| | 4 | M+G*2*(A-50) | main command value + auxiliary gain * 2 * (auxiliary value - 50) * DRV-22 | | | | |
| Auxiliary | 5 | M*{G*2*(A-50)} | main command value * auxiliary gain * 2 * (auxiliary value - 50) | | | | |
| Carrype | 6 | M/{G*2*(A-50)} | main command value / auxiliary gain * 2 * (auxiliary value - 50) | | | | |
| | 7 | M+M*G*2*(A-50) | main command value + main command value * auxiliary gain * 2 * (auxiliary gain - 50) | | | | |
| | 8 | (M-A)^2 | (main command value - auxiliary value) ^ 2 | | | | |
| | 9 | M^2 + A^2 | main command value ^ 2 + auxiliary value ^ 2 | | | | |
| | 10 | MAX(M,A) | MAXIMUM (main command value, auxiliary value) | | | | |
| | 11 | MIN(M,A) | MINIMUM (main command value, auxiliary value) | | | | |
| | 12 | (M+A)/2 | (main command value + auxiliary value) / 2 | | | | |
| | M: I | main frequencv va | lue (Hz or rpm) | | | | |
| | G: Auxiliary reference gain (%) | | | | | | |
| | A: Auxiliary frequency command value (Hz or rpm) or gain (%) | | | | | | |
| DRV-37 Auxiliary Ref Gain | Adjust the size of the input (DRV-35 Auxiliary Ref Src) configured as the auxiliary frequency. | | | | | | |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Set turr usir | Set one of the multifunction input terminals to 34 (Disable Aux Ref), and turn it on to disable auxiliary frequency commands and operate the inverter using the main frequency commands only. | | | | | |

Table 1. An Example of Auxiliary Frequency Operation

An Example of Auxiliary Frequency Operation

When the frequency setting in Smart Operator is the main frequency and Al1 analog voltage is the auxiliary frequency,

- Main frequency: Keypad (operation frequency 30 Hz)
- Maximum frequency (DRV-20 Max Frequency): 400 Hz
- Frequency with maximum analog input (DRV-22 Frequency at 100%): 60 Hz
- Auxiliary settings (DRV-35 Auxiliary Ref Src): Analog Input 1: 6V
- Auxiliary gain settings (DRV-37 Auxiliary Ref Gain): 50%
- DIN-01~15: Factory default output

For example, the auxiliary A in the following table is 60% (= 100% * [6 V / 10 V]).

| | Item ¹ | Functionality |
|----|-------------------------------|---|
| 0 | M[Hz]+(G*A)[Hz/100%] | 30Hz(M)+(50%(G)x60%(A)*60Hz/%)=48Hz |
| 1 | M[Hz]*(G*A) | 30Hz(M)x(50%(G)x60%(A))=9Hz |
| 2 | M[Hz]/(G*A) | 30Hz(M)/(50%(G)x60%(A))=100Hz |
| 3 | M[Hz]+{M[Hz]*(G*A)} | 30Hz(M)+{30[Hz]x(50%(G)x60%(A))}=39Hz |
| 4 | M[Hz]+ G*2*(A-50)[Hz/100%] | 30Hz(M)+50%(G)x2x(60%(A)–50%)x60Hz=36Hz |
| 5 | M[HZ]*{G*2*(A-50)} | 30Hz(M)x{50%(G)x2x(60%(A)–50%)}=3Hz |
| 6 | M[HZ]/{G*2*(A-50)} | 30Hz(M)/{50%(G)x2x(60%-50%)}=300Hz |
| 7 | M[HZ]+M[HZ]*G*2*(A-50) | 30Hz(M)+30Hz(M)x50%(G)x2x(60%(A)–50%)=33Hz |
| 8 | (M[Hz]-A[Hz/100%])^2 | (30Hz(M) - 60%(A)*60Hz/%)^2=36(Hz^2) |
| 9 | M[Hz]^2+(A[Hz/100%])^2 | (30Hz(M) + 60%(A)*60Hz/%)^2=2196(Hz^2) -> 400Hz |
| 10 | Max(M[Hz], A[Hz/100%]) | Max(30Hz(M) , 60%(A)*60Hz/%)=36Hz |
| 11 | Min(M[Hz], A[Hz/100%]) | Min(30Hz(M) , 60%(A)*60Hz/%)=30Hz |
| 12 | (M[Hz]+A[Hz/100%])/2 | (30Hz(M) + 60%(A)*60Hz/%)/2=33Hz |

Note

When the maximum frequency value is high, there may be an output frequency deviation due to errors in analog input or calculations.

¹ M: Main frequency command (Hz or rpm), G: Auxiliary gain (%), A: Auxiliary (%), Hz / 100% is converted to rpm instead of Hz when you change the set frequency for DRV-22 (Frequency at 100%) to rpm.

7.2 Jog operation

The jog operation allows for temporary control of the inverter. You can enter a jog operation command using the multifunction terminals.

The jog operation is the second-highest priority, after the dwell operation. If a jog operation is requested while operating the multistep, up-down, or 3-wire operation modes, the jog operation overrides all other operation modes.

7.2.1 Jog Operation by Terminal Block 1-Forward Jog

Set a jog operation with input at the multifunction terminal block. Refer to the following parameters for forward jog operation.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|---------------------|-------|------------------------------------|---------------------------------|------|
| DRV | 15 | Jog Frequency | Jog Frequency 10.00 | | 0.00~Max Frequency ² | 10.00 | Hz |
| | 16 | Jog Speed | 300 | | 0~Maximum Speed ³ | 300 | rpm |
| | 17 | Jog Acc Time | 20.00 | | 0.00~6000.00 | 20.00 | sec |
| | 18 | Jog Dec Time | 30 | 00.00 | 0.00~6000.00 | 30.00 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 9 | JOG | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

- ² DRV-20(Max Frequency)
- ³ DRV-21(Maximum Speed)

Forward Jog Description Details

| Code and Functions | Description | | | | |
|---|--|--|--|--|--|
| | Select one of the multifunction terminals, DI1-DI8, for the jog frequency settings, then set the codes for the relative terminal of the terminal input group (DIN) to 9 (JOG). | | | | |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Image 1. [An Example of Terminal Settings for Jog Operation] | | | | |
| DRV-15 Jog Frequency, Drv-16 Jog Speed | Set the unit of speed (Hz or rpm) for a jog operation. | | | | |
| DRV-17 Jog Acc Time | Set the acceleration time for a jog operation. | | | | |
| DRV-18 Jog Dec Time | Set the deceleration time for a jog operation. | | | | |

If a signal is entered at the jog terminal while an FX operation command is on, the operation frequency changes to the jog frequency and the jog operation begins.

7.2.2 Jog Operation by Terminal Block 2-Forward / Reverse Jog

For jog operation 1, an operation command must be entered to start the operation, but for jog operation 2, you only need a terminal with either a forward jog or reverse jog setting to start the jog operation. The priorities for frequency, acceleration and deceleration times, and terminal block inputs (Dwell, 3-wire, up-down, etc.) during jog operation are identical to jog operation 1. If a different operation command is entered during a jog operation, it is ignored and the operation keeps running with the jog frequency.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------------------------|-----------------|------------------------------|-----------|----------------|------------------------------------|---------------------------------|------|
| | 15 | Jog Frequency | | 10.00 | 0.00~Max Frequency ⁴ | 10.00 | Hz |
| DRV | RV 16 Jog Speed | | 300 | | 0~Maximum Speed ⁵ | 300 | rpm |
| | 17 | Jog Acc Time | 20.00 | | 0.00~6000.00 | 20.00 | sec |
| | 18 | Jog Dec Time | 30.00 | | 0.00~6000.00 | 30.00 | sec |
| 01, 0 DIN 07, 0 13 | 01, 03, 05, | DIx Define (DIx: DI1~DI8) | 35 | Forward JOG | | 1, 2, 4, 5, 10, 11, 12, 9 | |
| | 13, 15 | | 36 | Reverse JOG | - | | - |

An Example of Forward / Reverse Jog Settings

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.



[Image 2. An Example of Forward / Reverse Jog Operation]

⁴ DRV-20(Max Frequency)

⁵ DRV-21(Maximum Speed)

7.2.3 Jog Frequency Limits

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You can limit jog frequencies with upper limit and lower limit settings at ADV-19 (Jog Freq Limit En) (refer to <u>Limiting the Frequency Using the Maximum Frequency</u> <u>and Start Frequency</u>). Refer to the following parameters to limit the jog frequency:

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit | | |
|-------|------|-----------------------|------------------|-----|-------------------------------------|------------------|---|------|-----|
| DRV | 15 | Jog Frequency | 10.00 | | 0.00~Max Frequency ⁶ | 10.00 | Hz | | |
| | 14 | Cmd Freq Limit En | 0 No | | 0~1 | 0 | - | | |
| - | 15 | Cmd Freq Limit Lo | 0.50 | | 0.50 | | 0.00~Cmd Freq Limit Hi | 0.50 | Hz |
| ADV | 16 | Cmd Freq Limit Hi | Max Frequency | | Cmd Freq Limit Lo ~Max Frequency | Max Frequency | Hz | | |
| | 17 | Cmd Speed Limit Lo | 15 | | 0~ Cmd Speed Limit Hi | 15 | rpm | | |
| | 18 | Cmd Speed Limit Hi | 1800 | | 1800 | | Cmd Speed Limit Lo~Maximum Speed ⁷ | 1800 | rpm |
| | 19 | Jog Freq Limit En | 1 | Yes | 0~1 | 1 | - | | |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Limiting Jog Frequency Using Upper and Lower Limits' Setting Details

| Code and Functions | Description |
|---|---|
| ADV-14 Cmd Freq Limit En | The initial setting value is 0 (No). When the setting is changed to 1 (Yes), the frequency can be set only between the lower limit (ADV-15) and the upper limit (ADV-16). |
| ADV-15/17 Cmd Freq/Speed Limit Lo, ADV-16/18 Cmd Freq/Speed Limit Hi | Configures the upper limit to all parameters for the unit of speed (Hz and rpm) excluding the base frequencies (MOT1, MOT2-23 Base Frequency). Frequency cannot be set higher than the upper limit frequency. |
| ADV-19 Jog Freq Limit En | Limits jog the frequency with upper and lower limits when set to 1 (Yes). |

- ⁶ DRV-20(Max Frequency)
- ⁷ DRV-21 (Maximum Speed)

Advanced Functions

| Mode | Group | Code | LCD Display | Set | Value | Setting Range | Initial Value | Unit |
|-----------|-----------------|------|---------------------|-------|------------|------------------------------------|------------------|------|
| Setting | Operator Set | 15 | Multi Key Select | 1 | JOG Key | - | 0 | - |
| | | 15 | Jog Frequency | 10.00 | | 0.00~Max Frequency ⁸ | 10.00 | Hz |
| Parameter | DRV | 16 | Jog Speed | 3 | 800 | 0~Maximum Speed ⁹ | 300 | rpm |
| | | 17 | Jog Acc Time | 20 | 0.00 | 0.00~6000.00 | 20.00 | sec |
| | | 18 | Jog Dec Time | 30 | 0.00 | 0.00~6000.00 | 30.00 | sec |

7.2.4 Jog Operation with Smart Operator

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Set code 15 in the Operator Set group from the Setting mode to 1, JOG Key. Press the \boxed{MULTI} key and \boxed{I} on the status bar at the top will change to a reversed image (\boxed{I}) with the operation command source and reference command source on the status bar at the top of Smart Operator displaying KJ/J. Then, the jog operation with the Smart Operator will be available. Long-press the forward operation (\boxed{FWD}) key or reverse operation (\boxed{REV}) key of the Smart Operator to operate with the preset jog frequency (DRV-15 Jog Frequency). It stops if you do not press the forward operation (\boxed{FWD}) key or reverse operation (\boxed{REV}) key. Acceleration and deceleration times to jog operating frequency are configurable at DRV-17 (Jog Acc Time) and DRV-18 (Jog Dec Time).





⁸ DRV-20(Max Frequency)

⁹ DRV-21(Maximum Speed)

Note

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- During the inverter operation, you cannot change Multi Key Select parameters or activate/deactivate the (MULTI) key in the Setting mode.
- A jog operation is the second-highest priority after a dwell operation, and a jog operation with the Smart Operator is the highest priority among jog operations.

7.3 3-Wire Operation

The 3-wire operation latches the signal input (the signal stays on after the button is released) and is used when operating the inverter with a push button.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit | l |
|-------|--------------------------------------|------------------------------|-----------|---------|------------------|---------------------------------|------|---|
| DRV | 10 | 1st Command Source | 1 | Fx/Rx-1 | 0~6 | 1 | - | l |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 19 | 3-WIRE | - | 1, 2, 4, 5, 10, 11, 12, 9 | - | |

To enable the 3-wire operation, the following circuit sequence is necessary. The minimum input time (t) for the 3-wire operation is 1 ms, and the operation stops when both forward and reverse operation commands are entered at the same time.



[Image 4. An Example of 3-Wire Operation Settings]

Timing Diagram



[Image 5. An Example of 3-Wire Operation]

7.4 Safe Operation Mode

Operation commands are run only when the signal in the multifunction input terminal set as a safe operation mode is turned on. Safe operation mode is used to safely and carefully control the inverter through the multifunction terminals.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|------------------|------------------------|------------------|---------------------------------|------|
| | 70 | Run Enable | 1 Yes | | 0~1 | 0 | - |
| ADV | 71 | Run Disable Stop | 0 | CoastStop (FreeRun) | 0~2 | 0 | - |
| | 72 | Quick Stop Time | 5.00 | | 0.00~ 6000.00 | 5.00 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 18 RUN Enable | | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Safe Operation Mode Setting Details

| Code and Functions | Description |
|---|---|
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Selects one of the multifunction input terminals for operation in safe operation mode and sets it to 18 (RUN Enable). |

| Code and Functions | Description | | | | | | | | |
|------------------------------|---|------------------------|--|--|--|--|--|--|--|
| | Activates or deactivates safe operation mode. | | | | | | | | |
| ۵۵\/-۷۵ | | ltem | Functionality | | | | | | |
| Run Enable | 0 | No | Enables safe operation mode. | | | | | | |
| | 1 | Yes | Recognizes the operation command from a multifunction input terminal. | | | | | | |
| | Sets operation of the inverter when the multifunction input terminal in safe operation mode is off. When the safe operation mode input terminal is off, it decelerates to the safe operation mode deceleration time (Quick Stop Time), and when the operation command the lifted or the off state is selected, it stops accordin to the deceleration time (DRV-06 Dec Time). | | | | | | | | |
| | | ltem | Functionality | | | | | | |
| Run Disable | 0 | CoastStop (FreeRun) | Blocks the inverter output when the multifunction terminal is off. | | | | | | |
| Stop | 1 | Quick Stop | Decelerates to the Quick Stop Time and then stops. Once stopped, the operation command must be entered again to restart the operation, even if the multifunction terminal is turned On. | | | | | | |
| | 2 | Quick Stop Resume | Decelerates to the Quick Stop Time and then stops. Once stopped, a normal operation will continue if the multifunction terminal is back on with the operation command turned on. | | | | | | |
| ADV-72 Quick Stop Time | Sets the deceleration time when ADV-71 is set to 1 (Quick Stop) or 2 (Quick Stop Resume). | | | | | | | | |
| _ | ADV-71 ADV-71 ADV-72 Free Run 1(Quick Stop) 2(Quick Stop Resume) | | | | | | | | |

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Advanced Functions

7.5 Dwell Operation

The dwell operation is used to maintain torque during the application and release of the brakes on lift-type loads. An inverter dwell operation runs as follows based on the acceleration and deceleration dwell frequencies and dwell time set by the user:

- Acceleration dwell operation: When an operation command is input, acceleration will continue until it reaches the acceleration dwell frequency (ADV-05 AccDwell Frequency) based on the preset acceleration time, then it will operate at a constant speed during the acceleration dwell operation time (ADV-07 AccDwell Time). After the Acc Dwell Time has passed, acceleration is carried out based on the acceleration time and the operation speed that was originally set.
- **Deceleration dwell operation**: When a stop command is input, deceleration will continue until it reaches deceleration dwell frequency (ADV-08 DecDwell Frequency), then it will operate at a constant speed during the deceleration dwell operation time (DRV-07 DecDwell Time). After the set time, deceleration will be carried out based on the deceleration time that was originally set, then the operation will stop.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|--------------|---|------------------|------|
| | 05 | AccDwell Frequency | 5.00 | start frequency- max frequency ¹⁰ | 5.00 | Hz |
| | 06 | AccDwell Speed | 150 | 0~1800 | 150 | rpm |
| 07 | 07 | AccDwell Time | 0.0 | 0~60.0 | 0.0 | sec |
| ADV (| 08 | DecDwell Frequency | 5.00 | start frequency- max frequency | 5.00 | Hz |
| | 09 | DecDwell Speed | 150 | 0~1800 | 150 | rpm |
| | 10 | DecDwell Time | 0.0 | 0~60.0 | 0.0 | sec |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.



[Image 7. An Example of a Dwell Operation]

¹⁰ DRV-20(Max Frequency)

Note

Dwell operations do not work when:

- Dwell operations will not work if the time is set to 0.00 sec or the dwell frequency is set to 0.00 Hz.
- The acceleration dwell operating instructions are only valid once upon initial instruction, so they will not function if the acceleration dwell frequency is passed again during a stop or deceleration and then accelerated again.



[mage 0. An Example of Acceleration Dweil Operation]

 Although a deceleration dwell operation will be carried out whenever stop or deceleration commands are entered and the deceleration dwell frequency is passed through, it will not work during a deceleration by a simple frequency change (which is not a deceleration due to an operation stop).



7.6 Torque Boost

7.6.1 Manual Torque Boost

Manual torque boost allows users to adjust output voltage during a low speed operation or motor start. Increase low speed torque or improve motor starting properties by manually increasing output voltage. Configure manual torque boost while running loads that require high starting torque, such as lift-type loads.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|----------|------|----------------------|-----------|--------|---------------|------------------|------|
| | 31 | Torque Boost Mode | 0 | Manual | - | 0 | - |
| VF1, VF2 | 32 | Forward Boost | 2.0 | | 0.0~15.0 | 2.0 | % |
| - | 33 | Reverse Boost | 2.0 | | 0.0~15.0 | 2.0 | % |

Manual Torque Boost Setting Details

| Code and Functions | Description | | | |
|------------------------------|---|--|--|--|
| VF1, VF2-32 Forward Boost | Set torque boost for forward operation. | | | |
| VF1, VF2-33 Reverse Boost | Set torque boost for reverse operation. | | | |



[Image 10. An Example of Manual Torque Boost]

① Caution

Excessive torque boost setting may result in over-excitation, causing motor overheating or overcurrent trips.

7.6.2 Auto Torque Boost

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The auto torque boost adjusts the amount of boost automatically based on load volume and outputs inverter voltage, whereas the manual torque boost outputs inverter voltage based on the amount of torque boost set by the user regardless of the load characteristics.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|----------|------|----------------------|-----------|------|---------------|------------------|------|
| VF1, VF2 | 31 | Torque Boost Mode | 1 | Auto | - | 0 | - |
| | 34 | ATB Mot-Gain | 100.0 | | 0.0~300.0 | 100.0 | % |
| | 35 | ATB Gen-Gain | 100.0 | | 0.0~300.0 | 100.0 | % |
| | 36 | ATB LPF Gain | | 3 | 1~10000 | 3 | msec |

Auto Torque Boost Setting Details

| Code and Functions | Description |
|-----------------------------|---|
| VF1, VF2-34 ATB Mot-Gain | Adjusts the amount of torque boost compensation calculated by a reverse load. |
| VF1, VF2-35 ATB Gen-Gain | Adjusts the amount of torque boost compensation calculated by a regenerative load. |
| VF1, VF2-36 ATB LPF Gain | Sets time constant for low-pass filter of output voltage calculated by the auto torque boost. Refer to AIN-04, 19, 34 (AI1-3 LPF Gain) in 8.2.4 Filter . |

① Caution

Excessive torque boost setting may result in over-excitation, causing motor overheating or overcurrent trips.

7.7 PID Control

PID control is one of the most common autocontrol methods. It uses a combination of proportional, integral, and differential controls. PID control enables more flexible control over automation systems.

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The functions of PID control that can be applied to the inverter operation are as follows:

| Usage | Functionality |
|------------------------|---|
| Speed control | Controls speed by giving feedback on the current speed of the device or equipment to be controlled. It helps maintain a consistent speed or operate at a target speed. |
| Pressure Control | Controls pressure by giving feedback on the current pressure of the device or equipment to be controlled. It helps maintain consistent pressure or operate at the target pressure. |
| Flow Control | Controls flow by giving feedback on the amount of current flow in the device or equipment to be controlled. It helps maintain a consistent flow or operate at a target flow. |
| Temperature Control | Controls temperature by giving feedback on the current temperature of the device or equipment to be controlled. It helps maintain a consistent temperature or operate at a target temperature. |

Table 2. Usage and Functions of PID Control

7.7.1 Basic PID Operation

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PID operates by controlling the output frequency of the inverter, through automated system process control to maintain speed, pressure, flow, temperature and tension.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|------------------------|-----------|----------------|--|------------------|---------------------------|
| APP | 01 | Process PID Enable | 1 | Yes | - | 0 | - |
| PPID | 01 | Control State | 0 | Idle | | | |
| | | | 1 | Pre-PID | 0~4 | | |
| | | | 2 | RUN | | 0 | - |
| | | | 3 | Sleep Boost | | | |
| | | | 4 | Sleep | | | |
| | 02 | Output Value | - | | Unit Min ¹¹ ~ Unit Max ¹² | - | % |
| | 03 | Reference Value | - | | Unit Min ¹¹ ~ Unit Max ¹² | - | % |
| | 04 | Feedback Value | - | | Unit Min ¹¹ ~ Unit Max ¹² | - | % |
| | 05 | Error Value | - | | Unit Min ¹¹ ~ Unit Max ¹² | - | % |
| | 10 | Reference1 Source | 0 | Keypad | 0~9 | 0 | - |
| | 11 | Ref1 Keypad Set | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | PID Unit ¹³ |
| | 12 | Ref1 Auxiliary Src | 0 | None | 0~4 | 0 | - |
| | 13 | Ref1 Auxiliary Mode | 0 | M+(G*A) | 0~12 | 0 | - |
| | 14 | Ref1 Auxiliary Gain | 0.00 | | -200.00~200.00 | 0.00 | % |
| | 15 | Reference2 Source | 0 | Keypad | 0~9 | 0 | - |
| | 16 | Ref2 Keypad Set | | 0.00 | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | PID Unit ¹³ |

¹² PPID-93(Unit at 100%)

¹³ PPID-90(Unit Select)

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|------------------------|-----------|-------------------|-------------------------------|------------------|---------------------------|
| | 17 | Ref2 Auxiliary Src | 0 | None | 0~4 | 0 | - |
| | 18 | Ref2 Auxiliary Mode | 0 | M+(G*A) | 0~12 | 0 | - |
| | 19 | Ref2 Auxiliary Gain | 0.00 | | -200.00~200.00 | 0.00 | % |
| | 20 | Reference Acc Time | 20.00 | | 0.00~6000.00 | 20.00 | sec |
| | 21 | Reference Dec Time | 30.00 | | 0.00~6000.00 | 30.00 | sec |
| | 25 | Feedback Source | 0 | Analog Input 1 | 0~8 | 0 | - |
| | 26 | Fdb Auxiliary Src | 0 | None | 0~4 | 0 | - |
| | 27 | Fdb Auxiliary Mode | 0 | M+(G*A) | 0~12 | 0 | - |
| | 28 | Fdb Auxiliary Gain | 0.00 | | -200.00~200.00 | 0.00 | % |
| | 29 | Deadband Width | 0 | | 0~Unit Default ¹⁴ | 0 | PID Unit ¹³ |
| PPID | 30 | Deadband Delay | 0.00 | | 0.00~600.00 | 0.00 | sec |
| | 35 | Proportional Gain1 | | 50.0 | 0.0~1000.0 | 50.0 | % |
| | 36 | Integral Time1 | 10.00 | | 0.0~200.00 | 10.00 | sec |
| | 37 | Derivative Time1 | 0 | | 0~1000 | 0 | msec |
| | 38 | Feedforward Gain | 0.0 | | 0.0~1000.0 | 0.0 | % |
| | 40 | Proportional Gain2 | 50.0 | | 0.0~1000.0 | 50.0 | % |
| | 41 | Integral Time2 | 10.00 | | 0.00~200.00 | 10.00 | sec |
| | 42 | Derivative Time2 | 0 | | 0~1000 | 0 | msec |
| | 45 | Output Mode | 2 | PID+Main Freq | - | 2 | - |
| | 46 | Output Limit Low | 0.00 | | -100.00~ Output Limit High | 0.00 | % |
| | 47 | Output Limit High | 100.00 | | Output Limit Low~ 100.00 | 100.00 | % |
| | 48 | Output Scale | 100.0 | | 0.1~1000.0 | 100.0 | % |

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¹⁴ (PPID-93(Unit at 100%) - PPID-92(Unit at 0%))/2
| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|------------------|-----------|--------|--|------------------|------|
| | 49 | Output LPF Gain | 0 | | 0~10000 | 0 | msec |
| | 50 | Output Inverse | 0 | No | 0~1 | 0 | - |
| PPID | 80 | Step Reference 1 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 81 | Step Reference 2 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 82 | Step Reference 3 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 83 | Step Reference 4 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 84 | Step Reference 5 | | 0.00 | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 85 | Step Reference 6 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 86 | Step Reference 7 | 0.00 | | Unit Min ¹¹ ~ Unit Max ¹² | 0.00 | % |
| | 90 | Unit Select | 1 | % | 0~40 | 1 | - |
| | 91 | Unit Scale | 2 | X1 | 0~4 | 2 | - |
| | 92 | Unit at 0% | | 0.00 | 0.00~Unit at 100% | 0.00 | % |
| | 93 | Unit at 100% | | 100.00 | Unit at 0%~300.00 | 100.00 | % |

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| Group | Code | LCD Display | S | et Value | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|----|-------------------------|---------------|---|------|
| DIN | | | 37 | PPID Run Enable | | 1, 2, 4, 5, 10, 11, 12, | |
| | | DIx Define (DIx: DI1~DI8) | 39 | PPID Ref Change | | | |
| | 01, 03, 05, 07, 09, 11, 13, 15 | | 40 | PPID Gain Change | | | |
| | | | 41 | PPID I-Term Clear | | | |
| | | | 42 | PPID Output Hold | | | - |
| | | | 45 | PPID Step Ref-L | | 9 | |
| | | | 46 | PPID Step Ref-M | | | |
| | | | 47 | PPID Step Ref-H | | | |

Note

- PID output (PID OUT) is bipolar and restricted by PPID-46 (Output Limit Low) and PPID-47 (Output Limit High) settings. 100.0% of PID output is based on setting values of DRV-20 (Max Frequency).
- PID output is reflected as the target frequency of the inverter. It becomes the inverter output frequency by the acceleration and deceleration times.

Basic PID Operation Setting Details

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| Code and Functions | Description |
|---------------------------------|--|
| APP-01 Process PID Enable | Set the code to 1 (Yes) to set functions for process PID. |
| DIx Define (DIx: DI1~DI8) | Set the code to 37 (PPID Run Enable) and input configured terminal block to run process PID operation. |
| PPID-01 Control State | Displays the current status of the process PID control (Idle, RUN, Pre-PID, Sleep, or Sleep Boost). |
| PPID-02 Output Value | Displays the current output value of the PID controller by applying the preset unit, gain, and scale. |
| PPID-03 Reference Value | Displays the current reference value of the PID controller by applying the preset unit, gain, and scale. Reference 1 is applied by default. Set the Define code of DI1-DI8 of terminal input group (DIN) to 39 (PPID Ref Change) and turn on the terminal block to apply reference 2. |
| PPID-04 Feedback Value | Displays current feedback value of the PID controller by applying the preset unit, gain, and scale. |
| PPID-05 Error Value | Displays the current reference value of the PID controller by applying the preset unit, gain, and scale. Displays the error value of the PID controller, which is the difference between the current reference and feedback value, by applying the preset unit, gain, and scale. |

| Code and Functions | | Description | | | | | | |
|----------------------------------|--|--------------------------------|---|--|--|--|--|--|
| | Selects the reference input for the PID control. The same sources are not configurable for both the reference source (PPID-10 and 15) and feedback source (PPID-25). | | | | | | | |
| | | Item | Functionality | | | | | |
| | 0 | Keypad | Smart Operator | | | | | |
| | 1 | Analog Input 1 | | | | | | |
| | 2 | Analog Input 2 | Al terminal of the terminal block (analog input terminal) | | | | | |
| PPID-10 Reference1 | 3 | Analog Input 3 | Commany | | | | | |
| Source, PPID-15 Reference2 | 4 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | | | |
| | 5 | Internal Comm. | RS-485 input terminal | | | | | |
| Source | 6 | USB Comm. | USB Port | | | | | |
| | 7 | Option Comm. ¹⁵ | Communication option | | | | | |
| | 8 | UserSequence | User sequence | | | | | |
| | 9 | Ext PID-1 Output ¹⁶ | Extension I/O | | | | | |
| | 10 | X-Analog Input 1 ¹⁶ | | | | | | |
| | 11 | X-Analog Input 2 ¹⁶ | Analog input terminal for extension I/O | | | | | |
| | 12 | X-Analog Input 3 ¹⁶ | | | | | | |
| PPID- 11 Ref1 Keypad Set | When PPID-10 (PID control reference input) is set to 0 (Keypad), reference values can be entered. | | | | | | | |

- ¹⁵ Configurable only when equipped with communication options
 ¹⁶ Configurable only when equipped with extension I/O options

| Code and Functions | | | Description | | | | |
|-----------------------|--|--|---|--|--|--|--|
| | Sele value 13 if | cts an external input e is determined by th selected as an exter | source for PID control references. The reference e input source at PPID-10 and formula at PPID- nal input source. | | | | |
| | | Item | Functionality | | | | |
| | 0 | None | Not used | | | | |
| PPID- | 1 | Analog Input 1 | Alterminal of the terminal block (analog input | | | | |
| 12 Ref1 Auxiliary | _2 | Analog Input 2 | Al terminal of the terminal block (analog input terminal) | | | | |
| Src | 3 | Analog Input 3 | | | | | |
| | 4 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | | |
| | 5 | X-Analog Input 1 ¹⁷ | | | | | |
| | 6 | X-Analog Input 2 ¹⁷ | Analog input terminal for extension I/O | | | | |
| | _7 | X-Analog Input 3 ¹⁷ | | | | | |
| | If the value for PPID-12 is anything other than 0 (None), the final reference 1 value is determined by the formula set at PPID-13 with a source input at PPID-10 and one at PPID-12. | | | | | | |
| | | | Configuration | | | | |
| | 0 | | M + (G * A) | | | | |
| | 1 | M * (G * A) | | | | | |
| | 2 | M / (G * A) | | | | | |
| PPID- | 3 | M+(M*(G*A)) | | | | | |
| 13 Ref1 | _4 | M+G*2*(A-50) | | | | | |
| Mode | _5 | | M*(G*2*(A-50)) | | | | |
| | 6 | | M/(G*2*(A-50)) | | | | |
| | _7 | | M+M*G*2*(A-50) | | | | |
| | 8 | | (M-A)^2 | | | | |
| | 9 | | M^2+A^2 | | | | |
| | 10 | | MAX(M,A) | | | | |
| | 11 | | MIN(M,A) | | | | |
| | | (M+A)/2 | | | | | |

¹⁷ Configurable only when equipped with extension I/O options

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Advanced Functions

| Code and Functions | | Description | | | | |
|---|--|----------------|--|--|--|--|
| | If the value for PPID-12 is anything other than 0 (None), the final reference 1 value is determined by the formula set at PPID-13 with a source input at PPID-10 and one at PPID-12. | | | | | |
| | | Configuration | | | | |
| | 0 | M + (G * A) | | | | |
| | 1 | M * (G * A) | | | | |
| | 2 | M / (G * A) | | | | |
| | 3 | M+(M*(G*A)) | | | | |
| חוסס | 4 | M+G*2*(A-50) | | | | |
| 13 Ref1 Auxiliary Mode | 5 | M*(G*2*(A-50)) | | | | |
| | 6 | M/(G*2*(A-50)) | | | | |
| | 7 | M+M*G*2*(A-50) | | | | |
| | 8 | (M-A)^2 | | | | |
| | 9 | M^2+A^2 | | | | |
| | 10 | MAX(M,A) | | | | |
| | 11 | MIN(M,A) | | | | |
| | 12 | (M+A)/2 | | | | |
| | M = Value from the set source at PPID-1 | | | | | |
| | G = Gain value set at PPID-14 | | | | | |
| | A = Value from the set source at PPID-12 | | | | | |
| PPID- 14 Ref1 Auxiliary Gain | Gain value required for the formula at PPID-13. | | | | | |
| PPID-20 Reference Acc Time, PPID-21 Reference Dec Time | Sets acceleration and deceleration times for final reference values. | | | | | |

| Code and Functions | Description | | | | | | |
|-----------------------|-------------------------|--|--|--|--|--|--|
| PPID-25 Feedback | Seleo confi sourc | cts feedback input fo gurable for both the ce (PPID-25). | PID control. The same sources are not eference source (PPID-10 and 15) and feedback | | | | |
| | | ltem | Functionality | | | | |
| | 0 | Analog Input 1 | | | | | |
| | 1 | Analog Input 2 | AI terminal of the terminal block (analog input terminal) | | | | |
| | 2 | Analog Input 3 | | | | | |
| | 3 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | | |
| Source | 4 | Internal Comm. | RS-485 input terminal | | | | |
| | 5 | USB Comm. | USB Port | | | | |
| | 6 | Option Comm. ¹⁸ | Communication option | | | | |
| | 7 | UserSequence | User sequence | | | | |
| | 8 | Ext PID-1 Output 19 | B Extension I/O | | | | |
| | 9 | X-Analog Input 1 ¹⁹ | | | | | |
| | 10 | X-Analog Input 2 ¹⁹ | Analog input terminal for extension I/O | | | | |
| | 11 | X-Analog Input 3 ¹⁹ | | | | | |
| | Seleo value 27 if | cts an external input is determined by th selected an external | source for PID control feedback. The feedback e input source at PPID-25 and formula at PPID- input source. | | | | |
| | | Item | Functionality | | | | |
| | 0 | None | Not used | | | | |
| PPID-26 | 1 | Analog Input 1 | | | | | |
| Fdb Auxiliary | 2 | Analog Input 2 | Al terminal of the terminal block (analog input terminal) | | | | |
| Src | 3 | Analog Input 3 | | | | | |
| | 4 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | | |
| | 5 | X-Analog Input 1 | | | | | |
| | 6 | X-Analog Input 2 | Analog input terminal for extension I/O | | | | |
| | 7 | X-Analog Input 3 | | | | | |

¹⁸ Configurable only when equipped with communication options
 ¹⁹ Configurable only when equipped with extension I/O options

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| Code and Functions | | Description | | | | |
|-------------------------------------|---|--|--|--|--|--|
| | If the value for PPID-26 is anything other than 0 (None), the final feedback value is determined by the formula set at PPID-27 with a source input at PPID-25 and one at PPID-26. | | | | | |
| | | Configuration | | | | |
| | 0 | M+(G*A) | | | | |
| | 1 | M*(G*A) | | | | |
| | 2 | M/(G*A) | | | | |
| PPID-27 Edb | 3 | M+(M*(G*A)) | | | | |
| | 4 | M+G*2*(A-50) | | | | |
| | 5 | M*(G*2*(A-50)) | | | | |
| Auxiliary | 6 | M/(G*2*(A-50)) | | | | |
| Mode | 7 | M+M*G*2*(A-50) | | | | |
| | 8 | (M-A)^2 | | | | |
| | 9 | M^2+A^2 | | | | |
| | 10 | MAXIMUM(M,A) | | | | |
| | 11 | MINIMUM(M,A) | | | | |
| | 12 | (M+A)/2 | | | | |
| | M = Value from the set source at PPID-25 G = Gain value set at PPID-27 A = Value from the set source at PPID-26 | | | | | |
| PPID-28 Fdb Auxiliary Gain | Gain | value required for the formula at PPID-27. | | | | |



| Code and Functions | | Description | | | | | |
|---|---|--|--|--|--|--|--|
| PPID-36 Integral Time1, PPID-41 Integral Time2 | Sets time seco Differ Set I I-Terr integ • PII the ac ch fre (A | the time to output accumulated errors. When the error is 100%, the taken for 100% output will be set. When the integral time is set to one nd, 100% will be output one second after the error reaches 100%. rences in a normal state can be reduced by Integral Time settings. Define code of DI1-DI8 of terminal input group (DIN) to 41 (PPID m Clear) and turn on the terminal block to delete all cumulative ral quantity. D output (final target frequency of the inverter) changes according to e set gain values at PPID-36 and PPID-41. Set the gain values and celeration and deceleration times in consideration of the impacts from anges in acceleration and deceleration times to reach the operating equency that meets this PID output based on preset values at DRV-05 cc Time) and DRV-06 (Dec Time). | | | | | |
| | Integ input to ap | Integral Time 1 is set by default. Set Define code of DI1-DI8 of terminal input group (DIN) to 40 (PPID Gain Change) and turn on the terminal block to apply Integral Time 2. | | | | | |
| PPID-37 Derivative Time1, PPID-42 Derivative Time2 | Sets time 1% v Deriv input block | Sets the output volume for the rate of change in errors. If the Derivative time is set to 1 ms and the rate of change in errors per second is 100 %, 1% will be output every 10 ms. Derivative Time 1 is set by default. Set Define code of DI1-DI8 of terminal input group (DIN) to 40 (PPID Gain Change), and turn on the terminal block to apply Derivative Time 2 | | | | | |
| PPID-38 FeedForward Gain | Sets leads | the ratio that adds the target to the PID output. Adjusting this value s to a faster response. | | | | | |
| | Sets whether to select PID output mode for frequency output by PID calculation, to add values from frequency setting sources at DRV-11 (1st Freq Ref Src) to PID calculation value, or to add External PID output. There are five modes in total. Refer to the following: | | | | | | |
| | | Configuration | | | | | |
| PPID-45 Output Mode | 0 | Not Use Output | | | | | |
| Output Mode | 1 | Only PID Freq Out | | | | | |
| | 2 | PID+Main Freq | | | | | |
| | 3 | Only PID Trq Out | | | | | |
| | 4 | | | | | | |
| | 5 | PID+EPID1+Main | | | | | |

| Code and Functions | | | | Descri | iption | | | | |
|--|--|-------------|------------|----------|--------|------|----|------|--|
| PPID-46 Output Limit Low, PPID-47 Output Limit High | Limits the output of the controller. | | | | | | | | |
| PPID-48 Output Scale | Adjusts the volume of the controller output. | | | | | | | | |
| PPID-49 Output LPF Gain | Used when the output of the PID controller changes too fast or the entire system is unstable due to severe oscillation. In general, a lower value (the default value is 0) is used to speed up the response, but in some cases a higher value is used to increase stability. The higher the value, the more stable the PID controller output is, but the slower the response time. | | | | | | | | |
| PPID-50 Output Inverse | Set Output Inverse to 1 (Yes) and the difference (error) between the reference and feedback values are set as a feedback reference value. | | | | | | | | |
| PPID- 80~86 Step Reference 1~7 | Select a Define code for DI1-DI8 of terminal input group (DIN) among 45- 47 (PPID Step Ref -L, PPID Step Ref -M, and PPID Step Ref -H). PPID Step Ref -L, PPID Step Ref -M, and PPID Step Ref -H are recognized as binary codes and references set at PPID-80-86 are selected for operation | | | | | | | | |
| | Sets the ι | unit of the | control va | ariable. | | | | | |
| | 0 | CUST | 11 | Hz | 22 | m³/h | 33 | f³/s | |
| | 1 | % | 12 | rpm | 23 | l/s | 34 | f³/m | |
| | 2 | PSI | 13 | V | 24 | l/m | 35 | f³/h | |
| | 3 | °F | 14 | A | 25 | l/h | 36 | lb/s | |
| PPID-90 | 4 | °C | 15 | kW | 26 | kg/s | 37 | lb/m | |
| Unit Select | 5 | inWC | 16 | HP | 27 | kg/m | 38 | lb/h | |
| | 6 | inM | 17 | mpm | 28 | kg/h | 39 | ppm | |
| | 7 | Bar | 18 | ft | 29 | gl/s | 40 | pps | |
| | 8 | mBar | 19 | m/s | 30 | gl/m | | | |
| | 9 | Pa | 20 | m³/s | 31 | gl/h | | | |
| | 10 | kPa | 21 | m³/m | 32 | ft/s | | | |

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| Code and Functions | Description |
|--|--|
| PPID-91 Unit Scale | Adjusts the size according to the unit selected at PPID-90. |
| PPID-92 Unit at 0 % PPID- 93 Unit at100% | Sets PID Unit 0% value and PID Unit 100% value as the minimum and maximum values of the unit set at PPID-90. |



PID Command Selection Block



LSELECTRIC 195

Advanced Functions

PID Command Scale Block

PID feedback



[Image 13. PID Command Scale Block]





PID output

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[Image 15. PID Output Block]

Advanced Functions

PID Output Mode



7.7.2 PID Operation Sleep Mode

If operation continues at a frequency under the operational condition for PID for a certain amount of time, it will increase the PID reference and boost the will operate to maintain PID operation sleep mode longer before entering into sleep mode. The PID operation starts again when the PID feedback becomes lower than the PID Wakeup level, and the input will be maintained longer than the time set at PPID-68 (WakeUp Delay1) or PPID-74 (WakeUp Delay2) after entering PID operation sleep mode. PID Wakeup level is PPID-67 (Wakeup Set1) or PPID-73 (Wakeup Set2) subtracted from PPID-03 (reference Value).

For PID operation sleep mode, two sets are configurable for sleep mode frequency (Sleep Check Freq), sleep mode delay time (Sleep Delay), wakeup deviation, and wake-up delay time (Wakeup Delay). You can select them based on multifunction input terminal settings and input status.

| Group | Code | LCD Display | (| Set Value | Setting Range | Initial Value | Unit |
|-------|-------------------|--|------|-------------------------|-------------------------------------|------------------|---------------------------|
| | | | 0 | None | | | |
| PPID | 60 | Sleep Mode | 1 | Always Enable | 0~2 | 0 | |
| | | | 2 | DI Dependent | | | |
| | 61 | Sleep Boost Set | 0 | | 0~Unit Max ²⁰ /2 | 0 | PID Unit ²¹ |
| | 62 | Sleep Boost Freq | 0.00 | | 0.00~Max Frequency ²² | 0.00 | Hz |
| | 63 | Sleep Boost Spd | 0 | | 0~Maximum Speed ²³ | 0 | rpm |
| | 64 | Sleep Check Freq1 | 0.00 | | 0.00~Max Frequency ²² | 0.00 | Hz |
| | 65 | Sleep Check Spd1 | 0 | | 0~Maximum Speed ²³ | 0 | rpm |
| | 66 | Sleep Delay 1 | | 60.0 | 0.0~600.0 | 60.0 | sec |
| PPID | 67 | WakeUp Set1 | | 0 | 0~Unit Default ²⁴ | 0 | PID Unit ²¹ |
| | 68 | WakeUp Delay1 | | 60.0 | 0.0~600.0 | 60.0 | sec |
| | 70 | Sleep Check Freq2 | 0.00 | | 0.00~Max Frequency ²² | 0.00 | Hz |
| | 71 | Sleep Check Spd2 | 0 | | 0~Maximum Speed ²³ | 0 | rpm |
| | 72 | Sleep Delay 2 | | 60.0 | 0.0~600.0 | 60.0 | sec |
| | 73 | WakeUp Set2 | | 0 | 0~Unit Default ²⁴ | 0 | PID Unit ²¹ |
| | 74 | WakeUp Delay2 | | 60.0 | 0~600.0 | 60.0 | sec |
| DIN | 01, 03, | DIx Define | 43 | PPID Sleep ON | | 1, 2, 4, | |
| | 09, 11, 13, 15 | , 07, DIx Define , 11, (DIx: DI1~DI8) , 15 | | PPID Sleep Change | - | 11, 12, 9 | |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

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²⁰ PPID-93(Unit at 100%)
 ²¹ PPID-90(Unit Select)
 ²² DRV-20(Max Frequency)

²³ DRV-21 (Maximum Speed)

²⁴ (PPID-93(Unit at 100%) - PPID-92(Unit at0%))/2

Advanced Functions



7.7.3 Pre-PID Operation

This function minimizes the error value by increasing feedback to reach a certain level up to preset reference value.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|------------------|--------------|--|------------------|---------------------------|
| | 55 | Pre-PID Set Freq | 0.00 | 0.00~Max Frequency ²⁵ | 0.00 | Hz |
| PPID | 56 | Pre-PID Set Spd | 0 | 0~Maximum Speed ²⁶ | 0 | rpm |
| | 57 | Pre-PID Exit | 0.00 | Unit Min ²⁷ ~Unit Max ²⁸ | 0.00 | PID Unit ²⁹ |
| | 58 | Pre-PID Delay | 60.0 | 0.0~600.0 | 60.0 | sec |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

²⁵ DRV-20(Max Frequency)

- ²⁶ DRV-21(Maximum Speed)
- ²⁷ 2 x PPID-92(Unit at 0%) PPID-93(Unit at 100%)
- ²⁸ PPID-93(Unit at 100%)
- ²⁹ PPID-90(Unit Select)

Pre-PID Operation Setting Details

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| Code and Functions | Description |
|--|---|
| PPID-55 Pre-PID Set Freq, PPID-56 Pre-PID Set Spd | Enter frequency or rotational speed up to the general acceleration when general acceleration is required without PID control. For example, when PPID-55 is set as 30 Hz, it continues general operation at 30 Hz until the controlled variable (PID feedback variable) is higher than what is set at PPID-57. |
| PPID-57 Pre-PID Exit | When the input feedback variable (controlled variable) of PID controller is higher than the value set at PPID-57, PID control operation begins. |
| PPID-58 Pre-PID Delay | When less feedback than Pre PID Set Freq or Pre PID Set Spd is maintained for longer than the Pre-PID Delay time, a Pre-PID Fail trip will occur and output will be blocked. |





7.7.4 PID Operation Switch (PID Openloop)

When a terminal to which 38 (PPID Open Loop) is set among multifunction input terminal codes (DI1-DI8 Define) for terminal input group (DIN-01, 03, 05, 07, 09, 11, 13, and 15) turns on, PID operation will be stopped and switched to a general operation. When the terminal turns Off, the PID operation will start again.



[Image 19. An Example of a PID Operation Switch]

7.7.5 PID Output Hold Operation

When a terminal to which 42 (PPID Output Hold) is set among multifunction input terminal codes (DI1-DI8 Define) for terminal input group (DIN-01, 03, 05, 07, 09, 11, 13, and 15) turns on, the current PID output will be maintained. When the terminal turns Off, the PID operation will start again.





7.8 External PID (EPID)

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It includes PID functions except for basic PID for inverter control. External PID (EPID) output can overlap PID output based on PID output mode (PPID-45 OutputMode) settings. External output is available according to analog output (OUT-01 and 10) settings.

EPID control enables the following functions:

| Usage | Functionality |
|---------------------|---|
| Speed Control | Controls speed by giving feedback on the current speed of the device or equipment to be controlled. It helps maintain a consistent speed or operate at a target speed. |
| Pressure Control | Controls pressure by giving feedback on the current pressure of the device or equipment to be controlled. It helps maintain consistent pressure or operate at the target pressure. |
| Flow Control | Controls flow by giving feedback on the amount of current flow in the device or equipment to be controlled. It helps maintain a consistent flow or operate at a target flow. |
| Temperature Control | Controls temperature by giving feedback on the current temperature of the device or equipment to be controlled. It helps maintain a consistent temperature or operate at a target temperature. |

 Table 3. Usage and Functionalities of External PID Control

Advancec Functions

7.8.1 Basic EPID Operation

S300 allows using two EPIDs simultaneously. Each EPI are configurable with two parameter groups (EPI1 and EPI2) as follows:

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|----------------------|-----------------|-----------------------|-----------|--|--|---------------------------|---------------------------|
| APP | 02 | ExternalPID Enable | 1 Yes | | - | 0 | - |
| | | | 0 | Idle | | | |
| | | | 1 | Pre-PID | | | |
| | 01 | Control State | 2 | RUN | 0~4 | 0 | _ |
| | 01 | Control Otale | 3 | Sleep Boost | 0 4 | U | - |
| | | | 4 | Sleep | | | |
| 02 03 EPI1, 04 | Output Value | - | | -100.00~ 100.00 | - | % | |
| | Reference Value | - | | Unit Min ³⁰ ~ Unit Max ³¹ | - | PID Unit ³² | |
| | 04 | Feedback Value | - | | Unit Min ³⁰ ~ Unit Max ³¹ | - | PID Unit ³² |
| EPI2 | 05 | Error Value | | - | Unit Min ³⁰ ~ Unit Max ³¹ | - | PID Unit ³² |
| | 06 | Mode | 1 | Always Enable | 1~3 | 0 | - |
| | 10 | Reference Source | 0 | Keypad | 0~9 | 0 | - |
| | 11 | Ref Keypad Set | | 0 | -Unit at 100%~ Unit at 100% | 0 | PID Unit ³² |
| | 25 | Feedback Source | 0 | Analog Input 1 | 0~8 | 0 | - |
| | 35 | Proportional Gain | | 50.0 | 0.0~1000.0 | 50.0 | % |
| | 36 | 36 Integral Time | | 10.00 | 0.00~200.00 | 10.00 | sec |

³⁰ 2 x EPI1, EPI2-92(Unit at 0%) - EPI1, EPI2-93(Unit at 100%)

- ³¹ EPI1,2-93(Unit at 100%)
- ³² EPI1, EPI2-90(Unit Select)

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|--------------------|--------------------|-----------|--------------------------|----------------------------------|--------------------|---------------------------|
| | 37 | B7 Derivative Time | | 0 | 0~1000 | 0 | msec |
| | 38 | FeedForward Gain | | 0.0 | 0.0~1000.0 | 0.0 | % |
| | 46 | Output Limit Low | 0.00 | | -100.00~ Output Limit High | 0.00 | % |
| EPI1, | 47 | Output Limit High | 100.00 | | Output Limit Low~100.00 | 100.00 | % |
| EPI2 4 | 49 | Output LPF Gain | | 0 | 0~10000 | 0 | msec |
| | 90 | Unit Select | 1 | % | 0~40 | 1 | - |
| | 91 | Unit Scale | 2 | X1 | 0~4 | 2 | - |
| | 92 Unit at 0% | | 0.00 | | 0.00~Unit at 100% | 0.00 | PID Unit ³² |
| | 93 Unit at 100% | | 100.00 | | Unit at 0%~ 300.00 % | 100.00 | PID Unit ³² |
| | | | 51 | EPID1 Run | | | |
| DIN | 01, 03, 05, 07, | DIx Define | 52 | EPID1 I-Term Clear | | 1, 2, 4, 5, 10, | |
| | 09, 11, 13, 15 | (DIx: DI1~DI8) | 53 | EPID2 Run | | 11, 12, 9 | - |
| | | | 54 | EPID2 I-Term Clear | | | |

Note

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EPID 1 and 2 outputs (PID OUT) are bipolar and restricted by EPI1, EPI2-47 (Output Limit High), and 48 (Output Limit Low) settings.

Basic EPID Operation Setting Details

| Code and Functions | | Description | | | | |
|----------------------------------|--|---|---|--|--|--|
| APP-02 ExternalPID Enable | Set t PID. | he code to 1 (Ye | es) to set functions for the External | | | |
| EPI1, EPI2-01 Control State | Disp RUN | ays the current ; , Pre-PID, Sleep | status of the EPID control (Idle, o, or Sleep Boost). | | | |
| EPI1, EPI2-02 Output Value | Displays the current output of the EPID controller. The preset unit, gain, and scale will be applied and display | | | | | |
| EPI1, EPI2-03 Reference Value | Disp contr and o | ays the current oller. The prese displayed. | reference value of the EPID t unit, gain, and scale will be applied | | | |
| EPI1, EPI2-04 Feedback Value | Displays the current feedback value of the EPID controller. The preset unit, gain, and scale will be ap and displayed. | | | | | |
| EPI1, EPI2-05 Error Value | Displ the c contr gain, the E | ays the error va urrent reference oller. The displa and scale settir PID is operating | value, which is the difference between ce and feedback value of the EPID layed value reflects the applied unit, tings. The value will update only while ng. | | | |
| | Sets how to use EPID1 and 2. | | | | | |
| | | ltem | Functionality | | | |
| | 0 | None | Do not use EPID. | | | |
| EDI1 EDI2-06 Mode | 1 | Always On | Always run EPID. | | | |
| | 2 Run In Drv Run | | Run during inverter operation only. | | | |
| | 3 | DI Dependent | Run when there is input at the terminal block (terminals set as EPID1, 2 Run). | | | |

| Code and Functions | Description | | | | | |
|-----------------------------------|--|--|---|--|--|--|
| | Selects the reference input for the PID control. Same sources are not configurable for both the reference source (EPI1 and EPI2-10) and feedback source (EPI1 and EPI2-25). | | | | | |
| | | ltem | Functionality | | | |
| | 0 | Keypad | Smart Operator | | | |
| | 1 | Analog Input 1 | AI terminal of the terminal | | | |
| | 2 | Analog Input 2 | block | | | |
| | 3 | Analog Input 3 | (analog input terminal) | | | |
| EPI1, EPI2-10 Reference Source | 4 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | |
| | 5 | Internal Comm. | RS-485 input terminal | | | |
| | 6 | USB Comm. | USB Port | | | |
| | 7 | Option Comm. 33 | Communication option | | | |
| | 8 | UserSequence | User sequence | | | |
| | 9 | Ext PID-1 Output ³⁴ | Extension I/O | | | |
| | 10 | X-Analog Input 1 34 | | | | |
| | 11 | X-Analog Input 2 34 | Analog input terminal for | | | |
| | 12 | X-Analog Input 3 34 | | | | |
| EPI1, EPI2-11 Ref Keypad Set | Whe contr enter | n the reference source ol are set to 0 (Keypa red. | es (EPI1 and EPI2-10) of EPID d), reference values can be | | | |

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³³ Configurable only when equipped with communication options
 ³⁴ Configurable only when equipped with extension I/O options

| Code and Functions | | Description | | | | | |
|------------------------------------|--|--------------------------------|---|--|--|--|--|
| | Selects feedback input for EPID control. Same sources are not configurable for both the reference source (EPI1, EPI2-10) and feedback source (EPID-25). | | | | | | |
| | | ltem | Functionality | | | | |
| | 0 | Analog Input 1 | AI terminal of the terminal | | | | |
| | 1 | Analog Input 2 | block | | | | |
| | 2 | Analog Input 3 | (analog input terminal) | | | | |
| EPI1, EPI2-25 Feedback Source | 3 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | | | |
| | 4 | Internal Comm. | RS-485 input terminal | | | | |
| | 5 | USB Comm. | USB Port | | | | |
| | 6 | Option Comm. 35 | Communication option | | | | |
| | 7 | UserSequence | User sequence | | | | |
| | 8 | Ext PID-1 Output 36 | Extension I/O | | | | |
| | 9 | X-Analog Input 1 ³⁶ | | | | | |
| | 10 | X-Analog Input 2 ³⁶ | extension I/O | | | | |
| | 11 | X-Analog Input 3 ³⁶ | | | | | |
| EPI1, EPI2-35 Proportional Gain | Sets the output ratio for differences (errors) between reference and feedback. If you set the value as 50%, the value that is 50% of error will be output. | | | | | | |

³⁵ Configurable only when equipped with communication options
 ³⁶ Configurable only when equipped with extension I/O options

| Code and Functions | Description | | | | |
|--|---|--|--|--|--|
| EPI1, EPI2-36 Integral Time | Sets the time to output accumulated errors. When the error is 100%, the time taken for 100% output will be set. When the integral time is set to one second, 100% will be output one second after the error reaches 100%. Differences in a normal state can be reduced by Integral Time settings. Set Define code of DI1-DI8 of terminal input group (DIN) as 52 and 54 (EPID I-Term Clear) and turn on the terminal block to delete all cumulative integral quantity. EPID output (final target frequency of the inverter) changes according to the set gain values at EPI-1 and 2-36. Set the gain values and acceleration and deceleration times after considering the impacts from changes in acceleration and deceleration times to reach the operating frequency that meets this EPID output based on the preset values at DRV-05 (Acc Time) and DRV-06 (Dec Time). | | | | |
| EPI1, EPI2-37 Derivative Time | Sets the output volume for the rate of change in errors. If the Derivative time is set to 1 ms and the rate of change in errors per second is 100 %, 1% will be output every 10 ms. | | | | |
| EPI1, EPI2-38 FeedForward Gain | Sets the ratio that adds preset target to EPID output. Adjusting this value leads to a faster response. | | | | |
| EPI1, EPI2-46 Output Limit Low, EPI1, EPI2-47 Output Limit High | Limits the output of the controller. | | | | |
| EPI1, EPI2-49 Output LPF Gain | Used when the output of the EPID controller changes too fast or the entire system is unstable due to severe oscillation. In general, a lower value (the default value is 0) is used to speed up the response, but in some cases a higher value is used to increase stability. The higher the value, the more stable the EPID controller output is, but the slower the responsiveness. | | | | |

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| Code and Functions | Description | | | | | | | |
|----------------------------|--|------------|----------|-----------|---------|------|----|------|
| | Sets th | ne unit of | f the co | ontrol va | riable. | | | |
| | 0 | CUST | 11 | Hz | 22 | m³/h | 33 | f³/s |
| | 1 | % | 12 | rpm | 23 | l/s | 34 | f³/m |
| | 2 | PSI | 13 | V | 24 | l/m | 35 | f³/h |
| | 3 | °F | 14 | А | 25 | l/h | 36 | lb/s |
| EDI1 EDI2 00 Unit Salaat | 4 | °C | 15 | kW | 26 | kg/s | 37 | lb/m |
| EFIT, EFIZ-90 Utilt Select | 5 | inWC | 16 | HP | 27 | kg/m | 38 | lb/h |
| | 6 | inM | 17 | mpm | 28 | kg/h | 39 | ppm |
| | 7 | Bar | 18 | ft | 29 | gl/s | 40 | pps |
| | 8 | mBar | 19 | m/s | 30 | gl/m | | |
| | 9 | Pa | 20 | m³/s | 31 | gl/h | | |
| | 10 | kPa | 21 | m³/m | 32 | ft/s | | |
| EPI1, EPI2-91 Unit Scale | Adjusts the size according to the unit selected at EPI1 and EPI2-90. | | | | | PI1 | | |
| EPI1, EPI2-92 Unit at 0 % | Sets the unit at 0% and 100% as the minimum and | | | | | | | |
| EPI1, EPI2-93 Unit at100% | maximum values for the units set at EPI1 and EPI2-90. | | | | | | | |
| DIx Define (DIx: DI1~DI8) | Sets it to 51 (EPID1 Run) or 53 (EPID2 Run) and executes relative EPID operation when the set terminal block is input. | | | | | | | |

7.8.2 EPID Command Block





7.8.3 EPID Feedback





7.8.4 EPID Output



[Image 23. EPID Output Block]

7.9 Kinetic Energy Buffering Operation

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When there is interruption of input power, the inverter's DC link voltage will decrease, causing a low voltage trip and blocking output. Kinetic energy buffering operation maintains DC link voltage with regenerative energy from the motor during the interruption. This extends the time taken until a low voltage trip occurs, after an instantaneous power interruption.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---------------|--------------------------------|-----------|----------------------|-------------------------------------|---------------------------------|------|
| | 15 | KEB Mode | 1 | KEB Ride- Through | 0~2 | 0 | - |
| APP | 16 | KEB Start Level | 80.0 | | 70.0~ (KEB Stop Level - 5.0) | 80.0 | % |
| | 17 | KEB Stop Level | 90.0 | | (KEB Start Level + 5.0)~ 95.0 | 90.0 | % |
| | 18 | KEB Control Gain | | 100.0 | 0.0~1000.0 | 100.0 | % |
| | 19 | KEB Damping Gain | 100 | | 0~300 | 100 | % |
| | 20 | KEB Acc Time | 10.00 | | 0.00~60.00 | 10.00 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3 | 35 | KEB Operating | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

KEB Operation-Setting Details

| Code and Functions | Description | | | | | | | |
|--|--|--|---|--|--|--|--|--|
| | Selects a KEB operation to use when the input power is interrupted. If 1 or 2 is selected, it will control the inverter's output frequency and charge the DC link (inverter's DC part) with regenerative energy from the motor. | | | | | | | |
| APP-15 KEB Mode | | ltem | Functionality | | | | | |
| | 0 | None | Do not use the KEB operation. It will execute general operation until a low voltage trip occurs, then will enter a free run. | | | | | |
| | 1KEB Ride- ThroughCharges the DC link with regenerative energy input power is interrupted, so that low voltage occur. If input power is recovered before a lo trip, it will return to normal operation with the frequency from the KEB operation. The time will be applied as the operating frequency ac | | Charges the DC link with regenerative energy when the input power is interrupted, so that low voltage trip will not occur. If input power is recovered before a low voltage trip, it will return to normal operation with the command frequency from the KEB operation. The time set at APP-20 will be applied as the operating frequency acceleration time when restoring to normal operation. The KEB operation will not be executed when there is a low voltage trip. | | | | | |
| | 2 | KEB Safety Stop | It will charge the DC link with regenerative energy when the input power is interrupted, so that a low voltage trip will not occur. If input power is recovered before a low voltage trip, it will change to a deceleration stop operation from KEB operation. The time set at PRT-1 (Trip Dec Time) will be applied as the operating frequency deceleration time during the deceleration stop operation. | | | | | |
| APP-16 KEB Start Level, APP-17 KEB Stop Level | Sets the start and stop times of the kinetic energy buffering operation. When stopping the inverter, the APP-17 KEB stop level and APP-16 KEB start level should be set to have more than a 5% difference with 100% of the DC link voltage. | | | | | | | |
| APP- 18 KEB Control Gain | Sets the controller P gains to maintain the voltage of the DC power unit during KEB operation. Change the setting value for operation when a low voltage trip occurs right after a power interruption. | | | | | | | |
| APP- 19 KEB Damping Gain | Sets KEE reso | s control gains 3 operation. If blved by incre | s to reduce voltage changes in DC unit at the start of a low voltage trip right after a power interruption is not asing P gains, increase the damping gains and operate. | | | | | |
| APP-20 KEB Acc Time | Sets the acceleration time for the operating frequency when returning from kinetic energy buffering operation to normal operation as the input power is recovered when selecting 1 (KEB Ride-Through) mode at APP-15. However, setting 0.00 sec applies acceleration time for general operation. | | | | | | | |









Note

There may be performance differences according to load status (capacity, inertia, and etc.) for KEB operation. You can adjust the gain related to KEB operation for enhancement.

- When a low voltage trip occurs right after an instantaneous power interruption, increase the setting values of APP-18 (KEB Control Gain) if the load inertia is small or the load is big.
- If a low voltage trip occurs right after even when you increase APP-18 (KEB Control Gain) setting values, increase the setting values of APP-16 (KEB Start Level) or APP-19 (KEB Damping Gain).
- Reduce the setting values of APP-18 (KEB Control Gain) and APP-19 (KEB Damping Gain) when there is motor vibration or big changes in the current or DC link voltage.

() Caution

- Depending on the duration of an instantaneous power interruption and the load inertia, a low voltage trip may occur when decelerating even during a KEB operation. Motors may vibrate during KEB operation for loads other than variable torque load (for example, fan or pump loads).
- When there is a big change in DC link voltage due to an imbalance or phase of input power, KEB operation may not run stably and may cause severe changes in the DC link voltage, which may lead to an overvoltage trip (OVT).
- Starting under the minimum input power voltage specification (200 V Type: 200V, 400V Type: 380 V) may cause a low voltage trip simultaneously with KEB operation.

7.10 Current Hunting Prevention (Anti-Hunting Regulator)

Current hunting (current distortion or oscillation) occurs during V/F control due to mechanical resonance, which may have a negative impact on the load system. Current hunting prevention (anti-hunting regulator) is a function used to prevent such issues.

| Group | Code | LCD Display Set Value | | t Value | Setting Range | Initial Value | Unit |
|----------------|------|-----------------------|---|---------|------------------|------------------|------|
| V/F1, V/ F2 | 71 | AHR Enable | 1 | Yes | 0~1 | 1 | - |
| | 72 | AHR P-Gain | | 50 | 0~1000 | 50 | % |
| | 73 | AHR Limit | 2 | | 0~100 | 2 | % |

Current Hunting Prevention-Setting Details

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| Code and Functions | Description | | | | | |
|-----------------------------------|--|-----|--|--|--|--|
| V/F1, V/F2-71 AHR Enable | Selects use of current hunting prevention operation. | | | | | |
| | ltem | | Functionality | | | |
| | 0 | No | Do not use current hunting prevention. | | | |
| | 1 | Yes | Use current hunting prevention. | | | |
| V/F1, V/F2-72 AHR P-Gain | The bigger it is set, the faster the response characteristics are, allowing better execution of current hunting prevention, but setting it too high may destabilize the current. | | | | | |
| V/F1, V/F2-73 AHR Limit | Limits output of anti-hunting regulator with reference % value of phase voltage. | | | | | |

7.11 Fire Mode

It protects other systems by allowing continuous operation of the inverter during emergencies, including fire from the inhalation fan or exhaust fan and excluding hardware malfunction or serious trips. It continuously operates at a set frequency in Fire Mode.

When a multifunction terminal set as 48 (Fire Mode Fwd) or 49 (Fire Mode Rev) is turned on among multifunction terminals DI1-DI8, the inverter ignores all commands and operates at the direction and frequency of the relative terminal block. Trips excluding certain ones (Arm Short, Over Current, Over Voltage, Ground Fault, and Main System Error) will be ignored and continuous operation will be executed.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|-----------|---------------------|---------------------------------------|------------------------------------|------|
| PRT | 90 | Fire Mode Password | 9251 | | 0000 ~ 9999 | 9251 | - |
| | 91 | Fire Mode Select | 0 | None | | 0 | - |
| | | | 1 | Test Mode | 0~2 | | |
| | | | 2 | Fire Mode | | | |
| | 93 | FireMode Frequency | 60.00 | | 0.00 ~ Max Frequency ³⁷ | 60.00 | Hz |
| | 94 | FireMode Speed | 1800 | | 0 ~ Maximum Speed ³⁸ | 1800 | rpm |
| | 95 | Fire Mode Count | 0 | | - | 0 | - |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 48 | Fire Mode Fwd | | 1, 2, 4, 5, 10, 11, 12, 9 | - |
| | | | 49 | Fire Mode Rev | - | | |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 49 | Fire Mode | - | 24, 14, 0 | - |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

³⁷ DRV-20(Max Frequency)

³⁸ DRV-21(Maximum Speed)
Fire Mode-Setting Details

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| Code and Functions | Description | | | | | |
|---|--------------------------------|---|--|--|--|--|
| PRT-90 Fire Mode Password | Set a The i By e Sele | Set a password to select Fire Mode. The initial password for Fire Mode is 9251. By entering the password, you can change the setting value of Fire Mode Select at PRT-91 once. | | | | |
| | Sets | Fire Mode. | | | | |
| | | ltem | Functionality | | | |
| PRT-91 Fire Mode Select | 0 | None | Do not use Fire Mode. | | | |
| | 1 | Fire Mode | A normal Fire Mode. | | | |
| | 2 | Test Mode | A mode for testing the Fire Mode. It processes trips when occurred during Fire Mode operation and the operation count (PRT-95) will not increase. | | | |
| PRT-93 Fire Mode Frequency, PRT-94 Fire Mode Speed | Fire items | Fire Mode operation is run based on the set speed commands in these items. | | | | |
| PRT-95 Fire Mode Count | Shov wher | Shows the number of Fire Mode operations. The count only increases when the setting value of PRT-91 is 1 (Fire Mode). | | | | |

① Caution

- The product is not guaranteed after the Fire Mode has worked. However, trips during Test Mode operation do not enable PRT-05 (Reset Restart) and are processed as trips with no increase in the PRT-95 (Fire Mode Count) value.
- When you stop operation after Fire Mode operation, the inverter will turn off.

7.12 Energy Saving Operation

7.12.1 Manual Energy Saving Operation

If the output current of the inverter is small, the output voltage is reduced to as much as set at ADV-53 (Energy Save Gain). The voltage before the energy saving operation is the base value of the percentage. The output voltage reduction rate may have errors when there is a change in the DC link voltage with the motor rated voltage set as 0. Manual energy saving operation does not work during inverter acceleration or deceleration.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|------------------|-----------|--------|------------------|------------------|------|
| | 52 | Energy Save Mode | 1 | Manual | - | 0 | - |
| ADV | 53 | Energy Save Gain | 0 | | 0~30 | 0 | % |



[Image 26. Manual Energy Saving Operation]

7.12.2 Automatic Energy Saving Operation

The level of energy saving will automatically be calculated based on the rated motor current (MOT1 and MOT2-26 Rated Current) and the no-load current (MOT1, and MOT2-35 No-load Current) and output voltage will be adjusted.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|------------------|-----------|------|------------------|------------------|------|
| ADV | 52 | Energy Save Mode | 2 | Auto | - | 0 | - |

① Caution

Note that the actual working time may be longer than the preset acceleration and deceleration times due to the time required to return to the normal operation from an energy saving operation when accelerating or decelerating from a change in the operating frequency or a stop command during an energy saving operation.

7.13 Speed Search Operation

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This operation is used to prevent fault trips that can occur while the inverter outputs voltage when the motor is free-running with the inverter output voltage disconnected. Because this feature estimates the rotational speed of the motor approximately based on the inverter output current, it does not detect the exact speed.

The speed search operation is available for a general acceleration operation, a start operation when powering on, a restart operation after a power interruption, an auto-restart operation after a trip, and an emergency stop operation.

| Group | Code | LCD Display Set Value | | Setting Range | Initial Value | Unit | |
|-------|-----------------|------------------------------|-----|-------------------|------------------|--------------|-----|
| APP | 05 | SpeedSearch Mode | 0 | Current Detect | 0~1 | 0 | - |
| | 06 | SS Block Time | 1.0 | | 0.0~60.0 | 1.0 | sec |
| | 07 | SS Sup-Current | 90 | | 0~200 | 90 | % |
| | 09 SS Bandwidth | | 100 | | 1~300 | 100 | % |
| | 10 | PM SS Curr Peak | 15 | | 10~100 | 15 | % |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 19 | Speed Search | - | 24, 14 ,0 | - |

Speed Search Operation Setting Details

| Code and Functions | Description | | | | |
|------------------------------|---|--|---|--|--|
| | Sele | cts a speed sea | rch mode. | | |
| APP-05 | | ltem | Functionality | | |
| Speed Search Mode | 0 | Current Detect | Limits the current that flows in the motor and starts. | | |
| | 1 | Speed Estimate | Detects the rotational speed of the motor and starts. | | |
| APP-06 SS Block Time | This opera coun searc resta | parameter preve ation command ter-electromotive ch will start when rt prevention tim | ents speed search operation from working after the is input, as it may cause an overcurrent trip from e force, depending on the motor capacity. Speed n the time set to the SS Block Time or the free-run ne expires, whichever is later. | | |
| APP-07 SS Sup- Current | Adjus (MO ⁻ a sm | Adjusts the size of current during speed search based on rated current (MOT1 and MOT2-26) of the motor. Change the size of SS Sup-Current to a smaller value if the load during speed search operation is too small. | | | |

| Code and Functions | Description |
|---------------------------------|--|
| APP-08 SS Bandwidth | Adjusts the gain for a speed search. |
| APP-10 SS PM SS Curr Peak | This parameter adjusts the size of current during speed search. Accuracy may be decreased due to noise if the value is too small, while a speed search may be difficult at a high speed if the value is too big. |

① Caution

Set BAS-01 (Start Mode) to 2 (Speed Search) and enable a speed search operation during acceleration to start the operation smoothly at free run. If the speed search function is not set, an overcurrent trip or overload trip may occur.

Note

For synchronous motor operation, rotational speed of the motor is detected before starting regardless of APP-05 (SpeedSearch Mode).

7.13.1 General Acceleration Operation

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|------------------------------|-----------|-----------------|------------------|------------------|------|
| BAS | 01 | Start Mode | 2 | Speed Search | - | 0 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 19 | Speed Search | - | 24, 14, 0 | - |

Speed Search During General Acceleration Operation Setting Details

| Code and Functions | Description |
|--------------------|--|
| BAS-01 Start Mode | Sets the value as 2 (Speed Search). It accelerates to speed search operation upon operation command input at the inverter. When the inverter is rotating by the load environment, a fault trip may occur if the operation command is input for the inverter to output voltage. The speed search function prevents such fault trips in such cases and enables acceleration. |

| 7.13.2 | Start Operation | While | Powering | On |
|--------|------------------------|-------|----------|----|
|--------|------------------------|-------|----------|----|

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|------------------------------|-----------|-----------------|------------------|------------------|------|
| ADV | 02 | Power-on Run | 2 | Speed Search | - | 0 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 19 | Speed Search | - | 24, 14, 0 | - |

Speed Search During Start Operation While Powering On-Setting Details

| Code and Functions | Description |
|---------------------|---|
| ADV-02 Power-on Run | Sets the value as 2 (Speed Search). If inverter input power is supplied while the inverter operation command is on, the speed search operation will accelerate the motor up to the target frequency. |

7.13.3 Restart Operation After Power Interruption

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|------------------------------|-----------|-----------------|------------------|------------------|------|
| PRT | 03 | Intrp Restart | 2 | Speed Search | - | 0 | - |
| | 04 | Intrp Time | | 60.0 | 10.0~60.0 | 60.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 19 | Speed Search | 0~49 | 24, 14, 0 | - |

Speed Search During Restart Operation After Power Interruption Setting Details

| Code and Functions | Description |
|--|---|
| PRT-03 Intrp Restart, PRT-04 Intrp Time | Sets the value for operation during an interruption (PRT-03) as 2 (Speed Search). If the trip is lifted within the interruption decision time (PRT-04) when there is a low voltage trip with the inverter operation command input, the speed search operation will accelerate the motor to the target frequency. |

7.13.4 Auto Restart Operation After A Trip

Refer to 7.14.2 Auto Restart for Speed Search.

7.13.5 Emergency Operation

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|------------|------------------------------|----|-----------------|------------------|------------------|------|
| PRT | 85 | BX Restart Mode | 2 | Speed Search | - | 1 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 19 | Speed Search | - | 24, 14, 0 | - |

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Speed Search During Emergency Operation Setting Details

| Code and Functions | Description |
|------------------------|---|
| PRT-85 BX Restart Mode | Sets the value as 2 (Speed Search). If an emergency stop is lifted while the inverter operation command is on, the speed search operation will accelerate the motor to the target frequency. |

7.14 Auto Restart Setting

Used to restart the inverter automatically based on the setting values when a trip is lifted after the operation stops from an inverter abnormality.

7.14.1 Auto Restart for General Acceleration

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---------------|------------------------------|-----------|-------------------------|------------------|------------------|------|
| | 05 | Reset Restart | 1 | Start Mode | - | 0 | - |
| PRT | 06 | Retry Number | | 1 | 1~10 | 1 | - |
| | 07 | Retry Delay | | 1.0 | 0.0~60.0 | 1.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 33 | Reset Restart F Trip | - | 24, 14, 0 | _ |

Auto Restart for General Acceleration Setting Details

| Code and Functions | Description |
|---|---|
| PRT-05 Reset Restart, PRT-06 Retry Number, PRT-07 Retry Delay | When PRT-05 is set as 1 (Start Mode), it will accelerate as general acceleration and operate. Auto restart count is set at PRT-06. If a fault trip occurs during operation, the inverter will automatically restart after the time set at PRT-07. At each restart, the internal S/W of the inverter will decrease the number of attempts by 1. When the retry count reaches 0 after the number of trips set, the inverter will no longer attempt an auto restart. After an auto restart, if a trip does not occur again within 60 seconds, the inverter will increase the auto restart count that was previously reduced by the internal S/W. The maximum number of increases is limited by the set auto restart count. |

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[Image 27. An Example of Operation When Auto Restart Count for General Acceleration Is Set as 2]

7.14.2 Auto Restart for Speed Search

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|---------------|------------------------------|-----------|-------------------------|------------------|------------------|------|
| | 05 | Reset Restart | 2 | Speed Search | - | 0 | - |
| PRT 06 | 06 | Retry Number | 1 | | 1~10 | 1 | - |
| | 07 | Retry Delay | | 1.0 | 0.0~60.0 | 1.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 33 | Reset Restart F Trip | 0~49 | 24, 14, 0 | - |

Auto Restart for Speed Search Setting Details

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| Code and Functions | Description |
|---|---|
| PRT-05 Reset Restart, PRT-06 Retry Number, PRT-07 Retry Delay | When PRT-05 is set as 2 (Speed Search), it will accelerate as a speed search and operate. Auto restart count is set at PRT-06. If a fault trip occurs during operation, the inverter will automatically restart after the time set at PRT-07. At each restart, the internal S/W of the inverter will decrease the number of attempts by 1. When the retry count reaches 0 after the number of trips set, the inverter will no longer attempt an auto restart. After an auto restart, if a trip does not occur again within 60 seconds, the inverter will increase the auto restart count that was previously reduced by the internal S/W. The maximum number of increases is limited by the set auto restart count. |



[Image 28. An Example of Operation When Auto Restart Count for Speed Search Is Set as 2]

Caution

- If PRT-05 (Reset Restart) is set as anything other than 0 (None), note that it will automatically restart when a trip is lifted, rotating the motor.
- Note that when auto-restart is selected while the motor is rotating when PRT-05 (Reset Restart) is set as 1 (Start Mode) and the trip is lifted, it may abruptly decelerate the motor before operating as a general acceleration or cause overvoltage trip or overcurrent trip.

Note

If the inverter stops due to a low voltage trip, emergency stop (BX), inverter overheat (Drive Over Heat), or hardware abnormalities (HW Diag), auto restart is not activated.

7.15 Operational Noise Settings (Change of Carrier Frequency Settings)

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------------|-------------------|-----------|-------------------|------------------|------------------|------|
| | | | 0 | Normal PWM | | | |
| DRV | DRV 26 PWM* Mode | PWM* Mode | 1 | LowLeakage PWM | 0~1 | 1 | - |
| | 27 | Carrier Frequency | 2 | | 1~15 | 5 | kHz |

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* PWM: Pulse width modulation

Operational Noise Setting Details

| Code and Functions | | Description | | | |
|-----------------------------|--|-----------------|------------|--|--|
| DRV-26 PWM Mode | Heat loss and leakage current from the inverter can be reduced depending on the load factor. Selecting 1 (LowLeakage PWM) will reduce heat loss and leakage current compared to selecting 0 (Normal PWM); however, noise from the motor will increase. Low leakage PWM uses two-phase PWM, minimizing performance degradation while reducing switching loss of about 1/3. | | | | |
| | | Carrier fr | requency | | |
| | ltems | 1kHz | 15kHz | | |
| | | Low Leakage PWM | Normal PWM | | |
| | Operational noise of motor | 1 | Ļ | | |
| | Heat occurrence | \downarrow | † | | |
| | Noise occurrence | \downarrow | <u></u> | | |
| | Leakage current | \downarrow | \uparrow | | |
| DRV-27 Carrier Frequency | Selects operational noise of the motor by changing carrier frequency settings. Power transistors (IGBT) in the inverter generate and supply high-frequency switching voltage to the motor. The switching speed during this process is called the carrier frequency. If the carrier frequency is set high, it will reduce operational noise from the motor, and if the carrier frequency is set low, it will increase operational noise from the motor. | | | | |

Note

S300 Series Inverter Derating Standard

- S300 series inverters are designed to respond to two types of load factors: Heavy loading (heavy duty) and light loading (normal duty). The overload rate represents an acceptable load amount that exceeds the rated load, and is expressed in a ratio of excess to the rated load. The overload withstand of the S300 series inverters is 150%/1 min for heavy loading and 120%/1 min for light loading. The current rating differs from the load rating, as it also has an ambient temperature limit.
- The following image shows the limit of the rated current for ambient temperature under a light load operation.



[Image 29. Rated Current Limit per Ambient Temperature]

 The following table shows the maximum value for the carrier frequency that guarantees 100% rated current. For more information about derating standards, refer to 16.7.1 Continuous Rated Current Derating.

Maximum Value of Carrier Frequency by Inverter Capacity

| Inverter | capacity | Normal load Low Leakage/ Normal | Heavy load Low Leakage/ Normal |
|-------------|----------|---------------------------------------|--------------------------------------|
| | 0.4~22kW | 3kHz/2kHz | 8kHz/5kHz |
| 200 V class | 30~45kW | 3kHz/2kHz | 5kHz/3kHz |
| | 55~75kW | 2kHz | 4kHz |
| | 0.4~37kW | 3kHz/2kHz | 8kHz/5kHz |
| 400 V class | 45~75kW | 3kHz/2kHz | 5kHz/3kHz |
| | 90~220kW | 2kHz | 3kHz/2kHz |

7.16 Second Motor Operation

The second motor operation is used when a single inverter switch-operates two motors. The parameters for the second motor are configurable in the second motor operation function. The second motor is operated when a multifunction input terminal defined for the second functions is turned on.

| Group | Code | LCD Display | S | et Value | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|----|--------------|------------------|---------------------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 27 | 2nd Motor | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Second Motor Operation-Setting Details

| Code and Functions | Description |
|-----------------------|---|
| DIN-01~15 | MOT2 (second motor) group, V/F2 (second V/F control) group, and VEC2 (second vector control) group will be displayed when you set a multifunction terminal as 27 (2nd Motor). |
| DIx Define | A signal input at the multifunction terminal set to second motor will operate the motor according to the code settings listed below. |
| (DIx: DI1~DI8) | However, when the inverter is in operation, signal input at the multifunction terminal does not induce operating with parameters set at MOT2 (second motor) group, V/F2 (second V/F control) group, and VEC2 (second vector control) group. |

Table 4. An Example of Second Motor Operation

An Example of Second Motor Operation

Set as follows to switch-operate to 30 kW in DI3 terminal with a 37 kW motor using second motor operation:



[Image 30. Second Motor Operation Settings]

7.17 Switching Operation to Commercial Power

Power switching operation is used to switch motor operation from the inverter to commercial power or the other way around.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|---------------------------------|-----------|----------------------|------------------|---------------------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 21 | Exchange | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 17 | Drive Output Line | | 24, 14, 0 | - |
| 001 | | | 18 | Supply Power Line | | | |

Supply Power Transition Setting Details

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| Code and Functions | Description | | | | |
|---|---|--|--|--|--|
| DIN-01~15 DIx Define (DIx: DI1~DI8) | To switch input power for the motor from inverter output to commercial power, select a terminal to use and set the code value to 21 (Exchange). Power will be switched when the selected terminal is on. To switch the input power back to the inverter output terminal from commercial power, turn off the set terminal. | | | | |
| | This function sets the multifunction output terminal to no. 17, inverter output line (Drive Output Line) and no. 18, supply power line. The operation sequence is as follows: | | | | |
| OUT-50~54 DOx Define | Operation frequency Operation Command (Fx) | | | | |
| (DOx: DO1~DO3) | DIx(Exchange) DOx-17 (Drive Output Line) DOx-18 (Supply Power Line) $\rightarrow \leftarrow \rightarrow \leftarrow \\ 500ms 500ms$ | | | | |
| | [Image 31. An Example of Switching Operation to Commercial Power] | | | | |

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7.18 Input Power Frequency Settings and Voltage Monitoring

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The inverter input power voltage you monitor can be displayed in a line-to-line RMS value.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit | |
|-------|------|-------------------|----------------|------|------------------|------------------|------|--|
| DRV | 30 | Ref AC Input Volt | 200 V class | - | 200~240 | - | | |
| | | | 400 V class | - | 380~480 | - | | |
| | 31 | 60/50 Hz Select | 0 | 60Hz | 0~1 | 0 | | |
| | | | 1 | 50Hz | 0~1 | | - | |

Input Power Frequency Settings and Voltage Monitoring Setting Details

| Code and Functions | Description |
|-----------------------------|--|
| DRV-30 Ref AC Input Volt | The inverter input power voltage you monitor is displayed in a line- to-line RMS value. The value is renewed only when the inverter is at a stop without a trip and the values of input power voltage monitoring are within the set range. Base voltage for low voltage trip occurrence/lift and KEB start/end automatically change based on this voltage. |
| DRV-31 60/50 Hz Select | Select the frequency for inverter input power. If the frequency changes from 60 Hz to 50 Hz, all the frequencies set above 60 Hz (or rpm) and related items (maximum frequency, base frequency, and etc.) will change to 50 Hz as well. Likewise, changing the input power frequency setting from 50 Hz to 60Hz will change all related function settings from 50 Hz to 60 Hz. |

7.19 Second Operation Mode Settings

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Apply two types of operation modes and switch between them as required. Set the second command mode aside from the main command mode for operation commands and frequency settings with the multifunction input terminal. Mode switching can be used to stop remote control, to switch operation mode to operate via local panel, or to operate the inverter from another remote control room during a remote operation using a communication option.

Select one of the Define codes of DI1-DI8 of terminal input group (DIN) as 20 (2nd Source).

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|-----------|---------------|------------------|---------------------------------|------|
| DRV | 10 | 1st Command Source | 1 | Fx/Rx-1 | 0~6 | 1 | - |
| | 11 | 1st Freq Ref Src | 0 | Keypad | 0~8 | 0 | - |
| | 12 | 1st Torque Src | 0 | Keypad | 0~3 | 0 | - |
| | 40 | 2nd Command Src | 1 | Fx/Rx-1 | - | 1 | - |
| | 41 | 2nd Freq Ref Src | 0 | Keypad | 0~8 | 0 | - |
| | 42 | 2nd Torque Src | 0 | Keypad | 0~3 | 0 | - |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 20 | 2nd Source | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Second Operation Mode Setting Details

| Code and Functions | Description |
|---------------------------|---|
| DRV-40 2nd | If signals are provided to the multifunction terminal set as the |
| Command Src, | second command source (2nd Source), the operation can be |
| DRV-41 2nd Freq | performed using the set values at DRV-40-42 instead of ones at |
| Ref Src, | DRV-10-12. |
| DRV-43 Acc/ DecTimeSrc | You cannot change to the second operation mode while operating in the first operation mode. |

() Caution

- When you set the multifunction input terminal to second command source (2nd Source) and turn on the signal, operation status will change, as all the frequency settings and operation commands change to the second commands. Therefore, before inputting functions to the multifunction terminal, ensure that the second commands are correctly set. Note that if deceleration time is too short or inertia of the load is too high, an overvoltage fault trip may occur.
- Depending on the settings for the operation commands, the inverter may stop when you switch the command modes during operation.

7.20 Regeneration Avoidance

Regeneration avoidance is used during temporary regenerative operations to avoid braking. If a motor regenerates during inverter operation, the operation speed will automatically go up to prevent regeneration zone.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------------------------|------|-----------------------|----------------|-----|------------------|------------------|------|
| | 25 | RegenAvd Enable | 1 | Yes | - | 1 | - |
| 29 APP 30 31 32 | 20 | | 200 V class | 350 | 300~400 | 350 | |
| | 29 | Regenava Lever | 400 V class | 700 | 600~800 | 700 | V |
| | 30 | RegenAvd FreqLimit | 10.00 | | 0.00~10.00 | 10.00 | Hz |
| | 31 | RegenAvd Spd Limit | 300 | | 0~300 | 300 | rpm |
| | 32 | RegenAvd Gain | | 100 | 0~200 | 100 | % |
| | 33 | RegenAvd FF Gain | 100 | | 0~200 | 100 | % |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Regeneration Avoidance Setting Details

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| Code and Functions | Description |
|--|--|
| APP-25 RegenAvd Sel | Frequent occurrence of regenerative voltage during motor operation at a constant speed may force excessive work on the brake unit, which may damage the brake or shorten its life. To prevent this situation, select this to suppress the DC link voltage and disable operation of the brake unit. |
| APP-29 RegenAvd Level | Sets the brake operation avoidance level voltage when the DC link voltage goes up due to regenerative voltage. |
| APP-30 RegenAvd Freq Limit, APP-31 RegenAvd Spd Limit | Sets the width for the frequency (speed) that is changeable compared to the actual operating frequency when avoiding regeneration zone. |
| APP-32 RegenAvd Gain | Sets the gain for the DC link voltage regulator to avoid regeneration zone. |
| APP-33 RegenAvd FF-Gain | Sets the ratio that adds preset target amount to the controller output. Adjusting this value leads to a faster response. |



Regeneration Avoidance Active



7.21 Load Speed

You can display load speed in monitor mode in the scale and unit of your choice.

The load speed is displayed with values to which MOT1, MOT2-96 (Load Speed Gain) and MOT1, MOT2-97 (Load Speed Scale) are applied in the unit of rpm or mpm, whichever is set at MOT1 and MOT2-98 (Load Speed Unit).

Refer to <u>**12.2.3 Operation Status Monitor Settings</u>** for how to set the load speed in monitor mode.</u>

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|----------|------|---------------------|-----------|---------|------------------|------------------|------|
| | 96 | Load Speed Gain | | 100.0 | 0.1~6000.0 | 100.0 | % |
| MOT1, | | Load Speed Scale | 0 | x1 | | 0 | |
| | 97 | | 1 | x0.1 | 0~4 | | - |
| | | | 2 | x0.01 | | | |
| IVIO I Z | | | 3 | x0.001 | | | |
| | | | 4 | x0.0001 | | | |
| | 98 | Load Speed Unit | 0 | rpm | 0~1 | 0 | |
| | | | 1 | mpm | 0~1 | | - |

7.22 Output Power Display

You can adjust the scale of the output power displayed in the monitor mode.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|--------------|-----------|------------------|------------------|------|
| DRV | 45 | Trim Power % | 100 | 70~130 | 100 | % |

Refer to <u>12.2.1 Item Change in Monitor Display Mode</u> and select 4 (Output Power) among monitor items. Then, increase the setting value appropriately if the output power displayed in the Smart Operator is smaller than expected. On the contrary, decrease the setting value appropriately if the output power displayed on the loader is bigger than expected.

Output power is displayed as a calculation of the voltage and current, and there may be errors in the output power if the power factor is low.

Refer to <u>4.2.4.2 Monitor mode type</u> for monitor mode types and <u>12.2.1 Item Change</u> <u>in Monitor Display Mode</u> for item change in monitor display mode.

7.23 Motor Pre-Heating

You can heat the motor or pump by supplying a constant current to prevent freezing when the motor or pump is at stop.

| Group | Code | LCD Display | Se | t Value | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|----------------------------|------|-------------|------------------|---------------------------------|------|
| | 40 | Pre-Heat Level | | 20 | 1~100 | 20 | % |
| APP | 41 | Pre-Heat Duty | 30 | | 1~100 | 30 | % |
| | 42 | Pre-Heat Delay T | 60.0 | | 0.0~600.0 | 0.0 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: D1~D8) | 50 | Pre Heat | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

| Code and Functions | Description |
|--|---|
| APP-40 Pre-Heat Level | Sets the injectable current for initial heating. The pre-heat current is set in % value compared to rated current of the motor. |
| APP-41 Pre-Heat Duty | Sets the duty (time) for current flow during 10 seconds of initial heating in a % value. |
| APP-42 Pre-Heat Delay T | Sets a certain delay time to prevent an overcurrent trip from DC input during free-run stop of the motor. |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | You need to set the code of the terminal you want (DI1-DI8 Define) as 50 (Pre Heat) for initial heating. |

Motor Pre-Heating Setting Details

Motor pre-heating continuously work until there is an inverter command when the set multifunction input terminal is turned on. The inverter operation starts immediately upon inverter command input during motor pre-heating.





If a terminal block for initial heating is turned on after the inverter operation command is turned off, the inverter will stop operation and perform motor pre-heating.



[Image 34. An Example of Motor Pre-Heating When Free-Run Stops]

The above image is a waveform for APP-42 (Pre-Heat Delay T). When the inverter stop mode (BAS-02 Stop mode) is set to 2 (CoastStop(FreeRun)) and the pre-heat signal is input at the multifunction input terminal, motor pre-heating will be performed until there is an inverter operation command. When the inverter operation command is turned on, it will accelerate then operates at a constant speed according to the target frequency. When the operation command is turned off, the motor will free run for the time set at APP-42 (Pre-Heat Delay T) before starting motor pre-heating.

① Caution

- If the setting value for APP-40 (Pre Heat Level) exceeds the rated current of the inverter, the value will be limited to the rated current.
- Setting the APP-40 (Pre Heat Level) value too high or having a long DC current output time may overheat or damage the motor, causing an inverter overload trip. Reduce DC output current or time in such a case.

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Advanced Functions

7.24 DC Injection by Terminal Block

This function secures flux by supplying DC current to the induction motor via an external sequence. It only works when the inverter is stopped. When an operation command is applied and the operation starts, DC injection will stop even if the terminal block is turned on. When the terminal block for DC injection is turned on when inverter operation command is already input, the inverter will stop its operation and start performing a DC injection.

| Group | Code | LCD Display Se | | t Value | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|----|-----------------|------------------|---------------------------------|------|
| BAS | 10 | DC Injection Level 39 | 50 | | 1~100 | 50 | % |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 28 | DC Injection | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

DC Injection Setting Details

| Code and Functions | Description |
|---|--|
| BAS-10 DC Injection Level | Sets in % value compared to rated current of the motor. |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | You need to set the code of the terminal you want (DI1-DI8 Define) as 28 (DC Injection) to perform a DC injection. |

() Caution

- If the setting value for BAS-10 (DC Injection Level) exceeds the rated current of the inverter, the value is limited to the rated current.
- Setting the BAS-10 (DC Injection Level) value too high or having a long DC current output time may overheat or damage the motor, causing an inverter overload trip. Reduce DC output current or time in such a case.

³⁹ The percentage to the peak of rated current of the motor **e.g.**) where the setting value is 60% and rated current of the motor is 30 Arms, the DC output is $30 \times \sqrt{2} \times 0.6 = 25.45$ A.



7.25 Brake Control

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Used to control the On/Off operation of the load's electronic braking system.

If the DI1-DI8 Define code of the terminal block input group (DIN) is anything other than 55 (Brake Monitor Sel), the brake release delay time and brake engage delay time will be ignored.

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-------|-----------|-------------------------------------|------------------|------|
| | 13 | Brake | 0 | No | 0~1 | 0 | _ |
| AFF | 43 | Enable | 1 | Yes | 0.01 | 0 | - |
| | | | 0 | DISABLE | | | |
| | | | 1 | RELEASING | | | |
| | 40 | Br Control State | 2 | RELEASE | 0~4 | 0 | - |
| | | olulo | 3 | ENGAGING | | | |
| | | | 4 | ENGAGE | | | |
| | 41 | Br Release Load | 50.00 | | 0.00~180.00 | 50.00 | % |
| | 42 | Br Load Req Delay | | 1.00 | 0.00~10.00 | 1.00 | sec |
| | 43 | Br Release Delay | | 1.00 | 0.00~10.00 | 1.00 | sec |
| ADV | 44 | Br Release FwdFreq | | 1.00 | 0.00~Max Frequency ⁴⁰ | 1.00 | Hz |
| | 45 | Br Release Fwd Spd | | 30 | 0~Maximum Speed ⁴¹ | 30 | rpm |
| | 46 | Br Release RevFreq | | 1.00 | 0.00~Max Frequency ⁴⁰ | 1.00 | Hz |
| | 47 | Br Release Rev Spd | | 30 | 0~Maximum Speed ⁴¹ | 30 | rpm |
| | 48 | Br Engage Delay | 1.00 | | 0.00~10.00 | 1.00 | sec |
| | 49 | Br Engage Freq | 1.00 | | 0.00~Max Frequency ⁴⁰ | 2.00 | Hz |
| | 50 | Br Engage Speed | | 30 | 0~Maximum Speed ⁴¹ | 60 | rpm |

⁴⁰ DRV-20(Max Frequency)

⁴¹ DRV-21(Maximum Speed)

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---|-------------------|-----------|----------------------|------------------|------------------------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DI1~DI8 Define | 55 | Brake Monitor Sel | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |
| OUT | 50, 52, 54 | DO1~DO3 Define | 30 | Brake Control | - | 24, 14, 0 | - |

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* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Brake Control Setting Details

| Code and Functions | Description |
|---|---|
| APP-43 Brake Enable | Set the code to 1 (Yes) to set the functions for brake control. |
| ADV-40 Br Control State | Displays the current status of brake control (DISABLE, RELEASING, RELEASE, ENGAGE, or ENGAGING). |
| ADV-41 Br Release Load, ADV- 42 Br Load Req Delay | When the output load exceeds brake release load (ADV-41 Br Release Load) after reaching the brake release frequency, the brake release signal will be output via the output relay set for the brake control or multifunction output terminal after brake release request delay (ADV-42 Br Load Req Delay) time. |
| ADV-43 Br Release Delay | Sets brake release delay time. It will accelerate after maintaining the frequency for a set amount of time. |
| ADV-44 Br Release FwdFreq, ADV-45 Br Release Fwd Spd, ADV-46 Br Release RevFreq, ADV-47 Br Release Rev Spd | If an operation command is input when the motor is stopped, the inverter will accelerate to the brake release frequency (ADV-44 Br Release FwdFreq, ADV-46 Br Release RevFreq) or rotation count (ADV-45 Br Release Fwd Spd, ADV-47 Br Release Rev Spd) depending on the direction; forward or reverse. |
| ADV-49 Br Engage Freq, ADV-50 Br Engage Speed | If a stop command is input during operation, the motor will decelerate. Once the output frequency reaches the brake engage frequency (ADV-49 Br Engage Freq) or rotation count (ADV-50 Br Engage Speed), the motor will stop deceleration and output a brake engage signal to a preset output terminal. |
| ADV-48 Br Engage Delay | Sets the brake engage delay time. The frequency will be maintained for a set amount of time before the output frequency becomes 0. |

Brake Status Diagram

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[Image 35. Brake Status Block]

| Table 5. | Brake | Operation | Status |
|----------|-------|-----------|--------|
| | | | |

| Status Name | Description |
|----------------|--|
| DISABLE | Impossible to control the brake. |
| | RELEASING |
| Releasing Wait | Enters when there is a brake release request. It makes the ramp frequency (frequency that went through acceleration and deceleration functions) to reach the frequency set at ADV-44 (Br Release FwdFreq) or ADV- 46 (Br Release RevFreq). If the motor load (output current or output torque) is bigger than the set value at ADV-41 (Br Release Load) during a certain time (ADV-42 Br Load Req Delay), the output of the terminal block where 30 (Brake Control) is set will turn on. A Br Release Invalid trip occurs if the motor load is not fulfilled after the time set at ADV-42 (Br Load Req Delay). |
| Release Delay | When you select 55 (Brake Monitor Sel) for the DI1-DI8 Define code of the terminal block input group (DIN), a Br Releasing Fail trip will occur if the input at that terminal block is not on (brake engaged) within the ADV-43 (Br Release Delay) time. |
| RELEASE | The brake will be released and the inverter will normally accelerate to the target frequency before operating at a constant speed. |

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| Status Name | Description |
|---------------|--|
| | ENGAGING |
| Engaging Wait | Enters when there is a brake engage request. The inverter will decelerate to compare the ramp frequency with the frequency set at ADV-49 (Br Engage Freq). If the ramp frequency goes below the frequency set at ADV-49 Br Engage Freq) during deceleration, the output of the terminal block where 30 (Brake Control) is set will turn off. |
| Engage Delay | When you select 55 (Brake Monitor Sel) for the DI1-DI8 Define code of the terminal block input group (DIN), a Br Engaging Fail trip will occur if the terminal block input is not off (brake released) within the ADV-48 (Br Engage Delay) time. |
| ENGAGE | The brake will be engaged and the inverter will be stopped (no PWM output). |

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Table 6. Brake Status Change Criteria

| No. | Description |
|-----|--|
| 0 | When you set App-43 (Brake Enable) as 1 (Yes). |
| 2 | When there is an operation command input. |
| 3 | When the motor load exceeds the setting value of ADV-41 (Br Release Load) within the time set at ADV-42 (Br Load Req Delay). |
| 4 | When the time set at ADV-43 Br Release Delay) has passed under Release Delay. |
| 6 | When there is a stop command input. |
| 6 | When reaching the brake engage speed (ADV-49 Br Engage Freq, ADV-50 Br Engage Speed) while decelerating. |
| 0 | When the time set at ADV-48 (Engage Delay) has passed after reaching the brake engage speed. |
| 8 | When you set APP-43 (Brake Enable) as 0 (No). |



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7.26 Position Control

Position control helps move to the target position in a preset speed pattern.

7.26.1 Installation, Wiring, and Operation Preparation

For position control, an encoder must be installed to figure out the position. Refer to the encoder option manual for its installation.

Prepare for position control in the following order:

- 1 Check the rotational direction of the motor and tune the encoder.
 - Set the rotational direction of the motor and encoder parameters (ENC-11 Enc Output Phase, ENC-12 Resolution/Pulse) according to encoder manual.
- 2 Set motor parameters and execute auto-tuning.
 - Set MOT1-05 (Control Mode) as 4 (Vector).
 - Check the rating plate of the motor and set MOT1, MOT2-04 (Motor Type), 21 (Motor Capacity), 23 (Base Frequency), 24 (Rated Speed), 25 (Number of Polse), 26 (Rated Current), 27 (Rated Voltage), and 28 (Efficiency). Refer to <u>3.1</u> <u>Setting Up Motor Rating Plate Information</u> for details.
 - Set BAS-20 (Auto Tuning) to 1 (Auto Tuning) and tune motor parameters. Refer to <u>3.4 Auto Tuning</u> for details.

7.26.2 Independent Position Control Operation

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The inverter can output proper frequency to help the load reach the target position according to current position (Cur Position) and target position (Tar Position) commands.

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|------------------|---|---------------------|------------------|------------------|------|
| ADD | 11 | Pos Ctrl Enable | 0 | No | 0~1 | 0 | |
| AFF | 44 | FUS CITI ETIADIE | 1 | Yes | 0~1 | 0 | - |
| | | | 0 | Stop | | | |
| | | | 1 | POS Run | | | |
| | | | 2 | POS Run Pre-Posi | | _ | |
| | 01 | Pos Ctrl State | 3 | POS Run Relative | 0-6 | | - |
| | | | 4 | Trip | | | |
| | | | 5 | POS Run Home | - | | |
| | | | 6 | POS Home | | | |
| POS1 | 02 | Pos Ctrl Mode | 0 | Pos Single | | | |
| | | | 1 | Multi Sync Pos | | 0 | |
| | 03 | Tar Position | | - | 0~65000 | - | UC |
| | 04 | Cur Position | | - | 0~65000 | - | UC |
| | 05 | Pre Position | | 0 | 0~65000 | 0 | UC |
| | 06 | Error Value | | - | 0~65000 | - | Puls |
| | 07 | Reference Value | | - | 0~65000 | - | Puls |
| | 08 | Feedback Value | | - | 0~65000 | - | Puls |
| | 09 | Total Move Time | | - | 0.00~650.00 | - | sec |

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| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-------------------|-------|-------------------------------|------------------------------|------------------|------|
| | | | 0 | DI Dependent | | | |
| | | | 1 | Keypad | | | |
| | | | 2 | Internal Comm. | | | |
| | 10 | Cmd Source | 3 | USB Comm. | 0~5 | 0 | - |
| | | | 4 | Option Comm. ⁴² | | | |
| | | | 5 | UserSequence | | | |
| | | | 0 | Stop | | | |
| | | | 1 | POS Run | | | - |
| | 11 | Cmd Keypad Set | 2 | POS Run Pre-Posi | 0~3 | 0 | |
| POS1 | | | 3 | POS Run Relative | | | |
| | 12 | Multi Sync Time | | 0.00 | 0.00~650.00 | 0.00 | sec |
| | 15 | Stop Homing | 0 | No | 0~1 | 0 | |
| | 15 | | 1 | Yes | 0~1 | 0 | - |
| | 20 | Proportional Gain | 50.0 | | 0.0~1000.0 | 50.0 | % |
| | 21 | FeedForward Gain | 100.0 | | 0.0~1000.0 | 100.0 | % |
| | 22 | Output LPF Gain | | 0 | 10000 | 0 | msec |
| | 30 | SW Limit Prot | 0 | Trip | 0~1 | 0 | - |
| | | Mode | 1 | Warning | 01 | 0 | |
| | 31 | SW Limit Hi | 0 | No | 0~1 | 0 | _ |
| | | Enable | 1 | Yes | 01 | 0 | |
| | 32 | SW Limit Lo | 0 | No | 0~1 | 0 | _ |
| | 52 | Enable | 1 | Yes | 0.01 | 0 | - |
| | 33 | Pos SW Limit High | 60000 | | Pos SW Limit Low~65000 | 60000 | UC |
| | 34 | Pos SW Limit Low | | 5000 | 0∼Pos SW Limit High | 5000 | UC |

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⁴² Configurable only when equipped with communication options

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|---------------------|-------|------------------------|-------------------------------------|------------------|------|
| | 35 | HW Limit Prot | 0 | Trip | | 0 | |
| | 55 | Mode | 1 | Warning | - | 0 | - |
| | 36 | Max Track Pulse | | 30000 | 0~65000 | 30000 | Puls |
| | 37 | Tar Bound Pulse | | 200 | 0~65000 | 200 | Puls |
| | 40 | Error Stop Mode | 0 | CoastStop (FreeRun) | 0~1 | 0 | - |
| | | | 1 | Trip Dec Stop | | | |
| | | | 0 | Inverse + index | | | |
| | 50 | Homing Type | 1 | Inverse + No Index | 0~3 | 0 | - |
| POS1 | | | 2 | Index | | | |
| | | | 3 | No Index | | | |
| | 51 | Homing Dir | 0 | FWD | 0~1 | 0 | |
| | | | 1 | REV | 0~1 | | |
| | 52 | Homing Freq | 2.00 | | 0.00~Max Frequency ⁴³ | 2.00 | Hz |
| | 53 | Homing Speed | 1800 | | 0~ Maximum Speed ⁴⁴ | 1800 | rpm |
| | 54 | Homing Ramp Time | 10.00 | | 6000.00 | 10.00 | sec |
| | 55 | Pup Polativo Dir | 0 | FWD | 0~1 | 0 | |
| | 55 | | 1 | REV | 0,01 | 0 | - |
| | 60 | UC Numerator | | 1 | 1~65000 | 1 | - |
| | 61 | UC Denominator | | 1 | 1~65000 | 1 | - |
| | 01 | TRJ Tar Pos-01 | | 30000 | 0~65,000 | 30000 | UC |
| POS2 | 02 | TRJ Tar Freq-01 | | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 03 | TRJ Tar Spd-01 | | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |

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⁴³ DRV-20(Max Frequency)
 ⁴⁴ DRV-21(Maximum Speed)

Advanced Functions

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------|-----------|-------------------------------------|------------------|------|
| POS2 | 04 | TRJ Acc Time-01 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 05 | TRJ Dec Time-01 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 07 | TRJ Tar Pos-02 | 30000 | 0~65000 | 30000 | UC |
| | 08 | TRJ Tar Freq-02 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 09 | TRJ Tar Spd-02 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 10 | TRJ Acc Time-02 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 11 | TRJ Dec Time-02 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 13 | TRJ Tar Pos-03 | 30000 | 0~65000 | 30000 | UC |
| | 14 | TRJ Tar Freq-03 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 15 | TRJ Tar Spd-03 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 16 | TRJ Acc Time-03 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 17 | TRJ Dec Time-03 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 19 | TRJ Tar Pos-04 | 30000 | 0~65000 | 30000 | UC |
| | 20 | TRJ Tar Freq-04 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 21 | TRJ Tar Spd-04 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 22 | TRJ Acc Time-04 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 23 | TRJ Dec Time-04 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 25 | TRJ Tar Pos-05 | 30000 | 0~65000 | 30000 | UC |
| | 26 | TRJ Tar Freq-05 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |

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| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------|-----------|-------------------------------------|------------------|------|
| | 27 | TRJ Tar Spd-05 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 28 | TRJ Acc Time-05 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 16 | TRJ Dec Time-05 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 31 | TRJ Tar Pos-06 | 30000 | 0~65000 | 30000 | UC |
| | 32 | TRJ Tar Freq-06 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 33 | TRJ Tar Spd-06 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 34 | TRJ Acc Time-06 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 35 | TRJ Dec Time-06 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 37 | TRJ Tar Pos-07 | 30000 | 0~65000 | 30000 | UC |
| POS2 | 38 | TRJ Tar Freq-07 | 6000 | 1.00~Max Frequency ⁴³ | 6000 | Hz |
| | 39 | TRJ Tar Spd-07 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 40 | TRJ Acc Time-07 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 41 | TRJ Dec Time-07 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 43 | TRJ Tar Pos-08 | 30000 | 0~65000 | 30000 | UC |
| | 44 | TRJ Tar Freq-08 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 45 | TRJ Tar Spd-08 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 46 | TRJ Acc Time-08 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 47 | TRJ Dec Time-08 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |

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Advanced Functions

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------|-----------|-------------------------------------|------------------|------|
| | 49 | TRJ Tar Pos-09 | 30000 | 0~65000 | 30000 | UC |
| | 50 | TRJ Tar Freq-09 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 51 | TRJ Tar Spd-09 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 52 | TRJ Acc Time-09 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 53 | TRJ Dec Time-09 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 55 | TRJ Tar Pos-10 | 30000 | 0~65000 | 30000 | UC |
| POS2 | 56 | TRJ Tar Freq-10 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 57 | TRJ Tar Spd-10 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 58 | TRJ Acc Time-10 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 59 | TRJ Dec Time-10 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 61 | TRJ Tar Pos-11 | 30000 | 0~65000 | 30000 | UC |
| | 62 | TRJ Tar Freq-11 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 63 | TRJ Tar Spd-11 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 64 | TRJ Acc Time-11 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 65 | TRJ Dec Time-11 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 67 | TRJ Tar Pos-12 | 30000 | 0~65000 | 30000 | UC |
| | 68 | TRJ Tar Freq-12 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 69 | TRJ Tar Spd-12 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------|-----------|-------------------------------------|------------------|-----------|
| POS2 | 70 | TRJ Acc Time-12 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 71 | TRJ Dec Time-12 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 72 | TRJ Tar Pos-13 | 30000 | 0~65000 | 30000 | UC |
| | 73 | TRJ Tar Freq-13 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 74 | TRJ Tar Spd-13 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 75 | TRJ Acc Time-13 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 76 | TRJ Dec Time-13 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 78 | TRJ Tar Pos-14 | 30000 | 0~65000 | 30000 | UC |
| | 79 | TRJ Tar Freq-14 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 80 | TRJ Tar Spd-14 | 0 | 0~Maximum Speed ⁴⁴ | 0 | rpm |
| | 81 | TRJ Acc Time-14 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 82 | TRJ Dec Time-14 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 84 | TRJ Tar Pos-15 | 30000 | 0~65000 | 30000 | UC |
| | 85 | TRJ Tar Freq-15 | 60.00 | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 86 | TRJ Tar Spd-15 | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 87 | TRJ Acc Time-15 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 88 | TRJ Dec Time-15 | 10.00 | 0.00~ 6000.00 | 10.00 | sec |
| | 90 | TRJ Tar Pos-16 | 30000 | 0~65000 | 30000 | Hz rpm |

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| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|---|---------------------------------------|-------|---------------------|-------------------------------------|------------------------------------|------|
| POS2 | 91 | TRJ Tar Freq-16 | 60.00 | | 1.00~Max Frequency ⁴³ | 60.00 | Hz |
| | 92 | TRJ Tar Spd-16 | | 1800 | 0~Maximum Speed ⁴⁴ | 1800 | rpm |
| | 93 | TRJ Acc Time-16 | 10.00 | | 0.00~ 6000.00 | 10.00 | sec |
| | 94 | TRJ Dec Time-16 | 10.00 | | 0.00~ 6000.00 | 10.00 | sec |
| | | | 56 | POS Home | | 1, 2, 4, 5, 10, 11, 12, 9 | |
| | 01, 03, 05, 07, 09, 11, 13, 15 | , , DIx Define , (DIx: DI1~DI8) | 57 | POS Run Home | | | |
| | | | 58 | POS HW Lmt L | | | |
| | | | 59 | POS HW Lmt H | | | |
| | | | 60 | POS Pattern-L | | | |
| DIN | | | 61 | POS Pattern-M | | | - |
| | | | 62 | POS Pattern-H | | | |
| | | | 63 | POS Pattern-X | - | | |
| | | | 64 | POS Run | | | |
| | | | 65 | POS Run Pre-Posi | | | |
| | | | | 66 | POS Run Relative | | |

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* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.
7.26.2.1 Overall Block Diagram

Independent position control operation mode consists of five functional blocks: Speed pattern occurrence, position control, speed command selection, current position processing, and homing.



[Image 37. Block Diagram of Overall Position Control Operation]

The speed pattern occurrence block makes a speed profile in a trapezoid shape using information such as the current position, target position, acceleration and deceleration times, and maximum frequency.

The position control block makes proper frequency commands by PI controlling position reference pulse and position feedback pulse.

Speed command selection block is responsible for exception handling (homing, trip processing) during position control operation.

The current position processing block properly processes or monitors pulse from feedback.

Selecting Operation Command Source

If you set App-44 (Pos Ctrl Enable) to 1 (Yes), operation command source is determined by POS1-10 (Cmd Source) regardless of the settings at DRV-10 (1st Command Source) and DRV-11 (1st Freq Ref Src).

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The position control operation for each source of POS1-10 (Cmd Source) is as follows:

| Code and Functions | | ltem | | Functionality | Remark |
|-----------------------|---|-----------------|--|--|---|
| POS1- | 0 | DI Dependent | Set th of the as 63 contro | e Define code for DI1-DI8 terminal input group (DIN) (POS Run) for position ol operation. | |
| | 1 | Keynad | Set the following values for POS1-11 (Cmd Keypad Set) and the relative position control operation will start. | | |
| | | litojpud | 1 | POS Run | |
| | | | 2 | POS Run Pre-Posi | |
| 10 Cmd | | | 3 | POS Run Relative | |
| Source | 2 | Internal Comm. | Allows via bu | s position control operation ilt-in 485 communication. | |
| | 3 | USB Comm. | Allows via US board | s position control operation SB port on the control | Allows position control via common area |
| | 4 | Option Comm. 45 | Allows via co | s position control operation mmunication option card. | parameter communication |
| | 5 | UserSequence | Allows operation | s for position control tion via the user sequence on in the inverter. | i address, 0606h. |

⁴⁵ Configurable only when equipped with communication options

7.26.2.2 Position Path Selection and Speed Pattern Occurrence Block

Select a target path and create a required path profile (trapezoid speed pattern of "acceleration \rightarrow constant speed \rightarrow deceleration") to reach the target position from the current position using the target position, acceleration time, deceleration time, and maximum speed according to the target path.



[Image 38. Position Path Selection and Speed Pattern Occurrence Block]

Current position (POS1-04 Cur Position), target position (POS2 TRJ Tar Pos-1116), path acceleration time (POS2 TRJ Acc Time-1-16), path deceleration time (POS2 TRJ Dec Time-1-16), and path normal speed (POS2 TRJ Freq/Spd-1-16) are required for speed profile algorithm.

In POS2 group, there are 16 position control paths in total, each path consisting of four parameters (target position, acceleration time, deceleration time, and frequency/ speed).

You can set each code of four multifunction input terminals (DIN DI1-DI8 Define) to 60-63 (POS Pattern-L, POS Pattern-M, POS Pattern-H, and POS Pattern-X) and select one of the 16 position paths in POS2 group for position control operation.

The position path information can only be changed when stopped. The terminal block input for path change during position operation will not change the path for operation. Position path is changed according to the information at the terminal block when position operation ends.

| POS2 TRJ Index | POS Pattern-X | POS Pattern-H | POS Pattern-M | POS Pattern-L | Remark |
|-------------------|------------------|------------------|------------------|------------------|---------------------------------|
| 1 | | | | | Select the TRJ-01 value at POS2 |
| 2 | | | | On | Select the TRJ-02 value at POS2 |
| 3 | | | On | | Select the TRJ-03 value at POS2 |
| 4 | | | On | On | Select the TRJ-04 value at POS2 |
| 5 | | On | | | Select the TRJ-05 value at POS2 |
| 6 | | On | | On | Select the TRJ-06 value at POS2 |
| 7 | | On | On | | Select the TRJ-07 value at POS2 |
| 8 | | On | On | On | Select the TRJ-08 value at POS2 |
| 9 | On | | | | Select the TRJ-09 value at POS2 |
| 10 | On | | | On | Select the TRJ-10 value at POS2 |
| 11 | On | | On | | Select the TRJ-11 value at POS2 |
| 12 | On | | On | On | Select the TRJ-12 value at POS2 |
| 13 | On | On | | | Select the TRJ-13 value at POS2 |
| 14 | On | On | | On | Select the TRJ-14 value at POS2 |
| 15 | On | On | On | | Select the TRJ-15 value at POS2 |
| 16 | On | On | On | On | Select the TRJ-16 value at POS2 |

Table 7. An Example of Position Control Operation Path Profile Settings

An Example of Position Control Path Reference

• TRJ Tar Pos-xx: 14400UC

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- TRJ Freq-xx: 30.00 Hz (based on TRJ Spd-x: 900 rpm, 4 Poles)
- TRJ Acc Time-xx: 20sec
- TRJ Dec Time-xx: 30sec
- ENC-12 Resolution/Pulse: 1024
- Multiplication: 4 multiplication (ENC-11 Enc Out Phase value as (A + B) or (A + B))



[Image 39. An Example of Operation Based on Position Control Path Settings]

Related Parameters-Setting Details

| Code and Functions | Description |
|--|---|
| POS1-03 Tar Position | Read-only with the unit of UC. It shows target position information (POS2 TRJ Tar Pos-xx) currently selected in POS2 group via four multifunction inputs; POS Pattern-L, POS Pattern-M, POS Pattern-H, and POS Pattern-X. |
| POS1-04 Cur Position | Read-only with the unit of UC. It shows the current position. |
| POS1-60 UC Numerater (Unit Change Numerator: unit change numerator), | Sets the ratio for unit change to change the position unit from a pulse to the user unit. Unit of parameters whose unit changes from Unit Change are expressed in UC. The formula is as follows: $[UC] = \frac{UC Numerater}{UC N Merater} \times [Pulse]$ |
| POS1-61 UC Denominator (Unit Change Denominator: unit change denominator) | UC DeNominator Input range of POS1-60 and POS1-61 is 1-65535 respectively. Therefore, when the denominator is too big compared to the numerator, fix the numerator as 1 and reduce the denominator appropriately to make it less than 32768 before inputting. |

() Caution

- Make sure the value of 65535 * UC Denominator / UC Numerator does not exceed 2,147,483,647. That is, the position control does not work properly when the value of UC Denominator / UC Numerator is smaller than 1 / 32768.
- Note that when the value of UC Denominator / UC Numerator is bigger than 1, UC unit value is bigger than 1 pulse and position control does not work properly.

7.26.2.3 Position Controller Block

The position profile is created by integrating speed profile from the speed profile block. The position profile becomes the position reference pulse in the position controller. The position reference pulse and position feedback pulse from S300 encoder option are p-controlled (proportional control) to make a reference speed command.



[Image 40. Position Control Block]

Related Parameters-Setting Details

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| Code and Functions | Description |
|------------------------------|--|
| POS1-6 Error Value | Displays the difference (pulses) between the position reference pulse and position feedback pulse real-time during position control operation. It is always 0 in other operation modes. |
| POS1-20 Porportional Gain | Enter P gain (%). For example, where the P gain is 10% with 2 πrad of position error based on mechanical angle of the motor, 10% of normal speed of position control (POS-2 TRJ Tar Freq-xx or Tar Spd-xx) will be generated as the output of position controller. For example, where POS2 TRJ Freq-xx is 60.00 Hz, 6.00 Hz is the output of the position controller. |
| POS1-21 Feed Forward Gain | Sets the feed forward (FF) gain (%). It enhances responsiveness and stability of the position controller by feedforward-compensating speed profile (presumable information). |

7.26.2.4 Speed Command Selection Block

It selects speed via operation by homing or trips from position control operation during position control operations.



[Image 41. Speed Command Selection Block]

7.26.3 Trip Processing Block

It processes trips regarding position control operation during position control operation. You can monitor upper and lower limit hardware switch (Pos HW Limit High/Low) or upper and lower limit software switch (Pos SW Limit Low/High) inputs.

When it is in the relative status, it will operate according to the set mode at POS1-40 Error Stop Mode (0: CoastStop(FreeRun)/1: Trip Dec Stop).





| Code and Functions | | D | escription |
|-------------------------------|--|---|---|
| POS1-07 Reference Value | Curre | nt command positic | on value. |
| POS1-08 Feedback Value | Curre | nt position value. | |
| | Select opera | ts operation mode v tion. | when there is a trip from control |
| | | ltem | Functionality |
| POS1-40 Error Stop Mode | 0 | CoastStop (FreeRun) | Immediately blocks inverter output. When an external brake control is in use, the brake will be closed at the same time the inverter output is blocked. |
| | 1 | Trip Dec Stop | The motor will decelerate to the time set at PRT-1 Trip Dec Time and then stop. |
| POS1-31 SW Limit Hi Enable | Sets u 0 (No) | use of upper limit so), the upper limit so | oftware switch. When the value is ftware switch will not work. |
| POS1-32 SW Limit Lo Enable | Sets u 0 (No) | use of lower limit so), the lower limit sof | ftware switch. When the value is tware switch does not work. |
| POS1-33 Pos SW Limit High | The u is 1 (Y | pper limit level (UC ′es). |) is configurable when POS1-30 |
| POS1-34 Pos SW Limit Low | The lo is 1 (Y | ower limit level (UC) ⁄es). |) is configurable when POS1-30 |
| POS1-36 Max Track Pulse | When the po the inv POS1 | the difference betw osition control block verter operation, it v -40 (0: CoastStop(l | veen POS1-7 and POS1-8 in is bigger than POS1-36 during will operate in the mode set at FreeRun)/1: Trip Dec Stop). |
| POS1-37 Tar Bound Pulse | Tar Bo POS1 the po | ound Error occurs w -03 (Tar Position) a osition control block | vhen the difference between ind POS1-04 (Cur Position) in is bigger than POS1-37. |
| PRT-01 Trip Dec Time | The in then s will clo Freq c | iverter will decelera itop. If an external k ose at brake engag or ADV-50 Br Engag | te to the set amount of time and brake control is in use, the brake e frequency (ADV-49 Br Engage ge Speed). |

List of Related Parameters

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7.26.3.1 Current Position Calculation Block

Performs functions such as monitoring and position change for pulses from encoder feedback.



[Image 43. Current Position Calculation Block]

7.26.3.2 Homing Operation

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Moves according to certain speed and certain acceleration and deceleration times by multifunction input signals and determines the position reference using various methods when it reaches position reference.





Advanced Functions Speed Cur Position Encoder Z-Pulse Dlx (Pos Run Home) Dlx (Pos Home) 1 2 3

Homing operation according to POS1-50 Homing Type is as follows:





[Image 46. An Example of Homing Operation (Fwd [Rev] + No Index)]

| Code and Functions | ltem | | Section | Functionality | |
|---------------------------|------|---------------------|---------------|--|---|
| | 0 | Rev +Index | 1 | | When the multifunction terminal that is set as 57 (POS Run Home) is turned on, it will operate according to the settings at POS1-51 (Homing Dir), POS1-52, 53 (Homing Freq, Homing Speed), and POS1-54 (Homing Ramptime). |
| POS1-50 Homing Type | | | Rev +Index | 2 | The rotational direction will change as soon as the multifunction terminal with 56 (POS Home) setting turns on and the operation is conducted at 20% speed of setting values at POS1-52 and 53 (Homing Freq and Homing Speed). |
| | | | 3 | When the input at multifunction terminal with 56 (POS Home) setting is out, that is, when the multifunction terminal is turned off, the current position (POS1-04 Cur Position) will be initialized to user-set position (POS1-05 Pre Position) at the first-met Index Pulse (encoder Z pulse) and the motor will be stopped. | |
| | 1 | Rev +No Index | 1 | When the multifunction terminal that is set as 57 (POS Run Home) is turned on, it will operate according to the settings at POS1-51 (Homing Dir), POS1-52, 53 (Homing Freq, Homing Speed), and POS1-54 (Homing Ramptime). | |
| | | | 2 | The rotational direction will change as soon as the multifunction terminal with 56 (POS Home) setting turns on and the operation is conducted at 20% speed of setting values at POS1-52 and 53 (Homing Freq and Homing Speed). | |
| | | | | 3 | When the input at the multifunction terminal with the 56 (POS Home) setting is out, that is, when the multifunction terminal is turned off, the current position (POS1-04 Cur Position) will be initialized to the user-set position (POS1-05 Pre Position) and the motor will be stopped. |

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| Code and Functions | Item | | Section | Functionality |
|---------------------------|------|---------------------|---------|--|
| | | Fwd +Index | 1 | When the multifunction terminal that is set as 57 (POS Run Home) is turned on, it will operate according to the settings at POS1-51 (Homing Dir), POS1-52, 53 (Homing Freq, Homing Speed), and POS1-54 (Homing Ramptime). |
| POS1-50 Homing Type | 2 | | 2 | As soon as the multifunction terminal with the 56 (POS Home) setting turns on, the operation will be conducted at 20% speed of the setting values at POS1-52 and 53 (Homing Freq and Homing Speed). |
| | | | 3 | When the input at multifunction terminal with 56 (POS Home) setting is out, that is, when the multifunction terminal is turned off, the current position (POS1-04 Cur Position) will be initialized to the user-set position (POS1-05 Pre Position) at the first-met Index Pulse (encoder Z pulse) and the motor will be stopped. |
| | 3 | Fwd +No Index | 1 | When the multifunction terminal that is set as 57 (POS Run Home) is turned on, it will operate according to the settings at POS1-51 (Homing Dir), POS1-52, 53 (Homing Freq, Homing Speed), and POS1-54 (Homing Ramptime). |
| | | | 2 | As soon as the multifunction terminal with the 56 (POS Home) setting turns on, the operation will be conducted at 20% speed of the setting values at POS1-52 and 53 (Homing Freq and Homing Speed). |
| | | | 3 | When the input at the multifunction terminal with the 56 (POS Home) setting is out, that is, when the multifunction terminal is turned off, the current position (POS1-04 Cur Position) will be initialized to the user-set position (POS1-05 Pre Position) and the motor will be stopped. |

7.26.4 Proportional Synchronous Position Control

It is an operation mode where multiple inverters reach their respective target positions within the same time frame. All inverters must be connected to the master inverter that uses the user sequence or superordinate controller via communication, as information exchange (current position, and etc.) among the inverters at a stop is compulsory.

This function is useful for applications (e.g.: stage settings) that require multiple inverters to reach their respective target positions within the same time frame.

7.26.4.1 Implementation of Proportional Synchronous Position Control System

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In proportional synchronous position control operation mode, multiple inverters reach respective target position (mm) at the same time. The following image shows implementation of proportional synchronous control system using superordinate controller and inverters.



[Image 47. Proportional Synchronous Position Control System]

The following is the implementation of proportional synchronous position control operation per each step from the above image.

Step 1 Setting proportional synchronous position control operation mode

Select 1 (Multi Sync Pos) at POS1-02 (Pos Ctrl Mode) for all inverters (1-n) to set proportional synchronous position control operation mode.

Step 2 Setting the target position and synchronization time for each inverter

Set the target position (UC, POS1-03 Tar Position) and target synchronization time (POS1-12 Multi Sync Time or communication address 0605h proportional synchronization target operation time) for each inverter. Refer to <u>10 Using Built-in Communication Features</u> for details on setting synchronization time with communication address.

Pos Multi Sync F trip occurs when the set target synchronization time is smaller than the travel time (POS1-09 Total Move Time) of the relevant inverter.

Step 3 Starting synchronous operation

Provide operation commands to each inverter through multifunction terminal which is set to 64 (POS Run) according to operation command source (POS1-10 Cmd Source) or RS485 communication (communication address 0606h position control operation command). Each inverter moves to their target positions from their current positions according to the target synchronization time.

Step 4 Ending synchronous operation

Provide stop commands to each inverter through the multifunction terminal set to 64 (POS Run) according to the operation command source (POS1-10 Cmd Source) or RS485 communication (communication address 0606h position control operation command) when each inverter reaches their target positions.

7.26.5 Cause of Abnormalities and Inspection

When there is a trip related to position control, refer to the following depending on the type of trips for inspection:

| Table 8. | Position | Control-Related | Trips |
|----------|----------|------------------------|--------------|
|----------|----------|------------------------|--------------|

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| Trip | Cause of Abnormality | Inspections |
|-------------------|---|---|
| POS SW Limit High | Occurs when the setting value of POS1-04 (Cur Position) is higher than one of POS1-33 (Pos SW Limit High). | Check if the setting values of POS1-03 (Tar Position) and POS1-05 (Pre Position) are in between the setting values |
| POS SW Limit Low | Occurs when the setting value of POS1-04 (Cur Position) is lower than POS1-34 (Pos SW Limit Low). | of POS1-33 (Pos SW Limit High) and POS1-34 (Pos SW LimitLow). |
| POS HW Limit High | Occurs when there is an input signal at the multifunction terminal to which 59 (POS HW Lmt H) is set for the Define code of DI1-DI8 of the terminal input group (DIN). | Check wiring for the |
| POS HW Limit Low | Occurs when there is an input signal at the multifunction terminal where 58 (POS HW Lmt L) is set for the Define code of DI1-DI8 of the terminal input group (DIN). | of the set inverter. |
| Pos Max Track Err | Occurs when the difference between the reference pulse and position feedback pulse is bigger than the setting value of POS1-36 (Max Track Pulse). | Check the load status, |
| Pos Tar Bound Err | Occurs when the difference between the target position and actual position is bigger than the setting values of POS1-37 (Tar Bound Pulse) after performing position control. | connected to the motor may cause a trip. |

7.27 Using User Sequence

User sequence is used to implement a simple sequence by utilizing the combination of various function blocks via DriveView9, the PC software for inverter connection from our company. Refer to DriveView9 manual for more details.

7.27.1 Operation Preparations

To use a user sequence, implement the user sequence with DriveView9 and download related parameters to S300, and then operate with the user sequence.

| Group | Code | LCD Display | , | Set Value | Setting Range | Initial Value | Unit |
|-------|------|----------------------|----|----------------------|------------------|--|------|
| APP | 03 | UserSeq Enable | 1 | Yes | - | 0 | - |
| | 01 | UserSeq Control | 1 | On | 0~1 | 0 | - |
| | 02 | UserSeq Loop Time | 10 | | 10~1000 | 10 | msec |
| | 03 | All Blk Exec Time | | - | - | - | usec |
| | 04 | Status | 0 | Standby | 0~6 | 0 | - |
| | 05 | Last Error | - | | - | - | - |
| | 06 | BlockID of LastErr | | - | - | - | - |
| | 07 | LastError Docot | 0 | No | 0~1 | 0 | |
| US | 07 | | 1 | Yes | 0~1 | 0 | - |
| | 08 | Check Validation | 0 | No | 0~1 | ng Initial Un 0 - 1 0 - 1 0 - 000 10 mso $ use$ 6 0 - $ 1$ 0 - 1 0 - 1 0 - 1 0 - 1 0 - 1 0 - 1 0 - 1 0 - | |
| | 00 | | 1 | Yes | 0,01 | 0 | - |
| | 09 | UserSeq Para Form | 0 | Signed 0 dec. pl. | 0~11 | 0 | - |
| | 10 | Dup Forward | 0 | Off | 0-1 | 0 | |
| | 10 | Run Forward | 1 | On | 0~1 | 0 | - |
| | 11 | | 0 | Off | 0~1 | | |
| | | Rull Reveise | 1 | On | 0~1 | 0 | - |

| Group | Code | LCD Display | ÷ | Set Value | Setting Range | Initial Value | Unit |
|---------------------------------------|----------------|----------------------|-------|--------------|-------------------------------------|------------------|------|
| 15Con Free16Comma17Comma18Acc19Dec | 15 | Command Frequency | | 0.00 | 0.00~Max Frequency ⁴⁶ | 0.00 | Hz |
| | 16 | Command Speed | | 0 | 0~Maximum Speed ⁴⁷ | 0 | rpm |
| | Command Torque | | 0.0 | -180.0~180.0 | 0.0 | % | |
| | 18 | Acc Time | 20.00 | | 0.00~ 6000.00 | 20.00 | sec |
| | 19 | Dec Time | | 30.00 | 0.00~ 6000.00 | 30.00 | sec |
| | 20 | Output Current | | - | - | - | Α |
| | 21 | Output Frequency | - | | - | - | Hz |
| | 22 | Output RPM | - | | - | - | rpm |
| US | 23 | Output Voltage | | - | - | - | V |
| | 24 | DC Link Voltage | | - | - | - | V |
| | 25 | Output Power | | - | - | - | kW |
| | 26 | Output Torque | | - | - | - | % |
| | 40 | Speed Searching | 0 | Off | 0~1 | - | - |
| | | | 1 | On | | | |
| | 41 | Acceleration | 0 | Off | 0~1 | - | - |
| | | | 1 | On | | | |
| | 42 | ConstRate | 0 | Off | 0~1 | - | - |
| | | Operating | 1 | On | | | |
| | 43 | Deceleration | 0 | Off | 0~1 | - | - |
| | | | 1 | On | | | |
| | 44 | Dec to stop | 0 | Off | 0~1 | - | - |
| | | I | 1 | On | | | |

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⁴⁶ DRV-20(Max Frequency)
 ⁴⁷ DRV-21(Maximum Speed)

| Group | Code | LCD Display | , | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-------------------|---|-----------|------------------|------------------|------|
| | 45 | | 0 | Off | 0-1 | | |
| | 40 | H/W 003 | 1 | On | 0~1 | - | - |
| | 46 | | 0 | Off | 0.1 | | |
| | 40 | 5/11 005 | 1 | On | 0~1 | - | - |
| | 47 | Dwall Operating | 0 | Off | 0.1 | | |
| | 47 | Dwell Operating | 1 | On | 0~1 | - | - |
| | 40 | Otomand | 0 | Off | 0.1 | | |
| | 40 | Stopped | 1 | On | 0~1 | - | - |
| | 40 | Forward Direction | 0 | Off | 0.1 | | |
| 05 | 49 | Forward Direction | 1 | On | 0~1 | - | - |
| | 50 | Doverse Direction | 0 | Off | 0.1 | | |
| | 50 | Reverse Direction | 1 | On | 0~1 | - | - |
| | E 1 | DC Operating | 0 | Off | 0.1 | | |
| | 51 | | 1 | On | 0~1 | - | - |
| | 50 | Warpod | 0 | Off | 0~1 | | - |
| | 52 | vvarned | 1 | On | 0~1 | - | |
| | 52 | Tripped | 0 | Off | 0-1 | | |
| | - 55 | inpped | 1 | On | 0~1 | - | - |

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* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Auto Restart for General Acceleration Setting Details

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| Code and Functions | Description | | | | | |
|------------------------------|---|--|--------------------------------------|--|--|--|
| APP-03 UserSeq Enable | Set th user s in the | Set this parameter to 1 (Yes) and five parameter groups related to user sequence (US, USL, USV, USP, and USM) will be displayed in the Smart Operator. | | | | |
| US-01 UserSeq Control | Set th saved | is parameter to 1 (Yes in S300. |) to operate with the user sequence | | | |
| US-02 UserSeq Loop Time | Sets e | execution cycle for the | user sequence. | | | |
| US-03 All Blk Exec Time | Displa seque | Displays the total execution time of all functions used for the user sequence. | | | | |
| | Displa S300. | iys the status of user s | sequence currently being executed in | | | |
| | | Item | Functionality | | | |
| | 0 | Standby | On standby | | | |
| LIS 04 Status | 1 | Starting | Start | | | |
| 03-04 Status | _ 2 | Init | Initialization | | | |
| | 3 | Running | In operation | | | |
| | 4 | Waiting | Paused | | | |
| | 5 | Stopping | Operation stopped. | | | |
| | 6 | Error | Error | | | |
| US-05 Last Error | Error | values recently occurre | ed while executing a user sequence. | | | |
| US-06 BlockID of Last Err | Function block ID where the error occurred. | | | | | |
| US-07 LastError Reset | Initiali | Initializes errors. | | | | |
| US-08 Check Validation | Check | Checks validity of the user sequence saved in S300. | | | | |

| Code and Functions | Description | | | | | |
|-----------------------|---|---------------------|--|--|--|--|
| | Sets the display mode for parameters used in the user sequence. | | | | | |
| | | Item | Functionality | | | |
| | 0 | Signed 0 dec. pl. | Signed integer, decimal number | | | |
| | 1 | Signed 1 dec. pl. | Signed real number to one decimal place, decimal number | | | |
| US-09 UserSeq | 2 | Signed 2 dec. pl. | Signed real number to two decimal places, decimal number | | | |
| | 3 | Signed 3 dec. pl. | Signed real number to three decima places, decimal number | | | |
| | 4 | Signed 4 dec. pl. | Signed real number to four decimal places, decimal number | | | |
| Para Form | 5 | Unsigned 0 dec. pl. | Unsigned integer, decimal number | | | |
| | 6 | Unsigned 1 dec. pl. | Unsigned real number to one decimal place, decimal number | | | |
| | 7 | Unsigned 2 dec. pl. | Unsigned real number to two decima places, decimal number | | | |
| | 8 | Unsigned 3 dec. pl. | Unsigned real number to three decimal places, decimal number | | | |
| | 9 | Unsigned 4 dec. pl. | Unsigned real number to four decimal places, decimal number | | | |
| | 10 | 16bit Hex | 16-bit hexadecimal | | | |
| | 11 | 32bit Hex | 32-bit hexadecimal | | | |

7.27.2 Logic Function

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It is a function block used for user sequence and logic operations.

| Description | | | | | |
|--|---|--|--|--|--|
| Selects an operator for a logic operation. | | | | | |
| | Operator | | | | |
| 0 | NOT(A) | | | | |
| 1 | AND(A,B,C) | | | | |
| 2 | NAND(A,B,C) | | | | |
| 3 | OR(A,B,C) | | | | |
| 4 | NOR(A,B,C) | | | | |
| 5 | XOR(A,B) | | | | |
| 6 | (A AND B) OR C | | | | |
| | AND(A,B,!C) | | | | |
| 8 | OR(A,B,!C) | | | | |
| 9 | R-EDGE-DETECT(A) | | | | |
| 10 | F-EDGE-DETECT(A) | | | | |
| Desci [0 : N | ription by main logic OT(A)] Input A Unput B | | | | |
| | [Image 48. Logic function (0 : NOT(A)) 1 | | | | |
| | Select 0 1 2 3 4 5 6 7 8 9 10 Descl [0 : N | | | | |





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Advanced Functions



| Code and Functions | Description |
|---|------------------------------------|
| USL-06, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76 Valuexx InputA (Valuexx: Value01~Value15) | Input A value of each logic block. |
| USL-07, 12, 17, 22, 27, 32, 37, 42, 47, 52, 57, 62, 67, 72, 77 Valuexx InputB (Valuexx: Value01~Value15) | Input B value of each logic block. |
| USL- 8, 13, 18, 23, 28, 33, 38, 43, 48, 53, 58, 63, 68, 73, 78 Valuexx InputC (Valuexx: Value01~Value15) | Input C value of each logic block. |
| USL- 9, 14, 19, 24, 29, 34, 39, 44, 49, 54, 59, 64, 69, 74, 79 Valuexx Output (Valuexx: Value01~Value15) | Output value of each logic block. |

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Advanced Functions

7.27.3 Arithmetic Function (Value Function)

It is a function block used for user sequence and arithmetic operations.

| Code and Functions | Description | | | | | | |
|--|--|--|---|--|--|--|--|
| | Selects an operator for an arithmetic operation. | | | | | | |
| | Operator | | Description | | | | |
| | 0 | A+B+C | Outputs A + B + C. | | | | |
| | 1 | A-B-C | Outputs A - B - C. | | | | |
| | 2 | A+B-C | Outputs A + B - C. | | | | |
| | 3 | ABS(A+B+C) | Outputs absolute value of A + B + C. | | | | |
| | 4 | A mod B | Outputs the remainder of A divided by B. | | | | |
| | 5 | (A*B)/C | Outputs (A * B) / C. Outputs 0 if C equals 0. | | | | |
| USV-05, 10, 15, 20. | 6 | MIN(A,B,C) | Outputs the smallest value among A, B, and C. | | | | |
| | 7 | MAX(A,B,C) Outputs the biggest value amon and C. | | | | | |
| 25, 30, 35, 40, 45, | 8 | SWITCH(A) B/C | Outputs B if A equals 0, and C if not 0. | | | | |
| 50, 55, 60, 65, 70, 75 Logicxx Type | 9 | BitTest(A,B) | Outputs 1 if the bit at position B of A is 1, and 0 if it is 0. | | | | |
| (Logicxx: Logic02~Logic15) | 10 | BitSet(A,B) | Sets the bit at position B of A to 1 and outputs. B is a value in between 0-16, and is recognized as 16 if it is over 16. Output is always 0 if B equals 0. | | | | |
| | 11 | BitClear(A,B) | Sets the bit at position B of A to 0 and outputs. B is a value in between 0-16, and is recognized as 16 if it is over 16. Output is always A if B equals 0. | | | | |
| | 12 | Up Counter | It counts up/down based on C according | | | | |
| | 13 | Down Counter | to the change in A value. Output ranges between 0-32767. | | | | |
| | 14 | BINARY DECODE | Decodes according to C, B, and A values and outputs. | | | | |

| Code and Functions | | Description | |
|--|---------------|-----------------------|---|
| | | Operator | Description |
| | 15 | A>B+/-C | Implements hysteresis band C to B value. |
| | 16 | A>=B | Outputs 1 if A >= B, and 0 if not. |
| | 17 | A<=B | Outputs 1 if A <= B, and 0 if not. |
| | 18 | A(1+B) | Outputs A * (1 + B / 100). |
| | 19 | (A*B)/100)+C | Outputs (A * B) / 100) + C. |
| | 20 | ABS(A)> ABS(B)+/-C | Implements hysteresis band C to absolute value (B). |
| | 21 | ABS(A)>= ABS(B) | Outputs 1 if absolute value (A))>= absolute value (B), and 0 if not. |
| | 22 | IF(C)-A | Outputs A if C equals 0, and -A if not. |
| | 23 | IF(A==B) | Outputs 1 if A equals B, and 0 if not. |
| USV-05, 10, 15, 20, | 24 | IF(A!=B) | Outputs 1 if A is not B, and 0 if it is. |
| 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, | 25 | IF(C) HOLD(A) | Outputs previous A value if C equals 1, and current A value if C equals 0. |
| (Logicxx Type (Logicxx: | 26 | ON DELAY | Delays On operation for as long as B time for A input, and outputs. |
| 209.002 209.010) | 27 | OFF DELAY | Delays Off operation for as long as B time for A input, and outputs. |
| | 28 | Timer | 100 msec timer. |
| | 29 | Window | Detects if A input is within a fixed band. The polarity of output is determined by C. |
| | 30 | Window C <=A<=B | Detects if C input is within a fixed band. The polarity of output is determined by the size of A and B. |
| | 31 | Lowpass Filter | Low-pass filter. |
| | 32 | LimitA UprB LwrC | Limits A value with the upper limit (C) and lower limit (B). |
| | 33 ExtratBits | | Outputs A value as bits as many as C at the bit position of B. The bit starts from no. 0. |

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| Code and Functions | Description | | | | | | | |
|-----------------------|--|---|--------------------|-------|--------------------|--------|--|--|
| | Additional descriptions on main functions | | | | | | | |
| | [12/1: | B : Up/Down | Counter] | | | | | |
| | Count | works under | the following co | ondit | ions: | | | |
| | C Condition A for Count Operation | | | | | | | |
| | 0 0→1 | | | | | | | |
| | 1 | | | 1→0 |) | | | |
| | 2 | | Ch | nang | e A | | | |
| | | | | | | | | |
| | [14 : | [14 : BINARY DECODE] | | | | | | |
| | Decod condit | Decoded output according to C, B, and A values follow below conditions: | | | | | | |
| USV-05, 10, 15, 20, | С | | В | | Α | Output | | |
| 25, 30, 35, 40, 45, | 0 | | 0 | | 0 | 0 | | |
| 75 Logicxx Type | | 0 | 0 | | Value other than 0 | 1 | | |
| (Logicxx: | | 0 | Value other that | an 0 | 0 | 2 | | |
| Logic02~Logic15) | | 0 | Value other that | an 0 | Value other than 0 | 3 | | |
| | Value other than 0 | | 0 | | 0 | 4 | | |
| | Value other than 0 | | 0 | | Value other than 0 | 5 | | |
| | Value | other than 0 | Value other than 0 | | 0 | 6 | | |
| | Value | other than 0 | Value other than 0 | | Value other than 0 | 7 | | |
| | | | | | | | | |
| | Output works under the following conditions: | | | | | | | |
| | | Condition | | | Output | | | |
| | | A > (B+ | C) | 1 | | | | |
| | | A < (B- | C) | 0 | | | | |
| | (B-C) < A < (B+C) No change | | | | | | | |



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Advanced Functions



| Code and Functions | Description |
|---|--|
| USV-05, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75 Logicxx Type (Logicxx: Logic02~Logic15) | [30 : WINDOW C<= A<=B] Input B Input C Input C Input A Output [Image 63. Logic function (30 : WINDOW C <= A <= B)] |
| USV-06, 11, 16, 21, 26, 31, 36, 41, 46, 51, 56, 61, 66, 71, 76 Valuexx InputA (Valuexx: Value01~Value15) | Input A value of each logic block. |
| USV-07, 12, 17, 22, 27, 32, 37, 42, 47, 52, 57, 62, 67, 72, 77 Valuexx InputB (Valuexx: Value01~Value15) | Input B value of each logic block. |
| USV-08, 13, 18, 23, 28, 33, 38, 43, 48, 53, 58, 63, 68, 73, 78 Valuexx InputC (Valuexx: Value01~Value15) | Input C value of each logic block. |
| USV-09, 14, 19, 24, 29, 34, 39, 44, 49, 54, 59, 64, 69, 74, 79 Valuexx Output (Valuexx: Value01~Value15) | Output value of each logic block. |

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7.27.4 Parameter Function (ParaSet Function)

This function sets parameters registered in the block by getting inputs of rising edge or falling edge values from the user sequence.

| Code and Functions | Description | | | | | |
|---|---|---|----------------------------------|--|--|--|
| USP-01, 04, 07, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58 Parasetxx In | Sets event parameter values of your choice. | | | | | |
| USP-02, 05, 08, 11, 14, 17, 20, 23, 26 | Sets ever | Sets event type for parameter operations. | | | | |
| 29, 32, 35, 38, 41, | | ltem | Functionality | | | |
| 44, 47, 50, 53, 56, 59 | 0 | 0-1 EDGE | Sets event type as rising edge. | | | |
| Paraset01~20 Type | 1 | 1-0 EDGE | Sets event type as falling edge. | | | |
| USP-03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60 Paraset 01~20 Result | Displays set parameter values. | | | | | |
| USP 61~90 Var 01~Var 30 | Parameters for user only. | | | | | |

7.27.5 Special Function

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It is a special function used in the user sequence.

| Code and Functions | Description |
|---|---|
| USM-01~16 Mux1 Inputxx (Inputxx: Input01~Input16), USM-17 Mux1 Output | Input data and output value for MUX1. |
| USM-18 Demux1 Input USM-19~34, Demux1 Outputxx (Outputxx: Output01~Output16) | Input data and output value for DEMUX1. |
| USM-35 PI Run Enable, USM-36 Reference Value, USM-38 Proportional Gain, USM-39 Integral Time, USM-46 Output limit Low, USM-47 Output Limit High, USM-49 Output Scale, USM-50 I-Term Clear, USM-51 Output Value, USM-52 Error Value | Exclusive PI controller for user sequence. Refer to <u>7.8 External PID (EPID)</u> for function details. |
| USM 80 Block Input 01, USM 81 Block Output 01 | The blocks define functions that must be executed when ending the user sequence. |

7.27.6 Simple Master

Simple master allows you to operate multiple inverters as slaves by having one of the inverters acting as a communication master through the user sequence.

7.27.6.1 Simple Master

Simple master consists of the following:



[Image 64. Simple Master Composition]

7.27.6.2 Simple-Master-Related Communication Parameter Settings

Refer to **<u>10.2.2 Parameter Settings for Slave Communication</u> for inverters that are slaves.**

For the inverter that is the master, following parameters need to be additionally set aside from slave communication parameter settings.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------|----------|-------------|-------------------------|-----|------------------|------------------|------|
| INTC 02 | Protocol | 0 | Modbus RTU | 0~2 | 0 | _ | |
| | | 1 | LS Inv 485 | | | | |
| | | 2 | Modbus RTU Master | | | | |
| Group | Code | LCD Display | Se | t Value | Setting Range | Initial Value | Unit |
|-------|---|--|-------|------------------------|------------------|---------------------------------|------|
| | 01 | Comm Enable Mode | 1 | Always Enable | 0~2 | 0 | - |
| | 02, 09, 16, 23, 30, 37, 44, 51, 58, 65 | P01~10-Slave RW Mode | 0 | Not Used | 0~3 | 0 | - |
| | 3, 10, 17, 24, 31, 38, 45, 52, 59, 66 P01~10- SlaveStationID | | | 1 | 1~64 | 0 | - |
| INTM | 4, 11, 18, 25, 32, 39, 46, 53, 60, 67 P01~10-Data Count | | | 1 | 1~4 | 0 | - |
| | 5, 12, 19, 26, 33, 40, 47, 54, 61, 68 | 12, 19, 26, 3, 40, 47, 4, 61, 68 P01~10-Slave DataAddr | | 000h | 0000h~ FFFFh | 0000h | - |
| | 6, 13, 20, 27, 34, 41, 48, 55, 62, 69 | P01~10- MasterDataAddr | 0000h | | 0000h~ FFFFh | 0000h | - |
| | 7, 14, 21, 28, 35, 42, 49, 56, 63, 70 | P01~10-Time Period | | 0.10 | 0.10~1.00 | 0.10 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: D1~D8) | 67 | Modbus Master En | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

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Advanced Functions

Communication Parameters Setting Details

| Code and Functions | | Description | | | | | |
|---|---|---|---|--|--|--|--|
| INTC-02 Protocol | Sets tl The in for cor | he value to 2 (Modbus verter plays as a self- mmunication with subo | RTU Master). communication master and allows ordinate inverters. | | | | |
| | Sets s | imple master operatio | ns. | | | | |
| | | Item | Functionality | | | | |
| | 0 | None | Deactivates the simple master. | | | | |
| INTM-01 Comm | 1 | Always Enable | Activates the simple master. | | | | |
| Enable Mode | 2 | DI Dependent | Simple master works when the multifunction terminal with 67 (Modbus Master En) setting for the Define code of DI1-DI8 of the terminal input group (DIN) turns on. | | | | |
| | Sets read/write mode for communication frames with each slave, P1-10. | | | | | | |
| INTM-02, 09, 16, 23, | ltem | | Functionality | | | | |
| 30, 37, 44, 51, 58 | 0 | Not Used | P1-10 frames are not used. | | | | |
| P01~10-Slave RW | 1 | Read Mode | Reads parameters from the slaves. | | | | |
| wode | 2 | Write Mode | Writes parameters on the slaves. | | | | |
| | 3 | Broadcast Write | Writes parameters by broadcast on all slaves. | | | | |
| INTM-03, 10, 17, 24, 31, 38, 45, 52, 59 P01~10-SlaveStation ID | Sets c with ea | Sets communication station numbers for communication frames with each slave, P1-10. | | | | | |
| INTM-04, 11, 18, 25, 32, 39, 46, 53, 60 P01~10-Data Count | Sets tl slave, | he number of data for P1-10. | communication frames with each | | | | |

| Code and Functions | Description |
|---|--|
| INTM-05, 12, 19, 26, 33, 40, 47, 54, 61 P01~10-Slave DataAddr | Sets the starting address of parameters for communication frames with each slave, P1-10. |
| INTM-06, 13, 20, 27, 34, 41, 48, 55, 62 P01~10- MasterDataAddr | Sets the starting address of the master parameter for communication frames with each slave, P1-10. |
| INTM-07, 14, 21, 28, 35, 42, 49, 56, 63 P01~10-Time Period | Sets the communication cycle for communication frames with each slave, P1-10. |

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7.28 Operating Winder/Unwinder

Also called a spooler, a winder winds web materials (iron wire, iron sheet, steel wire, etc.) while maintaining consistent tension. While, unwinder unwinds the web materials while maintaining consistent tension.

The inverter's winder and unwinder functions are used in a closed-loop tension control system, which winds or unwinds tensions by basically using the analog feedback from tension control/detection devices, including a dancer and load cell, to operate the PID controller. The PID controller used in a closed-loop tension control system is called a Web PID because it differs from the existing PID controller. However, even in open-loop tension control systems without Web PID or tension control detection devices like dancers or load cells, the inverter's winder and unwinder functions can still be utilized.

The tension control operation for the S300 inverter can be roughly categorized into winder/unwinder, closed-loop/open-loop, and speed/tension command operations.

Motor speed $[rpm] = \frac{Flux [mpm]}{\pi \cdot diameter [m]}$ Formula 1

Operating winder

The actual diameter (m) of the winder increases as the process progresses. **Formula 1** As shown in Formula 1, to maintain the flux (mpm), the motor speed (rpm) should decrease with the increasing diameter. The speed of the motor (i.e. the inverter's output frequency) is decreased by the Web PID controller. In addition, the increasing diameter is calculated and presumed internally. The calculated diameter is used to decrease the inverter's output frequency.

Unlike the winder, the unwinder's diameter (m) will decrease as the process progresses. **Formula 1** As shown in the Formula 1, to maintain the flux (mpm), the motor speed (rpm) should increase with the decreasing diameter. In a closed-loop tension control system, the motor speed (i.e. the inverter's output frequency) is increased by the Web PID controller. In addition, the decreasing diameter is calculated and presumed internally. The calculated diameter is used to increase the inverter's output frequency.

These methods result in much more stable performance than the existing method that only uses a PID controller to control the tension of the winder. The diameter calculated internally compensates the inverter's output frequency once more, so the role of the Web PID controller in the inverter's output frequency is much smaller. Therefore, the Web PID controller output's saturation risk is removed, and the I controller output oscillation significantly decreases. Other major functions are as follows:

• Function to remove transient phenomena of a dancer or load cell during powering on (Related code: WEB1-42)

- Inertia compensation function (Related code: WEB1-47, 48)
- Function to maintain the tension and conduct emergency stop operation (Related code: APP-46)
- Function to detect web material before broken (Related code: WEB1-80~84)

7.28.1 Overall Compositions

7.28.1.1 Speed Control Mode with a Tension Sensor (Capstan Operation)



*Diameter: Thickness is applied when operating capstan.

[Image 65. Speed Control mode with a tension sensor (Capstan operation)]

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7.28.1.2 Torque Control Mode with a Tension Sensor

[Image 66. Torque Control mode with a tension sensor]



7.28.1.3 Speed Control Mode without a Tension Sensor

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[Image 67. Speed Control mode without a tension sensor]

Advanced Functions



7.28.1.4 Torque Control Mode without a Tension Sensor

[Image 68. Torque Control mode without a tension sensor]

7.28.2 Main Speed Command Part

The unit for the main speed command is percent (%) and is the same concept as the flux (mpm). For example, there is a system with a maximum flux of 800 mpm, and if you want to operate the system at 400 mpm, set the main speed command to 50% (400/800x100%).

You can send the command by using Smart Operator, analog input, communication, etc.



[Image 69. Main speed command part]

7.28.2.1 Main Speed Command

Main Speed Command Settings

| Group | Code | LCD Display | S | Set Value | Setting Range | Initial Value | Unit |
|--|-------------|----------------------|----|------------------|------------------|--|------|
| | 10 | Main Spd Monitor | - | - | - | - | |
| Main Spd Source0Keypad0-111Main Spd Kpd Set-0.00-1012Main Spd Kpd Set-0.00-1013Main XcelTime En0No 10-7 | 11 | Main Spd Source | 0 | Keypad | 0-11 | 0 | - |
| | 0.00-100.00 | 0.00 | % | | | | |
| | 13 | Main XcelTime En | 0 | No | 0.1 | 0 | |
| | | | 1 | Yes | 0-1 | | - |
| | 14 | Main Spd Acc Time | - | | 0.00-300.00 | 10.00 | sec |
| | 15 | Main Spd Dec Time | | - | 0.00-300.00 | 20.00 | sec |
| | 1 | AO1 Define | 16 | Web MainSpeed | 0-17 | 0 | - |
| 001 | 10 | AO2 Define | 16 | Web MainSpeed | 0-17 | Initial Value - 0 0.00 0.00 0 20.00 0 0 | - |

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Main Speed Command Settings Details

| Code and Functions | Description |
|-----------------------------|---|
| WEB1-10 Main Spd Monitor | Shows the main speed (%). Shows targeted main speed when the inverter is stopped and ramp main speed when the inverter is in operation. |
| WEB1-11 Main Spd Source | Select the method for main speed command. 5(Internal Comm.), 7(Option Comm.) Alternately, selecting 8 (UserSequence.) allows you to set the main speed command value by up to two decimal places. For example, if you want to use 60.00% of the main speed command, enter 6,000 at the common area address, 0x03C0, in the built-in 485 communication or communication option card. |

| Code and Functions | Description | | | | |
|--|---|---|---|--|--|
| | | Operator | Description | | |
| Code and Functions WEB1-11 Main Spd Source WEB1-12 Main Spd Kpd Set WEB1-13 Main XcelTime En WEB1-14 Main Spd Acc Time, WEB1-15 Main Spd Dec Time OUT-01, 10 AOx Define | 0 | Keypad | Operates at the main speed input in the WEB1-12. | | |
| | 1 | Analog Input 1 | | | |
| | 2 | Analog Input 2 | Al terminal of the terminal block (analog input terminal) | | |
| | 3 | Analog Input 3 | | | |
| WEB1-11 Main Spd Source | 4 | Pulse Input | PTI terminal of the terminal block (pulse input terminal, input pulse of 0-32 kHz) | | |
| | 5 | Internal Comm. | RS-485 input terminal | | |
| | 6 | USB Comm. | USB Port | | |
| | 7 | Option Comm. 48 | Communication options | | |
| | 8 | User Sequence | User sequence | | |
| | 9 | X-Analog Input 1 ⁴⁹ | | | |
| | 10 | X-Analog Input 2 49 | Analog input terminal for expansion I/O | | |
| | 11 | X-Analog Input 3 ⁴⁹ | | | |
| WEB1-12 Main Spd Kpd Set | Opera WEB1 | perates at the main speed input in this code when selecting EB1=11 value as 0 (Keypad). | | | |
| WEB1-13 Main XcelTime En | You ca speed ramp times this ca ramp speed opera | an set the acceleration . Selecting this code at the main speed at in the WEB1-14 and ase, the main speed at the external super command may be e tion of the system. | on and deceleration times of the main value as 1 (Yes) will increase/decrease the acceleration and deceleration Web1-15. The initial value is 0 (No). In should be set to increase or decrease ordinate controller. If failed, the main entered in the steps, resulting in unstable | | |
| WEB1-14 Main Spd Acc Time, WEB1-15 Main Spd Dec Time | Activa accele refere the ma sec, w secon 0% to | ted when WEB1-13 eration and decelerat nce for the accelerat ain speed. For exam /hich is the set value ds (10 sec x 50%/10 50%. | value is 1 (Yes). You can set the ion times of the main speed. The ion and deceleration times is 100% of ple, when the WEB1-14 is set to 10.00 shipped from the factory, it will take 5 0%) to accelerate the main speed from | | |
| OUT-01, 10 AOx Define (AOx: AO1, AO2) | Settin main s | g the value to 16 (We speed via analog out | eb MainSpeed) allows monitoring of the put. | | |

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⁴⁸ Configurable only when equipped with communication options
 ⁴⁹ Configurable only when equipped with expansion I/O options

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|-----------|------------|------------------|---------------------------------|------|
| APP | 46 | Q Stop Dec T | - | | 0.00-6000.00 | 5.00 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1-DI8) | 69 | Quick Stop | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

7.28.2.2 Emergency Stop (Quick Stop)

A closed-loop tension control system that uses a dancer or load cell may maintain the tension during the emergency and execute an emergency stop for the system.

When the terminal input set to 69 (Quick Stop) value is entered, the system will start the deceleration stop according to the set deceleration time in APP-46 (Q Stop Dec T). The deceleration time is always consistent regardless of the current inverter's output frequency.

For example, assuming inverters 1, 2, and 3 are associated and operated in the system and the current output frequency is 25 Hz, 40 Hz, and 60 Hz, respectively, when the multifunction input terminals set to 69 (Quick Stop) are turned on, all three inverters decelerate for 5 seconds, which is the initial value for APP-46 (Quick Stop Dec T).

In this case, the output of the Web PID controller is valid, so the inverter output is not blocked and the tension is maintained.

7.28.3 Tension Command Part

The unit for the tension command is percent (%) and is the same concept as the force (kgf). For example, if you want to maintain the value of 10 kgf in the system with the load cell's maximum measured load (force) of 2 kgf, set the tension command to 50% (10/20 x 100%).

In an open-loop system, the unit for the tension command is the same concept as the torque (%). Therefore, the output torque for the minimum diameter is the criterion. For example, the output torque to maintain the desired tension for the minimum diameter is 10%, and the tension command should be set to 10% to maintain the same tension at the maximum diameter. The tension command can be sent by using Smart Operator, analog input, communication, etc.



| Group | Code | LCD Display | S | Set Value | Setting Range | Initial Value | Unit |
|-------|------|---------------------|----|-----------------------------------|--------------------|------------------|------|
| | 03 | Reference Value | | - | - | - | % |
| | | | 0 | Keypad | | - - O | |
| | | | 1 | Analog Input 1 | | | |
| | | | 2 | Analog Input 2 | | 0 | |
| | | | 3 | Analog Input 3 | | | |
| | 20 | Reference Source | 4 | Pulse Input | 0-8 | | |
| WEB1 | | | 5 | Internal Comm. | | | |
| | | | 6 | USB Comm. | | | - |
| | | | 7 | Option Comm. ⁵⁰ | | | |
| | | | 8 | User Sequence | | | |
| | | | 9 | X-Analog Input 1 ⁵¹ | | | |
| | | | 10 | X-Analog Input 2 ⁵¹ | | | |
| | | | 11 | X-Analog Input 3 ⁵¹ | | | |
| | 21 | Ref Keypad Set | | - | -100.00- 100.00 | 20.00 | % |

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⁵⁰ Configurable only when equipped with communication options
 ⁵¹ Configurable only when equipped with expansion I/O options

Tension Command Settings Details

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| Code and Functions | Description |
|-----------------------------|---|
| WEB1-08 Reference Value | Shows the current PID controller reference (%, tension). |
| WEB1-21 Ref Keypad Set | You can set the PID controller's reference value by using a Smart Operator. Activated when WEB1-20 value is 0 (Keypad). |
| WEB1-20 Reference Source | Selects the input type (analog, built-in communication, external communication, and extension IO). |

7.28.4.1 Taper Function

| Group | Code | LCD Display | S | Set Value | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|----|----------------------|--------------------|---|------|
| | | | 0 | None | | | |
| | 23 | Taper Selection | 1 | Linear | 0-2 | 0 | - |
| WEB1 | | | 2 | Hyperbolic | | | |
| | 24 | Taper Set | | - | -100.00- 100.00 | Initial Value 0 0 1, 2, 4, 5, 10, 11, 12, 9 | % |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1-Dl8) | 82 | Web Taper Disable | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

For roll winders, the larger the diameter, the higher the stress is to the center. The targeted tension is to the tangent line, but the stress creates the tension. Therefore, the sum of the two vectors is applied as the total tension. Therefore, the taper function is used to maintain the desired size of the tension, i.e., it decreases the PID reference values according to the calculated diameter to offset the vector created by the stress. For details, refer to the illustration below.

The taper function is used for the load applied with a load cell (weight sensor) rather than a dancer (location sensor) among the tension sensors.



Set up the taper to create the desired size of the synthesized tension

[Image 71. Changes in stress and tension according to the diameter of the roll winder]

Linear Taper

Tension Demand = Tension Spt × (100% - Taper Spt × (Diameter - Core Size))

Hyperbolic Taper

Tension Demand = Tension Spt × (100% - Taper Spt × (1 - $\frac{Core Size}{Diameter}$))



[Image 72. Trend of the tension change according to the taper type and settings]

7.28.4.2 Tension Boost/Down Function

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| Group | Code | LCD Display | ç | Set Value | Setting Range | Initial Value | Unit |
|-------|--------------------|--|----|------------------|--|---|------|
| | 25 | Tension Up | 0 | Fixed | 0.1 | 0 | |
| | 25 | Туре | 1 | Proportional | 0-1 | U | - |
| | 26 | Tension Up In | | - | 0.00-50.00 | Initial Value Initial 0 0 0.00 0 0 0 1, 2, 4, 5, 10, 11, 12, 9 1 | % |
| VVEBI | 27 | Tension Down Type | 0 | Fixed | Setting Range Initial Value Ur 0-1 0 - 0.00-50.00 0.00 9 0-1 0 - 0-1 0 - 0-1 0 9 0-1 0 - 0.00-50.00 0.00 9 - 1, 2, 4, 5, 10, 11, 12, 9 - | 0 | |
| | | | 1 | Proportional | | | - |
| | 28 | Tension Down In | | - | | % | |
| DIN | 01, 03, 05, 07, | Tension Down In - 0.00-50.00 0.00 , Dlx Define (Dlx: Dl1-Dl8) 80 Web Tns Up En - 1, 2, 4, 5, 10, 11, 12, 9 | 80 | Web Tns Up En | | 1, 2, 4, | |
| ЛИ | 09, 11, 13, 15 | | - | | | | |

You can boost/down the tension (PID reference) by the set values.

7.28.4.3 Tension Command Ramp

Increases the ramp for the final tension command with a taper function, which is applied or boosted/downed for the set time.

Setting the final tension command to WEB1-22 (PID Ref Ramp Time) allows for increasing the ramp for the set time. The gradient is set to tension command 100%. Prevents from PID output saturation due to difference between command and feedback values during the initial powering on and operation. It is used for smooth initial powering on for an open-loop system.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|--------|------|----------------------|-----------|------------------|------------------|------|
| | 03 | Reference Value | - | - | - | % |
| WEB1 - | 22 | PID Ref Ramp Time | 5.00 | 0.00-300.00 | 5.00 | sec |

7.28.5 Web PID Controller

Uses analog feedback from tension detection devices, including a dancer and load cell to determine the Web PID controller outputs in the closed-loop tension control system. The Web PID controller means the optimized PID controller for tension control system.



7.28.5.1 Web PID Control Part



| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------|-----------------|---------------|---------------------|--------------------|------------------|------|
| | 02 | Output Value | | - | -100.00- 100.00 | - | % |
| | 03 | Reference Value | | - | | - | % |
| | 04 | Feedback Value | | - | -300.00- 300.00 | - | % |
| | 05 | Error Value | | - | -300.00- 300.00 | - | % |
| | 30 | Web DID Enable | 0 | No | 0.1 | 0 | |
| | | Web FID Ellable | 1 | Yes | 0-1 | 0 | - |
| | | | 0 | Analog Input 1 | | | |
| | 31 | Feedback Source | 1 | Analog Input 2 | - | | |
| | | | 2 | Analog Input 3 | | | |
| | | | 3 | Pulse Input | | | |
| | | | 4 | Internal Comm. | | | |
| WEB1 | | | 5 | USB Comm. | 0-10 | 0 | - |
| | | | 6 | Option Comm. 52 | - | | |
| | | | 7 | UserSequence | | | |
| | | | 8 | X-Analog Input 1 53 | | | |
| | | | 9 | X-Analog Input 2 53 | | | |
| | | | 10 | X-Analog Input 3 53 | | | |
| | 37 | 7 Out Limit Low | | -100.00 | -100.00- 100.00 | -100.00 | % |
| | 38 Out | Out Limit High | | -100.00 | -100.00- 100.00 | 100.00 | % |
| | 39 | Output Scale | | 30.0 | 0-1000.0 | 100.0 | % |
| | 40 | Output LPF Gain | | 0 | 0-10000 | 0 | msec |
| | 41 | Output Inverse | 0 | No Yes | 0-1 | 0 | - |
| | 42 | PID Start Ramp | 1 Yes 5.00 | | 0.00- 300.00 | 0.00 | sec |

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⁵² Configurable only when equipped with communication options
 ⁵³ Configurable only when equipped with expansion I/O options

Advanced Functions

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---------|----------------|-----------|------------------|------------------|------------------|------|
| | 01, 03, | | 78 | Web I-Term Clear | | 124 | |
| DIN | 05, 07, | DIx Define | 77 | Disable WPID | - | 5, 10, | - |
| | 13, 15 | (DIX: DIT-DI8) | 72 | Web Splice | | 11, 12, 9 | |

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Web PID Controller Settings Details

| Code and Functions | Description | | | | |
|--|--|---|--|--|--|
| WEB1-2 Output Value | Shows the current PID output value (%). | | | | |
| WEB1-3 Reference Value | Shows the current PID | 's reference value (%). | | | |
| WEB1-4 Feedback Value | Shows the current PID | 's feedback value (%). | | | |
| WEB1-5 Error Value | Shows the current PID | 's error value (%). | | | |
| | Determines whether to use Web PID controller. Set the values to 1 (Yes) and use the Web PID controller when the terminals set to 77 (Disable WPID) value among the multifunction input terminals are turned off. | | | | |
| | Table 9. How to select whether to use the Web PIDcontroller | | | | |
| WEB1-30 Web PID Enable | WEB1-30 (Web PID Enable) | The status of the multifunction input terminal set to a value of 77 (Disable WPID). | Whether to use the Web PID controller | | |
| | 1(Yes) | Off | 0 | | |
| | 1(Yes) | On | Х | | |
| | 0(No) | Off | Χ | | |
| | 0(No) | On | Х | | |
| WEB1-31 Feedback Source | Selects PID controller feedback input type (analog, built-in communication, external communication, and extension IO). | | | | |
| WEB1-37 Out Limit Lo WEB1-38 Out Limit Hi | You can set the upper and lower limits for PID controller output. In addition, the accumulated values for the I controller are limited to the upper and lower limits set by this code. | | | | |

| Code and Functions | Description |
|----------------------------|--|
| WEB1-39 Output Scale | You can adjust the scale of the PID controller output. When assuming PID controller saturation, setting it to 100% will return 100% of the PID controller output, and setting it to 30% will return 30% of the PID controller output. |
| WEB1-40 Output LPF Gain | Sets the delay time constant of the PID controller output. Normally, it is set to 0 ms for quick response from the PID controller. Increasing the settings may decrease the PID controller's response speed but increase the stability. |
| WEB1-41 Output Inverse | Selects whether to invert the PID controller output. Selecting the value to 1 (Yes) results in inverse PID output symbols. It is useful when the orientation of the tension detection devices, including a dancer and load cell, is inversed. |

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| Code and Functions | Description |
|------------------------------|---|
| | The PID output can be increased ramp for a set time during the inverter's initial powering on. This function allows the smooth output of the PID controller during the initial powering on to improve transient phenomena, including fluctuations of a dancer or load cell during the initial powering on. PID error (%) (a) |
| | P Controller output (%) |
| WEB1-42 PID Start Ramp | (b) 100(%) |
| | WEB1-42 PID Start Ramp |
| | Operation command |
| | (c) Operation Command On |
| | [Image 74. How does WEB1-42 (PID Start Ramp) work] |
| | Assuming the P gain is 100%, and the PID error is 100% during the powering on, the dotted line on (b) indicates the P controller's output when the PID Start Ramp is 0 seconds. The solid line on (b) indicates that the P controller's output will increase the ramp for PID Start Ramp time during the initial powering on, i.e., the output in a solid line rather than in a dotted line is more useful for improving transient phenomena during the initial powering on. In addition, the PID Start Ramp value uses 100% of the PID controller output as a criterion. For example, setting the PID Start Ramp to 5 seconds will take 5 seconds for the PID controller output to be 100% saturated during the initial powering on and 2.5 seconds to 50% saturated. |
| DIx Define (DIx: DI1-DI8) | Turning on the multifunction input terminal that sets Define codes of DI1-DI8 of terminal input group (DIN) to 77 (Disable WPID) will not trigger the Web PID. Setting the code value to 78 (Web I-Term Clear) and turning on the set terminal will remove all accumulated integrals. |



7.28.5.2 Web PID Gain Calculation Part

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Advanced Functions

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|-----------|---------------------|------------------|---------------------------------|------|
| | 32 | Proportional Gain1 | | 100.0 | | 5.00 | % |
| | 33 | Integral Time1 | | 10.00 | | 10.00 | sec |
| | 34 | Proportional Gain2 | | 5.00 | 0.00- 100.00 | 5.00 | % |
| | 35 | Integral Time2 | | 10.00 | 0.00- 200.00 | 10.00 | sec |
| 36 | Derivative Time | 10 | | 0- 1000 | 0 | msec | |
| | WEB1 43 PI Gain Chg Mode PI Change Speed1 | PI Gain Chg | 0 | Ramp | 0_1 | 0 | |
| WEB1 | | 1 | MainSpeed | 0-1 | 0 | | |
| | | PI Change Speed1 | 20.00 | | 0.00- 100.00 | 20.00 | % |
| | 45 | PI Change Speed2 | 80.00 | | 0.00- 100.00 | 80.00 | % |
| | 46 | PI Gain Ramp Time | 30.00 | | 0.00- 300.00 | 0.00 | sec |
| | | | 0 | None | | 0 | |
| | 47 | Profile P Mode | 1 | Linear | 0-2 | | - |
| | | | 2 | Square | | | |
| | 48 | Profile P Gain | | - | 0.01- 10.00 | 1.00 | % |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1-DI8) | 73 | WPID Gain Change | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Web PID Gain Calculation Part Settings Details

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| Code and Functions | Description | | | | | |
|--|---|--|--|--|--|--|
| WEB1-32 Proportional Gain1 WEB1-34 Proportional Gain2 | Is a Proportional (P) gain for the PID controller. The P controller output is 100% when the P gain is 100% and the error value is 100%. | | | | | |
| WEB1-33 Integral Time1 WEB1-35 Integral Time 2 | It is the Integral Time (I) gain for the PID controller. The time spent until the I controller output is saturated to 100% is 10 seconds, when the I gain is 10 sec, and the error value is 100%. | | | | | |
| WEB1-36 Derivate Time | It is the Derivate Time (D) gain for the PID controller. For example, the output will gradually decrease to 34% after 10 ms when the D controller output is 100%, the D gain is 10 ms, and the changed value for the error is 100%. | | | | | |
| WEB1-43 PI Gain Chg Mode | Sets how to change the P/I gain. Set this value to 0 (Ramp) to change the P/I gain by setting the 73 (Timer Gain Change) value for one of the multifunction input terminals Set this value to 1 (MainSpeed) to change the P/I gain according to the inverter operation speed. | | | | | |
| WEB1-44, 45 PI Change Speed1, 2 | Sets the reference speed when changing the P/I gain according to the inverter operation speed. | | | | | |
| WEB1-46 PI Gain Ramp Time | Is a ramp time applied when P/I gain switchover triggers due to a change in terminal input set to 73 (WPID Gain Change) during the inverter operation. It is also applied when the user uses the loader to change P/I gain during the inverter operation. The ramp time is switched over at 1000% for P gain and 200 sec for I gain. For example, when P/I Gain Ramp Time is set to 30 seconds and P gain is changed from 100% to 200%, it will take 3 seconds (30 sec x 100/1000). | | | | | |
| WEB1-47 Profile P Mode | Is a P gain compensation method for inertia compensation according to the diameter. | | | | | |
| WEB1-48 Profile P Gain | Sets the maximum amount of the compensation for P gain compensation. | | | | | |

P, I Gain Switchover Function

[Gain change according to the input change]

If something changes in the terminal input set to 73 (WPID Gain Change) during the inverter operation or the user changes the WEB1-32 (PID Proportional Gain1) and WEB1-33 (Integral Gain1) settings and P/I gain switchover is triggered temporarily without switchover ramp time, the system response may unstable. To prevent such risk, set the P/I gain switchover to gradient change according to the suitable settings of WEB1-46 (PI Gain Ramp Time).



[Image 76. Gain change according to the multifunction input's WPID gain Change]

Table 10. P/I gain selection according to the multifunction input's "WPID Gain Change" status

| The status of the terminal set to 73 (WPID Gain Change) | Selected P/I gain |
|--|----------------------------|
| 0# | WEB1-32 Proportional Gain1 |
| Oli | WEB1-33 Integral Time1 |
| 0- | WEB1-34 Proportional Gain2 |
| On | WEB1-35 Integral Time2 |

[Gain change according to the speed]

You can change the P/I gain to the ramp according to the inverter's operation speed changes.



[Image 77. P/I gain switchover according to the speed]

Inertia Compensation Function

The diameter of the winder increases as time passes, and the larger the diameter, the stronger the inertia, which requires a (+) inertia compensation by the increase. Conversely, the diameter of the unwinder decreases as time passes, and the smaller the diameter, the weaker the inertia, which requires a (-) inertia compensation by the decrease. For such inertia compensation, increase the P gain as the diameter increases.



[Image 78. Trend in P gain changes according to the Profile P Mode]



7.28.6 Diameter Calculation Part



The flux of the winder/unwinder, motor speed, and diameter in the tension control system has a correlation in the **Formula 2**.

 $Flux[mpm] = motor speed [rpm] \times (diameter \times \pi)[m] = consistent$

Formula 2

In a closed-loop tension control system, the winder always has a consistent flux (MPM) unless the user adjusts it at their own discretion, and the winder's actual diameter (m) increases as time passes. Therefore, the tension to a dancer or load cell increases as the flux that should be consistent in the **Formula 2** increases, the Web PID controller's output becomes (-) values. In this case, the actual speed (rpm) of the motor decreases, so the flux in Formula 2 decreases again to maintain the certain value.

You can use winder's flux (always consistent) (mpm) and motor's actual speed (decrease) (rpm) to obtain the diameter calculation in **Formula 3**. The estimated diameter will increase as time passes.

Estimated diameter $\times \pi[m] = \frac{Flux [mpm]}{Motor speed [rpm]}$ Formula 3

The flux (MPM) is always consistent for the unwinder unless the users adjust the flux at their own discretion, and unlike the winder, the actual diameter (m) is decreased. Therefore, as the flux that should be consistent in the **Formula 2** decreases, the tension to a dancer or load cell increases, as it does for the winder. However, unlike the winder, the unwinder internally has inverted symbols of Web PID controller output. Therefore, the Web PID controller output becomes a (+) value. In this case, unlike the winder, the motor's actual speed (rpm) increases, so the flux in the **Formula 2** increases to maintain a consistent value. You can obtain the diameter calculation in the Formula 3 above by using the unwinder's flux (always consistent) (mpm) and motor's actual speed (increases) (rpm). The estimated diameter will decrease as time passes.

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---------|----------------|-----------|--------------|------------------|------------------|------|
| | 51 | Curr Bobbin | | - | 1-4 | - | % |
| | 52 | Bobbin1 | | 10.00 | 0.00- 100.00 | 10.00 | % |
| WEB1 | 53 | Bobbin2 | | 15.00 | 0.00- 100.00 | 15.00 | % |
| - | 54 | Bobbin3 | 20.00 | | 0.00- 100.00 | 20.00 | % |
| | 55 | Bobbin4 | | 25.00 | 0.00- 100.00 | 25.00 | % |
| | 01, 03, | | 74 | Web Bobbin-L | | 124 | |
| DIN | 05, 07, | | 75 | Web Bobbin-H | - | 5, 10, | - |
| | 13, 15 | (UIX: UI1-UI8) | 76 | Web Preset | | 11, 12, 9 | |

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| 7.28.6.1 | Bobbin | Selection and | Initializing | Diameter Functions |
|----------|--------|---------------|--------------|---------------------------|
|----------|--------|---------------|--------------|---------------------------|

Bobbin Selection and Diameter Initialization Functions Settings Details

| Code and Functions | Description |
|------------------------|--|
| WEB1-51 Curr Bobbin | Shows currently selected bobbin numbers (1-4). |

| Code and Functions | | Description | | | |
|--------------------------------------|---|--|--|--|--|
| | The bobbin diameter is selected as follows according to the combination of multifunction input terminals set to 74 (Web Bobbin-L) and 75 (Web Bobbin-H). When the bobbin is selected, initialize to the selected bobbin's diameter by turning the multifunction input terminal set to 76 (Web Preset) on and off. | | | | |
| | The status of the multifunction input terminal set to 75 (Web Bobbin-H) | The status of the multifunction input terminal set to 74 (Web Bobbin-L) | Selected bobbin | | |
| | Off | Off | Bobbin1 (WEB1-52) | | |
| | Off | On | Bobbin2 (WEB1-53) | | |
| | On | Off | Bobbin3 (WEB1-54) | | |
| | On | On | Bobbin4 (WEB1-55) | | |
| WEB1-52-55 Bobbin 1-4 Diameter | illustration below, enter the calculated 14.2%, 28.5%, 35.7%, and 50.0% to WEB1-52-55 (Bobbin 1-4 Diameter), respectively. Then, enter 14.2%, the percent (%) diameter of Bobbin1, the smallest bobbin, into WEB1-61 (Min Diameter). Select the currently installed bobbin using the combination of multifunction input terminals set to 74 (Web Bobbin-L) and 75 (Web Bobbin-H) and initialize it by turning on and off another multifunction input terminal, 76 (Web Preset). | | | | |
| | Bobbin1 100 mm /700 mm x100 =14.2% Bobbin2 100 mm/700 mm x100 250 mm/700 mm x100 250 mm/700 mm x100 350 mm/700 mm x100 | | | | |
| | Caution The multifunction inputurned on or off when the diameter when it i | ut terminals set to 76 (\ replacing the bobbin. ` s turned on. | Veb Preset) must be You can't calculate | | |

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--|---|---------------|-----------------------|--------------|-------------------------------------|------------------|------|
| | 50 | Curr Diameter | | - | - | - | % |
| | 57 | Diameter LPF | | 30.00 | 0.00- 300.00 | 1.00 | sec |
| WEB1 59 61 | 59 | Max Main Freq | - | | 0.00-Max Frequency ⁵⁴ | 60.00 | Hz |
| | 61 | Min Diameter | 10.00 | | 5.00- 100.00 | 10.00 | % |
| DIN 01, 03, 05, 07, 09, 11, 13, 15 | | 77 | Disable WPID | VPID Calc | | | |
| | 01, 03, 05, 07, Dlx Define 09, 11, (Dlx: Dl1-Dl8) 13, 15 | 79 | Diameter Calc Hold | | 1, 2, 4, 5, 10, | - | |
| | | (810-110 xiu) | 72 | Web Splice | | 9 | |
| | | | 76 | Web Preset | | - | |

| 7.28.6.2 | Diameter | Calculation | Function |
|----------|----------|-------------|----------|
|----------|----------|-------------|----------|

The previous Formula 3 can be converted into a percent (%) to create Formula 4.

Estimated diameter [%] =
$$\frac{Main speed [\%]}{\frac{Output frequency [Hz]}{Max Main Freq} \times 100[\%]} \times Min Diameter$$

Formula 4

The main speed (%) is always consistent unless the users adjust it at their own discretion, as the bobbin's actual diameter increases as time passes. At the same time, the size of the tension to a dancer or load cell gradually increases. Therefore, the Web PID controller returns a (-) output, and the inverter's "current output frequency (Hz)" will decrease. Therefore, the estimated diameter (%) according to the **Formula 4** increases. The estimated diameter (%) range is limited from the upper 100% to the lower WEB1-61 (Min Diameter) value, and you can set the time constant value under WEB1-57 (Diameter LPF) to adjust the diameter (%) calculation speed.

The estimated diameter plays the key role in determining the final speed command (Hz). For more information, refer to the **7.28.7 Final Speed Calculation Part**.

⁵⁴ DRV-20(Max Frequency)

Diameter Calculation Function Details

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| Code and Functions | Description |
|--------------------------|---|
| WEB1-50 Curr Diameter | Displays the current bobbin's diameter (%). After turning on/off the multifunction terminal set to 76 (Web Preset), the diameter (%) of the selected bobbin will be displayed, and the calculated diameter (%) in the Formula 4 will be updated during the operation. |
| WEB1-57 Diameter LPF | Sets the time constant value for the diameter (%) calculation. Normally, it is set to the traverse return time. |
| WEB1-59 Max Main | Enter the maximum speed (Hz) at the diameter of the smallest bobbin without anything winding it when the main speed is 100 (%). For example, assuming that in the [Image 15] , the empty diameter of the smallest bobbin is 0.1 m (100 mm) and system's maximum flux is 350 mpm, the motor has 4-poles, and the belt ratio (motor is faster) is 2.3/1, the WEB1-59 (Max Main Freq) value is calculated as follows. |
| | WEB1-90(Max Main Freq) = |
| | $\frac{350[mpm]}{0.10[m] \times \pi} \times 2.3(Belt ratio) \times \frac{4 (the number of poles)}{120} = 85.46[Hz]$ Formula 5 |
| WEB1-61 Min Diameter | Enter the diameter ratio (%) of the bobbin without anything winding it to the full bobbin with fabric winding around it. If there are various types of bobbins, enter the smallest diameter ratio (%) of the smallest bobbin to the largest bobbin. [Image 80] As shown in Illustration 80, when the sizes of the bobbins are varied, enter 14.2%. |

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|------|-----------------------|------------------|------------------------------------|------|
| | 58 | Dia Calc Hold Freq | | 5.00 | 0.00- 30.00 | 5.00 | Hz |
| VVEB1 | 60 | Min Main Speed | 3.00 | | 0.00- 100.00 | 1.00 | % |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1-Dl8) | 79 | Diameter Calc Hold | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

| 7.28.6.3 Stopping Dian | neter Calculation Function |
|------------------------|----------------------------|
|------------------------|----------------------------|

Stop the diameter calculation during the calculation if: The diameter calculation is useful only during normal operation.

- Main speed command (%) < WEB1-60 (Min Main Speed)
- Output frequency (%) < WEB1-58 (Dia Calc Hold Freq)
- The multifunction input terminal set to 79 (Diameter Calc Hold) is turned on
- The multifunction terminal set to 69 (Quick Stop) is turned on (for an emergency stop)
- The multifunction terminal set to 77 (Disable WPID) is turned on
- The WEB1-80 (WebBreak Enable) value is 0 (disconnection detection is activated)
- The WEB1-30 (Web PID Enable) value is 0 (WEB PID is unactivated)

7.28.6.4 Web Function without a Diameter Calculation

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|---------------|---|-----------|------------------|------------------|------|
| | 50 | Diameter Calc | 0 | No | 0.4 | 4 | |
| VVEBT | 50 | Mode | 1 | Yes | 0-1 | | - |

Selecting the WEB1-56 (Diameter Calc Mode) value to 0 (No) will make the current diameter into the minimum diameter (WEB1-61 Min Diameter) regardless of the diameter value, so it virtually doesn't affect the tension control.



7.28.7 Final Speed Calculation Part

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The final speed calculation part uses the main speed (%) calculated in the main speed command part, PID output (%) calculated in the Web PID controller part, and diameter (%) calculated in the diameter calculation part to determine the inverter's final speed command (Hz).

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------------|------------|----------------------------|-----------|-----|------------------|------------------|------|
| WEB1 70 71 | Fixed WPID | 0 | No | 0.1 | 4 | | |
| | 70 | Enable | 1 | Yes | 0-1 | | - |
| | 71 | Fixed WPID Min Main Spd | 10.00 | | 0.00-50.00 | 10.00 | % |

7.28.7.1 How does PID output works (for fixed /unfixed PID controller)

| Code and Functions | Description | | | |
|------------------------------|---|--|--|--|
| | Setting the EB1-70 (Fixed WPID Enable) value to 1 (Yes), the PID output (%), which is the Web PID controller's output in the Formula 6 , will always be consistent regardless of the size of the main speed (%). | | | |
| | Final PID output[%] = PID output[%] | | | |
| WEB1-70 Fixed WPID Enable | Formula 6 | | | |
| | Setting the WEB1-70 (Fixed WPID Enable) value to 0 (No), the PID output (%), which is the Web PID controller's output in the Formula 7 , will be proportional to the size of the main speed (%). i.e., the share of the PID output (%) in the main speed will be maintained consistently. The mechanism behind such proportions works when the main speed (%) is lower, the PID output (%) is proportionally decreased to the value, and vice versa. | | | |
| | Final PID output [%] = PID output [%] × | | | |
| | Main speed command [%] | | | |
| | 100.00[%] | | | |
| | Formula 7 | | | |
| Code and Functions | | Description | | | | | |
|---------------------------------------|--|--|---------------------------------|--|--|--|--|
| | Prevent Web P WEB1-70 value (%) command b Spd or lower. | Prevent Web PID controller's output becomes too small when the WEB1-70 value is 0 (No) and the system receives the main speed (%) command below the value set in the Fixed WPID Min Main Spd or lower. | | | | | |
| | Fir | nal PID output [%] =PID o | output [%] × | | | | |
| | | Fixed WPID Min Mai | in Spd | | | | |
| | | 100.00[%] | | | | | |
| | Formula 8 | | | | | | |
| WEB1-71 Fixed WPID Min Main Spd | The table below shows how the final PID output (%) is determined according to the Fixed WPID Enable settings, assuming the WEB1-39 (Output Scale) value is 20%, WEB1-71 is 10%, and the PID output is 20% saturated. | | | | | | |
| | Table 11. PID controller typ | output comparison dep e | ending on the PID | | | | |
| | Main speed command (%) | When WEB1-70 value is 1 (Yes) | When WEB1-70 value is 0 (No) | | | | |
| | 2.0 | 20.0 | 2.0 ⁵⁵ | | | | |
| | 8.0 | 20.0 | 2.0 ⁵⁵ | | | | |
| | 20.0 | 20.0 | 4.0 56 | | | | |
| | 80.0 | 20.0 | 16.0 ⁵⁶ | | | | |

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- ⁵⁵ Because the main speed is below **Fixed WPID Min Main Spd** (10%), it is determined according to the **Formula 8**.
- ⁵⁶ Because the main speed is Fixed WPID Min Main Spd (10%) or higher, it is determined according to the Formula 9.

Advanced Functions

7.28.7.2 Final Speed (Hz) Calculation

[Image 81] In the Illustration 81, the U1 (%) is the main speed command (%) = PID output (%), and it is converted to frequency (Hz) as follows:

 $Main speed + PID output [Hz] = \frac{Main Speed + PID output [\%]}{100.0[\%]} \times WEB1-59(Max Main Freq)$

Formula 9

<u>7.28.6 Diameter Calculation Part</u> The variation of the **Formula 2** is as follows. The inverter's final speed (Hz) is calculated and outputted according to the formula below.

Final speed $[Hz] = \frac{WEB1-61(Min Diameter)}{Estimated material diameter [\%]} \times (Main speed + PID output [Hz])$

Formula 10

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|----------------------------------|----|------------------------|------------------|------------------------------------|------|
| OUT | 1.10 | AOx Define (AOx: AO1- AO2) | 17 | Web MainSpeed +WPID | 0-17 | 1, 2, 4, 5, 10, 11, 12, 9 | - |

You can monitor the final speed through analog output by setting one of the multifunction terminals DI1-DI8 values to 17 (Web MainSpeed+WPID)

① Caution

The final speed (Hz), which is the result of the Formula 10 and calculated periodically in the final speed calculation part changes constantly. In this case, the acceleration and deceleration times are DRV-05 (ACC Time) and DRV-06 (Dec Time). You can set other values for DRV-05 (ACC Time) and DRV-06 (Dec Time). However, you must set them at 2.0 seconds or lower for a faster reflection of the final speed.

| 1.20.1.3 Reverse Extremely Slow Speed Function | 7.28.7.3 | Reverse | Extremely | Slow | Speed | Function |
|--|----------|---------|-----------|------|-------|----------|
|--|----------|---------|-----------|------|-------|----------|

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| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|---|-----------|------------------|------------------|------|
| WEB1 | 72 | Rev Tension Enable | 1 | Yes | 0-1 | 1 | - |

[Image 81] When the symbol of the U1 (%), or the main speed command (%) + PID output (%) is (-) in Illustration 81, select WEB1-72 (Rev Tension Enable) code to 1 (Yes) value and send forward operation command will operate the system reverse orientation by the absolute value of the PID output (%). It allows to maintain the tension of the web materials to the closed-loop tension control system.

Setting the WEB1-72 (Rev Tension Enable) code to 0 (No) and sending the forward operation command will limit the output frequency to 0 Hz.

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|---|------------------------------|----|------------|------------------|------------------------------------|------|
| WEB1 | 73 | Splice Level | | 0.00 | 0.00- 100.00 | 0.00 | % |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define (DIx: DI1-DI8) | 79 | Web Splice | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

7.28.7.4 Splicing Function

A splicing system is a system allowing bobbin replacement during operation by controlling the motors by two motors. In this case, the bobbin replacement must conducted without a flux change. When the multifunction input terminal set to 79 (Web Splice) value turns on, the PID controller output is blocked, and the inverter's final speed command is determined only by the combination of the main speed command and WEB1-73(Splice Level) according to the **Formula 11-Formula 13**.

Dramatic load changes occur when the new bobbin is winded with materials, so the material may hang down. To prevent such an event, speed it up by WEB1-73 (Splice Level) once again, as shown in the **Formula 10** when the new bobbin is winded with materials.</1994> For example, when WEB1-73 (Splice Level) value is 20%, the main speed command is 50%, and the multifunction input set to 79 (Web Splice) turns on, the main speed command (%) becomes 60% (50% + 50% x 20%/100%).

Main speed command [%] =

 $Main speed[\%] + Main speed[\%] \times \frac{WEB1-73(Splice Level)[\%]}{100[\%]}$

Formula 11

The figure converted into frequency (Hz) is as follows:

Main speed command [%] =

Final main speed command [%] 100[%] × WEB1-59 (Max Main Freq) [Hz]

Formula 12

Finally, the inverter's final speed command output is obtained via the formula below. When the multifunction terminal is set to 72 (Web Splice) value turned on, the diameter of the bobbin is initialized to the diameter selected among WEB1-52-55 (Bobbin1-4) values.

Final speed command [%] = Main speed command [Hz] $\times \frac{WEB1-61(Min Diameter)}{WEB1-52-55(Bobbin1-4)}$

Formula 13



The splicing system of the winder has the structure below:

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[Image 82. Splicing Diagram]

| Table 12. | Explanation | for splicing | diagram |
|-----------|-------------|--------------|---------|
|-----------|-------------|--------------|---------|

| No. | Description |
|-----|---|
| 0 | The Bobbin 1, wrapped with materials, will send a signal to the superordinate controller when it nears its maximum diameter. |
| 2 | The superordinate controller will send an On signal to the multifunction terminal set to 72(Web Splice), which controls currently empty Bobbin 2. |
| 3 | While the Web PID controller's output is blocked, the inverter starts to operate empty Bobbin 2 only with a combination of command of the main speed command (%) and WEB1-45 (Splice Level) as shown in the Formula 11-Formula 13 . |
| 4 | The replacement shaft for bobbin rotates 180 degrees to change the location of Bobbin 1 and Bobbin 2. |
| 6 | Sending the signal that the switchover for Bobbin 2 is completed to the superordinate controller. |
| 6 | The superordinate controller stops the splicing behavior by sending an Off signal to the multifunction input terminal set to 72 (Web Splice), which controls Bobbin 2. Now, the Web PID operation and the diameter calculation resume, and the inverter's output frequency is determined by the Formula 10 . |

7.28.7.5 Speed Bias Function

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|---------------|-----------|------------------|------------------|------|
| WEB1 | 74 | Web Bias Freq | 0.00 | 0.00-60.00 | 0.00 | % |

Add the frequency value by the WEB1-74 (Web Bias Freq) to the command speed to output final command speed. This setting is only valid for open-loop speed control mode.

By adding the speed bias, the speed controller in the open-loop speed control mode will be saturated, and the torque limit output will be obtained during the operation.



7.28.8 Final Tension Calculation Part

[Image 83. Final tension calculation part]

The final tension calculation is used for an open-loop/closed-loop tension control system.

The closed-loop tension system outputs the final torque command by using the tension command, Web PID output, and diameter.

The open-loop tension system do not use Web PID output and uses tension command, diameter, and friction loss to output final torque command.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|--------------------|-----------|------------------|------------------|------|
| WEB1 | 90 | Web PID FF Gain | 100.0 | 0.0-1000.0 | 100.00 | % |

The gain set in WEB1-90 (Web PID FF Gain) adjusts the scale of the tension command from the tension command part.

The open-loop tension system requires the WEB1-90 (Web PID FF Gain) values to be at 100%, a set value shipped from the factory. The closed-loop tension system allows other values for faster tension response.



7.28.9 Disconnection Detection Part

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The closed-loop tension control system uses tension detection devices, including a dancer and load cell. When the feedback from the tension detection device is maintained at too-higher or too-lower values for longer than the set time, the inverter sends signals to the superordinate controller via contact with a multifunction output and starts suitable protection behavior to prevent web materials from breaking.

The open-loop tension control system has no tension detection devices, so it determines the possibility of web material breaking by using the final torque output. If the final torque command differs by more than a certain range, disconnection detection behavior is triggered to start protection behavior according to the settings.

The open-loop speed control tension system triggers disconnection detection when the torque output is maintained higher than the set values for the torque limit.

| Whether there is a tension sensor | Control mode | Disconnection detection input | Criteria for disconnection detection | |
|-----------------------------------|--------------------|-------------------------------|---|--|
| Closed loop | Speed control | Tension PID | High Level: WEB1-82(WebBreak Level Hi) | |
| Closed-loop | Tension control | feedback | Low Level: WEB1-81(WebBreak Level Lo) | |
| Open-loop | Speed control | Torque output | High Level: Torque limit + WEB1-82(WebBreak Level Hi) Low Level: Torque limit - WEB1-81(WebBreak Level Lo) | |
| | Tension control | ioique output | High Level: Final torque command + WEB1-82(WebBreak Level Hi) Low Level: Final torque command - WEB1-81(WebBreak Level Lo) | |

Table 13. Criteria for disconnection detection by WEB behavior modes

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-------|-----------|------------------|------------------|------|
| | 80 | WebBreak Enable | 2 | Warning | 0~2 | 2 | - |
| WEB1 | 81 | WebBreak Level Lo | 20.00 | | 0.00- 100.00 | 20.00 | % |
| | 82 | WebBreak Level Hi | | 80.00 | 0.00- 100.00 | 80.00 | % |
| | 83 | WebBreak Delay | | 5.00 | 0.00- 300.00 | 5.00 | sec |
| | 84 | WebBreak Start Dly | | 10.00 | 0.00- 300.00 | 10.00 | sec |

| Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|-------|---------------|----------------------------------|----|---------------|------------------|------------------------------------|------|
| OUT | 50, 52, 54 | DOx Define (DOx: DO1- DO3) | 50 | WebBreak Warn | 0-50 | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Disconnection Detection Part Details

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| Code and Functions | | Description | | | | |
|----------------------------------|--|--|--|--|--|--|
| | Sets whether to use the disconnection detection function. | | | | | |
| | С | onfiguration | Functionality | | | |
| | 0 | None | Disconnection detection function is not operating. | | | |
| | 1 | Trip | The inverter stops by free run when disconnection is detected. | | | |
| WEB1-80 WebBreak Enable | 2 | Warning | The inverter keeps operating without a free- run stop when disconnection is detected. The warning will be displayed in the digital loader. If a multifunction output terminal is set to 50 (WebBreak Warn), only that terminal will be turned on. When the user sends the stop command to execute deceleration stop for the inverter, the warning displayed in the digital loader will be turned off, and the multifunction output terminal set to 50 (WebBreak Warn) will be turned off. | | | |
| WEB1-81 WebBreak Level Lo | Disco feedl Leve triggo (speo value | onnection detect back from a dan I Lo settings. Fo ered when the o ed control) or fin es. | tion function is triggered when the analog cer or load cell is lower than the WebBreak or an open-loop tension system, the behavior is utput torque is lower than a figure the torque limit al torque command (tension control) minus set | | | |
| WEB1-82 WebBreak Level Hi | Disco feedl Leve | onnection detect back from a dan I Hi settings. | tion function is triggered when the analog cer or load cell is higher than the WebBreak | | | |
| WEB1-83 WebBreak Delay | Consider it in the Disconnection (Web Break) status when the analog feedback from a dancer or load cell is the disconnection detection level (WEB1-82) or higher or disconnection detection level (WEB1-81) or lower and remains for the time set to WebBreak Delay. | | | | | |
| WEB1-84 WebBreak Start Dly | The disconnection detection function is not triggered until the set time for this code from the initial powering on of the inverter. It is because the disconnection detection function may malfunction due to the unstable location of a dancer or load cell at the initial powering on. | | | | | |



7.28.10 Torque Limit Calculation Part

*The above torque limit is only available when the source of the torque limit is set to "System."

[Image 85. Torque limit calculation part]

7.28.10.1 Torque Limit Calculation

It only exists in the open-loop speed control tension system. It uses tension command, diameter, and friction loss value to calculate the torque limits as follows:

```
Torque Limit [%] = Tension command [%] \times \frac{Current \, diameter \, [\%]}{Minimum \, diameter} \pm friction \, loss
Formula 14
```

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7.28.10.2 Measuring Friction Loss

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Friction occurs for all mechanical equipment during operations. It decreases the system control performance and results in loss. When the materials are connected by a certain tension, for example, a tension control system, the friction loss from the roll may affect the materials' tension.

In a closed-loop tension system, Web PID will compensate for the friction loss. However, in an open-loop tension system, Web PID is not used, so the roll's friction loss is measured before system operation and compensated during the tension control operation.

| Group | Code | LCD Display | S | Set Value Setting Range | | Initial Value | Unit |
|-------|------|-----------------------|-------|-------------------------|---------------------------------------|------------------|------|
| | 1 | Friction Auto Tuning | 0 No | | 0~1 | 0 | |
| | | Fliction Auto Turning | 1 | Yes | 0~1 | 0 | - |
| | 2 | Fric Comp Freq 1 | | 6.00 | 1.00~ Fric Comp Freq 2 | 6.00 | Hz |
| | 3 | Fric Comp Spd 1 | 180 | | 30~ Fric Comp Spd 2 | 180 | rpm |
| | 4 | Fric Comp Trq 1 | | 0.00 | 0.00~100.00 | 0.00 | % |
| | 5 | Fric Comp Freq 2 | 12.00 | | Fric Comp Freq 1~ Fric Comp Freq 3 | 12.00 | Hz |
| | 6 | Fric Comp Spd 2 | | 360 | Fric Comp Spd 1~ Fric Comp Spd 3 | 360 | rpm |
| WEB2 | 7 | Fric Comp Trq 2 | | 0.00 | 0.00~100.00 | 0.00 | % |
| VVLDZ | 8 | Fric Comp Freq 3 | | 18.00 | Fric Comp Freq 2~ Fric Comp Freq 4 | 18.00 | Hz |
| | 9 | Fric Comp Spd 3 | | 540 | Fric Comp Spd 2~ Fric Comp Spd 4 | 540 | rpm |
| | 10 | Fric Comp Trq 3 | 0.00 | | 0.00~100.00 | 0.00 | % |
| | 11 | Fric Comp Freq 4 | | 24.00 | Fric Comp Freq 3~ Fric Comp Freq 5 | 24.00 | Hz |
| | 12 | Fric Comp Spd 4 | | 720 | Fric Comp Spd 3~ Fric Comp Spd 5 | 720 | rpm |
| | 13 | Fric Comp Trq 4 | | 0.00 | 0.00~100.00 | 0.00 | % |
| | 14 | Fric Comp Freq 5 | | 30.00 | Fric Comp Freq 4~ Fric Comp Freq 6 | 30.00 | Hz |

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-------------------|-----------|--|------------------|------|
| | 15 | Fric Comp Spd 5 | 900 | Fric Comp Spd 4~ Fric Comp Spd 6 | 900 | rpm |
| | 16 | Fric Comp Trq 5 | 0.00 | 0.00~100.00 | 0.00 | % |
| | 17 | Fric Comp Freq 6 | 36.00 | Fric Comp Freq 5~ Fric Comp Freq 7 | 36.00 | Hz |
| | 18 | Fric Comp Spd 6 | 1080 | Fric Comp Spd 5~ Fric Comp Spd 7 | 1080 | rpm |
| | 19 | Fric Comp Trq 6 | 0.00 | 0.00~100.00 | 0.00 | % |
| | 20 | Fric Comp Freq 7 | 42.00 | Fric Comp Freq 6~ Fric Comp Freq 8 | 42.00 | Hz |
| | 21 | Fric Comp Spd 7 | 1260 | Fric Comp Spd 6~ Fric Comp Spd 8 | 1260 | rpm |
| | 22 | Fric Comp Trq 7 | 0.00 | 0.00~100.00 | 0.00 | % |
| WEB2 | 23 | Fric Comp Freq 8 | 48.00 | Fric Comp Freq 7~ Fric Comp Freq 9 | 48.00 | Hz |
| | 24 | Fric Comp Spd 8 | 1440 | Fric Comp Spd 7~ Fric Comp Spd 9 | 1440 | rpm |
| | 25 | Fric Comp Trq 8 | 0.00 | 0.00~100.00 | 0.00 | % |
| | 26 | Fric Comp Freq 9 | 54.00 | Fric Comp Freq 8~ Fric Comp Freq 10 | 54.00 | Hz |
| | 27 | Fric Comp Spd 9 | 1620 | Fric Comp Spd 8~ Fric Comp Spd 10 | 1620 | rpm |
| | 28 | Fric Comp Trq 9 | 0.00 | 0.00~100.00 | 0.00 | % |
| | 29 | Fric Comp Freq 10 | 60.00 | Fric Comp Freq 9~ Max Frequency ⁵⁷ | 60.00 | Hz |
| | 30 | Fric Comp Spd 10 | 1800 | Fric Comp Spd 9~ Maximum Speed ⁵⁸ | 1800 | rpm |
| | 31 | Fric Comp Trq 10 | 0.00 | 0.00~100.00 | 0.00 | % |

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The gray shaded area is activated when the speed unit is in rpm. 1 (select rpm Display) * at (DRV-32, Hz/rpm Select)

⁵⁷ DRV-20(Max Frequency)
 ⁵⁸ DRV-21(Maximum Speed)

Friction Loss Measurement Settings Details

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| Code and Functions | Description |
|---|---|
| WEB2-1 Friction Auto Tuning | Select 1 (Yes) after installing an empty bobbin not connected to the materials to the roll to measure the friction loss. The friction loss measurement is triggered when selecting the function. The friction loss is measured by 10 speed intervals set in WEB2-2-31 and at acceleration or operation at a constant speed. The motor will stop by free run after friction loss is measured. After auto-tuning, the measured values for each interval are saved in WEB2-4, 7, 10, 13, 16, 19, 22, 25, 28, and 31. |
| WEB2-2-31 Fric Comp Freq/ Spd 1-10 | Sets the speed to measure friction loss. The default value is divided into 10 intervals of 60 Hz (1800 rpm). The speed range is under DRV20 (Max Frequency) or DRV21 (Maximum Speed). Users can change the measured speed at their own discretion. |
| WEB2-4, 7, 10, 13, 16, 19, 22, 25, 28, 31 Fric Comp Trq 1-10 | The friction loss (%) for the set speed is saved after measuring the friction loss. Users can change the set values at their discretion. The measured friction loss is calculated and compensated by the speed as shown in the illustration below. |





| Group | Code | LCD Display | Set Value | Setting Range | Initial Value |
|-------|------|-----------------------|-----------|-------------------|------------------|
| WEB1 | 95 | TrqLimit BoostTime | 1.00 | 0.1-60.00 | 1.00 |
| | 96 | TrqLimit Boost | 150.00 | 100.00- 500.00 | 150.00 |

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Unit

sec

%

7.28.10.3 Initial Tension Boost

Initial Tension Boost Details

| Code and Functions | Description |
|-------------------------------|--|
| WEB1-95 TrqLimit BoostTime | Outputs the torque limit of the initial boost for the set time. This set value is only valid in the open-loop speed control mode. |
| WEB1-96 TrqLimit Boost | Increases the tension by the set value for the calculated final torque limit at the initial operation. This set value is only valid in the open-loop speed control mode. It allows fast tension response characteristics at the initial operation by increasing the initial tension. |

7.28.11 How to set parameters

7.28.11.1 How to activate WEB groups

To use the WEB functions, APP-45 (Tension Ctrl En) code value is set to 1 (Yes). When the WEB1 and WEB2 groups are activated, you can set the WEB related parameters. Using the vector control method is recommended. First, enter the parameter values and conduct auto tuning (BAS-20 Auto Tuning).

7.28.11.2 How to set parameters

You can determine the main speed of the inverter from the currently using applications' flux (mpm). The motor speed when the bobbin is in minimum diameter should be the main speed. Calculate the motor speed by using the formula below and set the value to the WEB1-12 (Main Spd Kpd Set). ⁵⁹ Calculate the number of poles using the set values in MOT1-25 (Number of Poles).

$$Motor speed [rpm] = \frac{Flux [mpm]}{\pi \cdot diameter [m]} \times belt ratio$$
Formula 15
$$Motor speed [Hz] = Motor speed [rpm] \times \frac{Pole number}{120}$$

Formula 16

Then, set the desired tension value in the application. The tension settings are in percent (%), meaning the ratio to the system's maximum tension. When there is a tension sensor, the force meant by the percent (%) value may vary depending on the tension sensor settings.

For example, the output of the tension sensor is 5 kg or 5 N, which is 5 V for output voltage, the inverter recognizes the value as 50% when receiving it by the analog input⁶⁰.

Then, enter the bobbin's diameter. Measure the maximum diameter and consider the measurement to be 100%. Then, measure the minimum and current diameters and calculate them with the formula below to set the values for WEB1-61 (Min Diameter) and WEB1-52 (Bobbin1 Diameter).

 $Minimum \ diameter [\%] = \frac{Minimum \ diameter \ [m]}{Maximum \ diameter \ [m]} \times 100\%$ $Formula \ 17$ $Current \ diameter [\%] = \frac{Current \ diameter \ [m]}{Maximum \ diameter \ [m]} \times 100\%$ $Formula \ 18$

⁵⁹ When WEB1-11 (Main Spd Source) is set to 0 (Keypad)

⁶⁰ Input range: 0-10V(0-100%)

Finally, select No. 70 (WebCtrl Fwd Run) or 71 (WebCtrl Rev Run) to Define codes of DI1-DI8 of the terminal input group (DIN) to send the operation command.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|----------------|-----------|--------------------|------------------|--------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DIx Define | 70 | WebCtrl Fwd Run | | 1, 2, 4, 5, 10, | |
| | | (DIx: DI1-DI8) | 71 | WebCtrl Rev Run | - | 11, 12, 9 | - |

7.29 System Stop (Quick Stop)

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The function stops to set the deceleration time through multifunction inputs during an emergency.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------------|-----------|---------------|------------------|---------------------------------|------|
| APP | 46 | Q Stop Dec T | 5.00 | | 0.00~6000.00 | 5.00 | sec |
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 69 | Quick Stop | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

During normal operation, if a multifunction input terminal set to 69 (Quick Stop) is activated, the motor will decelerate and stop according to the deceleration time set in APP-46 (Q Stop Dec T). The deceleration time in such a case is the Delta Frequency mode (select 1 (Delta Frequency) at BAS-76 (Ramp Time Mode).



7.30 No Restart after a Free-Run Stop

It prevents trips by prohibiting the restart command when restarting after a free-run stop due to free-run stop during an operation or a trip. When this function is in use, the restart command is prohibited for a fixed time as defined in the inverter according to its capacity or start setting.

An Example of Normal Operation

It runs a normal operation when there is an operation command after the prohibition time of a free-run stop after a free-run stop or a trip.





An Example of an Operation during a free-run Stop and Restart Prohibition

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A prevent Cmd trip occurs when there is an operation command during a free-run stop and restart prohibition after a free-run stop or a trip.



[Image 89. An Example of an Operation during Restart Prohibition after a free-run/Trip]

An Example of a Restart after Reset (Reset Restart) during a free-run Stop and Restart Prohibition

When you run speed search restart after free-run stop or a trip, speed search starts after a free-run stop and the restart prohibition time. A longer time between PRT-07 (Retry Delay) and a free-run stop and restart prohibition apply for the start time for speed search restart.



[Image 90. An Example of a Restart after a CoastStop(FreeRun)/Trip]

7.31 Timer Settings

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Use a timer function of the multifunction input terminal to control the On/Off for a relay and multifunction output according to the timer settings.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|---------------------|-------------------|-----------------|------------------|---------------------------------|------|
| DIN | 01, 03, 05, 07, 09, 11, 13, 15 | DI1~DI8 Define | 32 Timer Input | | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |
| | 25, 28, 31, 34, 37, 40, 43, 46 | DI1~DI8 On Delay | | 0 | 0~100000 | 0 | msec |
| | 26, 29, 32, 35, 38, 41, 44, 47 | DI1~D8 Off Delay | 0 | | 0~100000 | 0 | msec |
| | 50, 52, 54 | DO1~DO3 Define | 23 | Timer Output | - | 24, 14, 0 | - |
| OUT | 60, 63, 66 | DO1~DO3 On Delay | 0 | | 0~100000 | 0 | msec |
| | 61, 64, 67 | DO1~D3 Off Delay | 0 | | 0~100000 | 0 | msec |

Advanced Functions

Timer Setting Details

| Code and Functions | Description |
|---|---|
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Choose one of the multifunction input terminals for the timer and set it to 32 (Timer Input). |
| OUT-50, 52, 54 DOx Define (DOx: DO1~DO3) | Set a multifunction output terminal or relay for the timer to 23 (Timer Output). |
| DIN-25, 28, 31, 34, 37, 40, 43, 46 DIx On Delay, DIN-26, 29, 32, 35, 38, 41, 44, 47 DIx Off Delay (DIx: DI1~DI8), OUT-60, 63, 66 DOx On Delay, OUT-61, 64, 67 DOx Off Delay (DOx: DO1~DO3) | When a signal input (On) is received by the terminal set as a timer (Timer Input), the timer output (Timer Output) activates once the time set in the DO1-DO3 On Delay code has passed. When the multifunction input terminal is turned off, the multifunction output or relay will turn off after the time set in the DI1-DI8 Off Delay + DO1-DO3 Off Delay code. |

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• DI1~DI8 On Delay + DO1~DO3 On Delay = A DI1~DI8 Off Delay + DO1~DO3 Off Delay = B



[Image 91. An Example of Timer Settings at Multifunction Terminal]

7.32 Droop Control

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When driving a single load with multiple motors, this can be used for load balancing control or to prevent saturation of the speed controller in vector control.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------------------|-----------------------|-----------|------------------|------------------|------|
| | 63 | Droop Percent | - | 0.0~100.0 | 0 | % |
| VEC1 | 64 | Droop Start Torque | 50.0 | 0.0~100.0 | 50.0 | % |
| | 65 | Droop FreqLfp Gain | 500 | 0~1000 | 500 | msec |
| | 66 | Droop Start Freq | 10.00 | 0.00~ 600.00 | 10.00 | Hz |
| | 67 ⁶¹ | Droop Start Spd | 300 | 0~36000 | 300 | rpm |

Droop control adjusts speed in the speed control mode based on the load conditions.





The droop control block in [Image 92] is as follows.

⁶¹ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).



[Image 93. Droop Control Block]

In **[Image 94]**, it shows the speed reference is reduced by the amount of the droop speed when the speed reference exceeds VEC1-66 (Droop Start Freq) or VEC1-67 (Droop Start Spd) and the load factor reaches 100%.



8 Functions of Terminal Block

8.1 Multifunction Digital Inputs

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8.1.1 Delay Time Settings for Multifunction Input Terminals

You can set the time constant of filters for the multifunction input terminals. It is used to improve the responsiveness of the input terminals.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|----------------------|-----------|------------------|------------------|------|
| DIN | 25, 28, 31, 34, 37, 40, 43, 46 | DI1~DI8 On Delay | 0 | 0~100000 | 0 | msec |
| DIN | 26, 29, 32, 35, 38, 41, 44, 47 | DI1~DI8 Off Delay | 0 | 0~100000 | 0 | msec |
| | Dlx | | | | | |





| Code and Functions | Description |
|---|---|
| DIN-25, 28, 31, 34, 37, 40, 43, 46 Dlx On Delay, DIN-26, 29, 32, 35, 38, 41, 44, 47 Dlx Off Delay (Dlx: DI1~D8) | Sets the DI1-DI8 On Delay and Off Delay values for each input terminal. It is not used when set to 0. When you change the set time while a function is working during the time set for the parameter, the time will be measured from the time of change again. For example, when you set the DI1-DI8 On Delay time as 50 seconds and change it to 70 seconds after 20 seconds, 70 seconds are measured from 20 seconds after. |

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Delay Time for Multifunction Input Terminal Setting Details

8.1.2 Contact Settings for Multifunction Input Terminals

You can set a type of contact for the multifunction input terminals.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|--------------|-----------|-----------------|------------------|------------------|------|
| ואוס | 27, 30, 33, 36, 39, 42, 45, 48 | DI1~D8 NC/NO | 0 | Normal Open | - 0~1 | 0 | - |
| DIN | | | 1 | Normal Close | | | |

Contact of Multifunction Input Terminal Setting Details

| Code and Functions | Description |
|------------------------------------|---|
| DIN-27, 30, 33, 36, 39, 42, 45, 48 | You can select a type of contact for an input |
| DIx NC/NO Sel | terminal and use it for contact A (Normal Open) and |
| (DIx: DI1~DI8) | contact B (Normal Close) |

8.1.3 Multifunction Input Identification

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You can check the status of the multifunction input terminals.

For example, when you select an input terminal as contact A (normal Open) and input at the relevant terminal, the status of the input terminal becomes On.

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|-------------|---------------|----|----------|------------------|------------------|------|
| DIN | 02, 04, 06, | DI1~D8 Status | 0 | Off | - 0~1 | - | |
| | 14, 16 | | 1 | On | | | - |

8.1.4 Multifunction Digital Input

| Code and Functions | ltem | | Functionality |
|---------------------------------------|------|-----------------|--|
| | 0 | None | Multifunction terminal input is not used. |
| | 1 | FX | Refer to 5.2.1.2 Terminal Block as a Command |
| | 2 | RX | Input Device (Assigning FX/RX Terminals) |
| | 3 | RST | Refer to 9.4.3 Trip Status Reset . |
| DIN-01, | 4 | BX | Refer to 9.2.7 Output Block by Multifunction <u>Terminal</u> . |
| 03, 05, 07, 09, 11, 13, 15 6 | 5 | External Trip-1 | |
| | 6 | External Trip-2 | Defer to 0.2.2 External Trip Signal |
| DIx Define | 7 | External Trip-3 | Refer to <u>9.2.2 External Trip Signat</u> . |
| (DIx: | 8 | External Trip-4 | |
| (610~110 | 9 | JOG | Refer to 7.2 Jog operation . |
| | 10 | Speed-L | |
| - | 11 | Speed-M | Refer to 5.1.2.4 Multistep Frequency |
| | 12 | Speed-H | Configuration. |
| | 13 | Speed-X | |

Function

| Code and Functions | | ltem | Functionality | | |
|--|----|-----------------------|--|--|--|
| | 14 | XEL-L | | | |
| | 15 | XEL-M | Refer to 5.3.1.3 Multi-stage Acc/Dec Time Setting with Multifunction Terminals. | | |
| | 16 | XEL-H | <u> </u> | | |
| | 17 | XEL-Stop | Refer to 5.3.2.2 Acc/Dec Stop Command Settings. | | |
| | 18 | Run Enable | Refer to 7.4 Safe Operation Mode. | | |
| | 19 | 3-Wire | Refer to 7.3 3-Wire Operation. | | |
| | 20 | 2nd Source | Refer to 7.19 Second Operation Mode Settings. | | |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx | 21 | Exchange | Refer to 7.17 Switching Operation to Commercial Power. | | |
| | 22 | Up | | | |
| | 23 | Down | Pofer to 5 1 1 7 Up Down Operation | | |
| | 24 | Up/Down Clear | Refer to <u>5.1.1.7 op-Down Operation</u> . | | |
| Define (DIx [.] | 25 | Up/Down Save | | | |
| DI1~DI8) | 26 | Cmd Frequency Hold | Refer to 5.1.2.2 Holding Operating Frequency. | | |
| | 27 | 2nd Motor | Refer to 7.16 Second Motor Operation. | | |
| | 28 | DC Injection | Refer to 7.24 DC Injection by Terminal Block. | | |
| | 29 | Spd/Trq Change | Refer to 6.6.3 Speed/Torque Switch. | | |
| | 30 | Reserved | - | | |
| | 31 | Reserved | - | | |
| | 32 | Timer Input | Refer to 7.31 Timer Settings . | | |
| | 33 | Reserved | - | | |
| | 34 | Disable Aux Ref | Refer to 7.1 Auxiliary Frequency Operation. | | |

| Code and Functions | | ltem | Functionality |
|--|------------------|---|--|
| | 35 | Forward JOG | Refer to 7.2.2 Jog Operation by Terminal Block |
| | 36 | Reverse JOG | 2-Forward / Reverse Jog. |
| | 37 | PPID Run Enable | Refer to 7.7.1 Basic PID Operation. |
| | 38 | PPID Open Loop | Refer to 7.7.4 PID Operation Switch (PID Openloop) |
| 39 P 40 PF 41 PI 42 P | 39 | PPID Ref Change | |
| | 40 | PPID Gain Change | Refer to 7.7.1 Basic PID Operation. |
| | 41 | PPID I-Term Clear | |
| | PPID Output Hold | Refer to 7.7.5 PID Output Hold Operation. | |
| | 43 | PPID Sleep ON | |
| DIN-01, 03, 05, 07, 09, 11, 13, 15 Dlx Define 46 | 44 | PPID Sleep Change | Refer to 7.7.2 PID Operation Sleep Mode . |
| | 45 | PPID Step Ref-L | |
| | 46 | PPID Step Ref-M | Refer to 7.7.1 Basic PID Operation. |
| (Dlx: DI1~DI8) | 47 | PPID Step Ref-H | |
| | 48 | Fire Mode Fwd | Defer to 7 11 Fire Mode |
| | 49 | Fire Mode Rev | Relef to <u>7.11 Fire Mode</u> . |
| | 50 | Pre Heat | Refer to 7.23 Motor Pre-Heating. |
| | 51 | EPID1 Run | |
| | 52 | EPID1 I-Term Clear | Defer to 7.9.4 Peeie EDID Operation |
| | 53 | EPID2 Run | Relef to <u>7.6.1 Basic EPID Operation</u> . |
| | 54 | EPID2 I-Term Clear | |
| | 55 | Brake Monitor Sel | Refer to 7.25 Brake Control. |
| | 56 | POS Home | Defer to 7.26.2.2 Herring Operation |
| - | 57 | POS Run Home | Refer to <u>1.20.3.2 noming Operation</u> . |

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Advanced Functions

| Code and Functions | | ltem | Functionality |
|---|---|--------------------|--|
| | 58 | POS HW Lmt L | Defer to 7.26.2 Trip Processing Plack |
| | 59 | POS HW Lmt H | Refer to <u>7.20.3 The Processing block</u> . |
| ľ | 60 | POS Pattern-L | |
| | 61 | POS Pattern-M | Refer to 7.26.2.2 Position Path Selection and |
| | 62 | POS Pattern-H | Speed Pattern Occurrence Block. |
| | 63 | POS Pattern-X | |
| | 64 | POS Run | Refer to 7.26.2.1 Overall Block Diagram. |
| | 65 | POS Run Pre-Posi | Refer to 7.26.2.2 Position Path Selection and |
| ľ | 66 | POS Run Relative | Speed Pattern Occurrence Block. |
| | 67 | Modbus Master En | Refer to 7.27.6.2 Simple-Master-Related Communication Parameter Settings. |
| DIN-01, 03.05 | 68 | UserSeqCtrl OnOff | - |
| 03, 03, 07, 09, 07, 09, 11, 13, 15 69 Quick Stop Dlx 70 WebCtrl Fwd Run | Refer to 7.29 System Stop (Quick Stop). | | |
| | 70 | WebCtrl Fwd Run | Poter to 7 28 11 How to set parameters |
| Define | 71 | WebCtrl Rev Run | Teler to <u>7.20.11 now to set parameters</u> . |
| (DIX: DI1~DI8) | 72 | Web Splice | Refer to 7.28.7.4 Splicing Function. |
| | 73 | WPID Gain Change | Refer to 7.28.5.2 Web PID Gain Calculation Part. |
| | 74 | Web Bobbin-L | |
| | 75 | Web Bobbin-H | Refer to 7.28.6.1 Bobbin Selection and Initializing Diameter Functions. |
| | 76 | Web Preset | |
| | 77 | Disable WPID | Defer to 7 29 5 4 Web DID Control Dout |
| | 78 | Web I-Term Clear | Relet to <u>7.20.5.1 Web FID Control Fart</u> . |
| | 79 | Diameter Calc Hold | Refer to 7.28.6.3 Stopping Diameter Calculation <u>Function</u> . |
| | 80 | Web Tns Up En | Pofer to 7 28 4 2 Tansian Poast/Down Eurotian |
| | 81 | Web Tns Down En | Teler to 1.20.4.2 Tension boost bown Function. |
| | 82 | Web Taper Disable | Refer to 7.28.4.1 Taper Function. |

8.2 Analog Input

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8.2.1 Analog Input Mode

You can use Unipolar Voltage/Bipolar Voltage/Current inputs according to analog input mode settings.

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|------------|--|----|---------------------|------------------|------------------|------|
| | | | 0 | Unipolar Voltage | | 0 | |
| | 01, 16, 31 | (Alx: A1~A3) | 1 | Bipolar Voltage | 0~2 | | - |
| | | | 2 | Current | | | |
| AIN | 02, 17, 32 | | | | -10.00~ | | V |
| | | Alx Value ¹ (Alx: A1~A3) | - | 10.00 | | | |
| | | | | - | 0.00~ | - | m / |
| | | | | | 20.00 | | ША |
| | 03, 18, 33 | Alx Monitor[%] (Alx: A1~A3) | | - | 0.00~ 100.00 | - | % |

To use current mode, turn on SW4 at the relevant input port.

¹ The unit changes depending on the mode selection: Voltage or current.

Analog Input Terminal Setting Details

| Code and Functions | Description | | | | | |
|---|--|--|--|--|--|--|
| | You can select and use the types of analog input terminals as follows: | | | | | |
| AIN-01, 16, 31 Alx Type Select (Alx: Al1~Al3) | Unipolar Voltage: Input voltage of 0-10 V | | | | | |
| | Al1,2,3 5G Umage 2 External | | | | | |
| | Power Source Connection] Power Source Connection] | | | | | |
| | Bipolar Voltage: input voltage of -10-10 V | | | | | |
| | VR+ | | | | | |
| | AI1,2,3 | | | | | |
| | VR- | | | | | |
| | [Image 4. External [Image 5. Internal Power Source Connection] Power Source Connection] | | | | | |
| | Current: Input current of 4-20 mA, select SW4 as I1-I3 current (in the direction of ON) to use the current mode. | | | | | |
| | AI1,2,3 5G | | | | | |
| | [Image 6. External Current Source Connection] | | | | | |
| AIN-02, 17, 32 Alx Value (Alx: Al1~Al3) | Check the size of the voltage (V) / current (mA) input at the AI1 terminal. (Displays the voltage if AI1-AI3 Type Select is not set to 2 [Current].) | | | | | |
| AIN-03, 18, 33 Alx Monitor[%] (Alx: Al1~Al3) | Displays the size of the voltage input at the AI1 terminal as a percentage (%). | | | | | |

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|--------------------|------|----------------------------------|-----------|--------------------|------------------|------|
| | 05 | | 0.00 | 0.00-011 + x2 lp | 0.00 | V |
| | 05 | | 0.00 | 0.00~ATT + X2 III | 4.00 | mA |
| | 06 | AI1 + y1 Percent | -10.00 | -100.00~100.00 | 0.00 | % |
| | 07 | $\Lambda 11 \pm \sqrt{2} \ln 10$ | -100.00 | Al1 + x1 In~10.00 | 10.00 | V |
| | 07 | AH + X2 III | 0.00 | Al1 + x1 In~20.00 | 20.00 | mA |
| | 08 | Al1 + y2 Percent | 0.00 | -100.00~100.00 | 100.0 | % |
| | 09 | Al1 - x1 ln | 10.00 | Al1 - x2 In~0.00 | 0.00 | V |
| | 10 | Al1 - y1 Percent | 20.00 | -100.00~100.00 | 0.00 | % |
| | 11 | Al1 - x2 In | 100.00 | -10.00~Al1 - x1 In | -10.00 | V |
| | 12 | Al1 - y2 Percent | 0.00 | -100.00~100.00 | -100.00 | % |
| | 20 | Al2 + x1 ln | 0.00 | 0.00-012 + x2 lp | 0.00 | V |
| AIN 2 ⁻ | 20 | | 0.00 | 0.00~AIZ + XZ III | 4.00 | mA |
| | 21 | Al2 + y1 Percent | -10.00 | -100.00~100.00 | 0.00 | % |
| | 22 | Al2 + x2 ln | -100.00 | Al2 + x1 In~10.00 | 10.00 | V |
| | 22 | | 0.00 | Al2 + x1 In~20.00 | 20.00 | mA |
| | 23 | Al2 + y2 Percent | 0.00 | -100.00~100.00 | 100.00 | % |
| | 24 | Al2 - x1 In | 10.00 | Al2 - x2 In~0.00 | 0.00 | V |
| | 25 | Al2 - y1 Percent | 20.00 | -100.00~100.00 | 0.00 | % |
| | 26 | Al2 - x2 In | 100.00 | -10.00~Al2 - x1 In | -10.00 | V |
| | 27 | Al2 - y2 Percent | 0.00 | -100.00~100.00 | -100.00 | % |
| | 25 | | 0.00 | | 0.00 | V |
| | 35 | AI3 + X I III | 0.00 | 0.00~AI3 + X2 III | 4.00 | mA |
| | 36 | Al3 + y1 Percent | -10.00 | -100.00~100.00 | 0.00 | % |
| | 27 | | -100.00 | Al3 + x1 In~10.00 | 10.00 | V |
| | 51 | AI3 + X2 III | 0.00 | Al3 + x1 In~20.00 | 20.00 | mA |
| | 38 | Al3 + y2 Percent | 0.00 | -100.00~100.00 | 100.00 | % |
| | 39 | Al3 - x1 ln | 10.00 | Al3 - x2 In~0.00 | 0.00 | V |
| AIN | 40 | Al3 - y1 Percent | 20.00 | -100.00~100.00 | 0.00 | % |
| | 41 | Al3 - x2 In | 100.00 | -10.00~Al3 - x1 In | -10.00 | V |
| | 42 | Al3 - y2 Percent | 0.00 | -100.00~100.00 | -100.00 | % |

8.2.2 The Scale of Analog Input

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* The gray-shaded area is shown when the type of analog input terminal is bipolar voltage (select 1 [Bipolar Voltage] at AIN-01, 16, and 31 [AI1-AI3 Type Select]).

| The S | ize of | Analog | Input | Setting | Details |
|-------|--------|--------|-------|---------|----------------|
|-------|--------|--------|-------|---------|----------------|

| Code and Functions | Description | | |
|--|--|-------------------|------------------------------------|
| | These parameters are used to configure the gradient level and offset the values of the output frequency, based on the size of the input voltage. When the voltage value is smaller than the setting values of AIN-05, 20, and 35, the setting values of AIN-06, 21, and 36 will be applied to more than 0 V. When it is bigger than the setting values of AIN-07, 22, and 37, the setting values of AIN-08, 23, and 38 will be applied to less than 10 V. | | |
| AIN-05, 20, 35 Alx + x1 In, AIN-06, 21, 36 Alx+ y1 Percent, AIN-07, 22, 37 Alx + x2 In, AIN-08, 23, 38 Alx + y2 Percent (Alx: AI1~AI3) | 100.00% Al1~Al3+y2 Percent | | — Analog Input Percentage (%) |
| | Al1~Al3+y1 Percent | Al1~Al3 +x1 ln | → Voltage AI1~AI3 10V +x2 In |
| | [Image 7. The Size of Analog Input Based on Analog Voltage Input - | | |






Advanced Functions



8.2.3 Quantization

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------------|-----------------------|--------------|--------------------------|------------------|------|
| AIN | 13, 28, 43 | AI1~AI3 Quantizing | 0.04 | 0.00 ² ~10.00 | 0.04 | % |

² Quantization is disabled if set to 0.

Quantization Setting Details

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| Code and Functions | Description |
|--|--|
| AIN-13, 28, 43 Alx Quantizing (Alx: Al1~Al3) | Sets values for quantization. The inverter outputs the frequency by measuring (quantizing) the height (value) of the input signal at a consistent interval when quantization values are set. This means that the delicate control on the output frequency (power resolution) is low, but the noise is reduced, so it is suitable for systems that are sensitive to noise. The setting values for quantization is a percentage of the maximum analog input. Therefore, if the value is set to 1% when the maximum analog input is 10 V at the maximum frequency of 60 Hz, the output frequency will change by 0.6 Hz at 0.1 V intervals. To reduce the effect of the input signal changes (runout of height) on the operation frequency, the output frequency during increase or decrease of input signal value (height) is applied differently. When the input signal value increases, the output frequency will start to change if the height becomes equivalent to 3/4 of the quantization value. From then on, the output frequency will increase according to the quantization value. On the contrary, when the input signal decreases, the output frequency will start decreasing if the height becomes equivalent to 1/4 of the quantization value. Although the noise can be reduced using a low-pass filter (AIN-04, 19, and 34), the responsiveness on the input signal takes longer as the set value gets higher. Since it becomes difficult to control the frequency if the input signal is delayed, a long cycle of pulsation level / 4 (Quantization Level / 2 (Q |

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8.2.4 Filter

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------------|---------------------|--------------|-----------------------|------------------|------|
| AIN | 04, 19, 34 | AI1~AI3 LPF Gain | 10 | 0 ³ ~10000 | 10 | msec |

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Filter-Setting Details

| Code and Functions | Description |
|--------------------------------|--|
| | Sets time constant for the low-pass filter. Use this when the change in frequency settings is too big from too much noise. When used, it filters the analog signal to pass only the clean input signals. The higher the time constant of a filter, the lower the variation in frequency. However, this slows down the time and affects the responsiveness. The setting value, or time constant (time) indicates the time required for the frequency to reach 63% of the set frequency inside the inverter when there is a step input of voltage from an external power source. ♠ |
| | Step Input |
| | 95% |
| AIN-04, 19, 34 Alx LPF Gain | |
| Aix LPF Gain (Aix: Al1~Al3) | 63.2% |
| | Time Constant |
| | Time Constant X 3 |
| | [Image 15. An Example of Operation Based on Time Constant Settings for Low-Pass Filter] |

³ A low-pass filter is not used when set to 0.

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8.3 Multifunction Digital Output

8.3.1 Multifunction Output Terminal Settings

Multifunction output terminal and relay settings

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|-------------------|------------------------------|----|----------|------------------|------------------|------|
| | | | 0 | None | | | |
| OUT | 50, 52, 54 | DO1~DO3 Define | 14 | Run | 0~45 | 24, 14, 0 | - |
| | | Donno | 24 | Trip | | | |
| VIRT | 50, 52, 54, 56 | Virtual DO1~DO4 Define | 0 | None | 0~45 | 0 | - |

- DO1 Define: Selects items that control outputs at A1, C1, and B1 terminals dedicated to relay 1.
- DO2 Define: Selects items that control outputs at A2 and C2 terminals dedicated to relay 2.
- DO3 Define: Selects items that control outputs at Q3 and EG terminals dedicated to open collector output.
- Refer to 2.2.4 Step 4 Control Terminal Wiring for terminal block names.

FDT Detection Settings

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| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|--------------|---------------------------------|------------------|------|
| | 75 | FDT Frequency | 30.00 | 0.00~Max Frequency ⁴ | 30.00 | Hz |
| OUT | 76 | FDT Frequency Band | 10.00 | 0.00~Max Frequency ⁴ | 10.00 | Hz |
| | 77 | FDT Speed | 900 | 0~Maximum Speed ⁵ | 900 | rpm |
| | 78 | FDT Speed Band | 300 | 0~Maximum Speed ⁵ | 300 | rpm |

- ⁴ DRV-20(Max Frequency)
- ⁵ DRV-21(Maximum Speed)

Advanced Functions

Torque Detection Settings

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|--------|-----------------------|------------------------|--------------|---------------|------------------|------|
| OUT | 80 | Torque Detect Level | 100.0 | 0.0~150.0 | 100.0 | % |
| OUT 81 | Torque Detect Band | 50.0 | 0.0~100.0 | 50.0 | % | |

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Multifunction Output Terminal and Relay Settings Details

| Code and Functions | Description | | | |
|--|-------------|------------------|---|--|
| | Sets | terminal items f | or relay 1, 2, and open collector output. | |
| | ltem | | Functionality | |
| | 0 | None | Outputs according to set values at OUT 70, 71, and 72. | |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52 ,54, 56 Virtual DOx Define (DOx: DO1~DO4) | 1 | FDT-1 | Detects inverter output frequency reaching the user set frequency. Outputs signal when the conditions below are satisfied. • Absolute value (set frequency - output frequency) < detected frequency band / 2 FDT-1 operation with the detected frequency band of 10 Hz is as follows: 40Hz 20Hz 40Hz 40Hz 20Hz 40Hz 35Hz frequency DOx Operation Command (Fx) [Image 16. An Example of Torque Detection - 1] | |

| Code and Functions | Description | | |
|--|-------------|-------|--|
| | | ltem | Functionality |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52, 54, 56 Virtual DOx Define (DOx: DO1~DO4) | 2 | FDT-2 | Outputs a signal when the user-set frequency and detected frequency (OUT-75 FDT Frequency) are equal, and fulfills no. 1 above, FDT-1 conditions at the same time. • [Absolute value (set frequency - detected frequency) < detected frequency band / 2] & [FDT-1] FDT-2 output is as follows when the detected frequency band is 10 Hz and the detected frequency is 30 Hz. <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>50Hz</u> <u>100x</u> <u>00x</u> <u>00x</u> 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 100x 10 |
| | 3 | FDT-3 | Outputs signal when the operation frequency below meets the conditions. • Absolute value (output frequency - operating frequency) < detected frequency band / 2 FDT-3 output is as follows when the detected frequency band is 10 Hz and the detected frequency is 30 Hz: <u>30Hz</u> <u>30Hz</u> <u>35Hz</u> <u>25Hz</u> <u>25Hz</u> <u>00x</u> <u>0peration</u> <u>Command (Fx)</u> [Image 18. An Example of Torque Detection - 3] |

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| Code and Functions | Description | | | | |
|---|-------------|-----------------------|---|--|--|
| | | ltem | Functionality | | |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52 ,54, | 4 | FDT-4 | Output signal can be separately set for acceleration and deceleration conditions. • In acceleration: Operating frequency ≥ detected frequency • In deceleration: Operating frequency > (detected frequency - detected frequency band / 2) FDT-4 output is as follows when the detected frequency band is 10 Hz and the detected frequency is 30 Hz: | | |
| (DOx: DO1~DO4) | 5 | Over Load Warn | Outputs a signal when there is a motor overload warning | | |
| , | 6 | Drv Over Load Warn | Outputs a signal when there is a Drive Over Load warning as an inverse time characteristics protection due to an inverter overload. | | |
| | 7 | Under Load Warn | Outputs a signal when there is a warning for motor light loading. | | |
| | 8 | MainFan Warn | Outputs a signal when there is a fan fault warning. | | |
| | 9 | Stall | Outputs a signal when a motor is overloaded and stalled. | | |
| | 10 | Over Voltage Trip | Outputs a signal when the inverter DC link voltage rises above the protective operating voltage. | | |
| | 11 | Low Voltage | Outputs a signal when the inverter DC link voltage drops below the level of low voltage protection. | | |
| | 12 | Drv Over Heat Trip | Outputs signal when the inverter overheats. | | |

| Code and Functions | Description | | | |
|---|-------------|-----------------------|--|--|
| | | ltem | Functionality | |
| | 13 | Lost Int Comm Warn | Outputs a signal when there is a warning for RS-485 communication command loss at the terminal block. | |
| | 14 | Run | Outputs a signal when an operation command is entered and the inverter outputs voltage. No signal output during DC braking. | |
| | 15 | Stop | Outputs a signal at operation command off, and when there is no inverter output voltage. | |
| | 16 | Steady | Outputs a signal while operating at a constant speed. | |
| | 17 | Drive Output Line | Outputs a signal while the motor is driven by the inverter line. It outputs a signal when the multifunction input terminal (DI1-DI8 Define) with the 21 (Exchange) setting turns off. | |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52 ,54, | 18 | Supply Power Line | Outputs a signal during switching operation to commercial power. It outputs a signal when the multifunction input terminal (DI1-DI8 Define) with the 21 (Exchange) setting turns on. | |
| 56 Virtual DOx Define | 19 | Speed Search | Outputs a signal during inverter speed search operation. | |
| (DOx: DO1~DO4) | 20 | Ready | Outputs a signal when the inverter is normally operating while being on standby for external operation commands. | |
| | 21 | Zero Speed Detect | Used to detect a motor rotational speed of 0 rpm while operating with the vector setting for the control mode. There may be errors when turning on/off due to noise from encoder signals or the time constant of filters since the relay operates based on the rotation count (encoder signal) of the motor. | |
| | 22 | Torque Detect | Works when the torque generated while operating with the control mode is set as sensorless or vector is within the level set at OUT-80 (Torque Detect Level) and OUT-81 (Torque Detect Band). | |
| | 23 | Timer Output | This is a feature to activate the contact output after a certain period of time using the multifunction terminal block. Refer to 7.31 Timer Settings for details. | |

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| Code and Functions | Description | | | | |
|---|-------------|-----------------------|---|--|--|
| | | Item | Functionality | | |
| | 24 | Trip | Outputs a signal after a fault trip. | | |
| | 25 | Lost Keypad Warn | Outputs a signal when there is a warning for Smart Operator command loss. | | |
| | 26 | | Outputs a signal when there is a warning for braking resistance utilization. | | |
| | | | Configuration for details. | | |
| | 27 | Encoder Tune Warn | Outputs a signal when auto-tuning with no encoder card. | | |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52 ,54, 56 Virtual DOx | 28 | Encoder Dir Warn | Outputs a warning signal by detecting the wrong settings of the rotational direction for the motor by the encoder. It outputs a signal by sending out contact output when auto-tuning, while the encoder card is installed, but with incorrect wiring. | | |
| (DOx: DO1~DO4) | 31 | Run with Zero Spd | Outputs a signal when operation command is entered and the inverter outputs voltage. It outputs a signal during DC braking as well. | | |
| | 32 | STO Monitor | Outputs a signal when the connection of one or more signals for safety A and B (SA and SB) terminals connected to SP are turned off. | | |
| | 33 | Rst Restart F Trip | Outputs a signal when there is a Reset Restart Fail trip from PRT-06 (Retry Number) reducing to 0. Refer to <u>5.2.3.3 Reset and Restart after A</u> <u>Trip (Reset Restart)</u> for details. | | |
| | 34 | Lost USB Warn | Outputs a signal when there is a warning for USB command loss. | | |
| | 35 | KEB Operating | Outputs a signal during KEB operation. | | |

| Code and Functions | Description | | | | |
|---|--|-----------------------|---|--|--|
| | | ltem | Functionality | | |
| | 36 | Lost Al-1 Warn | Outputs a signal when there is an input loss warning for the AI1 terminal (analog input terminal) at the control terminal block. | | |
| | 37 | Lost Al-2 Warn | Outputs a signal when there is an input loss warning for the AI2 terminal (analog input terminal) at the control terminal block. | | |
| | 38 | Lost Al-3 Warn | Outputs a signal when there is an input loss warning for the AI3 terminal (analog input terminal) at the control terminal block. | | |
| OUT-50, 52, 54 DOx Define, VIRT-50, 52 ,54, 56 Virtual DOx | 39 | E24V EPI Monitor | Outputs the connection status of external 24 V power. | | |
| | 40 | Main Cap Repl Warn | Outputs a signal when there is a warning for main capacitor replacement. | | |
| Define (DOx: | 41 MainFan Repl Warn | | Outputs a signal when there is a warning for main fan replacement. | | |
| DO1~DO4) | 42 | AuxFan Repl Warn | Outputs a signal when there is a warning for auxiliary fan replacement. | | |
| | 43 | MainCap Diag Alarm | Outputs a signal when there is a warning to check the life of the main capacitor. | | |
| | 44 | Pos Tar Bound Err | Occurs when the difference between the target position and actual position is bigger than the setting values of PC1-37 (Tar Bound Pulse) after performing position control. | | |
| | 45 | Pos Max Track Err | Occurs when the difference between the reference pulse and position feedback pulse is bigger than the setting value of PC1-36 (Max Track Pulse). | | |
| OUT-51, 53, 55 DOx Status (DOx: 1~3) | Shows the on/off status of the multifunction output. | | | | |

8.3.2 Delay Time Settings for Digital Output Terminals

You can set time constant of filters for the digital output terminals. It is used to improve the responsiveness of the output terminals.

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| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------------|----------------------|--------------|---------------|------------------|------|
| OUT | 60, 63, 66 | DO1~DO3 On Delay | 5 | 0~100000 | 0 | msec |
| 001 | 61, 64, 67 | DO1~DO3 Off Delay | 5 | 0~100000 | 0 | msec |

On/Off Delay for Digital Output Terminal Setting Details

| Code and Functions | Description |
|-----------------------|---|
| OUT-60, 63, 66 | |
| DO1~DO3 On | |
| Delay | You can set on/off delay values for output terminals, respectively. |
| OUT-61, 64, 67 | It is not used when set to 0. |
| DO1~DO3 Off | |
| Delay | |

8.3.3 Contact Settings for Digital Output Terminals

You can set the contact type for digital output terminals.

| Group | Code | Code LCD Display Set Value | | Setting Range | Initial Value | Unit | |
|-------|------------|----------------------------|---|------------------|------------------|------|---|
| OUT | 62, 65, 68 | DO1~DO3 NC/NO | 0 | Normal Open | 0-1 | 0 | - |
| | | | 1 | Normal Close | - 0~1 | | |

Contact of Multifunction Input Terminal Setting Details

| Code and Functions | Description |
|--|--|
| OUT-62, 65, 68 DOx NC/NO (DOx: DO1~DO3) | You can select a type of contact for output terminals and use it for contact A (Normal Open) and contact B (Normal Close). |
| | |

8.3.4 Digital Output Identification

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You can check the status of the digital output terminals. For example, when you select an output terminal as contact A (Normal Open), the relevant terminal turns on when there is an output.

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|------------|-------------------|----|----------|------------------|------------------|------|
| | 51 53 55 | DO1~DO3 | 0 | Off | 0~1 | | |
| 001 | 51, 55, 55 | Status | 1 | On | 0~1 | - | - |
| | 51 53 55 | Virtual | 0 | Off | | | |
| VIRT | 57 | DO1~DO4 Status | 1 | On | 0~1 | - | - |

8.3.5 Multifunction Digital Output

| Code and Functions | | ltem | Functionality | | | | |
|--------------------------|----|--------------------|--|--|--|--|--|
| | 0 | None | Do not use a digital output for the multifunction terminals. | | | | |
| | 1 | FDT-1 | | | | | |
| | 2 | FDT-2 | | | | | |
| | 3 | FDT-3 | | | | | |
| OUT-50, 52, 54 DOx | 4 | FDT-4 | | | | | |
| | 5 | Over Load Warn | | | | | |
| | 6 | Drv Over Load Warn | Refer to 8.3.1 Multifunction Output Terminal | | | | |
| Define | 7 | Under Load Warn | | | | | |
| (DOX. DO1~ | 8 | MainFan Warn | <u>Settings</u> . | | | | |
| DO3) | 9 | Stall | | | | | |
| | 10 | Over Voltage Trip | | | | | |
| | 11 | Low Voltage | | | | | |
| - | 12 | Drv Over Heat Trip | | | | | |
| | 13 | Lost Int Comm Warn | | | | | |
| | 14 | Run | | | | | |

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| Code and Functions | ltem | | Functionality | | | | |
|------------------------------------|------|-----------------------|--|--|--|--|--|
| | 15 | Stop | | | | | |
| | 16 | Steady | | | | | |
| | 17 | Drive Output Line | | | | | |
| | 18 | Supply Power Line | | | | | |
| | 19 | Speed Search | | | | | |
| | 20 | Ready | | | | | |
| | 21 | Zero Speed Detect | | | | | |
| | 22 | Torque Detect | | | | | |
| | 23 | Timer Output | | | | | |
| | 24 | Trip | | | | | |
| | 25 | Lost Keypad Warn | | | | | |
| OUT-50, 52, 54 DOx Define | 26 | DB Warn %ED | | | | | |
| | 27 | Encoder Tune Warn | | | | | |
| | 28 | Encoder Dir Warn | Refer to 8.3.1 Multifunction Output Terminal | | | | |
| (DOx: | 29 | On/Off Control | <u>Settings</u> . | | | | |
| DO1~ DO3) | 30 | Brake Control | | | | | |
| | 31 | Run with Zero Spd | | | | | |
| | 32 | STO Monitor | | | | | |
| | 33 | Rst Restart F Trip | | | | | |
| | 34 | Lost USB Warn | | | | | |
| | 35 | KEB Operating | | | | | |
| | 36 | Lost Al-1 Warn | | | | | |
| | 37 | Lost Al-2 Warn | | | | | |
| | 38 | Lost Al-3 Warn | | | | | |
| | 39 | E24V Monitor | | | | | |
| | 40 | Main Cap Repl Warn | | | | | |
| | 41 | MainFan Repl Warn | | | | | |

| Code and Functions | | ltem | Functionality |
|--|----|----------------------|--|
| | 42 | AuxFan Repl Warn | |
| OUT-50, | 43 | MainCap Diag Alarm | |
| 52, 54 DOx | 44 | Pos Tar Bound Err | |
| DOx Define (DOx: DO1~ DO3) | 45 | 15 Pos Max Track Err | Refer to 8.3.1 Multifunction Output Terminal Settings |
| | 46 | OCS Run | <u> </u> |
| | 47 | FWD Run | |
| | 48 | REV Run | |

8.3.6 Direct Control over Multifunction Output

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You can control the digital output terminals directly. Set OUT-50, 52, and 54 (DO1-DO3 Define) to 0 (None) to directly operate multifunction output terminals according to OUT-70, 71, and 72 (DO1-DO3 Constant).

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|-------------------|------------------------------|-----------|------|------------------|------------------|------|
| 0.17 | 50, 52, 54 | DO1~DO3 Define | 0 | None | 0~48 | 24 | - |
| OUT | 70 71 70 | DO1~DO3 | 0 | Off | 0.1 | 0 | - |
| | 70,71,72 | Constant | 1 | On | 0~1 | | |
| VIRT | 50, 52, 54, 56 | Virtual DO1~DO4 Define | 0 | None | 0~48 | 0 | - |
| | 58, 59, 60, | Virtual | 0 | Off | 0.4 | 0 | |
| | 61 | DO1~DO4 Const | 1 | On | 0~1 | | - |

8.4 Pulse Input

8.4.1 Pulse Input Scale

Wire the pulse input terminal as follows and input the pulse frequency in between 0.00-32.00 kHz for use:



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[Image 20. Connecting External Pulse Train]

Related Parameters

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|----------------------------|------|------------------|--------------|------------------|------------------|------|
| | 45 | PTI Monitor[kHz] | - | 0.00~32.00 | - | kHz |
| 44 AIN 42 50 5 | 46 | PTI Monitor[%] | - | -100.00~100.00 | - | % |
| | 48 | PTI +x1 ln | 0.00 | 0.00~PTI +x2 In | 0.00 | kHz |
| | 49 | PTI +y1 Percent | 0.00 | -100.00~100.00 | 0.00 | % |
| | 50 | PTI +x2 ln | 0.00 | PTI +x1 In~32.00 | 0.00 | kHz |
| | 51 | PTI +y2 Percent | 100.00 | -100.00~100.00 | 100.00 | % |

Setting Details

| Code and Functions | Description |
|----------------------------|---|
| AIN-45 PTI Monitor[kHz] | Checks frequency of the pulse input at the PTI terminal. |
| AIN-46 PTI Monitor[%] | Displays frequency of the pulse input at the PTI terminal in a percentage. |
| | (Displays percentage of the final pulse input to which all of filter, scale, and quantization are applied.) |



8.4.2 Pulse Input Filter

Related Parameters

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|---------------------------|--------------|---------------|------------------|------|
| AIN | 47 | PTI LPF Gain ⁶ | 10 | 10~10000 | 10 | msec |

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Setting Details

| Code and Functions | Description |
|------------------------|--|
| AIN-47 PTI LPF Gain | It is the same as <u>8.2.4 Filter</u> . |

8.4.3 Pulse Input Quantization

Related Parameters

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|----------------|--------------|--------------------------|------------------|------|
| AIN | 52 | PTI Quantizing | 0.04 | 0.04 ⁷ ~10.00 | 0.04 | % |

Setting Details

| Code and Functions | Description |
|----------------------------|---|
| AIN-52 Pulse Quantizing | It is the same as 8.2.3 Quantization . |

- ⁶ The time constant of the filter less than that is meaningless, as pulse input detection is performed every 100 ms.
- ⁷ Quantization is disabled if set to 0.

8.5 Analog Output

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AO1 and AO2 terminals of the control terminal block provide output of -10 V -10 V voltage or 4–20 mA current.

Select SW2 and SW3 as VO1 and VO2 for voltage output and select them as IO1 and IO2 for the current output.

8.5.1 Analog Output of Voltage and Current

You can select output items and adjust the size of the output or change output type (voltage/current) by switching the direction of the SW2 and SW3 switches.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|------|--------------------------------|-----------|---------------------|------------------|------------------|------|
| | | 1017 | 0 | Unipolar Voltage | | | |
| | 02 | AO1 Type Select | 1 | Bipolar Voltage | 0~2 | 0 | - |
| | | | 2 | Current | | | |
| | 01 | AO1 Define | 0 | Frequency | 0~15 | 0 | - |
| | 03 | AO1 Gain | | 100.00 | -1000.00~1000.00 | 100.00 | % |
| | 04 | AO1 Bias | 0.00 | | -100.00~100.00 | 0.00 | % |
| | 05 | AO1 LPF Gain | 5 | | 0~10000 | 5 | msec |
| OUT 06 | 06 | AO1 Constant % ⁸ | 0.00 | | -100.00~100.00 | 0.00 | % |
| | 07 | AO1 Monitor | | - | -100.00~100.00 | - | % |
| | 11 | | 0 | Unipolar Voltage | | | |
| | | AO2 Type Select | 1 | Bipolar Voltage | 0~2 | 0 | - |
| | | | 2 | Current | | | |
| | 10 | AO2 Define | 0 | Frequency | 0~15 | 0 | - |
| | 12 | AO2 Gain | | 100.00 | -1000.00~1000.00 | 100.00 | % |
| | 13 | AO2 Bias | 0.00 | | -100.00~100.00 | 0.00 | % |

⁸ Set OUT-01 and 10 (A01, A02 Define) to 15 (Constant) to apply OUT-06 and 15 (O1, AO2 Constant %) values.

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| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-------------------------------|-----------|----------------|------------------|------|
| | 14 | AO2 LPF Gain | 5 | 0~10000 | 5 | msec |
| OUT | 15 | AO2 Constant% ⁸ | 0.00 | -100.00~100.00 | 0.00 | % |
| _ | 16 | AO2 Monitor | - | -100.00~100.00 | - | % |

8.5.2 Setting Details of Analog Output of Voltage and Current

| Code and Functions | Description |
|-----------------------|--|
| OUT-02, 11 AOx | Select 0 (Unipolar Voltage) and 0-+10 V of voltage is output. |
| Type Select | Select 1 (Bipolar Voltage) and -10-+10 V of voltage is output. |
| (AOx: | Select 2 (Current) and 4-20 mA of current is output. |
| AO1~AO2) | Select IO1 and IO2 for SW2 and SW3 when selecting 2 (Current). |

| Code and Functions | Description | | | | | | |
|-----------------------------------|--|---------------------|--|--|--|--|--|
| | Sets terminal items for relay 1, 2, and open collector output. | | | | | | |
| | Co | nfiguration | Description | Max (100% Output) Reference Value | | | |
| | 0 | Frequency | Outputs the operating frequency | The frequency set at DRV-20 (Max Frequency) | | | |
| | 1 | Output Current | Outputs the inverter sensing current | 200% of rated current of the inverter | | | |
| | | | | Voltage set at MOT1 and MOT2-27 (Rated Voltage) | | | |
| | 2 | Output Voltage | Inverter output voltage | 200 V220 V (when the rated voltage of the motor is set to 0) | | | |
| | | | | 400 V440 V (when the rated voltage of the motor is set to 0) | | | |
| | 3 | | | Overvoltage trip (OVT) voltage | | | |
| OUT-01, 10 AOx Define (AOx: | | DC Link Voltage | Inverter DC link voltage | 200 V Type 410V Inverter | | | |
| AO1~AO2) | | | | 400 V Type 820V Inverter | | | |
| | 4 | Torque | Inverter output torque | 250% of rated torque | | | |
| | 5 | Output Power | Inverter output power | 200% of the rated output power | | | |
| | 6 | Target Frequency | Set frequency output | The frequency set at DRV-20 (Max Frequency) | | | |
| | 7 | Ramp Frequency | The frequency that went through acceleration and deceleration functions (There may be difference with the actual output frequency.) | The frequency set at DRV-20 (Max Frequency) | | | |
| | 8 | Speed Feedback | Speed information input via encoder option card | The frequency set at DRV-20 (Max Frequency) | | | |

| Code and Functions | Description | | | | |
|--|--|---------------------------|---|--|--|
| | Co | nfiguration | Description | Max (100% Output) Reference Value | |
| | 9 Speed Deviation | | Deviation between speed reference (command) and rotational speed of the motor input via an encoder option card | Twice the rated slip | |
| | 10 | PPID Reference | Command value of the PID controller | 1.5 times the 100% of controller command | |
| | 11 | PPID Feedback | Feedback value of the PID controller | 1.5 times the 100% of controller feedback | |
| OUT-01, 10 AOx Define | 12 | PPID Output | Output value of the PID controller | 100% of the controller output | |
| (AOx: AO1~AO2) | 13 | EPID1 Output | Output value of the EPID1 controller | 100% of the controller output | |
| | 14 | EPID2 Output | Output value of the EPID2 controller | 100% of the controller output | |
| | 15 | Constant | Values set at OUT- 06 AO1 Constant % and OUT-15 AO2 Constant % | 100% | |
| | 16 | Web MainSpeed | Main speed (%) value during winder/ unwinder operation | 100% of the controller output | |
| | 17 | Web MainSpeed +WPID | Final speed value during winder/ unwinder operation | 100% of the controller output | |
| OUT-03, 12 AOx Gain (AOx: AO1~AO2) OUT-04, 13 AOx Bias (AOx: AO1~AO2) | +WPIDunwinder operationoutputAdjusts output value and offset.It is calculated by adding a bias value to the ratio of the current value based on the maximum value multiplied by the gain value.Analog Output Value[%] $Analog Output 1 and 2$ Maximum Values of Analog Output 1 and 2For example, if OUT-01 or OUT-10 is set to 0 (Frequency), the value calculated by the following formula will be displayed: $AO1, 2$ Monitor [%] $=$ $Current Frequency(DRV-20 Max Frequency)X Gain Value + Bias Value$ | | | | |

| Code and Functions | | Description | | | | |
|--|---|---------------------------------------|--|-------------------------------------|--|--|
| | In the following image, Y-axis represents analog output voltage (0–10 V) whereas X-axis represents the percentage (%) value of the output item. For instance, where the maximum frequency is 60 Hz with a current frequency of 30 Hz, the X-axis is 50%. | | | | | |
| | | | OUT-02 4 | A01 Gain | | |
| | | _ | 100% (Factory Default) | 80.0% | | |
| OUT-03, 12 AOx Gain (AOx: AO1~AO2) OUT-04, 13 AOx Bias (AOx: AO1~AO2) | OUT- 03 AO1 Bias | 0.0% (Factory Default) 20.0% | 10V 8V 5V 0% 50% 80% 100% | 8V 6.4V 4V 0% 50% 80% 100% | | |
| OUT-05, 14 AOx LPF Gain (AOx: AO1~AO2) | Sets the Refer to | e time con AIN-04, ´ | stant of filters on an analog 19, 34 (AI1-3 LPF Gain) in <u>{</u> | ı output. 3.2.4 Filter | | |
| OUT-06, 15 AOx Constant % (AOx: AO1~AO2) | If codes 1 and 2 of an analog output (OUT-01 AO1 Define and OUT- 10 AO2 Define) are set to 15 (Constant), the analog voltage according to the set values at these parameters (0–100%) will be output. | | | | | |
| OUT-07, 16 AOx Monitor (AOx: AO1~AO2) | Monitors based o | s analog o n the may | output values. It is displayed kimum output voltage (10 V | d in a percentage (%)). | | |

8.6 Pulse Output

POT terminal of the control terminal block can output a pulse of 0-32.00 kHz.

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8.6.1 Pulse Output Settings

You can select output items and adjust the size of the output.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|-------------------|-----------|-----------|--|------------------|------|
| OUT | 20 | PTO Define | 0 | Frequency | It is the same as OUT-01 (AO1 Define) and OUT- 10 (AO2 Define) items of <u>8.5.2</u> <u>Setting Details of</u> <u>Analog Output</u> <u>of Voltage and</u> <u>Current</u> . | 0 | - |
| | 21 | PTO Gain | 0.00 | | -100.00~100.00 | 0.00 | % |
| | 22 | PTO Bias 0.00 | | 0.00 | -100.00~100.00 | 0.00 | % |
| | 23 | PTO LPF Gain | 5 | | 0~10000 | 5 | msec |
| | 24 | PTO Constant % | | 0.00 | 0.00~100.00 | 0.00 | % |
| | 25 | PTO Monitor | | - | 0.00~100.00 | - | % |

8.6.2 Pulse Output Setting Details

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| Code and Functions | Description |
|---|--|
| OUT-20 PTO Define | It is the same as OUT-01 (AO1 Define) and OUT-10 (AO2 Define) items of 8.5.2 Setting Details of Analog Output of Voltage and <u>Current</u>. |
| OUT-21 PTO Gain, OUT-22 PTO Bias | It is the same as the OUT-03 (AO1 Gain), OUT-12 (AO2 Gain), OUT- 04 (AO1 Bias), and OUT-13 (AO2 Bias) items of 8.5.2 Setting Details of Analog Output of Voltage and Current. |
| OUT-23 PTO LPF Gain | Sets the time constant of a low-pass filter for the pulse output. Refer to AIN-04, 19, 34 (AI1-3 LPF Gain) in <u>8.2.4 Filter</u> . |
| OUT-24 Constant % | It is the same as the OUT-06 (AO1 Constant %) and OUT-15 (AO2 Constant %) items of <u>8.5.2 Setting Details of Analog Output of</u> <u>Voltage and Current</u> . |
| OUT-25 PTO Monitor | It is the same as the OUT-07 (AO1 Monitor) and OUT-16 (AO2 Monitor) items of 8.5.2 Setting Details of Analog Output of Voltage and Current . |

9 Learning Protection Functions

This chapter describes the protection functions provided by the S300 series. Protection functions are categorized into two types: Protection from overheating and damage to the motor, and protection of the inverter itself and protection against inverter malfunction.

9.1 Motor Protection

9.1.1 Electronic Thermal (ETH) Prevention

ETH is a protective function that uses the output current of the inverter without a separate temperature sensor, to predict a rise in motor temperature to protect the motor based on its heat characteristics.

| Group | Code | LCD Display | S | Set Value | Setting Range | Initial Value | Unit |
|---------------|------|------------------|-----|-----------|---------------|------------------|------|
| | 75 | ETH Enable | 0 | None | 0~2 | 0 | - |
| MOT1, MOT2 | 76 | Motor Cooling | 0 | Self-Cool | 0~1 | 0 | - |
| | 77 | ETH Cont Current | | 120 | 50~150 | 120 | % |
| | 78 | ETH 1min Current | 150 | | 120~200 | 150 | % |

Electronic Thermal (ETH) Prevention Function Setting Details

| Code and Functions | | | Description | | | |
|-----------------------|---|------------------------|--|--|--|--|
| | It is possible to select how the inverter operates when an electronic thermal (ETH) prevention trip occurs. In the Smart Operator, it will be displayed as E-Thermal . | | | | | |
| | ltem | | Functionality | | | |
| MOT1. MOT2-75 | 0 | None | The ETH function is not activated. | | | |
| ETH Enable | 1 | CoastStop (FreeRun) | In the event of an electronic thermal (ETH) prevention trip, the inverter output will be blocked and the motor will enter a free run due to inertia. | | | |
| | 2 Dec | Dec | If a fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-01 Trip Dec Time will be applied. | | | |



| Code and Functions | Description | | | | | |
|--------------------------------------|---|--|--|--|--|--|
| | Sets the amount of current with the ETH function activated. The range below details the set values that can be used during continuous operation without the protection function. | | | | | |
| | Current (%) | | | | | |
| MOT1, MOT2-77 ETH Cont Current | MOT1, MOT2 -78 MOT1,MOT2 -77 60 Motor Overheat Prevention Trip Duration [Image 2. The trip time according to the current size of electronic thermal (ETH) prevention] | | | | | |
| MOT1, MOT2-78 ETH 1min Current | Inputs the amount of input current that can be continuously supplied to the motor for 1 minute, based on the motor-rated current (MOT1, MOT2-26 Rated Current). | | | | | |

9.1.2 Overload Early Warning and Trip

Based on the rated current of the motor, it generates a warning signal or handles a trip when an overload is supplied to the motor. The amount of current for warnings and trips can be set separately.

| Group | Code | LCD Display | S | et Value | Setting Range | Initial Value | Unit |
|-------|------------|---------------------------------|------|------------------------|------------------|------------------|------|
| | 35 | OL Warn Select | 1 | Yes | - | 0 | - |
| | 36 | OL Warn Level | 150 | | 30~200 | 150 | % |
| | 37 | OL Warn Time | 10.0 | | 0.0~600.0 | 10 | sec |
| PRT | 38 | OL Trip Select | 1 | CoastStop (FreeRun) | 0~2 | 1 | - |
| | 39 | OL Trip Level | 180 | | 30~200 | 180 | % |
| | 40 | OL Trip Time | 60.0 | | 0~60.0 | 60.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 5 | Over Load Warn | 5, 24 | 24 | - |
| | | 001 003) | 24 | Trip | | | |

Overload Early Warning and Trip Setting Details

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| Code and Functions | | | Description | | | | |
|--|---|--|---|--|--|--|--|
| PRT-35 OL Warn Select | If the multi If 1 (opera | f the overload reaches the warning level, the terminal block nultifunction output terminals will be used to output a warning signal. f 1 (Yes) is selected, it will operate. If 0 (No) is selected, it will not operate. | | | | | |
| | Whe value overl outpo to 5 (block | When the current supplied to the motor is greater than the preset value at the overload warning level (PRT-36) and exceeds the overload warning time (PRT-37), an overload warning signal will be output to the multifunction output terminal block. The multifunction output terminal block will output a signal when OUT-50, 52, 54 is set to 5 (Over Load Warn). At this time, the inverter output will not be blocked. | | | | | |
| PRT-36 OL Warn Level, PRT-37 OL Warn Time | | Output current Dlx (Over Load Warn) | | | | | |
| | [Image 3. Example of an overload warning signal output] | | | | | | |
| | Selects how the inverter operates in the event of an overload fault trip. | | | | | | |
| | | ltem | Functionality | | | | |
| | 0 | None | No protective action is taken. | | | | |
| PRT-38 OL Trip Select | 1 | CoastStop (FreeRun) | In the event of an overload fault trip, inverter output will be blocked and the motor will enter a free run due to inertia. | | | | |
| | 2 | Trip Dec Time Stop | If a fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) is applied. | | | | |
| PRT-39 OL Trip Level, PRT-40 OL Trip Time | Whe value trip ti acco dece | When the current supplied to the motor is greater than the preset value at the overload trip level (OL Trip) and exceeds the overload trip time (OL Trip Time), the inverter output will either be blocked according to the preset value from PRT-38 or slow to a stop after deceleration. | | | | | |

Note

Overload warnings warn of an overload before an overload fault trip occurs. The overload warning signal may not work in an overload fault trip situation, if the overload warning level (OL Warn Level) and the overload warning time (OL Warn Time) are set higher than the overload trip level (OL Trip Level) and overload trip time (OL Trip Time).

9.1.3 Underload Fault Trip and Warning

It is a feature that detects a motor underload. If this feature is operated, a trip and warning will occur if the motor load falls below the set under load level.

| Group | Code | LCD Display | Se | et Value | Setting Range | Initial Value | Unit |
|-------|------------|---------------------------------|------|------------------------|------------------|------------------|------|
| DRV | 25 | Load Duty Select | 1 | Normal Duty | 0~1 | 1 | - |
| | 45 | UL Warn Select | 1 | Yes | 0~1 | 0 | - |
| | 46 | UL Warn Time | 10.0 | | 0.0~600.0 | 10.0 | sec |
| PRT | 47 | UL Trip Select 1 | | CoastStop (FreeRun) | 0~2 | 0 | - |
| | 48 | UL Trip Time | 30.0 | | 0.0~600.0 | 30.0 | sec |
| | 49 | UL LF Level | 30 | | 10~30 | 30 | % |
| | 50 | UL BF Level | 30 | | 10~30 | 30 | % |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 7 | Under Load Warn | 0~39 | 24, 14, 10 | - |

Underload Trip and Warning Setting Details

| Code and Functions | Description |
|--------------------------|--|
| PRT-45 UL Warn Select | Sets the operation of the underload warning. When the warning operation selection is set to 1 (Yes) and the code for the multifunction output terminals of OUT-50, 52, and 54 is set to 7 (Under Load Warn), a signal will be output in the underload warning condition. |

| Code and Functions | Description | | | | | | |
|--|--|--|--|--|--|--|--|
| | Sele | ct how the invert | er operates in the event of an underload fault trip. | | | | |
| | | ltem | Functionality | | | | |
| | 0 | None | No protective action is taken. | | | | |
| PRT-47 UL Trip Select | 1 | CoastStop (FreeRun) | In the event of an underload fault trip, the inverter output will be blocked and the motor will enter a free run due to inertia. | | | | |
| | 2 | Trip Dec Time Stop | If an underload fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) will be applied. | | | | |
| PRT-46 UL Warn Time PRT-48 UL Trip Time | Sets prote trip c warn lowe | Sets the underload warning and fault trip occurrence time. The protection function operates when the under load warning and fault trip occurrence conditions are maintained during the underload warning time or underload trip time under the underload upper and lower limit levels described below. | | | | | |
| | [Who Duty • Pf | en the preset va /)] RT-49 (underload | alue of DRV-25 (Load Duty Select) is 1 (Heavy | | | | |
| | In PRT-50 (underload upper limit level), the underload rate is set based on the motor rated current (MOT1, MOT2-26 Rated Current). | | | | | | |
| PRT-49 UL LF Level, PRT-50 UL BF Level | Underload Maximum Level % | | | | | | |
| | Rated Slip X 2 Base frequency [Image 4. The underload trip occurrence area according to frequency (load class: Heavy load)] | | | | | | |

| Code and Functions | Description |
|---|--|
| PRT-49 UL LF Level, PRT-50 UL BF Level | [When the preset value of DRV-25 (Load Duty Select) is 0 (Normal Duty)] In PRT-49 (underload lower limit level), the underload rate is set at the frequency twice the rated slip of the motor. However, the rated slip of the motor is calculated from base frequency (MOT1, MOT2-23 Base Frequency), motor rated speed (MOT1, MOT2-24 Rated Speed), and number of poles (MOT1, MOT2-25 Number of Poles) in the inverter's internal S/W. In PRT-50 (underload upper limit level), the underload rate is set at the base frequency (MOT1, MOT2-23 Base Frequency). The upper and lower limit levels are based on the motor rated current (MOT1, MOT2-26 Rated Current). Underload Maximum Level % Underload Minimum Level % Underload trip occurrence area according to frequency (load class: Underload)] |

Note

Underload fault trip and warning functions do not operate during energy saving operation (ADV-50 Energy Save Mode).

9.1.4 Stall Prevention

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The stall prevention function is a protective function that prevents motor stalling caused by overloads. If this function is used, the inverter output frequency will be adjusted automatically according to the load size. When a stall is caused by an overload, high currents are induced in the motor and may cause motor overheating or damage to the motor and interrupt the operation of the motor-driven devices.

| Group | Code | LCD Display | Set | Value | Setting Range | Initial Value | Unit |
|----------|---------------|---------------------------------|-------|-------|--|------------------|------|
| | 76 | Stall Prevent Acc | 1 | Yes | 0~1 | 0 | - |
| | 77 | Stall Prevent Dec | 1 | Yes | 0~1 | 0 | - |
| VF1, VF2 | 78 | Stall Prevent Std | 1 | Yes | 0~1 | 0 | - |
| | 79 | Stall Frequency-1 | 60.00 | | Start frequency-Stall Frequency-2 | 15.00 | Hz |
| | 80 | Stall Speed-1 | 1 | 800 | Start speed-Stall Speed-2 | 1800 | rpm |
| | 81 | Stall Level-1 | | 80 | 30~250 | 180 | % |
| | 82 | Stall Frequency-2 | 60.00 | | Stall Frequency1~Stall Frequency-3 | 30.00 | Hz |
| | 83 | Stall Speed-2 | 1800 | | Stall Speed-1~Stall Speed-3 | 1800 | rpm |
| | 84 | Stall Level-2 | | 80 | 30~250 | 180 | % |
| | 85 | Stall Frequency-3 | 6 | 0.00 | Stall Frequency- 2~Stall Frequency-4 | 45.00 | Hz |
| | 86 | Stall Speed-3 | 1800 | | Stall Speed-2~Stall Speed-4 | 1800 | rpm |
| | 87 | Stall Level-3 | - | 80 | 30~250 | 180 | % |
| | 88 | Stall Frequency-4 | 6 | 0.00 | Stall Frequency- 3~Max Frequency ¹ | 60.00 | Hz |
| | 89 | Stall Speed-4 | 1 | 800 | Stall Speed- 4~Maximum Speed ² | 1800 | rpm |
| | 90 | Stall Level-4 | | 80 | 30~250 | 180 | % |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 9 | Stall | 0~39 | 24 | - |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

¹ DRV-20(Max Frequency)

² DRV-21(Maximum Speed)

Protection Function:

Stall Prevention Setting Details

| Code and Functions | Description | | | | | |
|---|--|--|--|--|--|--|
| VF1, VF2-76 Stall Prevent Acc | The output frequency will be adjusted and accelerated within the set stall level range if the magnitude of the inverter output current exceeds the set stall level (VF1, VF2-81, 84, 87, 90) during acceleration. If current level stays above the stall level, the motor will decelerate to the start frequency (VF1, VF2-15). If the output current level decreases below the preset level while operating the stall prevention function, the motor will terminate the stall prevention function and resume acceleration. | | | | | |
| VF1, VF2-77 Stall Prevent Dec | The inverter will decelerate and keep the DC link voltage below a certain level to prevent an overvoltage fault trip during deceleration. The stall prevention function is terminated when the DC link voltage falls within the normal range, and deceleration is performed according to the set slope. The actual deceleration time may be longer than the set deceleration time depending on the load. | | | | | |
| VF1, VF2-78 Stall Prevent Std | Similar to the stall protection function during acceleration, the output frequency will decelerate when the current level exceeds the preset stall level while operating at constant speed. As the load current decreases and falls below the set level, it will accelerate again below the set acceleration slope and the stall prevention function will be terminated when the target frequency is reached. | | | | | |
| VF1, VF2- 79 Stall Frequency-1~ VF1, VF2 90 Stall Level-4 | Stall protection levels can be configured for different frequencies, based on the load type. In addition, as shown in the illustration below, the stall level can be set above the base frequency. Lower and upper limits are set in accordance with stall frequency numbers. For example, in the setting range of Stall Frequency 2 (VF1, VF2-82), stall frequency 1 (VF1, VF2-79 Stall Frequency-1) will become the lower limit, and stall frequency 3 (VF1, VF2-85 Stall Frequency-3) will become the upper limit. Stall level 1 Stall level 2 Stall level 3 Stall level 4 Stall level 4 Stall level 4 Stall stall level 4 Stall stall stall frequency 2 Stall stall level 4 Stall stall stall frequency 3 I Image 6. Stall prevention level by frequency band] | | | | | |
| | [Image 6. Stall prevention level by frequency band] | | | | | |

Note

- To obtain the shortest and most optimal deceleration performance by avoiding an overvoltage trip in a load with large inertia but short deceleration time, set BAS-85 (Flux Brake Enable) to 1 (Yes) with stall prevention during deceleration. Do not use this function when frequent deceleration of the load is required, as the motor can overheat and may be damaged easily.
- The stall level is the percentage (%) of the motor rated current (MOT1, MOT2-26 Rated Current).
- During DC operation (DC Start, DC Brake, etc.), KEB operation or speed search operation, the stall prevention function will not operate during acceleration or while operating at a constant speed.

Note

To resolve the problem if operation is impossible while the stall prevention function is operating, follow these steps.

- By adjusting the amount of manual torque boost to a small amount or by using the auto torque boost feature, reduce the initial operating current.
- Set the stall prevention operating reference current level to a high value (VF1, VF2-81 Stall Level-1). Set the value considering the motor's current capacity. It is possible for the motor to be damaged by fire if the setting is too high.

① Caution

Use caution when decelerating while using stall protection, as depending on the load, the actual deceleration time can take longer than the set deceleration time.

9.1.5 Flux Braking

Flux braking is used to gain the optimum deceleration time without the braking resistance. If the deceleration time is too short, an overvoltage trip may occur due to regeneration energy generated from the motor. When using flux braking, braking can be performed with the optimal deceleration time without an overvoltage trip because regenerative energy is controlled to be consumed by the motor.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|----------------------|-----------|-----|---------------|------------------|------|
| BAS | 95 | Flux Brake Enable | 1 | Yes | 0~1 | | - |

Note

Flux braking may be less effective if the input voltage (DRV-30 Ref AC Input Volt) is high.

① Caution

- Flux braking will operate simultaneously only during deceleration. Do not use this function when frequent deceleration of the load is required, as the motor can overheat and may be damaged easily.
- When installing the braking unit, motor vibration may occur depending on the amount of regenerative energy generated by the flux braking operation. In this case, disable the flux braking.

9.1.6 Electronic Thermal (ETH) Prevention through Motor Overheat Sensor

Connect the electronic thermal temperature sensor attached to the motor to the analog input terminal of the inverter terminal block so that the protection function can be activated in the event of motor overheating.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|------------------------|-----------|------------------------|------------------|------------------|------|
| PRT | 60 | Thermal-T Mode | 1 | CoastStop (FreeRun) | 1~4 | 0 | - |
| | 61 | Thermal-T Source | 3 | Analog Input 3 | 0~7 | 3 | - |
| | 62 | Thermal-T Level | 50.0 | | 0.0~100.0 | 58.0 | % |
| | 63 | Thermal-T Area | 1 | Over Level | 0~1 | 1 | - |
| DIN | 27, 30, 33, 36, 39, 42, 45, 48 | DI1~D8 NC/NO | 1 | Normal Close | 0~1 | 0 | - |
| OUT | 01, 10 | AO1~AO2 Define | 15 | Constant | 0~15 | 0 | - |
| | 02, 11 | AO1~AO2 Type Select | 2 | Current | 0~2 | 0 | - |
| | 06, 15 | AO1~AO2 Constant % | 100.00 | | 0.00~100.00 | 0.00 | % |
| Motor | Overheat | Sensor | Input | Setting | Details |
|-------|-----------------|--------|-------|---------|---------|
|-------|-----------------|--------|-------|---------|---------|

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| Code and Functions | | | Description |
|-------------------------------|-----------------|---------------------------------------|--|
| | Sets | the inverter ope | ration status when the motor is overheated. |
| | | ltem | Functionality |
| | 0 | None | No protective action is taken. |
| | 1 | CoastStop (FreeRun) | In the event of an electronic thermal (ETH) fault trip, the inverter output will be blocked and the motor will enter a free run due to inertia. |
| PRT-60 Thermal-T Mode | 2 | Trip Dec Stop | If an electronic thermal (ETH) fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) will be applied. |
| | 3 | Warning | Motor Over Heat warning message will be displayed on the Smart Operator. It does not affect inverter operation. In the event of lost Smart Operator communication, it will operate at the frequency set in PRT-14 (Lost Preset Freq). |
| | 4 | Lost Preset | If the motor overheats, it will operate at the frequency set in PRT-14 Lost Preset Freq. |
| | Seleo to the | cts the terminal e analog input te | type when connecting the motor overheat sensor erminal of the inverter terminal block. |
| | | ltem | Functionality |
| | 0 | None | The motor overheat sensor connection is not used. |
| PRT-61 Thermal-T Source | 1 | Analog Input 1 | Sets the motor overheat sensor connection to the Al1 terminal (analog input terminal) of the control terminal block. |
| | 2 | Analog Input 2 | Sets the motor overheat sensor connection to the Al2 terminal (analog input terminal) of the control terminal block. |
| | 3 | Analog Input 3 | Sets the motor overheat sensor connection to the Al3 terminal (analog input terminal) of the control terminal block. |
| PRT-62 Thermal-T Level | Sets | the motor overh | eat detection sensor trip level. |

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| Code and Functions | | Description | | | | | |
|--|------------------------|---|--|--|--|--|--|
| | ltem | | Functionality | | | | |
| PRT-63 Thermal-T Area | 0 | Under Level | Operates when the motor overheat sensor input is less than PRT-62. | | | | |
| memai-i Area | 1 | Over Level | Operates when the motor overheat sensor input is greater than PRT-62. | | | | |
| OUT-01, 10 AOx Define, OUT-02, 11 AOx Type Select, OUT-06, 15 AOx Constant % (AOx: AO1, AO2) | They via tł term | r are used to sup ne analog output nal. | oply constant current to the temperature sensor t terminal and to receive it via the analog input | | | | |

When using a temperature sensor such as PTC by connecting it to the analog input terminal

The PTC sensor can be connected in two ways: a 2-wire connection or a 3-wire connection.

• 2-wire connection: Set PRT-61 (Thermal-T Source) to 3 (Analog Input 3). Select the switch (SW4) as V3, and set the PTC selection switch to the PTC state.



 3-wire connection: Set PRT-61 (Thermal-T Source) to 3 (Analog Input 3). Select the switch (SW4) as V3, and set the PTC selection switch to the Off state. Select the switch (SW2) as IO1. When using the analog output (AO1) terminal to supply a constant current to the temperature sensor and receive the sensor through the analog input (AI3) terminal, wire as follows.

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PTC Sensor

[Image 8. PTC sensor 3-wire connection method]

9.2 Inverter and Sequence Protection

9.2.1 Input/output open-phase protection

Open-phase protection is used to prevent overcurrent levels induced at the inverter inputs due to an open-phase within the input power supply. Furthermore, if there is a open-phase between the motor and the inverter output, there might be motor stall due to a lack of torque. The output open-phase protection function is used to prevent this from occurring.

9.2.1.1 Input Open-phase Protection

| Group | Code | LCD Display | | Value | Setting Range | Initial Value | Unit |
|-------|------|-------------------|--|-------|---------------|------------------|------|
| PRT | 10 | In Phase Open Chk | | Yes | 0~1 | 0 | - |
| | 11 | IPO Voltage Band | | 20 | 1~100 | 20 | V |

Input Open-phase Check Setting Details

| Code and Functions | Description |
|-----------------------------|--|
| PRT- 11 IPO Voltage Band | It is the reference voltage to check the input open-phase. |

Note

- The input open-phase can be checked only when a load of 50% or more of the inverter rated current is input.
- Use caution when setting the input open-phase detection voltage band (PRT-11 IPO Voltage Band) too small, since the open-phase may be checked even if there is no actual input open-phase.
- Use caution when setting the input open-phase detection voltage band (PRT-11 IPO Voltage Band) too big, since the open-phase cannot be checked even if there is an actual input open-phase.

9.2.1.2 Output Open-phase Protection

In the event of an open-phase in the connection between the motor and the inverter output, there may be motor stall due to a lack of torque. In the event of one or more open-phases of U, V, or W of the inverter output terminal block, the inverter will detect the output open-phase, cut off the output, and display a trip.

| Group | Code | LCD Display | Set | Set Value Setting Range | | Initial Value | Unit |
|-------|------|--------------------|-----|-------------------------|-----|------------------|------|
| PRT | 12 | Out Phase Open Chk | 1 | Yes | 0~1 | 0 | - |

Note

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- The output open-phase will not be detected in the case of trip status, initial excitation, flux build-up, speed search operation, and motor parameter tuning mode.
- The output open-phase is not detected when the inverter is stopped.
- Each phase for which the output open-phase is checked will display the output openphase trip message (OutputPhase U Open, OutputPhase V Open, OutputPhase W Open).
- In case of output open-phase of 2 or more phases, No Motor Trip will be displayed.

9.2.2 External Trip Signal

If the DI1-DI8 Define codes of the terminal block input group (DIN) are set to 5-8 (External Trip-1 to External Trip-4, external trip), it is possible to stop the inverter operation by using an external signal.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------------------|--------------------------------|-----------|-----------------|------------------|---------------------|------|
| | | | 5 | External Trip-1 | | | |
| | 01, 03, 05, | DIx Define | 6 | External Trip-2 | | 1, 2, 4, | |
| DIN | 13, 15 | (DIX. DI1~DI8) | 7 | External Trip-3 | - | 5, 10, 11, 12, 9 | - |
| | | | 8 | External Trip-4 | | | |
| | 27, 30, 33, 36, 39, 42, 45, 48 | DIx NC/NO (DIx: DI1~DI8) | 0 | Normal Open | 0~1 | 0 | - |
| PRT | 78, 79, 80, 81 | Ext-Trip x Mode (x: 1~4) | 0 | Latch | 0~1 | 0 | - |

External Trip Signal Setting Details

| Code and Functions | | | Description | | |
|-----------------------|---|-------------------|--|--|--|
| | Sele | cts the type of m | nultifunction input contact. | | |
| 35, 39, 42, 45, 48 | | ltem | Functionality | | |
| DIx NC/NO | 0 | Normal Open | Operates as an A contact (Normal Open). | | |
| (DIx: DI1~DI8) | 1 | Normal Close | Operates as a B contact (Normal Close). | | |
| | You can select the trip attributes for each external trip signal. | | | | |
| | Item | | Functionality | | |
| PRT-78~81 | 0 | Latch | Even if the external trip signal is cleared, the inverter will remain in a trip state. You must perform a reset through the terminal block or Smart Operator to clear the trip. | | |
| | 1 | Level | The trip will be cleared immediately when the external trip signal is cleared. | | |

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[Image 9. Example of External Trip Signal Settings]

9.2.3 Inverter Overload Protection

When the inverter input current exceeds the rated current, a protective function is activated to prevent damages to the inverter based on inverse proportional characteristics.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|---------------------|-----------|-----------------------|------------------|------------------|------|
| DRV | 25 | Load Duty Select | 1 | Heavy Duty | 0~1 | 1 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: | 6 | Drv Over Load Warn | 6, 24 | 24, 14, 0 | - |
| | | DO1~DO3) | 24 | Trip | | | |

Inverter Overload Protection Setting Details

| Code and Functions | | | Description |
|--|------------------------------|---|---|
| | Sele | ct the load level. | |
| | | ltem | Functionality |
| DRV-25 Load Duty | 0 | Normal Duty | VT (Variable Torque) load settings for loads such as fans and pumps (overload capacity: based on VT rated current) 3 |
| Select | 1 | Heavy Duty | CT (Constant Torque) load settings for loads such as hoists, cranes, and parking facilities (overload capacity: CT rated current 150%, 1 minute) |
| OUT-50, 52, 54 DOx Define (DOx:DO1~DO3 | Whe termi Whe (Trip | n 60% of the oven nal block output n an overload tri) will turn on. | erload trip standard load amount is reached, the t set to 6 (Drive Over Load Warn) will turn on. ip occurs, the terminal block output set to 24 |

Note

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A warning signal output can be provided in advance by the multifunction relay terminal before the inverter overload protection function (IOLT) operates. When 60% (150%, 36 sec) of the accumulated time that the inverter overload protection operation (150%, 1 min) occurs, a warning signal output will be provided

 ³ 200V: 45 kW or less 120%, 1 minute / 55 kW or more 110%, 1 minute 400V: 75 kW or less 120%, 1 minute / 90 kW or more 110%, 1 minute

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Note

When DRV-25 (Load Duty Select) is set, the initial value of DRV-27 Carrier Frequency is changed in accordance with the inverter's capacity.

 Table 1. Initial value of carrier frequency for each load

| | Configuration | Initial value of carrier frequency | | | | |
|---|---------------|------------------------------------|---------------|------|--|--|
| 0 | Normal Duty | 200V 400V | Full capacity | 2kHz | | |
| | | 200V | 0.4~45kW | 5kHz | | |
| 1 | | | 55~75kW | 4kHz | | |
| 1 | | 400V | 0.4~75kW | 5kHz | | |
| | | | 90~220kW | 3kHz | | |

9.2.4 Using external 24V power (External 24V)

If the inverter input power is blocked, it can be used as backup power for the control unit by immediately supplying power to the control board through the terminal block (EPI, 5G). In this case, only limited functions are available, such as setting parameters through the Smart Operator operation and communicating with the upper-level controller. If PRT-89 (Ext 24V Pwr Lost) is set to 1 (Yes), a trip will be displayed when an external 24V power supply is not available.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|---------------------|-----------|-----|------------------|------------------|------|
| DDT | 89 | Ext 24V Pwr Lost | 0 | No | 0.1 | 0 | - |
| PRI | | | 1 | Yes | 0~1 | | |

External 24V Power Setting Details

| Code and Functions | Description |
|----------------------------|---|
| PRT-89 Ext 24V Pwr Lost | Selects whether a Lost External 24V trip will occur if the external 24V power supply is disconnected. In the event that the external 24V power supply is connected while the Lost External 24V trip has occurred, pressing the (stop/reset) key will cancel the trip. |

() Caution

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• Definition of inverter operation state when external 24V power is supplied (when PRT-89 [Ext 24V Pwr Lost] is set as 1 [Yes])

| Table 2. | Inverter o | peration | items | when | using | an exte | ernal 2 | 4V p | ower a | supp | ly |
|----------|------------|-----------------|-------|------|-------|---------|---------|-------|--------|------|----|
| | | p 0 1 0 1 0 1 1 | | | | | | · · r | | | ·J |

| Disabled items | Enabled items |
|---|--|
| Inverter operation is unavailable (When the Smart Operator inputs an operation command, the frequency will be maintained at 0 Hz). | Enabled communication options |
| The Lost Sensor, Low Voltage, STO Feedback A/B, and ADC Offset trips will be disabled and the corresponding trips will not occur. | Smart Operator enabled (parameter configuration available) |
| All digital/analog terminal block input/output functions will not operate. | Control board status LED enabled |
| Power-related functions will not operate. (cannot control cooling fan and cannot detect trip, cannot control magnetic contactor [MC], cannot communicate between control boards, cannot recognize temperature sensor [NTC], cannot recognize capacity, cannot detect fuse trip) | - |

• External 24V power supply specifications: 21.6 VDC~26.4 VDC, 500 mA

9.2.5 Loss of Input Value by Inverter Unit

You can select the inverter operating method when the input value is lost due to disconnection of the signal line of the analog input of the terminal block, internal communication, communication option, USB or Smart Operator.

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| Group | Code | LCD Display | ę | Set Value | Setting Range | Initial Value | Unit | |
|-------|---------------|---------------------------------|-------|------------------------|--|------------------|------|----|
| PRT | 14 | Lost Preset Freq | 60.00 | | Lost Preset 60.00 0.00~Max Frequency 4 0 | | 0.00 | Hz |
| | 15 | Lost Preset Speed | 15 | | 0~Maximum Speed ⁵ | 0 | rpm | |
| | 16 | Lost Keypad Mode | 1 | CoastStop (FreeRun) | 0~4 | 0 | - | |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 25 | Lost Keypad Warn | 25 | 24, 14, 0 | - | |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Lost Smart Operator Communication Setting Details

| Code and Functions | Description |
|----------------------------|---|
| PRT-14 Lost Preset Freq | In situations where the operation of the lost Smart Operator communication (PRT-16 Lost Keypad Mode) is set to 4 (Lost Preset), the protection function will operate and set the frequency to continue operation. |

- ⁴ DRV-20(Max Frequency)
- ⁵ DRV-21(Maximum Speed)

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| Code and Functions | | Description | | | | | |
|-------------------------------|--|-------------|--|--|--|--|--|
| | Selects how the inverter operates when Smart Operator communication is lost. | | | | | | |
| | | ltem | Functionality | | | | |
| | 0 | None | The protection function for lost Smart Operator communication will not operate. | | | | |
| PRT-16 Lost Keypad Mode | 1 CoastStop (FreeRun) | | In the event of lost Smart Operator communication, the inverter output is blocked and the motor will enter a free run due to inertia. | | | | |
| | 2 Trip Dec Stop | | The motor will decelerate and then stop when Smart Operator communication is lost. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) is applied. | | | | |
| | 3 | Warning | When the DO1-DO3 Define code of the output terminal block group (OUT-50, 52, 54) is set to 25 (Lost Keypad Warn), the corresponding warning signal will be output to the multifunction output terminal block when Smart Operator communication is lost. | | | | |
| | 4 | Lost Preset | In the event of lost Smart Operator communication, it will operate at the frequency set at PRT-14. | | | | |

Note

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In the event of a communication error between the Smart Operator and the inverter control board lasting for more than two seconds, it will be considered lost, and it will be operated according to the method set out in PRT-16 (Lost Keypad Mode).

- If the set value of PRT-16 (Lost Keypad Mode) is 1 (CoastStop(FreeRun)) or 2 (Trip Dec Stop), it will operate as a level trip.
- If the set value of PRT-16 (Lost Keypad Mode) is 3 (Warning) or 2 (Lost Preset), it will operate as a warning.

| Group | Code | LCD Display | S | et Value | Setting Range | Initial Value | Unit |
|-------|---------------|----------------------------------|-------|--------------------------|------------------------------------|------------------|------|
| | 14 | Lost Preset Freq | | 60.00 | 0.00~Max Frequency ⁶ | 0.00 | Hz |
| DDT | 15 | Lost Preset Speed | 15 | | 0~Maximum Speed ⁷ | 0 | rpm |
| PRT | 17 | Lost IntComm Mode | 1 | CoastStop (FreeRun) | 0~4 | 0 | - |
| | 18 | Lost IntComm Time | | 1.0 | 0.1~120.0 | 1.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 13 | Lost Internal Comm | 13 | 24, 14, 0 | - |
| | 14 | Lost Preset Freq | 60.00 | | 0.00~Max Frequency ⁶ | 0.00 | Hz |
| DDT | 15 | Lost Preset Speed | | 15 | 0~Maximum Speed ⁷ | 0 | rpm |
| PKI | 17 | Lost IntComm Mode | 1 | CoastStop (FreeRun) | 0~4 | 0 | - |
| | 18 | Lost IntComm Time | | 1.0 | 0.1~120.0 | 1.0 | sec |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 13 | Lost Internal Comm | 13 | 24, 14, 0 | - |

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9.2.5.1 Lost Internal Communication

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

⁶ DRV-20(Max Frequency)
 ⁷ DRV-21(Maximum Speed)

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Lost Internal Communication Setting Details

| Code and Functions | | Description | | | | | |
|-----------------------------|-------------------------|---|---|--|--|--|--|
| PRT-14 Lost Preset Freq | In sit (PRT funct | uations where th -17 Lost IntCom ion will operate | ne operation of the lost internal communication nm Mode) is set to 5 (Lost Preset), the protection and sets the frequency to continue operation. | | | | |
| | Sele lost. | cts the operatior | n method when Smart Operator communication is | | | | |
| | | ltem | Functionality | | | | |
| | 0 | None | The protection function for lost internal communication will not operate. | | | | |
| PRT-17 Lost IntComm Mode | 1 | CoastStop (FreeRun) | In the event of lost internal communication, the inverter output will be blocked and the motor will enter a free run due to inertia. | | | | |
| | 2 Trip Dec Time Stop | | The motor will decelerate and then stop when internal communication is lost. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) is applied. | | | | |
| | 3 Warning | | When the DO1-DO3 Define code of the output terminal block group (OUT-50, 52, 54) is set to 13 (Lost Internal Comm), the corresponding warning signal is output to the multifunction output terminal block when internal communication is lost. | | | | |
| | 4 | Lost Preset | In the event of lost internal communication, it will operate at the frequency set at PRT-14. | | | | |
| PRT-18 Lost IntComm Time | Sets mom | the time to judg ent of lost interr | e the lost internal communication from the nal communication until the loss continues. | | | | |

Note

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- If the set value of PRT-17 (Lost IntComm Mode) is 1 (CoastStop(FreeRun)) or 2 (Trip Dec Stop), it operates as a level trip.
- If the set value of PRT-17 (Lost IntComm Mode) is 3 (Warning) or 2 (Lost Preset), it will operate as a warning.

9.2.5.2 Lost USB

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit | | |
|-------|---------------|----------------------------------|-----------|------------------------|---------------------------------|------------------|------------------------------------|------|----|
| PRT | 14 | Lost Preset Freq | 60.00 | | 60.00 | | 0.00~Max Frequency ⁸ | 0.00 | Hz |
| | 15 | Lost Preset Speed | 15 | | 0~Maximum Speed ⁹ | 0 | rpm | | |
| | 19 | Lost USB Mode | 1 | CoastStop (FreeRun) | 0~4 | 0 | - | | |
| | 20 | Lost USB Time | 1.0 | | 0.1~120.0 | 1.0 | sec | | |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 34 | Lost USB Warn | 0~39 | 24, 14, 0 | - | | |

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* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Lost USB Setting Details

| Code and Functions | Description |
|----------------------------|---|
| PRT-14 Lost Preset Freq | In situations where the operation of the lost USB (PRT-19 Lost USB Mode) is set to 5 (Lost Preset), the protection function will operate and set the frequency to continue operation. |

- ⁸ DRV-20(Max Frequency)
- ⁹ DRV-21(Maximum Speed)

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| Code and Functions | | | Description |
|-------------------------|-----------------|------------------------|--|
| | Sele | cts how the inve | rter operates when USB is lost. |
| | | ltem | Functionality |
| | 0 | None | The protection function for lost USB will not operate. |
| PRT-19 Lost USB Mode | 1 | CoastStop (FreeRun) | In the event of lost USB, the inverter output will be blocked and the motor will enter a free run due to inertia. |
| | 2 Trip Dec Stop | | The motor decelerates and then stops when USB is lost. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) is applied. |
| | 3 | Warning | When the DO1-DO3 Define code of the output terminal block group (OUT-50, 52, 54) is set to 13 (Lost Int Comm Warn), the corresponding warning signal will be output to the multifunction output terminal block when USB communication is lost. |
| | 4 | Lost Preset | In the event of lost USB, it will operate at the frequency set at PRT-14. |
| PRT-20 Lost USB Time | Sets the lo | the time to judg | e USB loss from the moment of USB loss until |

Note

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- If the set value of PRT-19 (Lost USB Mode) is 1 (CoastStop(FreeRun)) or 2 (Trip Dec Stop), it will operate as a level trip.
- If the set value of PRT-19 (Lost USB Mode) is 3 (Warning) or 2 (Lost Preset), it will operate as a warning.

9.2.5.3 Lost Analog Input

| Group | Code | LCD Display | S | et Value | Setting Range | Initial Value | Unit |
|-------|---------------|---|-----|-------------------------|-------------------------------------|------------------|------|
| PRT | 14 | Lost Preset Freq | | 60.00 | 0.00~Max Frequency ¹⁰ | 0.00 | Hz |
| | 15 | Lost Preset Speed | 15 | | 0~Maximum Speed ¹¹ | 0 | rpm |
| | 25, 28, 31 | Lost Alx Mode (Alx: Al1~Al3) | 1 | CoastStop (FreeRun) | 0~5 | 0 | - |
| | 26, 29, 32 | Lost Alx Chk Level (Alx: Al1~Al3) | 0 | Half of Low Limit | 0~2 | 0 | - |
| | 27, 30, 33 | Lost Alx Time (Alx: Al1~Al3) | 1.0 | | 0.1~120.0 | 1.0 | sec |
| OUT | 50, 52, 54 | , DOx Define , (DOx: DO1~DO3) | 36 | Lost Al-1 Warn | | | |
| | | | 37 | Lost AI-2 Warn | 36~39 | 24, 14, 0 | - |
| | | | 38 | Lost AI-3 Warn | | | |

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* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

Lost Analog Input Setting Details

| Code and Functions | Description |
|-----------------------------|--|
| PRT-14 Lost Preset Freq, | In situations where the operation of the lost analog input (PRT-25, 28, 31 Lost AI1-AI3 Mode) is set to 5 (Lost Preset), the protection function will operate and set the frequency to continue operation. |

¹⁰ DRV-20(Max Frequency)

¹¹ DRV-21(Maximum Speed)

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| Description | | | | | |
|--|--|--|--|--|--|
| Selects how the inverter operates when analog input is lost. | | | | | |
| | ltem | | Functionality | | |
| 0 | None | The protect not operate | ction function for lost analog input will e. | | |
| 1 | CoastStop (FreeRun) | In the ever output will free run du | nt of lost analog input, the inverter be blocked and the motor will enter a ue to inertia. | | |
| 2 | Trip Dec Time Stop | The motor analog inp However, t set in PRT | will decelerate and then stop when ut is lost. for the deceleration stop time, the time -01 (Trip Dec Time) is applied. | | |
| 3 | Hold Input | In the ever continue w when the i | nt of lost analog input, operation will vith the analog input value at the time nput loss was determined. | | |
| 4 | Hold Output | In the even continue w when the i For examp a constant value is de is deemed command value and | nt of lost analog input, operation will vith the analog output value at the time nput loss was determined. ole, in an inverter that accelerates with input value and whose analog input efined as the speed command, if it that analog input is lost, the speed at that point will be used as the output the inverter will continue to operate. | | |
| 5 | Lost Preset | In the event of lost analog input, it will operate the frequency set at PRT-14. | | | |
| Sets | the criterion leve | el for lost ar | nalog input. | | |
| | ltem | | Functionality | | |
| | | When the of the follo value), it w depending Al3 Type S | analog input value is within the range wing table (that is, 1/2 of the set <i>i</i> ll be considered lost analog input, on the settings of AIN-01, 16, 31 (AI1- Select). | | |
| 0 | Half of Low Limit | Unipolar Voltage | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 ln)/2 | | |
| | | Bipolar Voltage | Analog input value <= ABS[(AIN-05, 20, 35 Alx + x1 In)/2] | | |
| | | Current | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 ln)/2 | | |
| | Selection of the select | Selects how the inversion Item 0 None 1 CoastStop (FreeRun) 2 Trip Dec Time Stop 3 Hold Input 4 Hold Output 5 Lost Preset Item O 0 Half of Low Limit | Selects how the inverter operate Item 0 None 1 CoastStop (FreeRun) 1 CoastStop (FreeRun) 2 Trip Dec Time Stop 3 Hold Input 3 Hold Input 4 Hold Output 4 Hold Output 5 Lost Preset 5 Lost Preset 6 Half of Low Limit 0 Half of Low Limit | | |

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| Code and Functions | Description | | | | | | |
|---|--|--|---|---|---|--|--|
| | | Item | | Functionality | | | |
| | | | When the analog input value is within the range of the following table (that is, set value), it will be considered an analog input loss, depending on the settings of AIN-01, 16, 31 (AI1-AI3 Type Select). | | | | |
| | 1 | Below Low Limit | Unipolar Voltage | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 ln) | | | |
| | | | Bipolar Voltage | Analog input value <= ABS[(AIN-05, 20, 35 Alx + x1 In)] | | | |
| PRT-26, 29, 32 Lost Alx Chk Level (Alx: Al1~Al3) | | | Current | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 In) | | | |
| | 2 | Below Or Maximum | When the analog input value is within the range of the following table (that is, set value), it will be considered an analog input loss, depending on the settings of AIN-01, 16, 31 (AI1-AI3 Type Select). | | | | |
| | | | Unipolar Voltage | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 ln) or analog input value >= (AIN-07, 22, 37 Alx + x2 ln)-2% or more | | | |
| | | | Bipolar Voltage | Analog input value <= ABS[(AIN-05, 20, 35 Alx + x1 In)] or analog input value >= ABS[(AIN-07, 22, 37 Alx + x2 In)-2%] | | | |
| | | | | Current | 0 <= Analog input value <= (AIN-05, 20, 35 Alx + x1 ln) or analog input value >= (AIN-07, 22, 37 Alx + x2 ln)-2% or more | | |
| | ABS: The absolute value, y <= ABS[x], and y is a value that satisfies between -x <= y and y <= x. | | | | | | |
| PRT-27, 30, 33 Lost Alx Time (Alx: Al1~Al3) | Sets meet even 27, 3 | Sets the time to judge the analog input loss from the moment of meeting the conditions of the judgment level (PRT-26, 29, 32) in the event of set analog input loss until it continues to the time set in PRT- | | | | | |

If analog input is lost when the analog input definition is used as a speed command, PRT-25 (Lost Al1 Mode) is set to 2 (Trip Dec Time Stop), PRT-26 (Lost Al1 Chk Level) is set to 1 (Below Low Limit), and PRT-27 (Lost Al1 Time) is set to 5.0 sec, it will operate as follows:



[Image 10. Example of operation in case of lost analog input]

Note

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- If the set value of PRT-25, 28, 31(Lost Al1-Al3 Mode) is 1 (CoastStop(FreeRun)) or 2 (Trip Dec Time Stop), it will operate as a level trip.
- If the set value of PRT-25, 28, 31(Lost Al1-Al3 Mode) is 3 (Hold Input) or 4 (Hold Output), it will operate as a warning.

9.2.6 Dynamic Braking (DB) Resistor Configuration

It is possible to adjust the DC link voltage through a braking resistor. The products with 200V class 18.5kW or less and 400V class 37kW or less are equipped with a built-in braking unit to prevent overvoltage caused by an increase in the DC link voltage during regenerative operation. For products without a built-in brake unit, a separately mounted brake unit can be used. For more details on available brake unit, refer to **16.6 Braking Unit and Braking Resistor Specifications**.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-----------------------|------------|---------------------------------|-----------|----------------|------------------|------------------|------|
| 35 APP 36 37 | DB Turn On | 200 V class | 390 | 350~400 | 390 | V | |
| | Level | 400 V class | 780 | 600~800 | 780 | V | |
| | 36 | DB Warn %ED Enable | 1 Yes | | 0~1 | 0 | - |
| | 37 | DB Warn %ED | | 5 | 1~30 | 5 | % |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 26 | DB Warn %ED | 0~39 | 24, 14, 0 | - |

Dynamic Braking (DB) Resistor Setting Details

| Code and Functions | Description |
|---------------------------------|---|
| APP-35 DB Turn On Level | Turns on the brake circuit when the DC link voltage exceeds the set value. |
| APP-36 DB Warn %ED Enable | Selects whether to enable the dynamic braking resistor function. The inverter will decelerate and keep the DC link voltage below a certain level to prevent an overvoltage fault trip during deceleration. The actual deceleration time may be longer than the set deceleration time depending on the load. |



Caution

Do not set the braking resistor to exceed the resistor's power rating. If overloaded, it can overheat and cause a fire. When using a resistor with a heat sensor, the sensor output can be used as an external trip signal for the inverter's multifunction input.

9.2.7 Output Block by Multifunction Terminal

When the multifunction input terminal is set as the output block signal terminal and the signal is input to the terminal, then the operation stops.

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|-------------------------------------|---------------------------------|-----------|------------------------|------------------|---------------------------------|------|
| DIN | 01, 03, 05, 07 09, 11, 13, 15 | DIx Define (DIx: DI1~DI8) | 4 | ВХ | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |
| | 83 | BX Stop Mode | 0 | CoastStop (FreeRun) | 0~1 | 0 | - |
| PRT | 84 | BX Dec TIme | | - | 0.01~ 6000.00 | 3.00 | sec |
| | 85 | BX Restart Mode | 0 | None | 0~2 | 1 | - |

Output Block by Multifunction Terminal Setting Details

| Code and Functions | Description | | | | | |
|------------------------------|---|---|---|--|--|--|
| DIx Define (DIx: DI1~DI8) | If the set to Sma opera While inver curre | If the DI1-DI8 Define code of the terminal block input group (DIN) is set to 4 (BX), the inverter will block the output and display BX in the Smart Operator pop-up window when the signal is input (On) during operation. While BX is displayed on the Smart Operator pop-up window, the inverter's operation information including the operation frequency and current at the time of BX signal can be monitored. | | | | |
| | | ltem | Functionality | | | |
| | 0 | CoastStop (FreeRun) | In the event of an emergency stop, inverter output will be blocked and the motor will enter a free run due to inertia. | | | |
| PRT-83 BX Stop Mode | 1 | Trip Dec | If a fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-01 (Trip Dec Time) is applied. | | | |
| | 2 | BX Dec Stop | If a fault trip occurs, the motor will decelerate and stop. However, for the deceleration stop time, the time set in PRT-84 (BX Dec Time) is applied. | | | |

| Code and Functions | Description | | | | |
|---------------------------|-------------|-----------------|---|--|--|
| | | ltem | Functionality | | |
| PRT-85 BX Restart Mode | 0 | None | Does not restart the motor even if the emergency stop operation is reset. | | |
| | 1 | Start Mode | Accelerates and operates in the same way as normal acceleration operation when the emergency stop operation is reset. | | |
| | 2 | Speed Search | Operates in the same way as a speed search operation when the emergency stop operation is reset. | | |

Caution

When the multifunction terminal with the DI1-DI8 Define code of the terminal block input group (DIN) set to 4 (BX) is turned off while the operation command is input, the motor will accelerate again. Therefore, before releasing the emergency stop operation, make sure to check the motor rotation status and the set value of PRT-85 (BX Restart Mode).

9.2.8 Over Speed Error

It is a function that operates based on the control mode parameter (MOT1-05, MOT2-05). It is active when the set value of MOT1-05 is 3 (Sensorless) or 4 (Vector) and when the set value of MOT2-05 is 3 (Sensorless).

If the motor rotates at a speed higher than the over speed level (PRT-64 Over Speed Level) during the over speed detection time (PRT-65 Over Speed Time), the inverter output will be blocked.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|------------------------|--------------------|-----------|---------------|------------------|------|
| DDT | 64 Over Speed Level | | 120.0 | 20.0~120.0 | 120.0 | % |
| | 65 | Over Speed Time | 0.01 | 0.01~10.00 | 0.01 | sec |

9.2.9 Speed Deviation Error

It is a function that operates based on the control mode parameter (MOT1-05, MOT2-05). It is active when the set value of MOT1-05 is 3 (Sensorless) or 4 (Vector) and when the set value of MOT2-05 is 3 (Sensorless).

If the motor rotates at a speed higher than the speed deviation (PRT-67 Speed Dev BandFreq) for the set detection time (PRT-69 Speed Dev Time), the inverter output will be blocked.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|--------------------------|-----------------------|-------------|-----|-------------------------------------|------------------|------|
| | 66 | Speed Deviation En | Speed 1 Yes | | 0~1 | 0 | % |
| | 67 | Speed Dev BandFreq | 20.00 | | 2.00~Max Frequency ¹² | 20.00 | Hz |
| PKI | 68 Speed Dev Band Spd | | | 600 | 60~ Maximum Speed ¹³ | 600 | rpm |
| | 69 | Speed Dev Time | 1.0 | | 0.1~1000.0 | 1.0 | sec |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

9.2.10 Cooling Fan Control

This function turns the inverter cooling fan on and off. It is used in situations where the load stops and starts frequently, or noise free environment is required. The correct use of cooling fan control can extend the cooling fan's life.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|-------------|-----------|------------|------------------|------------------|------|
| DRV | 50 | Fan Control | 0 | During Run | 0~2 | 0 | - |

¹² DRV-20(Max Frequency)

¹³ DRV-21(Maximum Speed)

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| Code and Functions | Description | | | | |
|-----------------------|-------------|---------------|--|--|--|
| | | ltem | Functionality | | |
| DRV-50 Fan Control | 0 | During Run | Cooling fan runs when the power is supplied to the inverter and the operation command is on. The cooling fan stops when the power is supplied to the inverter and the operation command is off. When the inverter power unit temperature is higher than its set value, the cooling fan will operate automatically regardless of its operation command source. | | |
| | 1 | Always Run | The cooling fan runs constantly if the Input power is supplied to the inverter. | | |
| | 2 | Temp. Control | With input power connected and the run operation command on, if the setting is in Temp Control, the cooling fan will not operate unless the temperature in the heat sink reaches the set temperature. | | |

Cooling Fan Control Setting Details

Note

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Despite setting DRV-50 (Fan Control) to 0 (During Run), if the heat sink temperature reaches a set level by current input harmonic wave or noise, the cooling fan may run as a protection function. That is, even if the inverter is not running, the cooling fan may operate when the inverter power unit reaches a certain temperature.

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9.2.11 Cooling Fan Trip Detection

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|------------|----------------------|-----------|--------------|------------------|------------------|------|
| PRT 75 | 75 | MainFan Trip Mode | 0 | Trip | 0~1 | 0 | - |
| | 77 | AuxFan Trip Mode | 0 | Trip | 0~1 | 0 | - |
| OUT | 50, 52, 54 | DO1~DO3 Define | 8 | MainFan Warn | 0~45 | 24, 14, 0 | - |

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Cooling Fan Trip Detection Setting Details

| Code and Functions | | Description | | | | | | |
|---|---------------------------------|---|---|--|--|--|--|--|
| PRT-75 MainFan Trip Mode, | | ltem | Functionality | | | | | |
| | 0 | Trip | The inverter output will be blocked and the fan trip will be displayed when a cooling fan error is detected. | | | | | |
| PRT-77 AuxFan Trip Mode | 1 | Warning | When OUT-50, 52, 54 DO1-DO3 Define is set to 8 (MainFan Warn), the fan error signal will be output and the operation will continue. | | | | | |
| OUT-50, 52, 54 DOx Define (DOx: DO1~DO3) | Whe will b inver block | n the code value e output and the ter inside tempe ted due to activa | e is set to 8 (MainFan Warn), the fan error signal e operation will continue. However, when the erature rises above a certain level, output is ation of overheat protection. | | | | | |

9.3 Diagnostic Functions

9.3.1 Main Capacitor Diagnostic Function

Using the change in electric capacity value, it is possible to indirectly verify the degree of deterioration of the inverter's main capacitor. An induction motor ¹⁴ must be connected and DIAG-01 (Main Cap Diag En) must be set to 1 (Yes) in order to perform a measurement. Measure in the following order:

- Set DIAG-02 (Main Cap Diag Mode) to 1 (Diagnosed Capacity). In the pop-up window of the Smart Operator, the message "Power Off Please" will appear.
- 2 Cut off the power supply to the inverter. A Main Cap Diag Fail trip will occur if the power is not cut off within 10 seconds. It is safe since the motor output does not come out until the power is cut off.
- 3 In order to measure the electric capacity of the main capacitor, DC is momentarily output, and the measured capacitor capacity will be displayed on DIAG-04 (MainCap MeasuredLv) as a percent (%). DIAG-05 (MainCap Diag Time) displays the total time the capacitor has been operated.
- 4 The Smart Operator pop-up window will display a **Main Cap Damaged** warning message if the displayed capacitor capacity is less than the value displayed in DIAG-06 (MainCap Warn Level).

| Group | Code | LCD Display | ę | Set Value | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|------|-----------------------|---------------|------------------|------|
| | 01 | MainCap Diag En | 1 | Yes | 0~1 | 1 | - |
| | 02 | MainCap Diag Mode | 1 | Diagnosed Capacity | 0~1 | 0 | - |
| | 03 | MainCap Diag Sts | 0 | None | 0~2 | 0 | - |
| DIAG | 04 | MainCap MeasuredLv | - | | 0.00~100.00 | - | % |
| | 05 | MainCap Diag Time | - | | - | - | - |
| | 06 | MainCap Warn Level | 70.0 | | 50.0~90.0 | 70.0 | % |

¹⁴ Synchronous motors do not operate.

Protection Functions

① Caution

AC 190V/370V is the minimum input voltage for measuring the electric capacity of the main capacitor. A Main Cap Diag Fail trip will occur when the input voltage falls below the minimum.

9.3.2 Main Capacitor Diagnostic Check Alarm Function

Displays an alarm so that periodic testing of the main capacitor can be performed.

To perform this function, DIAG-07 Cap Diag Alarm En must be set to 1 (Yes).

When the time set in DIAG-08 (CapDiag AlarmCycle) elapses, from the time set in DIAG-05 (MainCap Diag Time) to the capacitor operation time set in DIAG-97 (MainCap Used Time), the **MainCap CheckAlarm** warning message will be displayed on the Smart Operator.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------------|------|-----------------------|-----------|-----|---------------|------------------|------|
| 07 DIAG 08 | 07 | Cap Diag Alarm En | 1 | Yes | 0~1 | 1 | - |
| | 08 | CapDiag AlarmCycle | 18000 | | 2000~50000 | 18000 | hour |

9.3.3 Main Capacitor Life Diagnostic Function

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When the cumulative run time of the main capacitor reaches the main capacitor replacement diagnostic level, a warning message will be displayed.

To perform this function, DIAG-11 (MainCap Repl En) must be set to 1 (Yes).

When DIAG-13 (MainCap Used Level) reaches DIAG-12 (MainCap Repl Level), a **Main Cap Repl Warn** warning message will be displayed. It is possible to check the usage time of the main capacitor in DIAG-97 MainCap Used Time.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|------|-----------------------|-----------|---|---------------|------------------|------|
| DIAG - | 11 | MainCap Repl En | 1 Yes | | 0~1 | 1 | - |
| | 12 | MainCap Repl Level | 90.00 | | 10.00~100.00 | 70.00 | % |
| | 13 | MainCap Used Level | - | | 0.00~100.00 | 0.00 | % |
| | 97 | MainCap Used Time | | - | - | 0 | - |

Protection Functions

9.3.4 Main Fan Life Diagnostic Function

When the cumulative run time of the main fan reaches the replacement diagnostic level, a warning message will be displayed.

To perform this function, DIAG-52 (MainFan Repl En) must be set to 1 (Yes).

When DIAG-54 (MainFan Used Level) reaches the value set in DIAG-53 (MainFan Repl Level), a **MainFan Repl Warn** warning message will be displayed.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|-----|---------------|------------------|------|
| DIAG | 52 | MainFan Repl En | 1 | Yes | 0~1 | 0 | - |
| | 53 | MainFan Repl Level | 90.00 | | 10.00~100.00 | 90.00 | % |
| | 54 | MainFan Used Level | - | | 0.00~100.00 | 0.00 | % |

9.3.5 Aux Fan Life Diagnostic Functions

When the cumulative run time of the aux fan reaches the replacement diagnostic level, a warning message will be displayed.

To perform this function, DIAG-62 (AuxFan Repl En) must be set to 1 (Yes).

When DIAG-64 (AuxFan Used Level) reaches the value set in DIAG-63 (AuxFan Repl Level), an **AuxFan Repl Warn** warning message will be displayed.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|----------------------|-----------|-------|---------------|------------------|------|
| DIAG | 62 | AuxFan Repl En | 1 | Yes | 0~1 | 0 | - |
| | 63 | AuxFan Repl Level | | 90.00 | 10.00~100.00 | 90.00 | % |
| | 64 | AuxFan Used Level | | - | 0.00~100.00 | 0.00 | % |

9.3.6 Pre-charge Relay Life Diagnostic Function

When the cumulative number of relay operations used for pre-charge reaches the replacement diagnostic level, a warning message will be displayed.

To perform this function, DIAG-40 (PreChargerWarn Sel) must be set to 1 (Yes).

When DIAG-42 (PreCharger Used Lv) reaches the value set in DIAG-41 (PreCharger Repl Lv), a **PreChargerReplWarn** warning message will be displayed.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|-----------------------|-----------|-------|---------------|------------------|------|
| DIAG | 40 | PreChargerWarn Sel | 1 | Yes | 0~1 | 0 | - |
| | 41 | PreCharger Repl Lv | | 90.00 | 10.00~100.00 | 90.00 | % |
| | 42 | PreCharger Used Lv | - | | 0.00~100.00 | 0.00 | % |

9.3.7 Monitoring Operation Time

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It is possible to monitor the operation time of the inverter and the fan.

| Group | Code | LCD Display | S | Set Value | Setting Range | Initial Value | Unit |
|-------|------|----------------|---|-----------|---------------|------------------|------|
| | 90 | MainFan Time | - | | - | - | - |
| | 01 | MainFan Time | 0 | No | 0~1 | 0 | |
| | 91 | Reset | 1 | Yes | 0~1 | 0 | - |
| | 95 | AuxFan Time | - | | - | - | - |
| DIAG | 06 | AuxFan Time | 0 | No | 0-1 | 0 | - |
| | 90 | Reset | 1 | Yes | 0~1 | | |
| | 98 | Drive On Time | - | | - | - | - |
| | 99 | Drive Run Time | | - | - | - | - |

Monitoring Operation Time Setting Details

| Code and Functions | Description |
|--|--|
| DIAG-90 MainFan Time, DIAG-95 AuxFan Time | Displays the cumulative operation time of the inverter cooling fan. The information is displayed in the form of "day hour:minute (0 days 00:00)." |
| DIAG-91 MainFan Time Reset DIAG-96 AuxFan Time Reset | When set to 1 (Yes), both the cumulative cooling fan operating time (On-time) and cumulative operating time (Run-time) will be deleted and displayed as 0 days 00:00. |
| DRV-98 Drive On Time | Displays the cumulative time when power is supplied to the inverter. The information is displayed in the form of "day hour:minute (0 days 00: 00)". |
| DRV-99 Drive Run Time | Displays the cumulative time when the operation command is entered and the inverter outputs voltage. The information is displayed in the form of "day hour:minute (0 days 00:00)." |

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9.4 Operation Settings related to Trip Occurrence

9.4.1 Operation related to Low Voltage Trip

When inverter input power is lost and the internal DC link voltage drops below a certain voltage level, the inverter will stop output and a low voltage trip will occur.

A trip occurs only during operation, and not when input voltage drops due to power off during stop.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|---------------------------------|-----------|-------------|------------------|------------------|------|
| PRT | 02 | LV Trip Mode | 0 | Latch | 0~1 | 0 | - |
| OUT | 50, 52, 54 | DOx Define (DOx: DO1~DO3) | 11 | Low Voltage | 0~39 | 24, 14, 0 | - |

If the voltage is reset again after a low voltage trip occurs, the voltage can be changed by the value set in DRV-30 (Ref AC Input Volt).

Trip occurrence voltage (based on DC link voltage)

- 220 V level: 1.414 * DRV-30 Ref AC Input Volt * 65%, minimum 180V
- 400 V level: 1.414 * DRV-30 Ref AC Input Volt * 65%, minimum 350V

Trip reset voltage (based on DC Link voltage)

- 200 V level: 1.414 * DRV-30 Ref AC Input Volt * 80% (about 249V for 220V)
- 400 V level: 1.414 * DRV-30 Ref AC Input Volt * 80% (about 430V for 380V)

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|----------------------|----------------|---|---------------|------------------|------|
| DRV | 20 | Ref AC Input Volt | 200 V class | - | 200~240 | - | V |
| | 30 | | 400 V class | - | 380~480 | - | V |

9.4.2 Operation related to Safety Trip

This function sets the reset operation mode when a safety trip occurs.

In the case of PRT-82 (Safety Trip Mode) set to 0 (Latch), the inverter will maintain the trip even if the safety signal is input, and the trip will be released only when it is forcibly reset through the terminal block or Smart Operator. When PRT-82 (Safety Trip Mode) is set to 1 (Level), the trip will be immediately reset upon receipt of the safety signal.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|---------------------|-----------|-------|---------------|------------------|------|
| PRT | 82 | Safety Trip Mode | 0 | Latch | 0~1 | 0 | - |

9.4.3 Trip Status Reset

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This function restarts the inverter after resetting the trip with the Smart Operator or the multifunction input terminal.

Restarting the inverter can be accomplished using the (STOP/RESET) key on the Smart Operator or the multifunction input terminal.

| Group | Code | LCD Display | Se | t Value | Setting Range | Initial Value | Unit |
|-------|----------------------------------|------------------------------|----|---------|------------------|------------------------------|------|
| DIN | 01, 03, 05, 07 09, 11, 13, 15 | Dlx Define (Dlx: Dl1~Dl8) | 3 | RST | - | 1, 2, 4, 5, 10, 11, 12, 9 | - |

Trip Status Reset Setting Details

| Code and Functions | Description |
|---|---|
| DIN-01, 03, 05, 07, 09, 11, 13, 15 DIx Define (DIx: DI1~DI8) | Set the DI1-DI8 Define code of the terminal block input group (DIN) to 3 (RST) and input the signal to the terminal in a trip state to reset the trip status. Only latch-type trips will be reset. When two or more latch-type trips occur at the same time, the trips will be released upon reset only when all conditions for trip release have been met. |

9.5 Trip/Warning List

The following list shows the types of trips and warnings that can occur while using the S300 inverter. Please refer to <u>9 Learning Protection Functions</u> for details about trips and warnings.

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9.5.1 Trip List

Table 3. Trip list

| LCD Display | Description | Property | Remark |
|--------------------|---------------------------------------|----------|---|
| Watch Dog | CPU watchdog trip | Fatal | - |
| Data Storage Error | Internal memory error | Fatal | - |
| Main System Error | Inverter internal S/W error | Fatal | - |
| ADC OffSet | Analog input error | Latch | - |
| Arm Short | ARM short current fault trip | Latch | - |
| AuxiliaryFan Fault | Aux fan error Latch | | Reserved |
| Br Engaging Fail | Brake operation failure | Latch | Brake control |
| Br Release Invalid | Brake release invalid | Latch | Brake control |
| Br Releasing Fail | Brake release failure | Latch | Brake control |
| BX | Trip by BX terminal input | Level | - |
| CAN Bus Error | Option interface fault | Latch | Communication or extended IO option |
| Control Fan Fault | Control fan fault | Latch | Reserved |
| Cur Pos Overf Err | Current position calculation error | Latch | Position control |
| Drive Over Heat | Inverter overheat trip | Latch | - |
| Drive Over Load | Inverter overload | Latch | - |
| Enc Wrong Direct | Encoder direction error | Latch | Encoder option |
| Encoder Error | Encoder error | Latch | Encoder option |
| Encoder No Connect | Encoder wiring error | Latch | Encoder option |
| Encoder Tuning Err | Encoder tuning failure | Latch | Encoder option |
| E-Thermal | Electronic thermal | Latch | Disabled by default |

| LCD Display | Description | Property | Remark |
|--------------------|--|-----------------|---|
| External Trip-1 | | | |
| External Trip-2 | External signal trip | Latch/ Level | - |
| External Trip-3 | | | |
| External Trip-4 | | | |
| Fuse Open | Fuse open | Latch | Reserved |
| Gate Power Loss | Power supply circuit error | Latch | - |
| Ground Fault Trip | Ground fault occurrence | Latch | - |
| Hw OCS Fail | Overcurrent control operation fault | Latch | - |
| If Tune Fail | If tuning failure | Latch | - |
| Input Phase Open | In phase open trip | Latch | - |
| IO Board Trip | IO board connection trip | Latch | - |
| KEB Safety Stop | KEB safety stop | Latch | - |
| Line To Line Short | Short circuit between output phases | Latch | - |
| Lost Analog In-1 | Lost analog input 1 | Level | Disabled by default |
| Lost Analog In-2 | Lost analog input 2 | Level | Disabled by default |
| Lost Analog In-3 | Lost analog input 3 | Level | Disabled by default |
| Lost Analog In-4 | Lost analog input 4 | Level | Disabled by default |
| Lost Ext Ana In-1 | Extended IO lost analog input 1 | Level | Extended IO option, disabled by default |
| Lost Ext Ana In-2 | Extended IO lost analog input 2 | Level | Extended IO option, disabled by default |
| Lost Ext Ana In-3 | Extended IO lost analog input 3 | Level | Extended IO option, disabled by default |
| Lost Ext Ana In-4 | Extended IO lost analog input 4 | Level | Extended IO option, disabled by default |
| Lost External 24V | Lost external 24V power | Latch | - |
| Lost Internal Comm | Lost Internal Communication | Level | Disabled by default |

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| LCD Display | Description | Property | Remark |
|--------------------|--------------------------------------|-------------------|---------------------------|
| Lost Keypad | Lost keypad (Smart Operator) | Level | Disabled by default |
| Lost Option Comm | Lost option card communication | Level | - |
| Lost Power MCU | Power unit fault | Latch | - |
| Lost USB | Lost USB connection | Level | Disabled by default |
| Low Voltage | Inverter low voltage | Latch / Level | - |
| Ls Tune Fail | Ls tuning failure | Latch | - |
| Lsigma Tune Fail | Lsigma tuning failure | Latch | - |
| Main Cap Diag Fail | Main capacitor diagnosis failure | Latch | - |
| Main Fan Fault | Fan trip | Latch | Default warning output |
| MC Fault | MC fault | Latch | - |
| Mechanical Brake | Mechanical brake fault | Latch | - |
| Motor Over Heat | Motor temperature sensor overheat | Latch/ Warning | Disabled by default |
| No Motor Trip | Motor connection fault | Latch | - |
| NTC Open | Temperature sensor open | Latch | - |
| NTC Short | Temperature sensor short circuit | Latch | - |
| Option Trip-1 | Option 1 installation fault | Latch | Communication option |
| Option Trip-2 | Option 2 installation fault | Latch | Encoder option |
| Option Trip-3 | Option 3 installation fault | Latch | Extension I/O |
| OutputPhase U Open | Output open phase (U terminal) | Latch | Disabled by default |
| OutputPhase V Open | Output open phase (V terminal) | Latch | Disabled by default |
| OutputPhase W Open | Output open phase (W terminal) | Latch | Disabled by default |
| Over Current | Overcurrent | Latch | - |
| Over Load | Motor overload | Latch | - |
| Over Speed | Overspeed | Latch | - |
| Over Voltage | Overvoltage | Latch | - |
| LCD Display | Description | Property | Remark | |
|--------------------|--|-------------------|---------------------|--|
| Para Write Trip | Parameter writing error | Latch | - | |
| ParameterReset Err | Parameter abnormal initialization | Latch | - | |
| Pole Pos Detect F | PM motor stimulus estimation failure | Latch | - | |
| Pos HW Limit High | H/W upper limit | Latch/ Warning | Position control | |
| Pos HW Limit Low | H/W lower limit | Latch/ Warning | Position control | |
| Pos Max Track Err | Position control deviation fault | Latch | Position control | |
| Watch Dog | CPU watchdog trip | Fatal | - | |
| Pos Multi Sync F | Multi-position sync failure | Latch | Position control | |
| Pos SW Limit High | S/W upper limit | Latch/ Warning | Position control | |
| Pos SW Limit Low | S/W lower limit | Latch/ Warning | Position control | |
| Pos Tar Bound Err | Target position reach deviation fault | Latch | Position control | |
| Power Index Error | Power unit capacity recognition circuit fault | Level | - | |
| Precharge Fail | Pre-charge relay fault | Latch | - | |
| Pre-PID Fail | Pre-PID failure | Latch | - | |
| Reset Restart Fail | Restart after reset failure | Latch | - | |
| Rs Tune Fail | Rs tuning failure | Latch | - | |
| Speed Deviation | Speed deviation | Latch | - | |
| STO Feedback A | STO A signal fault | Latch/ Level | - | |
| STO Feedback B | STO B signal fault | Latch/ Level | - | |
| STO P05 Fault | Safety circuit fault | Latch | - | |
| STO P24 Fault | Safety circuit fault | Latch | - | |
| System Error-1 | CPU fault | Latch | - | |
| Tr Tune Fail | Tr tuning failure | Latch | - | |
| Under Load | Motor under load | Latch | Disabled by default | |
| Prevent Cmd Trip | No operation behavior | Latch | - | |

9.5.2 Warning List

Table 4. Warning list

| LCD Display | Description | Property | Remark |
|--|--|----------------|--------|
| Over Load Warn | Motor overload | Warning | - |
| Under Load Warn | Motor under load | Warning | - |
| Drv Over Load Warn | Inverter overload | Warning | - |
| Lost Int Comm Warn | Lost Internal Communication | Warning | - |
| Lost Option Comm | Lost option card communication | Warning | - |
| Lost Keypad Warn | Lost Smart Operator | Warning | - |
| Lost USB Warn | Lost USB connection | Warning | - |
| DB Warn %ED | Exceeding the dynamic braking resistor | Warning | - |
| Lost Analog In-1 | Lost analog input 1 | Warning | - |
| Lost Analog In-2 | Lost analog input 2 | Warning | - |
| Lost Analog In-3 | Lost analog input 3 | Warning | - |
| Lost Ext Ana In-1 | Extended IO lost analog input 1 | Warning | - |
| Lost Ext Ana In-2 | Extended IO lost analog input 2 | Warning | - |
| Lost Ext Ana In-3 | Ext Ana In-3 Extended IO lost analog input 3 | | - |
| MainFan Warning | Fan Warning | Warning | - |
| AuxFan Warning | Aux fan warning | Warning | - |
| MainFan Repl Warn | Fan replacement | Warning | - |
| AuxFan Repl Warn | Aux fan replacement | Warning | - |
| CtrlFan Repl Warn | Control fan replacement | Warning | - |
| PreChargerReplWarn | Pre-charge resistor replacement | Warning | - |
| Speed->Torque Speed → torque contro change | | Status display | - |
| Torque->Speed | Torque \rightarrow speed control change | Status display | - |
| Main Cap Repl Warn | Main capacitor replacement | Warning | - |

| LCD Display | Description | Property | Remark |
|--------------------|--|-----------------------------|--------|
| Low Capacity Warn | Low main capacitor capacity | Warning | - |
| MainCap Diag Alarm | Main capacitor diagnosis | Warning | - |
| Power Off Please | Main capacitor diagnosis requires power off | Main capacitor diagnosis | - |
| AC Input Over Volt | Exceeding the allowable input power | Warning | - |
| Running Auto Tune | Auto tuning | Status display | - |
| Pos SW Limit High | S/W upper limit | Warning | - |
| Pos SW Limit Low | S/W lower limit | Warning | - |
| Pos HW Limit High | H/W upper limit | Warning | - |
| Pos HW Limit Low | H/W lower limit | Warning | - |
| Motor Over Heat | Motor temperature sensor overheat | Warning | - |
| AC Input Low Volt | Low allowable input power warning | Warning | - |
| Fire Mode | Operating in Fire Mode | Status display | - |

10 Using Built-in Communication Features

This section in the user manual explains how to control the inverter with a PLC or a computer over a long distance using RS485 communication features. To use the RS485 communication features, connect the communication cables and set the communication parameters on the inverter. Refer to the communication protocols and parameters to use RS485 communication features.

10.1 Communication Standards

The S300 product group supports Multi-Drop Link System via RS485 standard communication and offers an interface that is strongly resistant to noise. Please refer to the following table for details about the communication standards.

| Itomo | Standard | | | | |
|---|---|---|--|--|--|
| lienis | Slave | Simple Master | | | |
| Communication method/ Transmission type | RS485/Bus, Multi-Drop Link System | | | | |
| Protocol | Modbus-RTU, LS INV 485 Modbus-RTU | | | | |
| Number of Inverter | Maximum of | For reading and writing in each slave: Maximum of 5 | | | |
| Connections | 31 | For reading or writing in each slave: Maximum of 10 | | | |
| Transmission Distance | Maximum of 1,200 m (recommended distance: within 700 m) | | | | |
| Recommended cable size | 0.75 | 5 mm² (18 AWG), shielded twisted pair | | | |
| Installation type | Connect to | o dedicated terminals (S+, S-, and 5G) of the control terminal block | | | |
| Communication speed | 1200/2400/480 | 0/9600/19200/38400/57600/115200 bps available | | | |
| Control procedure | A | synchronous communication system | | | |
| Communication system | | Half duplex system | | | |
| Stop bit length | 1-bit/2-bit | | | | |
| Frame error check | | 2 bytes | | | |
| Parity Check | | None/Even/Odd | | | |

Table 1. S300 Communication Standards

10.2 Communication System Configuration

In the RS485 communication system, the S300 basically works as a slave and can be connected via various superordinate controllers.

10.2.1 Slave Inverter Composition



[Image 1. Slave Inverter Composition (Superordinate Controller: PLC)]



[Image 2. Slave Inverter Composition (Superordinate Controller: PC)]

- Connecting to RS485 terminal: Connect to S+, S-, or 5G of the terminal block.
- Always terminate (set INTC-07 Termi Resistor En to 1 [ON]) both ends of the wiring.
- Number of connectible inverters: You can connect up to 31 inverters (up to 10 inverters for simple master composition).
- Number of expandable station IDs: 1-250
- Valid length of communication line: The maximum length of communication line is 1,200 meters, but it is recommended to use no more than 700 meters of communication line to ensure stable communication.
- Use a repeater to enhance communication speed when using lines longer than 1,200 meters or a large number of devices. Repeaters are effective for environments with severe noise.

10.2.2 Parameter Settings for Slave Communication

Before proceeding with setting communication configurations, make sure that the communication lines are connected properly. Turn on the inverter and set the communication parameters. ٦

| Group | Code | LCD Display | Set Value | | Setting Range | | Initial Value | Unit |
|---------------|------------|-------------------|-----------------|---------------|-------------------|--------------------|------------------|------|
| | | | | | Modbus RTU | 1~250 ¹ | | |
| | 01 | Station ID | | 1 | LS INV 485 | 1~31 ² | 1 | - |
| | | | | | RTU Master | 1~250 ¹ | | |
| | 02 | Protocol | 0 | ModBus RTU | 0~2 | | 0 | - |
| | 03 | Baud Rate | 3 | 9600 bps | 0~7 | | 3 | - |
| 04 INTC 05 | RS485 Mode | 0 | D8 / PN / S1 | 0~3 | | 0 | - | |
| | 05 | Response Delay | 5 | | 0~1000 | | 5 | msec |
| | 06 | Modbus Addr | 0 | No | 0-1 | | 1 | |
| | 00 | Mode | 1 | Yes | 0~1 | | I | - |
| | 07 | Termi | 0 | Off | 0~1 | | 0 | |
| 07 | 07 | Resistor En | 1 | On | | | 0 | - |
| | 98 | Error Count | | - | - | | 0 | - |
| | 90 | Error Count | 0 No | | 0~1 | | 0 | |
| 99 | | Reset | 1 | Yes | | | | |

¹ Shown when communication protocol (INTC-02 Protocol) is 0 (Modbus RTU).

² Shown when communication protocol (INTC-02 Protocol) is other than 0 (Modbus RTU).

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Communication Parameters Setting Details

| Code and Functions | Description | | | | |
|---------------------------|---|---------------------------------------|--|--|--|
| INTC-01 Station ID | Sets the station ID of the inverter. You can set station ID between 1-250 or 1-31 depending on the setting values at INTC-02. | | | | |
| | Sele | ct one of the two | built-in protocols: Modbus-RTU or LS INV 485. | | |
| | | ltem | Functionality | | |
| INTC-02 | 0 | 0 Modbus RTU Modbus-RTU compatible pr | | | |
| Protocol | 1 | LS INV 485 | Dedicated protocol for the LS inverter | | |
| | 2 | Modbus RTU Master | Refer to manual of DriveVlew 9, the PC software used to connect our inverters | | |
| | Sets The | the communicat maximum setting | tion speed. You can set it up to 115200 bps. g range depends on the protocol. | | |
| | | ltem | Functionality | | |
| | 0 | 1200bps | a communication speed of 1200 bps | | |
| | 1 | 2400bps | a communication speed of 2400 bps | | |
| INTC-03 Baud Rate | 2 | 4800bps | a communication speed of 4800 bps | | |
| T dio | 3 | 9600bps | a communication speed of 9600 bps | | |
| | _4 | 19200bps | a communication speed of 19200 bps | | |
| | _5 | 38400bps | a communication speed of 38400 bps | | |
| | 6 | 56000bps | a communication speed of 56000 bps | | |
| | _7 | 115Kbps | a communication speed of 115200 bps | | |
| | Set a meth | a communication od, and the num | n configuration. Set the data length, parity check nber of stop bits. | | |
| | | ltem | Functionality | | |
| INTC-04 RS485 | 0 | D8 / PN / S1 | 8-bit data / no parity check / 1 stop bit | | |
| Widde | 1 | D8 / PN/ S2 | 8-bit data / no parity check / 2 stop bits | | |
| | 2 | D8 / PE / S1 | 8-bit data / even parity / 1 stop bit | | |
| | 3 | D8 / PO / S1 | 8-bit data / odd parity / 1 stop bit | | |
| INTC-05 Response Delay | Sets time for the slave (inverter) to respond to the master (PLC or inverter). Response time is used in a system where the slave device response is too fast for the master device to process. Set this code to an appropriate value for smooth master-slave communication. | | | | |

| Code and Functions | | | | Descri | otion | | | |
|--|---|---|--|-----------------------------------|--|--|-----------------------------------|----------------------|
| | When using modbus-RTU, the modbus address will be 1 subtracted from the parameter address of the inverter. However, to use the inverter parameter address as itself, set this parameter to 0 (No), and you can use the same address for modbus and inverter parameter. When it is currently operating at 60.00 Hz with the output current of 1.0 A, if you read the output frequency (0311h) as follows, the inverter will respond as follows according to the setting values at INTC-06: | | | | | | | |
| | [Master | \rightarrow Slave] | | | | | | |
| INTC-06 Modbus | Station ID | Function A | ddress / (Hi) | Address (Lo) | #of Points (Hi) | #of Points (Lo) | s CRC Lo | CRC Hi |
| AddrMode | 01 | 03 | 03 | 12 | 00 | 01 | XX | XX |
| | [Slave When II • Modb • Invert 60.00 Station ID | → Master] NTC-06 is s us address: er commun Hz) Function Code | et to 1 (0312h ication a Byte Count | Yes) ddress: (Data (Hi) | 0311h (outp Data (Hi) | Data (Lo) | ncy of CRC Lo | CRC Hi |
| | 01 | 03 | 02 | 17 | 70 | XX | XX | XX |
| INTC-06 Modbus AddrMode | When INTC-06 is set to 0 (No)• Modbus address: 0312h• Inverter communication address: 0312h (output current of 1.0 A)StationFunctionByteDataDataDataCRCCRCIDCodeCount(Hi)(Hi)(Lo)LoHi010302000Axxxxxx | | | | | | A) CRC Hi xx | |
| INTC-07 Termi Resistor En | Set this parameter to 1 (On) to activate terminating resistance of the built-in RS485 communication. | | | | | | | |
| INTC-98 Error Count INTC-99 Error Count Reset | INTC-98 built-in c data from the cour | counts and communicat m the maste nt to 0. | d display ion. You er in this | s the nui can che count. S | mber of err ck incorrec et INTC-99 | or respons t function to 1 (Yes) | ses fror codes c) to initi | n the or alize |

10.2.3 Setting Operation Command and Frequency

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Set DRV-10 (1st Command Source) to 4 (Internal Comm.) and DRV-11 (1st Freq Ref Src) code to 6 (Internal Comm.) in order to set the operation command and frequency to the parameters in the common area via communication. Refer to <u>5.2.1 Setting</u> <u>Methods of Operation Commands</u> for operation commands and <u>5.1.1 Operating</u> <u>Frequency Settings</u> for set frequency commands.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|---------------------------------|---------------------|-----------|-------------------|---------------|------------------|------|
| | 10 1st Command 4 Internal Comm. | | 0~6 | - | | | |
| DRV | 11 | 1st Freq Ref Src | 6 | Internal Comm. | 0~8 | - | |

10.2.4 Command Loss Protection Settings

Configure decision standards and protective operations when a communication problem lasts for a specified period of time.

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------------|----------------------|-----------|-------|------------------------------------|------------------|------|
| | 01 | Trip Dec Time | | 30.00 | 0.00~6000.00 | 30.00 | sec |
| | 14 | Lost Preset Freq | 0.00 | | 0.00~Max Frequency ³ | 0.00 | Hz |
| PRT | PRT 15 Los | Lost Preset Speed | 0 | | 0~Maximum Speed ⁴ | 0 | rpm |
| | 17 | Lost IntComm Mode | 0 None | | 0~4 | 0 | - |
| | 18 | Lost IntComm Time | 1.0 | | 1.0 0.1~120.0 | | sec |

* When the speed unit is rpm (select 1 [rpm Display] in DRV-32 [Hz/rpm Select]), gray shaded areas will be visible.

- ³ DRV-20(Max Frequency)
- ⁴ DRV-21(Maximum Speed)

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| Command Los | s Protective Operation Setting Details |
|-------------|--|
| | |

| Code and Functions | Description | | | | | |
|---|--|------------------------|---|--|--|--|
| | Selects inverter operation to run when a communication error has occurred and lasted for the time set at PRT-18. | | | | | |
| | | ltem | Functionality | | | |
| PRT-17 Lost IntComm Mode, PRT-18 Lost IntComm Time | 0 | None | The speed command immediately becomes the operation frequency without any protection function. | | | |
| | 1 CoastStop (FreeRun) | | The inverter output is blocked. The motor will CoastStop(FreeRun). | | | |
| | 2 | Trip Dec Time Stop | The motor will decelerate and then stop at the frequency set at PRT-01 (Trip Dec Time). | | | |
| | 3 Warning | | Operates at the previous command speed under warning. | | | |
| | 4 Lost Preset | | Operates at the frequency set at PRT-14 (Lost Preset Freq). | | | |
| | 3 | Warning Lost Preset | Operates at the previous command speed unde warning. Operates at the frequency set at PRT-14 (Lost Preset Freq). | | | |

10.3 Communication Parameter Address Operation

10.3.1 Parameters for Common Area

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|-------------------|-------|------|------|---------|
| 0000h | Inverter model | - | - | 0x11 | S300 |
| | | | | 1 | 0 .4kW |
| | | | | 2 | 0.75kW |
| | | | | 3 | 1.1kW |
| | | | | 4 | 1.5kW |
| | | | | 5 | 2.2IW |
| | | | | 6 | 3kW |
| | | | | 7 | 3.7kW |
| | | | | 8 | 4kW |
| | Inverter capacity | | - | 9 | 5.5kW |
| | | | | 10 | 7.5kW |
| | | | | 11 | 11kW |
| | | | | 12 | 15kW |
| 0001h | | - | | 13 | 18.5kW |
| | | | | 14 | 22kW |
| | | | | 15 | 30kW |
| | | | | 16 | 37kW |
| | | | | 17 | 45kW |
| | | | | 18 | 55kW |
| | | | | 19 | 75kW |
| | | | | 20 | 90kW |
| | | | | 21 | 110kW |
| | | | | 22 | 132kW |
| | | | | 23 | 160kW |
| | | | | 24 | 185kW |
| | | | l | 25 | 220kW |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---------------------------|-------|------|--|---|--|--|
| 00026 | Inverter input | | | 0 | 200 V class | | |
| 000211 | voltage | - | - | 1 | 400 V class | | |
| 0003h | Inverter software version | - | - | 0066h | Version 1.00 (Example) | | |
| 0004h | Reserved | - | - | | - | | |
| 0005h | Command frequency | 0.01 | Hz | | - | | |
| 0006h | Operation command | - | - | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B5 B4 B3 B2 B1 B0 | Reserved CoastStop(FreeRun) stop Fault reset Rev Fwd Stopped | | |
| 0007h | Acceleration time | 0.1 | sec | | - | | |
| 0008h | Deceleration time | 0.1 | sec | | - | | |
| 0009h | Output current | 0.1 | А | | - | | |
| 000Ah | Output frequency | 0.01 | Hz | | - | | |
| 000Bh | Output voltage | 1 | V | | - | | |
| 000Ch | DC link voltage | 1 | V | | - | | |
| 000Dh | Output power | 0.1 | kW | - | | | |

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|------------------|-------|------|--|-----------------------------------|--|
| 000Eh | Operation status | | _ | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 | Reserved | |
| | | | | B5 | Decelerating | |
| | | | | B4 | Accelerating | |
| | | | | B3 | Fault (trip) | |
| | | | | B2 | Operating in reverse direction | |
| | | | | B1 | Operating in forward direction | |
| | | | | B0 | Stopped | |
| 000Eb | Fault trip | 0 | | 0 | Normal state | |
| 000Fh | information | 0 | - | 1 | Tripped | |

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|--------------------------------|-------|------|--|----------|
| | | | | B15 B14 B13 B12 B11 B10 B9 B8 | Reserved |
| 0010h | Input terminal | - | - | B7 | DI8 |
| | mornation | | | B6 | DI7 |
| | | | | B5 | DI6 |
| | | | | B4 | DI5 |
| | | | | B3 | DI4 |
| | | | | B2 | DI3 |
| | | | | B1 | DI2 |
| | | | | B0 | DI1 |
| 0011h | Output terminal information | _ | - | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 | Reserved |
| | | | | B2 | DO3 |
| 0011h | output terminal information | - | - | B1 | DO2 |
| | | | | B0 | DO1 |
| 0012h | Al1 | 0.01 | % | | - |
| 0013h | Al2 | 0.01 | % | | - |
| 0014h | AI3 | 0.01 | % | | - |

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|---|-------|------|---------|
| 0015h | Rotational speed of the motor | 1 | rpm | - |
| 001Ah | Displays the Hz or rpm | - | - | - |
| 001Bh | Displays the number of poles of the motor | - | - | - |
| 001Ch | Reserved | - | - | - |
| 001Dh | Reserved | - | - | - |
| 0100h~ 010Fh | Status Para (S300) | - | - | - |
| 0110h~ 011Fh | Control Para (S300) | - | - | - |

10.3.2 Parameters for Expanded Common Area

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10.3.2.1 Monitored Area

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|-------------------|-------|------|--|--------|--|
| 0300h | Inverter model | - | - | S300 | 0011h | |
| | | | | Definition by Data Bit | | |
| | | | | B15 | | Unit |
| | | | | | 0 | W |
| | | | | B14 | 1 | kW |
| | | | | | 10 | MW |
| 0301h | Inverter capacity | _ | - | B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1 B0 | Ca | apacity above the decimal point apacity below the decimal point |
| | | | | Value | per Ca | apacity (Example) |
| | | | | 400W | | 1900h |
| | | | | 1.5kW | | 4015h |
| | | | | 7.5kW | | 4075h |
| | | | | 18.5kW | | 4125h |
| | | | | 75kW | | 44B0h |
| | | | | 220kW | | 4DC0h |
| | | | | 280kW | | 5180h |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---------------------------|-------|------|------------------------|---|------------------|--|
| 0302h | Inverter input | | | Voltage (Sin Thr | e/Power Type gle Phase, ee Phase) | Cooling type | |
| | | - | - | 0231h | 200 V / 3-phase | Powerful cooling | |
| | | | | 0431h | 400 V / 3-phase | Powerful cooling | |
| 0303h | Inverter software version | - | Hex | 0066h | Version 1.00 (| Example) | |
| 0304h | Inverter capacity | - | Нр | | - | | |



| Communication Address | parameter | Scale | Unit | | C |)etails | |
|--------------------------|-----------------------------|-------|------|------------------------|---|-----------------------------------|--|
| | | | | | 0 | Normal state | |
| | | | | B15 B14 | 2 | Run Disable | |
| | | | | B13 B12 | 4 | Warning occurred | |
| | | | | 012 | 8 | Trip occurred | |
| | | | - | B11 B10 B9 B8 | | Reserved | |
| | Inverter operation state | | | | 1 | Speed searching | |
| | | | | | 2 | Accelerating | |
| | | | | | 3 | At constant speed | |
| 0305h | | - | | B7 | 4 | Decelerating | |
| | | | | B6 B5 | 5 | Decelerating to stop | |
| | | | | B4 | 6 | H/W overcurrent suppression | |
| | | | | | 7 | S/W overcurrent suppression | |
| | | | | | 8 | Dwell operating | |
| | | | | | 0 | Stopped | |
| | | | | B3 B2 | 1 | Operating in forward direction | |
| | | | | B1 B0 | 2 | Operating in reverse direction | |
| | | | | | 3 | Operating DC | |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|-------------------------------------|-------|------|------------|-----------------------------|------------------------------|--|
| | | | _ | B15 | Operation command source | | |
| | | | | B14 | 0 | Smart Operator | |
| 0306h | Inverter operation, fraguapay | - | | B13 B12 | 1 | Communication option | |
| | command source | | | B10 B0 | 3 | Built-in RS485 communication | |
| | | | | B8 | 4 | Terminal block | |
| | | | | _ | 5 | USB | |
| | | | | | Freq | uency command source | |
| | | | | | 0 | Smart Operator speed | |
| | | | | | 1 | Smart Operator torque | |
| | | | | B7 | 2~4 | Up/down operation speed | |
| | | | | B6 B5 | 5 | Al1 | |
| | Inverter | | | B3 B4 | 6 | AI2 | |
| 0306h | frequency | - | - | B3 | 7 | AI3 | |
| | command source | | | B2 | 9 | Pulse | |
| | | | | B1 B0 | 10 | Built-in RS485 communication | |
| | | | | | 11 | Communication option | |
| | | | | | 13 | Jog | |
| | | | | | 14 | PID | |
| | | | | | 15 | USB | |
| | | | | | 25 | Multi-step | |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---------------------------------|-------|------|---|---|--|--|
| 0307h | Smart Operator software version | - | - | 0064h | Version 1.00 (example) | | |
| 0308h | Smart Operator title version | - | - | 0065h | Version 1.01 (example) | | |
| 0309h | Reserved | - | - | | - | | |
| 030Ah | Target frequency | - | Hz | Final ta | rget frequency applied to the inverter | | |
| 030Bh | Target speed | - | rpm | Final ta | rget speed applied to the inverter | | |
| 030Ch | Target torque | - | % | Final ta | rget torque applied to the inverter | | |
| 030Dh | Acceleration time | - | sec | Final acceleration time applied to the inverter | | | |
| 030Eh | Deceleration time | - | sec | Final deceleration time applied to the inverter | | | |
| 030Fh | AC input voltage | - | V | - | | | |
| 0310h | Output current | 0.1 | Α | - | | | |
| 0311h | Output frequency | 0.01 | Hz | - | | | |
| 0312h | Output rpm | 0 | rpm | | - | | |
| 0313h | Feedback speed of the motor | - | - | | - | | |
| 0314h | Output voltage | 1 | V | | - | | |
| 0315h | DC link voltage | 1 | V | | - | | |
| 0316h | Output power | 0.1 | kW | | - | | |
| 0317h | Output torque | 0.1 | % | | - | | |
| 0318h | PPID reference | 0.1 | % | P | ID reference value | | |
| 0319h | PPID feedback | 0.1 | % | F | PID feedback value | | |
| 031Ah | Number of poles of motor 1 | - | - | Displays the number of poles of the 1st motor | | | |
| 031Bh | Number of poles of motor 2 | - | - | Display | Displays the number of poles of the 2nd motor | | |
| 031Ch | Number of poles of the motor | - | - | Displays the number of poles of the selected motor | | | |

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|------------------------------|-------|------|--|-------------|
| 031Db | rom/Hz | | | 0 | Unit of Hz |
| 031011 | ιμιι/πΖ | - | - | 1 | Unit of rpm |
| 031Eh | Reserved | - | - | | - |
| 031Fh | Reserved | - | - | | - |
| | | | | B15 B14 B13 B12 B11 B10 B9 B8 | Reserved |
| | Digital input information | - | - | B7 | DI8 |
| 0320h | | | | B6 | DI7 |
| | | | | B5 | DI6 |
| | | | | B4 | DI5 |
| | | | | B3 | DI4 |
| | | | | B2 | DI3 |
| | | | | B1 | DI2 |
| | | | | B0 | DI1 |

Communication Functions

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|-------------------------------|-------|------|--|----------|--|
| 0321h | Digital output information | - | - | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 | Reserved | |
| | | | | B2 | DO3 | |
| | | | | B1 | DO2 | |
| | | | | B0 | DO1 | |

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|--------------------------------------|-------|------|---------|--------------|--|
| | | | | B15 | Virtual DI16 | |
| | | | | B14 | Virtual DI15 | |
| | | | | B13 | Virtual DI14 | |
| | | | | B12 | Virtual DI13 | |
| | | | | B11 | Virtual DI12 | |
| | Virtual digital input information | - | - | B10 | Virtual DI11 | |
| | | | | B9 | Virtual DI10 | |
| 02226 | | | | B8 | Virtual D 9 | |
| 032211 | | | | B7 | Virtual DI8 | |
| | | | | B6 | Virtual DI7 | |
| | | | | B5 | Virtual DI6 | |
| | | | | B4 | Virtual DI5 | |
| | | | | B3 | Virtual DI4 | |
| | | | | B2 | Virtual DI3 | |
| | | | | B1 | Virtual DI2 | |
| | | | | B0 | Virtual DI1 | |

Communication Functions

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|--|-------|------|--|-----------------|--|
| 0323h | Virtual digital output information | _ | _ | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 | Reserved | |
| | | | | B3 | Virtual DO4 | |
| | | | | B2 | Virtual DO3 | |
| | | | | B1 | Virtual DO2 | |
| | | | | B0 | Virtual DO1 | |
| 0324h | Information on analog input 1 (V1, I1) | 0.01 | % | Al1 | | |
| 0325h | Information on analog input 2 (V2, I2) | 0.01 | % | AI2 | | |
| 0326h | Information on analog input 3 (V3, I3) | 0.01 | % | AI3 | | |
| 0327h | Reserved | - | - | | - | |
| 0328h | Information on analog output 1 | 0.01 | % | | AO1(I/O board) | |
| 0329h | Information on analog output 2 | 0.01 | % | | AO2(I/O board) | |
| 032Ah | Reserved | - | - | | - | |
| 032Bh | Reserved | - | - | | - | |
| 032Ch | Reserved | - | - | - | | |
| 032Dh | Temperature | 1 | °C | | NTC temperature | |

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|----------------------------|-------|------|--|
| 032Eh | Inverter power consumption | - | kWh | - |
| 032Fh | Inverter power consumption | - | MWh | - |
| 0330h | Reserved | - | - | - |
| 0331h | Reserved | - | - | - |
| 0332h | Reserved | - | - | - |
| 0333h | Reserved | - | - | - |
| 0334h | Reserved | - | - | - |
| 0335h~ 0339h | Reserved | - | - | - |
| 033Ah | Reserved | - | - | - |
| 033Bh | Reserved | - | - | - |
| 033Ch | Reserved | - | - | - |
| 033Dh~ 0339h | Reserved | - | - | - |
| 0340h | Power time (date) | 0 | day | Total number of days the inverter has been powered on |
| 0341h | Power time (minute) | 0 | min | Total number of minutes excluding the total number of days in power time |
| 0342h | Operating time (date) | 0 | day | Total number of days the inverter has driven the motor for |
| 0343h | Operating time (minute) | 0 | min | Total number of minutes excluding the total number of days in operating time |
| 0344h | Fan time (date) | 0 | day | Total number of days the heat sink fan has been running |
| 0345h | Fan time (minute) | 0 | min | Total number of minutes excluding the total number of days in fan time |

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|----------------------|-------|------|--|----------|-----------------------|
| 0380h | Frequency command | 0.01 | Hz | Set command frequencies | | |
| 0381h | rpm command | 1 | rpm | Co | mmand rj | pm settings |
| 0382h | Operation command | _ | _ | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 | | Reserved |
| | | | | B3 | Coast | Stop(FreeRun) stop |
| | | | | B2 | | Trip reset |
| | | | | B1 | 0 | Rev |
| | | | | | 1 | Fwd |
| | | | | B0 | | Run |
| 0383h | Acceleration time | 0.1 | sec | Acceleration time setting | | |
| 0384h | Deceleration time | 0.1 | sec | Deceleration time setting | | |

10.3.2.2 Parameters for Inverter Control Area

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|---|-------|------|---------|--------------|--|
| | | | | B15 | Virtual DI16 | |
| | | | | B14 | Virtual DI15 | |
| | | | | B13 | Virtual DI14 | |
| | | | | B12 | Virtual DI13 | |
| | | | | B11 | Virtual DI12 | |
| 00051 | Virtual digital input control (0: Off, 1: On) | - | - | B10 | Virtual DI11 | |
| | | | | B9 | Virtual DI10 | |
| | | | | B8 | Virtual DI9 | |
| 038511 | | | | B7 | Virtual DI8 | |
| | | | | B6 | Virtual DI7 | |
| | | | | B5 | Virtual DI 6 | |
| | | | | B4 | Virtual DI 5 | |
| | | | | B3 | Virtual DI 4 | |
| | | | | B2 | Virtual DI 3 | |
| | | | | B1 | Virtual DI 2 | |
| | | | | B0 | Virtual DI 1 | |

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|--|-------|------|--|------------------------------------|--|
| 0386h | Virtual digital output control (0: Off, 1: On) | | - | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 | Reserved | |
| | | | | B3 | Virtual DO4 Const | |
| | | | | B2 | Virtual DO3 Const | |
| | | | | B1 | Virtual DO2 Const | |
| | | | | B0 | Virtual DO1 Const | |
| 0387h | Reserved | - | - | | - | |
| 0388h | PID reference | 0.1 | % | | - | |
| 0389h | PID feedback value | 0.1 | % | | - | |
| 038Ah | Reserved | - | - | | - | |
| 038Bh | Reserved | - | - | | - | |
| 038Ch | Forward speed limit | - | Hz | Sets th | ne forward limit frequency | |
| 038Dh | Reverse speed limit | - | Hz | Sets th | ne reverse limit frequency | |
| 038Eh | Reserved | - | - | | - | |
| 038Fh | Reserved | - | - | | - | |
| 0390h | Torque command | 0.1 | % | Set | s the command torque | |
| 0391h | Forward motoring torque limits | 0.1 | % | Sets th | e forward motoring torque limit | |

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|--|--------------|--------------|---|
| 0392h | Forward regenerative torque limits | 0.1 | % | Sets the forward regenerative torque limits |
| 0393h | Reverse motoring torque limits | 0.1 | % | Sets the reverse motoring torque limit |
| 0394h | Reverse regenerative torque limits | 0.1 | % | Sets the reverse regenerative torque limit |
| 0395h | Reserved | - | - | - |
| 0396h | Forward speed limit | 1 | rpm | Sets the forward limit speed |
| 0397h | Reverse speed limit | 1 | rpm | Sets the reverse limit speed |
| 0398h ~0399h | Reserved | - | - | - |
| 039Ah | Anytime Parameter items | - | - | Sets Smart Operator Anytype Parameter items (refer to <u>12.2 Monitoring</u> <u>Settings</u>) |
| 039Bh | Monitor 1 line-1 item | - | - | Sets Smart Operator monitor |
| 039Ch | Monitor 1 line-2 item | - | - | 1 items (refer to <u>12.2 Monitoring</u> |
| 039Dh | Monitor 1 line-3 item | - | - | <u>Settings</u>) |
| 039Eh ~039Fh | Reserved | - | - | - |
| 03A0h | EPID1 reference | 0.1 | % | EPID1 reference |
| 03A1h | EPID1 feedback value | 0.1 | % | EPID1 feedback value |
| 03A2h | EPID1 unit reference | EPID Unit | EPID Unit | EPID1 unit reference |
| 03A3h | EPID1 unit feedback value | EPID Unit | EPID Unit | EPID1 unit feedback value |

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|------------------------------|--------------|--------------|---|
| 03A4h | Reserved | - | - | - |
| 03A5h | EPID2 reference | 0.1 | % | EPID2 reference |
| 03A6h | EPID2 feedback value | 0.1 | % | EPID2 feedback value |
| 03A7h | EPID2 unit reference | EPID Unit | EPID Unit | EPID2 unit reference |
| 03A8h | EPID2 unit feedback value | EPID Unit | EPID Unit | EPID2 unit feedback value |
| 03A9h ~03AFh | Reserved | - | - | - |
| 03B0h | Monitor 2 line-1 item | - | - | |
| 03B1h | Monitor 2 line-2 item | - | - | |
| 03B2h | Monitor 2 line-3 item | - | - | |
| 03B3h | Monitor 2 line-4 item | - | - | Sets Smart Operator monitor 2 items |
| 03B4h | Monitor 2 line-5 item | - | - | (refer to <u>12.2 Monitoring</u> <u>Settings</u>) |
| 03B5h | Monitor 2 line-6 item | - | - | |
| 03B6h | Monitor gauge item | - | - | |
| 03B7h | Monitor graph item | - | - | |

| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|---|-------|------|--|
| 03E1h | Reserved | - | - | - |
| 03E2h | Parameter initialization | - | - | Parameter initialization |
| 03E3h | Changed parameter display | - | - | Changed parameter display |
| 03E4h | Reserved | - | - | - |
| 03E5h | Delete all trip history | - | - | Delete all trip history |
| 03E6h | Reserved | - | - | - |
| 03E7h | Hide parameter mode | - | - | Hide parameter mode |
| 03E8h | Lock parameter edit | - | - | Lock/lift parameter edit (toggle available) |
| 03E9h | Reserved | - | - | - |
| 03EAh | Reserved | - | - | - |
| 03EBh | Initialize the cumulative inverter operation time | - | - | Initialize the cumulative inverter operation time |
| 03ECh | Initialize the cumulative cooling fan operation time | - | - | Initialize the cumulative cooling fan operation time |

10.3.2.3 Parameters for Inverter Memory Control Area

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|------------------------------------|-------|------|----|--------------------|
| | | | | 0 | ADC Offset |
| | | | | 1 | Watchdog |
| | | | | 2 | Gate Power Loss |
| | | | | 3 | Main OS Error |
| | | | | 4 | Over Load |
| | | | | 5 | Under Load |
| | | | | 6 | Inverter Over Load |
| | | | | 7 | E-Thermal |
| | | | | 8 | Ground Fault |
| | | | | 9 | Out Phase U Open |
| | | | | 10 | In Phase Open |
| | | | - | 11 | Over Speed |
| 0400h | Index of the first current trip | - | | 12 | Speed Deviation |
| | | | | 13 | Drv Over Heat |
| | | | | 14 | NTC Open |
| | | | | 15 | NTC Short |
| | | | | 16 | Over Current |
| | | | | 17 | Over Voltage |
| | | | | 18 | IO Board |
| | | | | 19 | BX |
| | | | | 20 | Mechanical Brake |
| | | | | 21 | External 1 |
| | | | | 22 | External 2 |
| | | | | 23 | External 3 |
| | | | | 24 | External 4 |
| | | | | 25 | Arm Short |

10.3.2.4 Parameters for Inverter Trip Mode Area (Read Only)

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|--------------------|-------|------|----|-----------------------|
| | | | | 26 | Fuse Open |
| | | | | 27 | Encoder |
| | | | | 28 | Encoder No Connection |
| | | | | 29 | Encoder Wrong Dir |
| | | | | 30 | Motor Over Heat |
| | | | | 31 | Main Fan Fault |
| | | | | 32 | Parameter Write |
| | | | | 33 | Pre PID Fail |
| | | | | 34 | No Motor |
| | | | - | 35 | Option 1 |
| | | | | 36 | Option 2 |
| | | | | 37 | Option 3 |
| 0400h | Index of the first | - | | 38 | Low Voltage |
| | | | | 39 | Lost Sensor |
| | | | | 40 | Lost Int Comm |
| | | | | 41 | Lost Opt Comm |
| | | | | 42 | Lost Keypad |
| | | | | 43 | Lost USB |
| | | | | 44 | Lost AI 1 |
| | | | | 45 | Lost AI 2 |
| | | | | 46 | Lost AI 3 |
| | | | | 47 | Lost AI 4 |
| | | | | 48 | Lost Ext AI 1 |
| | | | | 49 | Lost Ext AI 2 |
| | | | | 50 | Lost Ext AI 3 |

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|--------------------|-------|------|-------|--------------------|
| | | | | 51 | Lost Ext AI 4 |
| | | | | 52 | STO Feedback A |
| | | | | 53 | STO Feedback B |
| | | | | 54 | STO P24 Fault |
| | | | | 55 | STO P5 Fault |
| | | | | 56 | Aux Fan Fault |
| | | | | 57 | Control Fan Fault |
| | | | | 58 | Data Storage |
| | | | | 59 | Precharge Fail |
| | | | | 60 | H/W OCS Fail |
| | | | | 61 | TR Tune Fail |
| | | - | | 62 | RS Tune Fail |
| 0400h | Index of the first | | | 63 | SLS Tune Fail |
| | | | | 64 | LS Tune Fail |
| | | | | 65 | IF Tune Fail |
| | | | | 66 | MC Fault |
| | | | | 67 | Load Default Para |
| | | | | 68 | Lost P24V |
| | | | | 69 | Out Phase V Open |
| | | | | 70 | Out Phase W Open |
| | | | | 71 | Reset/Restart Fail |
| | | | | 72 | Outline Short |
| | | | | 73 | KEB Safety Stop |
| | | | | 74 | Protect System 1 |
| | | | | FFFFh | None |

| Communication Address | parameter | Scale | Unit | Details | | |
|--------------------------|--|-------|------|-------------------------------|-------------------------------|--|
| 0401h | Index of the second current trip | - | - | Same as 0400h | | |
| 0402h | Index of the third current trip | - | - | | | |
| 0403h | Index of the fourth current trip | - | - | Same as 0400h | | |
| 0404h | Index of the fifth current trip | - | - | | | |
| 0405h | Output frequency right before a trip | 0.00 | Hz | Displays the output frequency | | |
| 0406h | Output current right before a trip | - | - | Displays output current | | |
| | | | | 0 | Stopped | |
| | | | | 1 | Zero speed operation | |
| | Inverter status | | | 2 | Acceleration operation | |
| 0407h | right before a trip | 0 | | 3 | Deceleration operation | |
| | | | | 4 | Operation at a constant speed | |
| | | | | 5 | Torque operation | |
| 0408h | DC Link voltage right before a trip | 0 | V | Dis | plays DC link voltage | |

| Communication Address | parameter | Scale | Unit | Details | |
|--------------------------|--|-------|------|--|-------------------|
| 0409h | Status of the input terminal block right before a trip | | BIT | B15 B14 B13 B12 B11 B10 B9 B8 | Reserved |
| | | | | B7 | DI8 (default I/O) |
| | | | | B6 | DI7 (default I/O) |
| | | | | B5 | DI6 (default I/O) |
| | | | | B4 | DI5 (default I/O) |
| | | | | B3 | DI4 (default I/O) |
| | | | | B2 | DI3 (default I/O) |
| | | | | B1 | DI2 (default I/O) |
| | | | | B0 | DI1 (default I/O) |
| 040Ah | Status of the output terminal block right before a trip | - | BIT | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 | Reserved |
| | | | | B2 | DO3 (default I/O) |
| | | | | B1 | DO2 (default I/O) |
| | | | | B0 | DO1 (default I/O) |
| Communication Address | parameter | Scale | Unit | Details |
|--------------------------|---|-------|------|--|
| 040Bh | Total time of power supply to the inverter LO WORD | - | - | Displays the total time of power supply to the inverter |
| 040Ch | Total time of power supply to the inverter HI WORD | - | - | will be displayed when there is an RTC option to tell the exact time.) |
| 040Dh | Total time of inverter operation LO WORD | - | - | Displays the total time of motor |
| 040Eh | Total time of inverter operation HI WORD | - | - | operation by the inverter |
| 040Fh | Reserved | - | - | - |
| 0410h | Inverter temperature right before a trip | 0 | °C | - |
| 0411h~ 041Fh | Reserved | - | - | - |

| Communication Address | parameter | Scale | Unit | | Details |
|--------------------------|------------------|-------|--|---------------|---------------------|
| | | | | 0 | Over Load |
| | | | | 1 | Under Load |
| | | | | 2 | Inverter Over Load |
| | | | | 3 | Lost Int Comm |
| Index of current | | | | 4 | Lost Opt Comm |
| | | | | 5 | Lost Keypad |
| | | | 6 | Lost USB | |
| | | | 7 | Dynamic Brake | |
| | | | 8 | Lost Al1 | |
| 0420h | warning | | - | 9 | Lost Al2 |
| | | | | 10 | Lost Al3 |
| | | | | 11 | Lost Al4 |
| | | | | 12 | Lost Ext AI1 |
| | | | | 13 | Lost Ext Al2 |
| | | | | 14 | Lost Ext Al3 |
| | | | | 15 | Lost Ext Al4 |
| | | | | 16 | Main Fan Lock |
| | | | | 17 | Aux Fan Lock |
| | | | | 18 | Control Fan Lock |
| | | | | 19 | Main Fan Replace |
| 04005 | Index of current | | | 20 | Aux Fan Replace |
| 0420N | warning | - | - | 21 | Control Fan Replace |
| | | | | 22 | Precharger Replace |
| | | | - Control Fan Lock 19 Main Fan Replace 20 Aux Fan Replace 21 Control Fan Replace 22 Precharger Replace 23 Supply P24V | Supply P24V | |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---|-------|------|--|--------------------------|--|--|
| 0422h | Output frequency right before an alarm occurrence | 0.00 | Hz | Displays the output frequency | | | |
| 0423h | Output current right before an alarm occurrence | 0.0 | A | Displays output current | | | |
| | | | | 0 | Stopped | | |
| | | | | 1 | Acceleration operation | | |
| 04246 | Inverter status | 0 | | 2 | Deceleration operation | | |
| 042411 | alarm occurrence | 0 | - | 3 | Operation at a constant | | |
| | | | | 4 | speed | | |
| | | | | 5 | Torque operation | | |
| 0425h | DC Link voltage right before an alarm occurrence | 0 | V | Dis | Displays DC link voltage | | |
| | | | | B15 B14 B13 B12 B11 B10 B9 B8 | Reserved | | |
| | Input terminal | | | B7 | DI8(default I/O) | | |
| 0426h | before an alarm | - | - | B6 | DI7(default I/O) | | |
| | occurrence | | | BI5 | DI6(default I/O) | | |
| | | | | B4 | DI5(default I/O) | | |
| | | | | B3 | DI4(default I/O) | | |
| | | | | B2 | DI3(default I/O) | | |
| | | | | B1 | DI2(default I/O) | | |
| | | | | B0 | DI1(default I/O) | | |

| Communication Address | parameter | Scale | Unit | | Details | |
|--------------------------|--|-------|------|---|------------------------|--|
| 0427h | Output terminal block status right before an alarm occurrence | _ | _ | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 | Reserved | |
| | | | | B2 | DO3(default I/O) | |
| | | | | B1 | DO2(default I/O) | |
| | | | | B0 | DO1(default I/O) | |
| 0428h | Total time of power supply to the inverter LO WORD | - | - | Displays the total time of power supply to the inverter (However, time of trip occurrence will be displayed when there is a RTC option to tell the exact time.) | | |
| 0429h | Total time of power supply to the inverter HI WORD | - | - | | | |
| 042Ah | Total time of inverter operation LO WORD | - | - | Displays the total time of moto | | |
| 042Bh | Total time of inverter operation HI WORD | - | - | ope | ration by the inverter | |
| 042Ch | Reserved | - | - | | - | |
| 042Dh | Inverter temperature right before alarm occurrence | 0 | °C | | - | |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---|-------|------|--|-------------------------------|--|--|
| 042Eh~ 042Fh | Reserved | - | - | - | | | |
| 0430h | Current number of recorded trip histories | - | - | - | | | |
| 0430h | Select trip history | - | - | Trip history ID to be displayed from 0432h to 0442h (0~4) Trip history ID 0: Most recent occurrence Trip history ID 4: Oldest occurrence | | | |
| 0432h | First trip type | - | - | Trip I | history ID set in 0431h | | |
| 0433h | Second trip type | - | - | Trip history ID set in 0431h | | | |
| 0434h | Third trip type | - | - | Trip history ID set in 0431h | | | |
| 0435h | Fourth trip type | - | - | Trip history ID set in 0431h | | | |
| 0436h | Fifth trip type | - | - | Trip history ID set in 0431h | | | |
| 0437h | Output frequency at the time of trip occurrence | 0.00 | Hz | Trip I | history ID set in 0431h | | |
| 0438h | Output current | 0.0 | Α | Trip I | history ID set in 0431h | | |
| | | | | Trip I | history ID set in 0431h | | |
| | | | | 0 | Stopped | | |
| | Inverter status | | | 1 | Zero speed operation | | |
| 0439h | right before a trip | 0 | - | 2 | Acceleration operation | | |
| | | | | 3 | Deceleration operation | | |
| | | | | 4 | Operation at a constant speed | | |
| 043Ah | DC Link voltage right before a trip | 0 | V | Trip I | history ID set in 0431h | | |

| Communication Address | parameter | Scale | Unit | Details | | | |
|--------------------------|---|-------|------|--|-------------------------|--|--|
| | | | | Trip I | nistory ID set in 0431h | | |
| | Status of the input terminal block right before a trip | _ | | B15 B14 B13 B12 B11 B10 B9 B8 | Reserved | | |
| 043Bh | | | _ | B7 | DI8(default I/O) | | |
| | | | | B6 | DI7(default I/O) | | |
| | | | | BI5 | DI6(default I/O) | | |
| | | | | B4 | DI5(default I/O) | | |
| | | | | B3 | DI4(default I/O) | | |
| | | | | B2 | DI3(default I/O) | | |
| | | | | B1 | DI2(default I/O) | | |
| | | | | B0 | DI1(default I/O) | | |

| Communication Address | parameter | Scale | Unit | | Details | | |
|--------------------------|--|-------|------|---|-------------------------|--|--|
| | | | | Trip I | nistory ID set in 0431h | | |
| 043Ch | Status of the output terminal block right before a trip | - | - | B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 | Reserved | | |
| | | | | B2 | DO3(default I/O) | | |
| | | | | B1 | DO2(default I/O) | | |
| | | | | B0 | DO1(default I/O) | | |
| 043Dh | Total time of power supply to the inverter LO WORD | | | Trip I | history ID set in 0431h | | |
| 043Eh | Total time of power supply to the inverter HI WORD | - | - | Displays the total time of pow supply to the inverter (However, time of trip occurre will be displayed when there BTC option to tell the exact time | | | |
| 043Fh | Total time of inverter operation | | | Trip I | nistory ID set in 0431h | | |
| 0440h | Total time of inverter operation HI WORD | - | - | Displays the total time of moto operation by the inverter | | | |
| 0441h | Reserved | - | - | | - | | |
| 0442h | Inverter temperature right before alarm occurrence | 0 | °C | - | | | |

Note

Writing the total time of power supply to and operation of the inverter

Time is a LONG type variable that uses minutes as the unit. That is, LO WORD and HI WORD are combined to make a variable of a LONG type before dividing a year into 12 months, a month into 30 days, a day into 24 hours, and an hour into 60 minutes, which are written in year, month, day, time, and minute. The reference time is 0 hour 0 minute, 0 month 0 day, 0 year, increasing one hour when the minute turns to 0 after 59. One day will be added after 23 hours and 59 minutes, instead of turning to 24 hours, and one month will be added after 23 hours and 59 minutes of 29 days, instead of turning to 30 days. Therefore, one year will increase after 23 hours and 59 minutes of 11 months and 29 days. Because this is only a calculation of time, not one for exact time.

However, with an RTC option, the total time of power supply to the inverter will change to the time of trip occurrence. The reference for that is 0 hour 0 minute, January 1, 2000 and it shows exact time. The calculation is the same as above, but on a 31-day basis for one month. It is because 31 days are multiplied for one month when converting time data of year, month, day, hour, and minute from the RTC option.

| Communication Address | parameter | Scale | Unit | | De | tails | | |
|--------------------------|--|-------|------|-----------------------------|---|--|--|---|
| 0605h | Target of proportional synchronous operation time | 0.00 | sec | Synchr set for PLC in | onous tir slaves fr proportio co | me required to be om the master or onal synchronous ntrol | | |
| | | | | 0 | | STOP | | |
| 0606b | Position control | _ | _ | 1 | POS Run | | | |
| 000011 | command | - | - | 2 | POS Run Pre-Posi | | | |
| | | | | 3 | POS | S Run Relative | | |
| | | | | | Status of Position Control Mode | | | |
| | | | | B15 | 0 | Pos Single | | |
| | | | | | 1 | Multi Sync Pos | | |
| | | | | B14 | Same as B15 | | | |
| | | | | | Stat Con | tus of Position trol Operation | | |
| 0607h | Operation status | - | - | B13 | 0 | IDLE | | |
| | | | | B12 | 1 | PRE-PROCESS | | |
| | | | | B11 B10 | 2 | ACC | | |
| | | | | B10 | 3 | DEC | | |
| | | | | B8 | 4 | STEADY | | |
| | | | | | | | | 5 |

10.3.2.5 Position Control Parameters

| Communication Address | parameter | Scale | Unit | | Details | | | |
|--------------------------|--------------------------|-------|------|----------------|----------------|--------------------------------|-------|--------------------------|
| | | | | | | | Statu | s of Position Control |
| | | | | B7 B6 | 0 | STOP | | |
| | | | | B3 B2 B1 | 1 | POS Run | | |
| | 0607h Operation status - | | | | 2 | POS Run Pre- Posi | | |
| 0607h | | - | - | | 3 | POS Run Relative | | |
| | | | | | 4 | TRIP | | |
| | | | | | Statu Contr | s of Position ol Activation | | |
| | | | | B0 | 0 | Off | | |
| | | | | | 1 | On | | |
| 0608h | Total operation time | 0.00 | sec | Total | time of po | osition control | | |

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10.3.3 Virtual Multifunction Input Settings

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You can control virtual multifunction inputs via built-in communication (communication address 0385h) or Smart Operator parameters (VIRT-03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 Virtual DI1~DI16 Const). Set DRV-10 (1st Command Source) to 1, 2, or 3 (Fx/Rx-1, Fx/Rx-2, or 3-Wire) for inverter operation with virtual multifunction inputs.

| Group | Code | LCD Display | Set | Value | Setting Range | Initial Value | Unit |
|-------|--|--|-----|-------------|------------------|------------------|------|
| | 01, 04, 07, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46 | , 07, 10, 13, 16, Virtual DIx , 25, 28, 31, 34, Define 7, 40, 43, 46 (DIx: DI1~DI16) | | FX | 0~49 | 0 | - |
| | 02, 05, 08, 11, 14, 17, | Virtual DIx | 0 | Off | | | |
| VIRT | 20, 23, 26, 29, 32, 35, 38, 41, 44, 47 | Status (DIx: DI1~DI16) | 1 | On | 0~1 | - | - |
| | 03, 06, 09, 12, 15, 18, | Virtual DIx | 0 | Off | | | |
| | 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 | Const (DIx: DI1~DI16) | 1 | On | 0~1 | 0 | - |
| DRV | 10 | 1st Command Source | 1 | Fx/ Rx-1 | 0~7 | 0 | - |

Virtual Multifunction Input Setting Details

| Code and Functions | Description |
|---|---|
| VIRT-01, 04, 07, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 43, 46 Virtual DIx Define, (DIx: DI1~DI16) | Set the desired functions in the Virtual DI1-DI16 Define codes and set the bit value with the desired function settings in communication address 0385h to 1, and functions set at each bit starts operating. Virtual multifunction operates independently from DIN-01-31 codes and duplicate settings are not allowed. For example, to control common area of virtual multifunction input with built-in communication and send forward operation commands, set VIRT-01 to 1 (FX). Then give 0001h value to communication address 0385h for forward operation to work. |
| VIRT-02, 05, 08, 11, 14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47 Virtual DIx Status, VIRT-03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 Virtual DIx Const (DIx: DI1~DI16) | Set Virtual DI1-DI16 Const value to 1 (On) to activate virtual multifunction inputs. Virtual multifunction input can be monitored easily using Virtual DIx Status code. |

10.3.4 Virtual Multifunction Output Settings

You can control multifunction outputs via built-in communication (communication address 0386h) or Smart Operator parameters (VIRT-03, 06, 09, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48 Virtual DIx Const). Refer to **<u>8.3 Multifunction Digital</u> <u>Output</u>** for related functions.

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| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|--------|----------------|---|-----------|------|------------------|------------------|------|
| 50, 52 | 50, 52, 54, 56 | Virtual DOx Define (Dox: DO1~DO4) | 0 | None | 0~45 | 0 | - |
| | | Virtual DOx | 0 | Off | | | |
| VIRT | 51, 53, 55, 57 | Status (Dox: DO1~DO4) | 1 | On | 0~1 | - | _ |
| - | | Virtual DOx | 0 | Off | | | |
| | 58~61 | Const (Dox: DO1~DO4) | 1 | On | 0~1 | 0 | - |

10.3.5 Communication Memory Map

| Communication Area | Memory Map | Description |
|---|-------------|--|
| Common area compatible with old model inverter communications (iS5, iP5A, iV5, iG5A, and etc.) | 0000h~00FFh | Area partially compatible with iS5, iP5A, iV5, and iG5A |

| Communication Area | Memory Map | | Description | |
|-------------------------------|-------------|---|---|--|
| | 0100h~010Fh | For built- in RS485 communication | Area registered in INTC-11-26 Para Status-1-16 | |
| | | For USB communication | Area registered in USBC- 11-26 Para Status-1-16 | |
| | 110h~11Fh | For built- in RS485 communication | Area registered in INTC-31-46 | |
| Expanded | | For USB communicationArea register 11-26 Para110h~11FhFor built- in RS485 communicationArea register INTC-110h~11FhFor USB communicationArea register USBC-120h~1FFhFor USB communicationArea register USBC-120h~1FFhReserved200h~023FhReserved240h~027FhReserved380h~02FFhReserved380h~03DFhInverter monitoring are Inverter control area3E0h~03FFhInverter memory control | Area registered in USBC-31-46 | |
| common area | 120h~1FFh | Reserved | | |
| | 0200h~023Fh | Reserved | | |
| | 0240h~027Fh | Reserved | | |
| | 0280h~02FFh | Reserved | | |
| | 0300h~037Fh | Inverter monitoring area | | |
| | 0380h~03DFh | Inver | ter control area | |
| | 03E0h~03FFh | Inverter m | nemory control area | |
| | 0400h~042Fh | Area for tri | p-related information | |
| | 0430h~0FFFh | | Reserved | |
| S300 parameter 16 bit area | 1000h~4FFFh | Refer to <u>13</u> communication a in inverter para accessing 1 | Fable of Functionsforaddress of each parametermeter address area when6-bit parameter data. | |
| S300 parameter 32 bit area | 9000h~CFFFh | Refer to <u>13 1</u> communication a in inverter para accessing 3 | Table of Functionsforaddress of each parametermeter address area when32-bit parameter data. | |
| Reserved | 9000h~FFFFh | | Reserved | |

10.3.6 Parameter Group for Data Transmission

By defining a parameter group, the communication addresses registered in the communication-related function group (INTC) can be used in communication. The parameter group for data transmission may be defined to transmit multiple parameters at once, in a single communication frame.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------------------|-------|--------------------------------|-----------|---------------|-------------------|------|
| INTC 11~2 31~4 | 11~26 | Para Status-xx (xx: 01~16) | - | 0000~FFFF | 0000 ⁵ | Hex |
| | 31~46 | Para Control-xx (xx: 01~16) | - | 0000~FFFF | 0000 ⁶ | Hex |

Registering Parameter Address for Built-in Communication

Communication Address Accessing Parameters Registered in Para Status-01-16 and Para Control-01-16.

| Communication Area | Memory Map | Description |
|-----------------------|--|--|
| 0100h~010Fh | Status Parameter- 1~Status Parameter-16 | Parameter values registered in INTC-11-26 Para Status 01-16 codes (read-only) |
| 0110h~011Fh | Control Parameter- 1~Control Parameter-16 | Parameter values registered in INTC-31-46 Para Control -01-16 codes (read/write) |

Note

When registering control parameters, set the operation speed (0005h, 0380h, and 0381h) and operation command (0006h and 0382h) parameters at the end of the parameter control frame (Para Control Frame). Register the operation speed and operation commands in the highest numbers of the codes you want to use. For example, when you use five control parameters, Para Control-01-05, register operation speed in Para Control-04 and operation commands in Para Control-05.

- ⁵ The initial values of Para Status-01, Para Status-02, and ParaStatus-03 are 000A, 000E, and 000F, respectively.
- ⁶ The initial values of Para Control-01 and Para Control-02 are 0005 and 0006 respectively.

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10.4 Built-in Communication Protocol

10.4.1 LS INV 485 protocol

Request

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| ENQ | Station ID | CMD | Data | SUM | EOT |
|--------|------------|--------|---------|---------|--------|
| 1 byte | 2 bytes | 1 byte | n bytes | 2 bytes | 1 byte |

Normal Response

| ACK | Station ID | CMD | Data | SUM | EOT |
|--------|------------|--------|-------------|---------|--------|
| 1 byte | 2 bytes | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

Error Response

| NAK | Station ID | CMD | error code | SUM | EOT |
|--------|------------|--------|------------|---------|--------|
| 1 byte | 2 bytes | 1 byte | 2 bytes | 2 bytes | 1 byte |

• A request starts with ENQ and ends with EOT.

- A normal response starts with ACK and ends with EOT.
- An error response starts with NAK and ends with EOT.
- A station ID indicates the inverter number and is displayed as a two-byte ASCII-HEX string. ASCII-HEX is a hexadecimal notation composed of numbers between "0"-"9" and letters between "A"-"F."
- CMD uses capitals and returns an "IF" error if lowercase characters are encountered. Refer to the following table:

| Character | ASCII-Hex | Command |
|-----------|-----------|------------------------------|
| 'R' | 52h | Read |
| 'W' | 57h | Write |
| 'X' | 58h | Request monitor registration |
| 'Y' | 59h | Perform monitor registration |

Table 2. LS INV 485 CMD Characters

* Single quotation mark (°) indicates characters.

- Data are written in ASCII-Hex (where data value is 3000: 3000 (decimal) → 0BB8h (Hex) → 30h 42h 42h 38h (ASCII-Hex)).
- Error codes are written in ASCII-HEX (refer to 10.4.1.5 ASCII Hex Code).
- Transmission/reception buffer size: transmission = 39 bytes, reception = 44 bytes.
- Monitor registration buffer: 8 Words
- SUM: Checks communication errors via sum.
- SUM = a total of the lower 8 bit values for station ID, command and data (Station ID + CMD + Data) in ASCII-HEX.

e.g.) for a read request to read one content from address 3000,

The SUM is calculated as follows: SUM = (0' + (1' + (R' + (3' + (0' + (0' + (0' + (1' = 30h + 31h + 52h + 33h + 30h + 30h + 31h = 1A7h. Control values such as ENQ, ACK, and NAK are excluded in the calculation. SUM takes a single lower byte, which makes it A7h.

| ENQ | Station ID | CMD | Address | Number of Addresses | SUM | EOT |
|--------|------------|--------|---------|------------------------|---------|--------|
| 05h | '01' | 'R' | '3000' | '1 ' | 'A7' | 04h |
| 1 byte | 2 bytes | 1 byte | 4 bytes | 1 byte | 2 bytes | 1 byte |

* Total byte = 12, single quotation mark (°) indicates characters.

Note

BroadCast

BroadCast sends commands to all inverters connected to the network simultaneously. When commands are sent from station ID 255, each inverter acts on the command regardless of the station ID. However, no response is given.

10.4.1.1 Detailed Read Protocol

Read Request

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For a read request of successive n words from address XXXX

| ENQ | Station ID | CMD | Address | Number of Addresses | SUM | EOT |
|--------|------------|--------|---------|------------------------|---------|--------|
| 05h | '01'~'FA' | 'R' | 'XXXX' | '1'∼'8' = n | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 4 bytes | 1 byte | 2 bytes | 1 byte |

* Total byte = 12, single quotation mark ($^{\circ}$) indicates characters.

Read Normal Response

| ACK | Station ID | CMD | Data | SUM | EOT |
|--------|------------|--------|-------------|---------|--------|
| 06h | '01'~'FA' | 'R' | 'XXXX' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

* Total byte = 7 + n * 4 = maximum of 39, single quotation mark (°) indicates characters.

Read Error Response

| NAK | Station ID | CMD | error code | SUM | EOT |
|--------|------------|--------|------------|---------|--------|
| 15h | '01'~'FA' | 'R' | "**" | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 2 bytes | 1 byte |

* Total byte = 9, single quotation mark (°) indicates characters.

Note

If there is invalid data among the consecutive numbers of data from XXXX address, the data returns "FFFF". i.e., the system reads DRV-05-08(1205h-1208h) and returns "FFFF" for data corresponding to the two parameters below, as DRV-07 and 08 don't exist:

Request

| ENQ | Station ID | CMD | Address | Number of Addresses | SUM | EOT |
|-----|------------|-----|---------|------------------------|------|-----|
| 05h | '01' | 'R' | '1205' | '4' | 'AF' | 04h |

Response

Acceleration time: 20.0 sec (200, 00C8h), deceleration time: 30.0sec(300, 012Ch)

| ENQ | Station ID | CMD | Data | SUM | EOT |
|-----|------------|-----|------------------------|------|-----|
| 06h | '01' | 'R' | '00C8 012C FFFF FFFFF' | '94' | 04h |

10.4.1.2 Detailed Write Protocol

Write Request

| ENQ | Station ID | CMD | Address | Number of Addresses | Data | SUM | EOT |
|--------|---------------|--------|---------|------------------------|-------------|---------|--------|
| 05h | '01'~'FA' | 'W' | 'XXXX' | '1'∼'8' = n | 'XXXX' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 4 bytes | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

* Total byte = 12 + n * 4 = maximum of 44, single quotation mark (°) indicates characters.

Write Normal Response

| ACK | Station ID | CMD | Data | SUM | EOT |
|--------|------------|--------|-------------|---------|--------|
| 06h | '01'~'FA' | 'W' | 'XXXX' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

* Total byte = 7 + n * 4 = maximum of 39, single quotation mark (°) indicates characters.

| NAK | Station ID | CMD | error code | SUM | EOT |
|--------|------------|--------|------------|---------|--------|
| 15h | '01'~'FA' | 'W' | "**" | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 2 bytes | 1 byte |

Write Error Response

* Total byte = 9, single quotation mark (") indicates characters.

Note

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If there is invalid data among the consecutive numbers of data from XXXX address, the data returns "FFFF". i.e., the system reads DRV-05-08(1205h-1208h) and returns "FFFF" for data corresponding to the two parameters below, as DRV-07 and 08 don't exist:

Request

Acceleration time: 20.0 sec (200, 00C8h), deceleration time: 30.0sec(300, 012Ch)

| ENQ | Station ID | CMD | Address | Address Number of Addresses | | EOT |
|-----|------------|-----|---------|-----------------------------|------|-----|
| 05h | '01' | 'W | '1205' | '3' | 'AF' | 04h |

Response

| ENQ | Station ID | CMD | Data | SUM | EOT |
|-----|------------|-----|------------------------|------|-----|
| 06h | '01' | 'R' | '00C8 012C FFFF FFFFF' | '94' | 04h |

10.4.1.3 Monitor Registration Detailed Protocol

A monitor registration request is made to designate the type of data that requires continuous monitoring and periodic updating.

Request monitor registration

Registration requests for n addresses (where n refers to the number of addresses. The addresses do not have to be contiguous.)

| ENQ | Station ID | CMD | Number of Addresses | Address | SUM | EOT |
|--------|------------|--------|------------------------|-------------|---------|--------|
| 05h | '01'~'FA' | 'X' | '1'~'8'=n | 'XXXX' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

* Total byte = 8 + n * 4 = maximum of 40, single quotation mark (°) indicates characters.

| ACK | Station ID | CMD | SUM | EOT |
|--------|------------|--------|---------|--------|
| 06h | '01'~'FA' | 'X' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 1 byte |

Monitor Registration Normal Response

* Total byte = 7, single quotation mark (°) indicates characters.

Monitor Registration Error Response

| NAK | Station ID | CMD | error code | SUM | EOT |
|--------|------------|--------|------------|---------|--------|
| 15h | '01'~'FA' | 'X' | "**" | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 2 bytes | 1 byte |

* Total byte = 9, single quotation mark (°) indicates characters.

Monitor Registration Execution Request

A data read request for a registered address, received from a monitor registration request

| ENQ | Station ID | CMD | SUM | EOT |
|--------|------------|--------|---------|--------|
| 05h | '01'~'FA' | 'Y' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 1 byte |

* Total byte = 7, single quotation mark (°) indicates characters.

Monitor Registration Execution Normal Response

| ACK | Station ID | CMD | Data | SUM | EOT |
|--------|------------|--------|-------------|---------|--------|
| 06h | '01'~'FA' | 'Y' | 'XXXX' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | n x 4 bytes | 2 bytes | 1 byte |

* Total byte = 7 + n * 4 = maximum of 39, single quotation mark (°) indicates characters.

Monitor Registration Execution Error Response

| NAK | Station ID | CMD | error code | SUM | EOT |
|--------|------------|--------|------------|---------|--------|
| 15h | '01'~'FA' | 'Y' | '**' | 'XX' | 04h |
| 1 byte | 2 bytes | 1 byte | 2 bytes | 2 bytes | 1 byte |

* Total byte = 9, single quotation mark (°) indicates characters.

10.4.1.4 Exception Code

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Table 3. LS INV 485 Exception Code

| Items | Abbreviation | Description |
|-------------------------|--------------|---|
| ILLEGAL FUNCTION | IF | The requested function cannot be performed by a slave, the corresponding function does not exist. |
| ILLEGAL DATA ADDRESS | IA | The received parameter address is not valid in the slave, the number of addresses is 9 or more |
| ILLEGAL DATA VALUE | ID | The received parameter data is invalid at the slave. |
| WRITE MODE ERROR | WM | Tried writing (W) to a parameter that does not allow writing (read-only parameters, or when writing is prohibited during operation) |
| FRAME ERROR | FE | The frame size does not match. |

10.4.1.5 ASCII Hex Code

Table 4. LS INV 485 ASCII Hex Code

| Character | Hex | Character | Hex | Character | Hex |
|-----------|-----|-----------|-----|-----------|-----|
| A | 41 | S | 73 | ۸ | 5E |
| В | 42 | t | 74 | _ | 5F |
| С | 43 | u | 75 | `` | 60 |
| D | 44 | V | 76 | { | 7B |
| E | 45 | w | 77 | | 7C |
| F | 46 | х | 78 | } | 7D |
| G | 47 | У | 79 | ~ | 7E |
| Н | 48 | Z | 7A | BEL | 07 |
| I | 49 | 0 | 30 | BS | 08 |
| J | 4A | 1 | 31 | CAN | 18 |
| K | 4B | 2 | 32 | CR | 0D |
| L | 4C | 3 | 33 | DC1 | 11 |
| Μ | 4D | 4 | 34 | DC2 | 12 |
| N | 4E | 5 | 35 | DC3 | 13 |
| 0 | 4F | 6 | 36 | DC4 | 14 |
| Р | 50 | 7 | 37 | DEL | 7F |
| Q | 51 | 8 | 38 | DLE | 10 |

| Character | Hex | Character | Hex | Character | Hex |
|-----------|-----|-----------|-----|-----------|-----|
| R | 52 | 9 | 39 | EM | 19 |
| S | 53 | space | 20 | ACK | 06 |
| Т | 53 | ! | 21 | ENQ | 05 |
| U | 55 | " | 22 | EOT | 04 |
| V | 56 | # | 23 | ESC | 1B |
| W | 57 | \$ | 24 | ETB | 17 |
| Х | 58 | % | 25 | ETX | 03 |
| Y | 59 | & | 26 | FF | 0C |
| Z | 5A | , | 27 | FS | 1C |
| а | 61 | (| 28 | GS | 1D |
| b | 62 |) | 29 | HT | 09 |
| С | 63 | * | 2A | LF | 0A |
| d | 64 | + | 2B | NAK | 15 |
| е | 65 | , | 2C | NUL | 00 |
| f | 66 | - | 2D | RS | 1E |
| g | 67 | • | 2E | S1 | 0F |
| h | 68 | / | 2F | SO | 0E |
| i | 69 | : | ЗA | SOH | 01 |
| j | 6A | ; | 3B | STX | 02 |
| k | 6B | < | 3C | SUB | 1A |
| I | 6C | = | 3D | SYN | 16 |
| m | 6D | > | 3E | US | 1F |
| n | 6E | ? | 3F | VT | 0B |
| 0 | 6F | @ | 40 | | |
| р | 70 | [| 5B | | |
| q | 71 | \ | 5C | | |
| r | 72 |] | 5D | | |

10.4.2 Modbus-RTU

10.4.2.1 Function Code and Protocol (unit: byte)

Station ID is INTC-01 (Station ID), the start communication address is the communication address, and the unit is bytes. Refer to <u>10.3.1 Parameters for</u> <u>Common Area</u> for communication address.

The communication address of the modbus is 1 subtracted from the parameter address of our inverter by default. However, set INTC-06 (Modbus Addr Mode) to 0 (No) for built-in RS485 communication to use the same address for the modbus and inverter parameter.

Read Holding Registers (Function Code: 0x03)

This is a protocol that reads consecutive parameters of the inverter as many as set numbers. Read Holding Registers and Read Input Registers (function code: 0X04) are processed the same by the inverter.

- Starting address: Starting address-1 of the inverter parameter (common area or Smart Operator) you want to read
- Number of registers: The number (maximum of 16) of inverter parameters (common area or Smart Operator) you want to read
- Number of bytes: The number of bytes of normal response values depending on the number of registers
- Value: The value of the inverter parameter (common area or Smart Operator) you want to read
- Exception code: The error response code (refer to 10.4.2.2 Exception Code)

Request

| Slave Station ID | Function Code | Starting Address (Hi) | Starting Address (Lo) | Number of Registers (Hi) | Number of Registers (Lo) | CRC (Lo) | CRC (Hi) |
|------------------------|------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|-------------|-------------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

Normal Response

| Slave Station ID | Function Code | Number of Bytes | Value (Hi) | Value (Lo) | ••• | Value (Hi) | Value (Lo) | CRC (Lo) | CRC (Hi) |
|------------------------|------------------|--------------------|---------------|---------------|-----|---------------|---------------|-------------|-------------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | | 1 byte | 1 byte | 1 byte | 1 byte |

* The number of values (Hi) and values (Lo) is dependent on the number of registers.

When an invalid parameter address is read, the data will respond as FFFFh. If all parameter addresses are invalid, the following error responses will be received.

Note

If there is invalid data among the consecutive numbers of data from XXXX address, the data returns "FFFF". i.e., the system reads DRV-05-08(1205h-1208h) and returns "FFFF" for data corresponding to the two parameters below, as DRV-07 and 08 don't exist:

Request

| Slave Station ID | Function | Starting Address | | Number of | Registers | CRC | | |
|------------------------|----------|------------------|----|-----------|-----------|-----|----|--|
| | Code | Hi | Lo | Hi | Lo | Lo | Hi | |
| 01 | 03 | 12 | 04 | 00 | 04 | 00 | B0 | |

Response

Acceleration time: 20.0 sec (200, 00C8h), deceleration time: 30.0sec(300, 012Ch)

| Slave Station ID | Function | Number of Bytes | Register1 | | Register2 | | Register3 | | Register4 | | CRC | |
|------------------------|----------|--------------------|-----------|----|-----------|----|-----------|----|-----------|----|-----|----|
| | Code | | Hi | Lo | Hi | Lo | Hi | Lo | Hi | Lo | Lo | Hi |
| 01 | 03 | 08 | 00 | C8 | 01 | 2C | FF | FF | FF | FF | 4D | 98 |

Write Single Registers (Function Code: 0x06)

It is a protocol that writes a single inverter parameter value.

- Address: Address-1 of the inverter parameter (common area or Smart Operator) you want to write
- Value: The value of the inverter parameter (common area or Smart Operator) you want to write
- Exception code: The error response code

Request

| Slave Station ID | Function Code | Address (Hi) | Address (Lo) | Value (Hi) | Value (Lo) | CRC(Lo) | CRC(Hi) |
|---------------------|------------------|-----------------|-----------------|---------------|---------------|---------|---------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

Normal Response

| Slave Station ID | Function Code | Address (Hi) | Address (Lo) | Value (Hi) | Value (Lo) | CRC(Lo) | CRC(Hi) |
|---------------------|------------------|-----------------|-----------------|---------------|---------------|---------|---------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

Error Response

| Slave Station ID | Function Code | Exception Code | CRC(Lo) | CRC (Hi) |
|------------------|---------------|----------------|---------|----------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

* The function code of error response is required function code + 0x80.

Write Multiple Registers (Function Code: 0x10)

This is a protocol that writes consecutive parameters of the inverter as many as set numbers.

- Starting address: Starting address-1 of the inverter parameter (common area or Smart Operator) you want to write
- Number of registers: The number (maximum of 16) of inverter parameters (common area or Smart Operator) you want to write
- Register value: The values of the inverter parameters (common area or Smart Operator) you want to write
- Error code: The error response code

Request

| Slave Station ID | Function Code | Starting Address (Hi) | Starting Address (Lo) | Starting Address (Hi) | Starting Address (Lo) | Number of Bytes | Register Value (Hi) | Register Value (Lo) | CRC (Lo) | CRC (Hi) |
|------------------------|------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------|---------------------------|---------------------------|-------------|-------------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

Normal Response

| Slave Station ID | Function Code | Starting Address (Hi) | Starting Address (Lo) | Number of Registers (Hi) | Number of Registers (Lo) | CRC (Lo) | CRC (Hi) |
|---------------------|------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|-------------|-------------|
| 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte | 1 byte |

When you have tried to write an invalid address or parameter that cannot be written, the rest of the parameters, except for the relative ones, will be normally written and responded to.

When you failed to write all parameters, the following error responses will be received:

Error Response

| Slave Station ID | Function Code | Exception Code | CRC(Lo) | CRC(Hi) |
|------------------|---------------|----------------|---------|---------|
| 1 byte 1 byte | | 1 byte | 1 byte | 1 byte |

* The exception code of error response is required function code + 0x80.

Note

If there is invalid data among the consecutive numbers of data from XXXX address, the value is written only for the normal address register and returns a normal response. i.e., when you write 5.00 sec (500,01F4h) for each DRV-05-08 (1205h-1208h), 5.00 sec (500,01F4h) value will be written for each DRV05 and 06 and returns a normal response.

Request

| Slave Station | Function Code | Starting Inction Address Code | | Number of Data1 Registers | | Data2 | | Data3 | | Data4 | | CRC | | | |
|------------------|------------------|-------------------------------------|----|---------------------------------|----|-------|----|-------|----|-------|----|-----|----|----|----|
| U | | Hi | Lo | Hi | Lo | Hi | Lo | Hi | Lo | Hi | Lo | Hi | Lo | Lo | Hi |
| 01 | 10 | 12 | 04 | 00 | 04 | 01 | F4 | 01 | F4 | 01 | F4 | 01 | F4 | FA | 79 |

Response

Normal Response

| Slave Station Function | | Starting | Address | Number of | ^f Registers | CRC | | |
|---------------------------|------|----------|---------|-----------|------------------------|-----|----|--|
| ID | Code | Hi | Lo | Hi | Lo | Lo | Hi | |
| 01 | 10 | 12 | 04 | 00 | 04 | 85 | 73 | |

10.4.2.2 Exception Code

Table 5. Modbus-RTU Exception Code

| | Items | Description |
|----|------------------------|--|
| 01 | ILLEGAL FUNCTION | The requested function cannot be performed by the inverter (the corresponding function does not exist) |
| | | All the parameter addresses (for multiple data read/write) for the inverter to receive and process are invalid |
| 02 | ILLEGAL DATA ADRESS | For read, data with valid addresses are responded to with the relevant data, whereas invalid parameter addresses are responded to with FFFFh |
| | | For write, only the data with valid addresses are processed and normally responded to |
| 03 | ILLEGAL DATA VALUE | The received parameter data is invalid at the slave. |

| | Items | Description |
|----|----------------------|--|
| 06 | SLAVE DEVICE BUSY | The slave is performing other commands |
| 14 | Write-Protection | The write command is not executable |

Table 6. An Example Modbus-RTU Communication

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Example of Modbus-RTU Communication in Use

The example assumes the acceleration time (communication address 0383h) was changed to 5.0 seconds and the deceleration time (communication address 0384h) was changed to 10.0 seconds.

Frame Transmission from Master to Inverter

| ltems | Station ID | Function | Starting Address | Number of Registers | Number of Bytes | Data Value 1 | Data Value 2 | CRC |
|-------------|------------------------------|--------------------------------|--|---------------------------|-----------------------|--|--|-------|
| Hex | 0x01 | 0x10 | 0382h | 0002h | 0x04 | 0032h | 0064h | 1202h |
| Description | INTC -01 Station ID | Preset Multiple Register | Starting commu- nication address-1 (0383h-1) | - | - | 50 (equivalent to 5.0 seconds of acceleration time) | 100 (equivalent to 10.0 seconds of deceleration time) | - |

Frame Transmission from Slave to Master (Response)

| ltems | Station ID | Function | Starting Address | Number of Registers | CRC |
|-------------|-----------------------|--------------------------------|---|------------------------|-------|
| Hex | 0x01 | 0x10 | 0382h | 0002h | E534h |
| Description | INTC-01 Station ID | Preset Multiple Register | Starting communication address-1 (0383h-1) | - | - |

11 Using USB Communication Functions

The S300 has a built-in USB Type-C port, which can be used to connect to PC and control the S300 with modbus-RTU protocols. Refer to **10.4.2 Modbus-RTU** for more details on modbus-RTU protocols.

The USB port is located above the RJ45 port on the main inverter unit. Separate the Smart Operator from the main inverter unit and connect the USB Type-C cable to a PC and the inverter.



[Image 1. Connecting Inverter and PC with USB]

Note

- You do not need to separate the Smart Operator from the main inverter unit if your inverter is the 400 V class 185-220 kW standard, as it has a USB port on the front cover. Refer to <u>400 V Class 185-220 kW</u> for the location of USB port for your model.
- The USB cable is sold separately.

11.1 Parameter Settings for USB Communication

Check if USB cable is connected properly and set the following communication parameters:

| Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|-------|------|-------------------|-----------|-----|------------------|------------------|------|
| 05 | | Response Delay | 5 | | 0~1000 | 5 | msec |
| | 06 | Madbus Addr Mada | 0 | No | 0~1 | 1 | - |
| | 00 | Woubus Audi Woue | 1 | Yes | 0~1 | | |
| USBC | 98 | Error Count | - | | - | 0 | - |
| | 00 | Error Count Doost | | No | 0~1 | 0 | |
| | 99 | Enor Count Reset | 1 | Yes | 0~1 | 0 | - |

Communication Parameters Setting Details

| Code and Functions | | | | Descri | ption | | | | |
|---|---|--|---|--|--|---|--|-------------------------------|--|
| INTC-05 Response Delay | Sets time inverter). response to an app | Sets time for the slave (inverter) to respond to the master (PLC or inverter). Response time is used in a system where the slave device response is too fast for the master device to process. Set this code to an appropriate value for smooth master-slave communication. | | | | | | | |
| | When us from the However paramete modbus When it i you read follows a [Master Station | ing modb paramete ; to use the r to 0 (N and inver s operating the outp ccording → Slave Function | ous-RTU, ber addres he inverte o) and yo ter paran ng at 60.0 ut frequen to the se b] | the mod s of the i er param ou can us neter. 00 Hz wi ncy (031 tting valu | lbus addre inverter. eter addre se the san th the outp 1h), the in ues at USP #of | ess will b ess as its ne addre out currer verter wi 3C-06: #of Poir | e 1 subtr eelf, set th ss for the nt of 1.0. Il respon | acted his A, if d as | |
| USBC-06 ModbusAddrMode | ID | Code | (Hi) | (Lo) | Points(Hi) | (Lo) | Lo | Hi | |
| | 01 | 03 | 03 | 12 | 00 | 01 | XX | XX | |
| | [Slave→ Master] When USBC-06 is set to 1 (Yes) Modbus address: 0312h Inverter communication address: 0311h (output frequency of 60.00 Hz) | | | | | | | | |
| | Station | Function | Number | of D | ata Da | ata (| | CRC | |
| | 01 | 03 | 02 | | 17 7 | '0 | XX | XX | |
| | When USBC-06 is set to 0 (No) Modbus address: 0312h Inverter communication address: 0312h (output current of 1.0 A) | | | | | | | | |
| | Station | Function | Number | of D | ata D | ata (| | CRC | |
| | 01 | 03 | Dytes 02 | | ni) (L 20 00 | A | XX | XX | |
| USBC-98 Error Count, USBC-99 Error Count Reset | USBC-98 counts and displays the number of error responses from the built-in communication. You can check incorrect function codes or data from the master in this count. Set USBC-99 to 1 (Yes) to initialize the count to 0. | | | | | | | | |

11.2 Parameter Group for Data Transmission

By defining a parameter group, the communication addresses registered in the communication related function group (USBC) can be used in communication. The parameter group for data transmission may be defined to transmit multiple parameters at once, in a single communication frame.

| Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|-------|-------|--------------------------------|--------------|------------------|-------------------|------|
| | 11~26 | Para Status-xx (xx: 01~16) | - | 0000~FFFF | 0000 ¹ | Hex |
| 31~ | 31~46 | Para Control-xx (xx: 01~16) | - | 0000~FFFF | 0000 ² | Hex |

Communication Address Accessing Parameters Registered in Para Status-01-16 and Para Control-01-16.

| Communication Address | parameter | Description |
|--------------------------|--|--|
| 0100h~010Fh | Status Parameter-1~ Status Parameter-16 | Parameter values registered in the USB-11-26 codes (read-only) |
| 0110h~011Fh | Control Parameter-1~ Control Parameter-16 | Parameter values registered in the USB-31-46 codes (read/ write) |

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¹ The initial values of Para Status-01, Para Status-02, and ParaStatus-03 are 000A, 000E, and 000F, respectively.

² The initial values of Para Control-01 and Para Control-02 are 0005 and 0006 respectively.

12 Inverter Setting Mode

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12.1 Parameter Management

12.1.1 Setting Mode Parameters

| Mode | Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|---------|--------------|------|--------------------------|----------|-----------------------|------------------|------------------|------|
| | | 01 | Language Select | 0 | English | | 0 | - |
| | | | | 1 | Russian | 0~8 | | |
| | | | | 2 | Spanish | | | |
| | | | | 3 | Italian | | | |
| | | | | 4 | Turkish | | | |
| | | | | 5 | Polish | | | |
| | | | | 6 | Persian | | | |
| | | | | 7 | Chinese | | | |
| | | | | 8 | Korean | | | |
| | Operator Set | 02 | LCD Contrast | Level 10 | | Level 0-20 | Level 10 | - |
| 0 - # | | 03 | LCD BackLight | Level 10 | | Level 0-20 | Level 10 | - |
| Setting | | 04 | LCD SleepMode Time | | 5 | 0~600 | 5 | Min |
| | | 05 | Buzzer Setting | 0 | All Off | 0~2 | 1 | |
| | | | | 1 | PowerUp/ LongkeyOn | | | - |
| | | | | 2 | All On | | | |
| | | 06 | Intro Display On | | On/Off ¹ | 0~1 | On | - |
| | Operator Set | 07 | Logo Display Time | | 2 | 1~10 | 2 | sec |
| | - | 08 | Menu Map On | | On/Off | 0~1 | Off | - |

¹ This is displayed in a pop-up window as a button.

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| Mode | Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------|--------------|------|------------------------|--|----------------------------------|------------------|------------------|------|
| | Drive Set | 10 | Drive S/W Ver. | - | | - | - | - |
| | Operator Set | 11 | Operator S/W Ver. | - | | - | - | - |
| | | 12 | Operator TitleVer. | - | | - | - | - |
| | | | Multi Key | 0 | Local/ Remote ² | | | - |
| | Drive Set | 15 | | 1 | JOG Key ³ | 0~2 | 0 | |
| | | | | 2 | Favorite Add/Del ⁴ | | | |
| | Drive Set | 19 | Mon Command Edit | Yes/No | | 0~1 | Yes | - |
| | | 20 | Anytime Parameter | | | | | |
| Setting | | 21 | Monitor Page-1.1 | | | | | |
| | | 22 | Monitor Page-1.2 | | | | | |
| | | 23 | Monitor Page-1.3 | Refer to 12.2 Monitoring Settings . | | | | |
| | | 24 | Monitor Page-2.1 | | | | | |
| | | 25 | Monitor Page-2.2 | | | | <u>></u> . | |
| | | 26 | Monitor Page-2.3 | | | | | |
| | | 27 | Monitor Page-2.4 | | | | | |
| | | 28 | Monitor Page-2.5 | | | | | |
| | | 29 | Monitor Page-2.6 | | | | | |

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- ² Refer to <u>5.2.2 Local/Remote Switching Operations with Multifunction Keys in the</u> <u>Smart Operator</u>.
- ³ Refer to **7.2.4 Jog Operation with Smart Operator**.
- ⁴ Refer to 4.5.1 Register/delete favorite parameters.

| Mode | Group | Code | LCD Display | ę | Set Value | Setting Range | Initial Value | Unit |
|---------|--------------|------|-----------------------|------------------------------------|--|------------------|------------------|------|
| | Drive Set | 30 | Monitor Gauge | | Refer to 12.2 Monitoring Settings . | | | |
| | | 31 | Monitor Graph | F | | | | |
| | | 32 | Graph Time Period | | | | | |
| | | 35 | I/О Туре | S | tandard IO | - | - | - |
| | | 36 | Option-1 Type | | | | | |
| | | 37 | Option-2 Type | None | | - | - | - |
| | | 38 | Option-3 Type | | | | | |
| | | 39 | Parameter Init | Refe | er to <u>12.1.4 Pa</u> | rameter In | itializat | ion. |
| | | 40 | Para Read from Drv | Re | Refer to 12.1.3 Reading and Writing | | | ng |
| | Operator Set | 41 | Para Write to Drv | Parameters. | | | | |
| | | 42 | Parameter Save | Refer to 12.1.8 Saving parameters. | | | | |
| Setting | | 47 | Macro Select | Refer to 4.6.1 Selecting macro. | | | | |
| | | 48 | Erase All Trip | | Yes/No | 0~1 | No | - |
| | Drive Set | 60 | Add Title Update | | Yes/No | 0~1 | No | - |
| | | 62 | WHour Count Reset | Yes/No | | 0~1 | No | - |
| | | 80 | Operator Temp | | - | - | - | °C |
| | | 85 | 85 Date Time Set | | - | - | - | - |
| | Operator Set | | | 0 | yyyy/mm/dd | | | |
| | Operator Set | 86 | Date Type Set | 1 | mm/dd/yyyy | 0~2 0 | 0 | - |
| | | | | 2 | dd/mm/yyyy | 1 | | |
| | | | Init Op | 0 | No | | | |
| | | 89 | Setting | 1 | Yes | 0~1 | 0 | - |

Setting Mode Parameter Details

| Code and Functions | Description | | | | | |
|--|--|--|--|--|--|--|
| Operator Set-01 Language Select | Sets a language for the Smart Operator. | | | | | |
| Operator Set-02 LCD Contrast | Adju Pres Adju displ | sts the LCD con s the key v st with the $ () /) $ ayed. | trast ratio on the Smart Operator. while holding the ستات key. keys when the contrast ratio setting pop-up is | | | |
| Operator Set-03 LCD Backlight | Adju Pres Adju displ | sts brightness of s the \iff key v st with the $(1/)$ ayed. | f LCD backlight on the Smart Operator. while holding the (MULTI) key. keys when the contrast ratio setting pop-up is | | | |
| Operator Set-04 LCD SleepMode Time | Sets the turn-off time for the LCD backlight on the Smart Operator. Set it to 0 to keep the LCD backlight on. | | | | | |
| | Sets the buzzer sound effect. | | | | | |
| | ltem | | Functionality | | | |
| | 0 | All Off | Turns off all buzzer sound effects. | | | |
| Operator Set-05 | 1 | PowerUp/ Longkey On | The buzzer sounds when the power is supplied to the Smart Operator and the LongKey works. | | | |
| Buzzer Setting | 2 | All On | The buzzer sounds when the power is supplied to the Smart Operator and the LongKey or general key works. | | | |
| | • An example of a LongKey operation: When pressing and holding key in Monitor mode | | | | | |
| Operator Set-06 Intro Display On | Whe on th | n set as On, the le screen upon p | intro (logo of our company) will be displayed first power supply to Smart Operator. | | | |
| Operator Set-07 Logo Display Time | Sets the duration of version and inverter capacity display. | | | | | |

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| Code and Functions | Description | | | | | | |
|---|---|-------------------|---|--|--|--|--|
| | Sets initial screen of the Smart Operator. | | | | | | |
| | | ltem | Functionality | | | | |
| Operator Set-08 Menu Map On | 0 | On | Menu is displayed as the initial screen upon power supply to the Smart Operator. | | | | |
| | 1 | Off | The monitoring screen is displayed as the initial screen upon power supply to the Smart Operator. | | | | |
| Operator Set-35 I/O Type | Cheo | ck the type of co | ntrol terminal board. | | | | |
| Operator Set- 37~39 Option Type | Checks the type of option card installed on the option slot. | | | | | | |
| Operator Set-48 Erase All Trip | Deletes all saved trip history if set as Yes. | | | | | | |
| Operator Set-60 Add Title Update | Used to manually update the LCD code display when a code is after a S/W version update on the main inverter unit. | | | | | | |
| Operator Set-62 WHour Count Reset | Initializes the cumulative power consumption if set as Yes. | | | | | | |
| Operator Set-80 Operator Temp | Displays the internal temperature of the Smart Operator. | | | | | | |
| Operator Set-85 Date Time Set | Sets the time and date in the Smart Operator. | | | | | | |
| | Sets the date display format in the Smart Operator. | | | | | | |
| Operator Set 96 | | ltem | Functionality | | | | |
| Date Type Set | 0 | yyyy/mm/dd | Displayed as year/month/day. | | | | |
| 51 | 1 | mm/dd/yyyy | Displayed as month/day/year. | | | | |
| | 2 | dd/mm/yyyy | Displayed as day/month/year. | | | | |

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12.1.2 Parameter Easy Start (Easy Start On)

You can easily set basic parameters for operating a motor with Easy Start On. You can also set this function in **Wizard** mode on the main menu screen. Refer to **<u>4.2.4.7 Wizard mode</u>** for details. 1

Go to the Drive Set tab in Setting mode, and set 61 (Easy Start On) as Yes. Turn the inverter off then on.

| Mode | Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|---------|-----------|------|---------------|---------------------|------------------|------------------|------|
| Setting | Drive Set | 61 | Easy Start On | Yes/No ⁵ | 0~1 | 0 | - |

Easy Start On Setting Details

| Code and Functions | Description |
|-----------------------|---|
| | Set up Easy Start On according to the following steps: |
| | 1 In Drive Set tab, set 61 (Easy Start On) as Yes. |
| | 2 Turn the inverter off then on. Easy Start On starts. |
| | 3 When the message Easy Start? is displayed on a pop-up window, press Yes. |
| Drive Set 61 | 4 The settings consist of seven steps in total. Select an item for each step. |
| Easy Start On | Step 1: Language |
| | Step 2: Motor capacity Step 2: Number of poles of the motor |
| | Step 3: Notor rated voltage |
| | Step 5: Motor rated frequency |
| | Step 6: Command Source |
| | Step 7: Command frequency |
| | When you are done with all of the above, the minimum parameters for the motor operation are all set. You can now operate the motor with the operation commands you set. Press (ESC) key to stop setting up. |

⁵ This is displayed in a pop-up window as a button.
12.1.3 Reading and Writing Parameters

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Reading and writing parameters enable users to copy parameter settings saved in the main inverter unit to the Smart Operator memory or copy parameter settings saved in the Smart Operator memory to the main inverter unit.

| Mode | Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|---------|--------------|------|--------------------|-----------|------------------|------------------|------|
| Sotting | Operator Set | 40 | Para Read from Drv | - | 1~20 | 0 | - |
| Setting | Operator Set | 41 | Para Write to Drv | - | 1~20 | 0 | - |

An Example of Reading Parameter Settings from the Inverter



[Image 1. Main Menu]

| SETTING | T1/K | R | STOP | 0.00 Hz |
|-----------|----------|-----|---------|------------|
| Drive | Set | | Opera | ator Set 👘 |
| 40. Para | Read | fro | om Driv | r |
| | | | | None |
| 41. Рага | Write | to | Drv | |
| | | | | None |
| 46. Favor | - All De | ele | te | |
| | | | | No |
| 48. Erase | e All Ti | rip | | |
| | | | | No |

[Image 2. Parameter Reading Selection in Setting Mode] • Move to **Setting** mode by pressing the MODE key on the menu screen.

- Press the Solution key in the Operator Set tab and move to code no. 40.
- Press the key.

| SETTING T1/K | R | STOP | 0.00 Hz |
|--------------|----|--------|----------|
| Drive Set | | Oper | ator Set |
| 40. Para R | ea | d from | i Drv |
| 00. None | | | DS |
| 01Empty | · | - | |
| 02Empty | r | - | |
| 03Empty | | - | |

[Image 3. Saving Parameter Settings]

| S | TTINGE T1/K F STOP 0.00 Hz | |
|---|----------------------------|--------|
| | Drive Set Operator Set | |
| | | |
| | A | |
| | (i) Success | 1 |
| | | - |
| | OK | |
| | | |
| - | 00 E | \neg |
| | V3Empty | |

[Image 4. The Screen after Successfully Reading Parameters]

| SETTINGE T1/K Drive Set | STOP 0.00 Hz Operator Set |
|----------------------------|------------------------------|
| 41. Para Re | ad from Drv |
| 00. None | DS |
| 01. PARA01_2 | 00723!1042.DAT |
| 02Empty- | |
| 03Empty- | |

| ſ | Image | 5 | Parameter | Saved 1 |
|---|--------|----|------------|---------|
| L | innage | υ. | i arameter | ouveu j |

- Press <>/<> keys to select an empty slot you want to save parameter settings in.
- Press the (key.

• When you successfully read parameter settings from the inverter, the popup window will display the **Success** message.

• The parameter settings from the inverter will be saved in the internal memory of the Smart Operator, and the name of file saved in the selected slot will be displayed. An Example of Writing Parameter Settings in the Inverter



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[Image 6. Main Menu]

| SETTING T1/K R ST | OP 0.00 Hz |
|----------------------|-------------|
| Drive Set 0 | perator Set |
| 41. Para Write to Dr | v |
| | None |
| 46. Favor All Delete | |
| | No |
| 48. Erase All Trip | |
| | No |
| 49. View Changed Pa | ira 🛛 👘 |
| | View All |

[Image 7. Parameter Writing Selection in Setting Mode]

| SETTING® T1/K | STOP 0.00 Hz |
|---------------|----------------|
| Drive Set | Operator Set |
| 41. Para W | rite to Drv |
| 00. None | DS |
| 01. PARA01_2 | 00723!1044.DAT |
| 02Empty- | |
| 03Empty- | |

[Image 8. Parameter Settings Selection] • Move to **Setting** mode by pressing MODE key on the menu screen.

- Press the Solution key in the Operator Set tab and move to code no. 41.
- Press the key.

- Press keys to select saved parameter settings.
- Press the key.





• When you successfully write parameter settings in the inverter, the pop-up window will display the **Success** message.

12.1.4 Parameter Initialization

You can initialize changed parameter settings collectively or by group.

However, during a fault trip or inverter operation, parameter settings cannot be initialized.

Select 1 (All Group) to initialize all groups.

| Mode | Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit | | | |
|---------|----------|------|----------------|----------------------------|------------|------------------|------------------|------|--|----|-----------|
| | | | | 0 | No | | | | | | |
| | | | | 1 | All Group | | | | | | |
| | | | | 2 DRV Group 3 BAS Group | | | | | | | |
| | | | | | | | | | | | |
| | | | 20 Parameter | 4 | MOT1 Group | | 0 | | | | |
| | | 39 | | 5 | V/F1 Group | | | | | | |
| Sotting | Operator | | | 6 | VEC1 Group | | | | | | |
| Setting | Set | | Init | 7 | MOT2 Group | 0~35 | | - | | | |
| | | | | 8 V/F2 Group | | | | | | | |
| | | | | 9 | VEC2 Group | | 0 | | | | |
| | | | | 10 | ADV Group | | | | | | |
| | | | | 11 | APP Group | | | | | | |
| | | | | 12 | DIN Group | | | | | | |
| | | | | | | | | | | 13 | AIN Group |

| Mode | Group | Code | LCD Display | | Set Value | Setting Range | Initial Value | Unit |
|---------|-----------------|------|----------------|------------|------------|------------------|------------------|------|
| | | | | 14 | OUT Group | | | |
| | | | | 15 | XDIN Group | | | |
| | | | | 16 | XAIN Group | | | |
| | | | | 17 | XOUT Group | - | | |
| | | | | 18 | PPID Group | | | |
| | | | | 19 | SYNC Group | | | |
| | | | | 20 | PRT Group | | | |
| | | | | 21 | DIAG Group | | | |
| | Operator Set | 39 | | 22 | RSR2 Group | - | | |
| | | | | 23 | INTC Group | | | |
| | | | | 24 | INTM Group | | | |
| Sotting | | | Parameter | 25 | USBC Group | 0~35 | 0 | |
| Setting | | | Init | 26 | RSR3 Group | - 0~35 | | |
| | | | | 27 | RSR4 Group | | | |
| | | | 28 V | VIRT Group | | | | |
| | | | | 29 | ENC Group | | | |
| | | | | 30 | EPI1 Group | | | |
| | | | | 31 | EPI2 Group | | 0 | |
| | | | | 32 | POS1 Group | | | |
| | | | | 33 | POS2 Group | | | |
| | | | | 34 | WEB1 Group | | | |
| | | | | 35 | WEB2 Group | | 0 | |
| | | | | 36 | OPC1 group | | | |
| | | | | 37 | OPC2 Group | | | |

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An Example of Parameter Initialization



[Image 10. Setting mode screen]

| SETTING T1/K | R STOP | 0.00 Hz |
|----------------|----------|----------|
| Drive Set | Oper | ator Set |
| 39. Parameter | Init | |
| | | None |
| 40. Para Read | from Dry | 1 |
| | | None |
| 41. Para Write | to Drv | |
| | | None |
| 42. Parameter | Save | |
| | | No |

[Image 11. Parameter Initialization Selection in Setting Mode]

| SETTINGE T1/K | STOP 0.00 Hz |
|---------------|--------------|
| Drive Set | Operator Set |
| 39. Parar | neter Init |
| 00 No |) DS |
| 01. All Group | |
| 02. DRV Group | o |
| 03. BAS Group | o |

[Image 12. Parameter Initialization Item Selection] • Move to **Setting** mode by pressing MODE key on the menu screen.

- Press the Solution key in the Operator Set tab and move to code no. 39.
- Press the (key.

- Press <>/<> keys and select 1 (All Group) among parameter initialization items.
- Press the 📣 key.

| SETTING T1/K R STOP | 0.00 Hz |
|-----------------------|------------|
| Drive Set Ope | rator Set |
| 39. Parameter Init | |
| | None |
| 40. Para Read from Dr | ۲ V |
| | None |
| 41. Para Write to Drv | |
| | None |
| 42. Parameter Save | |
| | No |

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[Image 13. Parameter Initialization Selection in Setting Mode]

12.1.5 Parameter Mode Lock

You can use a registered password to make the parameter mode inaccessible.

| Mode | Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|---------|----------|------|-----------------------|-----------|------------------|------------------|------|
| 0.111 | Operator | 50 | ParaView Lock | Unlocked | - | Unlocked | - |
| Setting | Set | 51 | ParaViewLock PwSet | 0000 | 0~9999 | 0000 | - |

Parameter Mode Lock Setting Details

| Code and Functions | Description |
|---------------------------------|---|
| Operator Set-50 ParaViewLock | Locks parameter mode or disables the lock. Locking parameter mode: Enter the previously registered password. The initial password is 0000 if using it for the first time. If the password you entered matches the set password, the lock icon ((⁻)) will be displayed when you enter parameter mode in the Smart Operator and the list of parameters will be hidden. Disabling parameter mode hide: Enter the password again. If the password you entered matches the set password, the lock icon ((⁻)) will disappear when you enter parameter mode in the Smart Operator, showing the list of parameters. |

• It returns to the initialization selection screen once initialization is complete.

| Code and Functions | Description |
|--|---|
| Operator Set-51 ParaViewLock PwSet | Registers the password to lock parameter mode. Follow the procedures below to register password. 1 Press the key in Smart Operator. |
| | 2 Enter 0000 upon initial registration, or enter the previous password if you already have one. If the password you entered matches your previous password, a pop-up window will be displayed for you to register a new one (if the password you entered does not match your previous password, the pop-up window will display Password Mismatch! message). |
| | Register a new password. The Password Changed message will be displayed in the pop- up window once registration is complete. |

An Example of Parameter Mode Lock



[Image 14. Setting mode screen]

| SETTING T1/K | STOP 0.00 Hz |
|------------------------|-----------------|
| Drive Set | Operator Set |
| 50. ParaView Loc | ж |
| | Unlocked |
| 51. ParaViewLocl | k PwSet |
| | Password |
| 52. ParaEdit Loc | k |
| | Unlocked |
| 53. ParaEditLock | (PwSet |
| | Password |
| [Image 15. Param | neter Mode Lock |
| Selection in Selection | etting Mode] |

• Move to **Setting** mode by pressing MODE key on the menu screen.

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- Press the Solution key in the Operator Set tab and move to code no. 50.
- Press the key.



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[Image 16. Password Setting for Parameter Mode Lock]

| SETTING T1/K | STOP 0.00 Hz |
|------------------|---------------------|
| Drive Set | Operator Set |
| 50. ParaView Lo | ck |
| 8 | Locked |
| 51. ParaViewLoc | k PwSet |
| | Password |
| 52. ParaEdit Loc | ж |
| | Unlocked |
| 53. ParaEditLocl | k PwSet |
| | Password |

[Image 17. Screen after Parameter Mode Lock Setting]



[Image 18. Screen with Parameter Mode Lock Setting]

- Enter the password. (The initial password is 0000.)
- Press the key.

• The ParaView Lock code value is changed to Locked and parameter mode lock is set.

• Press the MODE key and move to parameter mode and check if the ricon is displayed.

12.1.6 parameter lock

You can use registered password to prohibit changing parameter values in parameter mode.

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| Mode | Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|---------|----------|------|-----------------------|-----------|------------------|------------------|------|
| 0.41 | Operator | 52 | ParaEdit Lock | Unlocked | - | Unlocked | - |
| Setting | Set | 53 | ParaEditLock PwSet | 0000 | 0~9999 | 0000 | - |

Parameter Lock Setting Details

| Code and Functions | Description |
|--|--|
| | Prohibits changing parameter values in parameter mode or lifts prohibition. |
| Operator Set-52 ParaEditLock | • Prohibiting parameter value edit: Enter the previously registered password. The initial password is 0000 if using it for the first time. If the password you entered matches the set password, items in the parameter mode in the Smart Operator will be deactivated and you will not be able to change parameter values. |
| | Disabling prohibition of parameter value changes: Enter the password again. If the password you entered matches the set password, items in the parameter mode in the Smart Operator will be activated and you can change parameter values. |
| | Registers the password to prohibit parameter value changes in parameter mode. Follow the procedures below to register password. |
| Operator Set-53 ParaEditLock PwSet | 1 Press the 🛋 key in Smart Operator. |
| | 2 Enter 0000 upon initial registration, or enter the previous password if you already have one. If the password you entered matches your previous password, a pop-up window will be displayed for you to register a new one (if the password you entered does not match your previous password, the pop-up window will display Password Mismatch! message). |
| | Register a new password. The Password Changed message will be displayed in the pop- up window once registration is complete. |

An Example of a Parameter Change Prohibition



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[Image 19. Setting mode screen]

| SETTING T1/K | STOP 0.00 Hz |
|------------------|---------------------|
| Drive Set | Operator Set |
| 52. ParaEdit Loc | k |
| | Unlocked |
| 53. ParaEditLock | PwSet |
| | Password |
| 80. Operator Ter | np |
| 0 | 29 °c |
| 85. Date Time Se | t |
| 202 | 20/07/23 11:03 |

[Image 20. Parameter Change Prohibition Selection in Setting Mode]



[Image 21. Password Setting for Parameter Change Prohibition] • Move to **Setting** mode by pressing MODE key on the menu screen.

- Press the 🖘 key in the Operator Set tab and move to code no. 52.
- Press the (key.

- Enter the password. (The initial password is 0000.)
- Press the key.

| SETTING | T1/K | F | STOP | 0.00 Hz |
|-----------|---------|-----|-------|----------|
| Drive | Set | | Oper | ator Set |
| 52. Paral | Edit Le | ock | ٢ | |
| | | | | Locked |
| 53. Paral | EditLo | ck | PwSet | t |
| | | | P | assword |
| 80. 0pera | ator T | em | р | |
| 0 | | | | 29 °c |
| 85. Date | Time S | Set | | |
| | 2 | 02 | 0/07/ | 23 11:03 |

[Image 22. Screen after Parameter Change Prohibition Setting]

 PARAM
 T1/K
 R
 STOP
 0.00 Hz

 Image: Organization of the state of the state

[Image 23. Screen with Parameter Change Prohibition Setting]

() Caution

If parameter mode lock and parameter change prohibition are enabled, no functions related to inverter operation can be changed. Therefore, it is very important that you memorize the password if you have a registered password.

• The ParaEdit Lock code value is changed to Locked and parameter change prohibition is set.

• Press the MODE key and move to parameter mode and check if parameter items are deactivated.

12.1.7 Changed parameter display

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It exclusively shows parameters with different settings from the factory default in parameter mode. Use this feature to track changed parameters.

| Mode | Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------|----------|------|--------------|------------------|-----------------|------------------|------------------|------|
| Setting | Operator | 49 | View Changed | Yes ⁶ | View Changed | _ | No | _ |
| Cetting | Set | | Para | No ³ | View All | _ | 140 | |

Changed Parameter Display Setting Details

| Code and Functions | Description |
|---|--|
| Operator Set-49 View Changed Para | All parameters will be displayed in the parameter mode if set as No, and only the ones with changed values will be displayed if set as Yes. |

12.1.8 Saving parameters

When inverter parameters are changed, the values are saved in the internal memory when the inverter power is blocked. However, it may not be saved upon abnormal power block events. Therefore, you can save it right after changing the parameter. Save the current parameters by setting the 42 (Parameter Save) values under Operator Set tap to "Yes."

| Mode | Group | Code | LCD Display | Set Value | Setting Range | Initial Value | Unit |
|---------|-----------------|------|-------------------|---------------------|------------------|------------------|------|
| Setting | Operator Set | 42 | Parameter Save | Yes/No ⁶ | - | No | - |

12.2 Monitoring Settings

12.2.1 Item Change in Monitor Display Mode

You can monitor three items simultaneously in monitor mode. You can also change monitoring items. Refer to **<u>4.2.4.1 Monitor mode</u>** for details on screen composition and items of the monitor mode.

The following is an example of changing a monitor display item. You can select monitoring items in the setting mode.

| MONITOR | T1/K | R ST | OP | 30.00 Hz | |
|----------------|--------|------|----|----------|--|
| Frequency | | | | | |
| | | 3 | 0. | 00нг | |
| Output Cu | urrent | t | | | |
| | | | 0 |).0_ | |
| Output Voltage | | | | | |
| | | | | Οv | |
| | • | | | | |
| V/F | [S] 0 | 2:14 | MO | T1 | |

- It is the initial screen of monitor mode.
- The Output Frequency, Output Current, and Output Voltage are set as monitoring items by default.

[Image 24. Monitor mode screen]

| MONITOR | T1/K | RS | TOP | 30.00 Hz |
|-----------|--------|-------|------------|----------|
| Frequenc | у | | | |
| | | | <u>30.</u> | 00нг |
| Output Cu | irrent | t | | |
| | | | (| D.OA |
| Output Vo | oltage | | | |
| | | | | Οv |
| | • | 0.0.0 | | _ |
| V/F | [S] 0 | 2:14 | M(| DT1 |

[Image 25. Item Selection in Monitor Mode]

• Press the (key for one second after selecting the third item.

| SETTING T1/K | R STOP 30.00 Hz | | | | | |
|----------------|----------------------|--|--|--|--|--|
| Drive Set | Operator Set | | | | | |
| 23. Monitor Pa | 23. Monitor Page-1.3 | | | | | |
| | Output Voltage | | | | | |
| 24. Monitor Pa | age-2.1 | | | | | |
| | Frequency | | | | | |
| 25. Monitor Pa | age-2.2 | | | | | |
| | Output Current | | | | | |
| 26. Monitor Pa | ge-2.3 | | | | | |
| | Output Voltage | | | | | |

[Image 26. Selecting Monitor Items to Change in Setting Mode]

| SETTING T1/K | R STOP | 30.00 Hz |
|---------------|---------|----------|
| Drive Set | Oper | ator Set |
| 23. Monitor | r Page- | -1.3 |
| 03. Output Vo | oltage | D |
| 04. Output Po | wer | |
| 05. Watt Hour | - Meter | |
| 06. DC Link V | oltage | S |

[Image 27. Selecting Monitor Items to Display]



[Image 28. Screen with Monitor Items Changed]

- The screen moves to code no. 23 in the Operator Set tab in Setting mode.
- Press the key and set the items to display in Monitor mode.
 (You may change parameter values directly in the Operator Set tab in Setting mode instead of pressing the key for one second.)
- Press the <>/<>> keys and move the cursor to 6 (**DC Link Voltage**).
- Press the (\mathbf{A}) key to change the setting.

• Press the MODE key, move to Monitor mode from the Menu screen, and check if the third item has changed to DC Link Voltage.

12.2.2 Monitoring Item Settings for Top Status Bar

Items displayed on the right of top status bar in Smart Operator are always displayed regardless of the mode. Therefore, if you register parameters of your choice in the top status bar, you can always check the values even when you move or change modes. The initial value of this item is frequency. The command frequency is displayed when stopped, whereas current output frequency is displayed during operation. The following shows an example of changing monitoring values in the top status bar.

| MONITOR T1/K | STOP 30.00 Hz |
|----------------|---------------|
| Frequency | |
| | 30.00 нz |
| Output Current | |
| | 0.0 |
| Output Voltage | |
| | 0v |
| • • • | • |
| V/F [S] 02:1 | 4 MOT1 |

[Image 29. Monitor mode screen]

| SETTING K /K | R STOP 30.00 Hz |
|------------------|-----------------------|
| Drive Set | Operator Set |
| 20. Anytime Par | ameter |
| | Frequency |
| 21. Monitor Page | e–1.1 |
| | Frequency |
| 22. Monitor Page | e-1.2 |
| | Output Current |
| 23. Monitor Page | e–1.3 |
| | Output Voltage |
| | |

[Image 30. Selecting Monitoring Items to Change in Top Status Bar in Setting Mode]

| SETTINGB K /K Drive Set | R STOP 30.00 Hz Operator Set |
|---------------------------------|-----------------------------------|
| 20. Anytime | Parameter |
| 00. Frequenc | y DS |
| 01. Speed | |
| 02. Output Cu | irrent |
| 03. Output Vo | oltage |
| Image 31. Selectir in Top St | ng Monitoring Items atus Bar 1 |

- It is the initial screen of **Monitor** mode.
- The frequency is displayed in the top status bar by default.

• Press the Set tab in **Setting** mode and move to code no. 20.

• Press the (key to locate the cursor on the currently set value.

| SETTING K/K | STOP 30.00 Hz |
|----------------|-----------------|
| Drive Set | Operator Set |
| 20. Anytime | Parameter |
| 00. Frequency | y ds |
| 01. Speed | |
| 02. Output Cur | rrent |
| 03. Output Vol | tage |

[Image 32. Selecting the Output Current among Monitoring Items in the Top Status Bar]

| SETTING K /K | R STOP 0.0 A |
|-----------------|-----------------------|
| Drive Set | Operator Set |
| 20. Anytime Par | ameter |
| E | Output Current |
| 21. Monitor Pag | e–1.1 |
| | Frequency |
| 22. Monitor Pag | e-1.2 |
| | Output Current |
| 23. Monitor Pag | e–1.3 |
| | Output Voltage |
| | |

[Image 33. The Screen after a Monitor Item Change in the Top Status Bar]



[Image 34. Top Status Bar with Monitoring Item Changed]

- Press the <>/<> keys and move the cursor to 2 (Output Current).
- Press the (key to change the setting.

• The changed item will be displayed in code no. 20 in the Drive Set tab. Check if the item in the top status bar has changed from output frequency to output current.

• Press the MODE key to move to Monitor mode from the Menu screen, and check if the item in the top status bar is the output current.

12.2.3 Operation Status Monitor Settings

The following are setting mode parameters for the operation status monitor. You can set additional features with the Smart Operator.

٦

| Mode | Group | Code | LCD Display | Set Value | | Setting Range | Initial Value | Unit |
|---------|--------------|------|-------------------|----------------------|---------------------|------------------|------------------|------|
| | | 20 | Anytime Para | 0 | Frequency | 0~24 | 0 | - |
| | | 21 | Monitor Page-1.1 | | | | 0 | - |
| | | 22 | Monitor Page -1.2 | | | 2 | - | |
| | | 23 | Monitor Page -1.3 | | | 3 | - | |
| | | 24 | Monitor Page -2.1 | | | 0 | - | |
| | Drive Set | 25 | Monitor Page -2.2 | Same as Anytime Para | | | 2 | - |
| | | 26 | Monitor Page -2.3 | | | | 3 | sec |
| | | 27 | Monitor Page -2.4 | | | 6 | - | |
| | | 28 | Monitor Page -2.5 | | | 23 | - | |
| Setting | | 29 | Monitor Page -2.6 | | | | 7 | - |
| | | 30 | Monitor Gauge | | | 0 | - | |
| | | 31 | Monitor Graph | | | | 0 | - |
| | | | | 0 | 6 Sec | | | |
| | | | | 1 | 12 Sec | 0~5 | | |
| | | | | 2 | 1 Min | | | |
| | | 32 | Graph TimePeriod | 3 | 5 Min | | 3 | - |
| | | | 4 | 10 Min | | | | |
| | | | | 5 | 30 Min | | | |
| | | 33 | Monitor Mode Init | ١ | ∕es/No ⁷ | | 0 | - |

⁷ This is displayed in a pop-up window as a button.

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Operation Status Monitor Parameters Settings Details

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| Code and Functions | Description | | | | |
|--------------------------------------|---|---|---|--|--|
| | Sele of the displ Refe more | Select the items to display on the status bar in the top-right corner of the Smart Operator. Select setting values for the information to be displayed from below. Drive Set-21-31 have the same setting values. Refer to 12.2.2 Monitoring Item Settings for Top Status Bar for more details on this parameter. | | | |
| | | ltem | Functionality | | |
| | 0 | Frequency | Set frequency is displayed when stopped and operating frequency that is currently being output is displayed in Hz during operation. | | |
| | 1 | Speed | Works the same as no. 0, and the operation status is displayed in rpm. | | |
| | 2 | Output Current | Displays the output current. | | |
| | 3 | Output Voltage | Displays the output voltage. | | |
| | 4 | Output Power | Displays the output power. | | |
| Drive Set-20 Anytime Parameter | 5 | Watt Hour Meter | Displays the inverter power consumption. | | |
| i arameter | 6 | DC Link Voltage | Displays the DC link voltage inside the inverter. | | |
| | 7 | Digital In Status | Displays the status of input terminals of the terminal block. It is displayed from the right. | | |
| | 8 Digital Stat | | Displays the status of the output terminals of the terminal block. It is displayed from the right. | | |
| | 9 | AI1 Value | Displays the analog input values of the terminal block. | | |
| | 10 | AI1 Monitor[%] | Displays the analog input values of the terminal block as a percentage (-100 - 100%). | | |
| | 11 | Al2 Value | | | |
| | 12 | AI2 Monitor[%] | Same as 0 and 10 | | |
| | 13 | Al3 Value | | | |
| | 14 | AI3 Monitor[%] | | | |

| Code and Functions | | | Description | | | |
|---|--|---|---|--|--|--|
| | | ltem | Functionality | | | |
| | 15 | PID Output | Displays output of the PID controller. | | | |
| | 16 | PID Reference | Displays the size of reference value of the PID controller and the PID reference values are configurable. | | | |
| Drive Set-20 | 17 | PIDDisplays the feedback volume of controller. | | | | |
| Anytime | 18 | Torque | Displays the torque. | | | |
| Parameter | 19 | Torque Limit | Displays the torque limits. | | | |
| | 20 | Torque Monitor[Nm] | Displays the torque output (Nm). | | | |
| | 21 | Speed Limit | Displays the speed limits. | | | |
| | 22 | Load Speed | Displays the load speed. | | | |
| | 23 | Ac Input Volt | Displays the AC input voltage. | | | |
| | 24 | 24 Temperature Displays the inverter temperat | | | | |
| Setting-21~23 Monitor Page-x.x (x.x: 1.1~1.3) | Seleo from conc | cts items to disp Monitor Page-1 urrently. | lay on Monitor mode screen-1. All three items .1 to Monitor Page-1.3 can be displayed | | | |
| Setting-24~29 Monitor Page-x.x (x.x: 2.1~2.6) | Seleo Moni | cts items to disp tor Page-2.1 to l | lay on Monitor mode screen-2. All six items from Monitor Page-2.6 can be displayed concurrently. | | | |
| Setting-30 Monitor Gauge | Seleo can b | cts the items to o be displayed. | display for the Monitor mode gauge. One item | | | |
| Setting-31 Monitor Graph | Selects items to display in Monitor mode graph. One item can be displayed. | | | | | |
| Setting-32 Graph TimePeriod | Sets | the maximum ti | me for X-axis in the monitor mode graph. | | | |
| Setting-33 Monitor Mode Init | Seleo | ct Yes and Drive | Set-20-32 will be initialized. | | | |

Note

Watt Hour Meter (inverter power consumption)

Among the codes of Drive Set-20, 5 (Watt Hour Meter, inverter power consumption) uses calculations with voltage and current and is accumulated based on the power calculated every second. Power consumption is displayed as follows:

- For less than 1000 kW, it will be displayed as 999.9 kWh in the unit of kW.
- For 1 99 MW, it will be displayed as 99.99 MWh in the unit of MW.
- For 100 999 MW, it will be displayed as 999.9 MWh in the unit of MW.
- For 1000 MW and more, it will be displayed as 9999 MWh in the unit of MW up to 65535 MWh.
- For 65535 MW and more, it will be initialized to 0 and displayed as 999.9 kWh in the unit of kW.
- You can manually initialize cumulative power consumption if you set 62 (WHour Count Reset) in the Operator Set tab in Setting mode as Yes.

12.3 Trip Status Monitoring

12.3.1 For a Trip During Operation

The following example demonstrates how to monitor output current in the operation group using the Smart Operator.



• When there is a trip during operation, it will automatically switch to the trip mode screen and display the type of current trip.

| FAULT K /K R TRIP 40.00 Hz |
|-------------------------------------|
| ASHT |
| Arm Short |
| 01. Output Frequency |
| 13.56 Hz |
| 02. Output Current |
| 0.0 A |
| 03. Inverter State |
| Acceleration |
| [Image 36. Trip Status Selection] |

| HISTORY K/K R TRIP | 40.00 Hz |
|-------------------------|----------|
| Fault-1 Fault-2 Fault-3 | |
| Arm Shor | t |
| 01. Output Frequency | |
| | 0.00 Hz |
| 02. Output Current | |
| | 0.0 A |
| 03. Inverter State | |
| | Stop |

[Image 37. Trip History Selection]

| MONITOR | ₹ К/ | K 🖪 ST | 'OP 4 | 40.00 Hz |
|----------|-------|--------|-------------|----------|
| Frequer | псу | | | |
| | | 3 | <u>80.0</u> |)Онz |
| Output (| Curre | ent | | |
| | | | 0 | .0^ |
| 0utput ۱ | /olta | ge | | |
| | | | | 0v |
| | | | | |
| V/F | [S] | 01:54 | MOT | |

[Image 38. Trip Disabled]

 To check information such as output frequency, current, or operation status at the time of a trip occurrence, press the key and move to the relevant position. ٦

- If there is a trip history, press the (), () keys and check the status of the trip at that moment.
- The Fault-1 tab shows the latest trip.

• When the trip is disabled from reset, it will return to the screen before the trip.

12.3.2 For Concurrent Trips of Two or More

The following example demonstrates how to monitor output current in the operation group using the Smart Operator.

| FAULT K /K R TRIP 40.00 Hz |
|--------------------------------|
| ASHT MFAN |
| Arm Short |
| 01. Output Frequency |
| 13.56 Hz |
| 02. Output Current |
| 0.0 A |
| 03. Inverter State |
| Acceleration |
| [Image 39. Multiple Trips] |
| FAULT K /K R TRIP 40.00 Hz |
| ASHT MFAN |
| Trip Name (02) |
| 01. Arm Short |
| 02. Main Fan Fault |
| |
| |
| |

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[Image 40. The Type and Number of Multiple Trips]



- When there are two or more trips, the list of trips will be displayed at the top of the screen.
- Press the (key.

• It will display the type and number of concurrent trips.

• When a trip is disabled from reset, it will return to the screen before the trip.

13 Table of Functions

This chapter lists all the function settings for S300 series inverter. Set the parameters required for operation according to the table of functions.

The parameter address when accessing the inverter parameter with communication is calculated as follows:

16-bit parameter address = 16 bit group code + code number 32-bit parameter address = 32 bit group code + code number *2

If you want to get the process PID output via communication, its parameter is PPID-02 (Output Value) and the parameter address when accessing with 16-bit parameter is as follows:

2000h + 2 = 2002h

The parameter address when accessing with a 32-bit parameter is as follows:

A000h + 2 * 2 = A004h (read two consecutively)

By default, when accessing 32-bit parameters, the parameter addresses must be even numbers. If accessed with an odd number, the inverter will respond with an address that is 1 less. For example, the 32-bit parameter address of PPID-02 (Output Value) is A004h. However, if accessed with A005h, the inverter will recognize it as A004h and respond accordingly.

The group codes for each parameter are as follows:

| Group | 16-Bit | 32-Bit | Group | 16-Bit | 32-Bit |
|-------|--------|--------|-------|--------|--------|
| DRV | 1200h | 9200h | INTC | 2700h | A700h |
| BAS | 1300h | 9300h | INTM | 2800h | A800h |
| MOT1 | 1400h | 9400h | USBC | 2900h | A900h |
| VF1 | 1500h | 9500h | VIRT | 2C00h | AC00h |
| VEC1 | 1600h | 9600h | ENC | 2D00 | AD00 |
| MOT2 | 1700h | 9700h | EPI1 | 2E00 | AE00 |
| VF2 | 1800h | 9800h | EPI2 | 2F00 | AF00 |
| VEC2 | 1900h | 9900h | POS1 | 3000 | B000 |
| ADV | 1A00h | 9A00h | POS2 | 3100 | B100 |
| APP | 1B00h | 9B00h | WEB1 | 3200 | B200 |
| DIN | 1B00h | 9B00h | WEB2 | 3300 | B300 |

| Group | 16-Bit | 32-Bit | Group | 16-Bit | 32-Bit |
|-------|--------|--------|-------|--------|--------|
| AIN | 1C00h | 9C00h | US | 3900 | B900 |
| OUT | 1D00h | 9D00h | USL | 3A00 | BA00 |
| PPID | 2200h | A200h | USV | 3B00 | BB00 |
| PRT | 2400h | A400h | USP | 3C00 | BC00 |
| DIAG | 2500h | A500h | USM | 3D00 | BD00 |

13.1 Drive Group (DRV)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | Setting Range | Initial Value | Unit | Property ¹ | Ref. | Communication address/scale | |
|------|------------------|--------------------|--------------------|------|-----------------------|---------|-----------------------------|--------|
| | | | | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | 1-99 | 25 | - | 0 | 4.3.3 | 1200h | 9200h |
| 01 | Command | 0.00 Max Fraguenay | 0.00 | Hz | 0 | 5.1.1.2 | 1201h | 9202h |
| 01 | Frequency | 0.00-Max Frequency | | | | | 0.01 | 0.01 |
| 022 | Command Speed | 0 Maximum Speed | 0.3 | rpm | 0 | 5.1.1.2 | 1202h | 9204h |
| 02 - | | 0-maximum Speed | 0 • | | | | 1 | 1 |
| 02 | Command | 190.0.190.0 | 0.0 | 0/ | 0 | 6.3.2.1 | 1203h | 9206h |
| 03 | Torque | -100.0-100.0 | 0.0 | 70 | | | 0.1 | 0.1 |
| 05 | A oo Timo | 0.00.6000.00 | 20.00 4 | sec | 0 | 521 | 1205h | 920Ah |
| 05 | Acc time | 0.00-6000.00 | 60.00 ⁵ | | | 0.0.1 | 0.1 | 0.01 |

- ¹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable
- ² Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).
- ³ The rpm value varies according to the motor rating pole number (MOT1, 2-25).
- ⁴ For an inverter capacity of 75 kW or less (Refer to <u>16.8 Parameter Default Values</u> <u>Based on the Motor Capacity</u>)
- ⁵ For an inverter capacity 90 kW or more (Refer to <u>**16.8 Parameter Default Values</u>** <u>**Based on the Motor Capacity**)</u></u>

| Code | LCD Display | | Setting Range | ge Initial Value | | Property ¹ | Ref | Commu addres | Communication address/scale | |
|------|---------------------|----|------------------|---------------------|-----|-----------------------|---------|-----------------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 06 | Dec Time | | 0.00-6000.00 | 30.00 | sec | 0 | 531 | 1206h | 920Ch | |
| 00 | Dec IIIIe | | 0.00-0000.00 | 30.00 | 300 | 0 | 0.0.1 | 0.1 | 0.01 | |
| | | 0 | Keypad | | | | | | | |
| | | 1 | Fx/Rx-1 | | | | | | | |
| | | 2 | Fx/Rx-2 | | | | | | | |
| 10 | 1st Command | 3 | 3-Wire | 1 | _ | | 521 | 120ah | 9214h | |
| 10 | Source | 4 | Internal Comm | | | | 5.2.1 | TZOUT | | |
| | | 5 | USB Comm. | | | | | | | |
| | | 6 | Option Comm. | | | | | | | |
| | | 7 | UserSequence | | | | | | | |
| | | 0 | Keypad | | | | | | | |
| | | 1 | Analog Input 1 | | | | | | | |
| | | 2 | Analog Input 2 | | | | | | | |
| | | 3 | Analog Input 3 | | | | | | | |
| | | 4 | Pulse Input | | | | | | | |
| | | 5 | Up Down Drive | | | | | | 9216h | |
| 11 | 1st Freq Ref Src | 6 | Internal Comm. | 0 | - | \triangle | 5.1.1.1 | 120bh | | |
| | 010 | 7 | USB Comm. | | | | | | | |
| | | 8 | Option Comm. | | | | | | | |
| | | 9 | UserSequence | | | | | | | |
| | | 10 | X-Analog Input 1 | | | | | | | |
| | | 11 | X-Analog Input 2 | | | | | | | |
| | | 12 | X-Analog Input 3 | | | | | | | |

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| Code | le LCD Display | | LCD Display Setting Range | | Unit | Property ¹ | Ref. | Communication address/scale | |
|-----------------|----------------|-----------------|---------------------------|------------------|------|-----------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| 126 | 1st Torque | 5 | Internal Comm. | 0 | | | 632 | 120ch | 0218h |
| 12 - | Ref Src | 6 | USB Comm. | 0 | - | | 0.3.2 | 120011 | 921011 |
| | | 7 | Option Comm. | | | | | | |
| | | 8 | UserSequence | | | | | | |
| | | 9 | X-Analog Input 1 | | | | | | |
| | | 10 | X-Analog Input 2 | | | | | | |
| | | 11 | X-Analog Input 3 | | | | | | |
| 15 | Jog | 00 | | 10.00 | Hz | 0 | 721 | 120fh | 921Eh |
| 15 | Frequency | 0.0 | | | | | 1.2.1 | 0.01 | 0.01 |
| 16 ² | log Speed | 0- | Maximum Speed | 300 ³ | rpm | 0 | 721 | 1210h | 9220h |
| | oog opeed | 0- | | | | | 1.2.1 | 1 | 1 |
| 17 | Jog Acc | | 0 00-6000 00 | 20.00 | | 0 | 7.2.1 | 1211h | 9222h |
| | Time | | 0.00-0000.00 | 20.00 | 300 | | | 0.1 | 0.01 |
| 18 | Jog Dec | | 0 00-6000 00 | 30.00 | sec | 0 | 721 | 1212h | 9224h |
| | Time | | 0.00-0000.00 | 00.00 | 300 | | 1.2.1 | 0.1 | 0.01 |
| 20 | Max | | 40 00-590 00 | 60.00 | H7 | | 5125 | 1214h | 9228h |
| 20 | Frequency | | 40.00-000.00 | 00.00 | 112 | | 0.1.2.0 | 0.01 | 0.01 |
| 21 ² | Maximum | | 1200-17700 | 1800.3 | rom | | 5125 | 1215h | 922Ah |
| 21 | Speed | | 1200-11100 | 1000 | ipin | | 5.1.2.5 | 1 | 1 |
| 22 | Frequency | 00 | | 60.00 | Н7 | 0 | 5113 | 1216h | 922Ch |
| | at 100% | 0.0 | | 00.00 | 112 | | 5.1.1.3 | 0.01 | 0.01 |
| 23.2 | Speed at | 0 | Maximum Speed | 1800 3 | rom | 0 | 5113 | 1217h | 922Eh |
| 23- | 100% | 0-Maximum Speed | | 1000 3 | ipin | 0 | 5.1.1.3 | 1 | 1 |

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⁶ Activated when the MOT1-8 (Torque Control En) value is 1 (Yes).

Table of Functions

LSELECTRIC 533

| Code | LCD Display | | Setti <u>n</u> | g Range | | Uni <u>t</u> | Property ¹ | Ref | Commu addres | nication s/scale |
|---------------|----------------------|------------------|----------------|--------------------|-------|--------------|-----------------------|----------|-----------------|---------------------|
| | | | | | value | | | | 16-Bit | 32-Bit |
| 04.6 | Torque at | | 0.0 | 200.0 | 100.0 | 0/ | | <u> </u> | 1218h | 9230h |
| Z4 ° | 100% | | 0.0- | 200.0 | 100.0 | 70 | 0 | 0.3.2.2 | 0.1 | 0.1 |
| 25 | Load Duty | 0 | No | rmal Duty | 1 | | | 9.1.3 | 1210h | 02226 |
| 25 | Select | 1 | He | avy Duty | | - | | 9.1.2 | 121911 | 923211 |
| | | 0 | Nor | mal PWM | | | | | | |
| 26 | PWM Mode | 1 | Low | / Leakage PWM | 1 | - | \bigtriangleup | 7.15 | 121ah | 9234h |
| 27 | Carrier | | 1 | 15 | 2 | | 0 | 7 4 5 | 121bh | 9236h |
| 21 | Frequency | 1 | | -15 | 2 | КПС | KHZ O | 7.15 | 1 | 1 |
| 28 OVM Ena | OVM Mode | 0 | | No | 4 | | 0 | | 10106 | 00006 |
| | Enable | 1 | | Yes | | - | 0 | - | 121Ch | 9238N |
| | Ref AC Input | 200 V class 2 | | 200 2401/ | - | | | 7 10 | 121eh | 923Ch |
| 20 | | | | 200-240V | | v | v | 7.18 | 1 | 1 |
| 30 | Volt | 400 V | | 200 1001 | | | | 7 10 | 121fh | 923Eh |
| | | С | ass | 360 - 460 v | - | | | 7.10 | 1 | 1 |
| 21 | 60/50 Hz | 0 | | 60Hz | 0 | | | 7 10 | 10006 | 02406 |
| 51 | Select | 1 | | 50Hz | | - | | 1.10 | 122011 | 924011 |
| 20 | Hz/rpm | 0 | Hz | z Display | 0 | | _ | F 4 0 0 | 10006 | 00406 |
| 32 | Select | 1 | rpr | n Display | 0 | - | | 5.1.2.3 | 12230 | 9246N |
| | | 0 | | None | | | | | | |
| | | 1 | Ana | log Input 1 | | | | 7.1 | | |
| 35 | Auxiliary Ref Src | 2 | Ana | log Input 2 | 0 | - | | | 1224h | 9248h |
| | | 3 | Ana | log Input 3 | | | | | | |
| | | 4 | Pu | llse Input | | | | | | |

| Code | LCD Display | | Setting Range | | Unit | Property ¹ | Ref. | Commu addres | nication s/scale |
|------|-----------------------|----|----------------|-------|------|-----------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | M + (G * A) | | | | | | |
| | | 1 | M * (G * A) | | | | | | |
| | | 2 | M / (G * A) | | | | | | |
| | | 3 | M+(M*(G*A)) | | | | | | |
| | | 4 | M+G*2*(A-50) | | | | | | |
| | | 5 | M*(G*2*(A-50)) | | | | 7.1 | 1225h | 924Ah |
| 36 7 | Auxiliary Cal Type | 6 | M/(G*2*(A-50)) | 0 | - | | | | |
| | Carrypo | 7 | M+M*G*2*(A-50) | | | | | | |
| | | 8 | (M-A)^2 | | | | | | |
| | | 9 | M^2 + A^2 | | | | | | |
| | | 10 | MAX(M,A) | | | | | | |
| | | 11 | MIN(M,A) | | | | | | |
| | | 12 | (M+A)/2 | | | | | | |
| 377 | Auxiliary | | 200 0 200 0 | 100.0 | 0/2 | | 7 1 | 1228h | 9250h |
| 57 | Ref Gain | | -200.0-200.0 | 100.0 | 70 | | 7.1 | 0.1 | 0.1 |
| | | 0 | Keypad | | | | | | |
| | | 1 | Fx/Rx-1 | | | | | | |
| | | 2 | Fx/Rx-2 | | | | | | |
| 40.8 | 2nd Command | 3 | 3-Wire | 1 | | ~ | 7 1 9 | 1220h | 0252h |
| 40 - | Src | 4 | Internal Comm. | I | - | | 7.10 | 122911 | 923211 |
| | | 5 | USB Comm. | | | | | | |
| | | 6 | Option Comm. | | | | | | |
| | | 7 | UserSequence | | | | | | |

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Table of Functions

- ⁷ Activated when the DRV-35 (Auxiliary Ref Src) value is not 0 (None).
- ⁸ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 20 (2nd Source).

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| Code | LCD Display | Setting Range | Initial Value | Unit | Property ¹ | Ref. | Communicatio Ref. address/scale | | |
|-----------------|---------------------|---------------|------------------|-------|-----------------------|------|------------------------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| | | 5 | Up Down Drive | | | | | | |
| 41 ⁸ | 2nd Freq Ref Src | 6 | Internal Comm. | 0 | - | 0 | 7.18 | 122ah | 9254h |
| | | 7 | USB Comm. | | | | | | |
| | | 8 | Option Comm. | | | | | | |
| | | 9 | UserSequence | | | | | | |
| | | 10 | X-Analog Input 1 | | | | | | |
| | | 11 | X-Analog Input 2 | | | | | | |
| | | 12 | X-Analog Input 3 | | | | | | |
| | | 0 | Keypad | | | | | | 9254h |
| | | 1 | Analog Input01 | | | | | | |
| | | 2 | Analog Input02 | | | | | | |
| | | 3 | Analog Input03 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| 40.8 | 2nd Torque | 5 | Internal Comm. | 0 | | | 7 4 0 | 100-6 | |
| 42 ° | Src | 6 | USB Comm. | 0 | - | 0 | 7.18 | TZZan | |
| | | 7 | Option Comm. | | | | | | |
| | | 8 | UserSequence | | | | | | |
| | | 9 | X-Analog Input 1 | | | | | | |
| | | 10 | X-Analog Input 2 | | | | | | |
| | | 11 | X-Analog Input 3 | | | | | | |
| 45 | Trim Power | | 70.120 | 100 | 0/ | | 7 00 | 122dh | 925Ah |
| 45 | % | | 10-130 | 100 | 70 | | 1.22 | 1 | 1 |

| Code | LCD Display | Display Setting Range | | Initial Value | Unit | Property ¹ | Ref. | Communication address/scale | |
|------|-------------------|-----------------------|---------------|------------------|------|-----------------------|--------|-----------------------------|--------|
| | | | | | | | | 16-Bit | 32-Bit |
| 50 | Fan Control | 0 | During Run | 0 | - | 0 | 9.2.10 | 1232h | 9264h |
| | | 1 | Always Run | | | | | | |
| | | 2 | Temp. Control | | | | | | |
| 85 | Temperature | | - | Ĉ | x | - | 1255h | 92AAh | |
| | | ure - | | | | | 0.1 | 0.1 | |
| 86 | Sync Frequency | | | | 11- | | | 1256h | 92ACh |
| | | су | - | HZ | | - | 0.01 | 0.01 | |

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13.2 Basic Function Group (BAS)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | .CD Display Setting Range | | | Unit | Property ⁹ | Ref. | Communication address/scale | |
|-------|-------------|---------------------------|------------------------|---------|------|-----------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 20 | - | 0 | 4.3.3 | 1300h | 9300h |
| | | 0 | Acceleration | | | | | | |
| 01 | Start Mode | 1 | DC Start | 0 | - | \triangle | 5.2.4 | 1301h | 9302h |
| | | 2 | Speed Search | | | | | | |
| | | 0 | Deceleration | | | | | | |
| | | 1 | Dc Brake | | - | | 5.2.5 | | 9304h |
| 02 | Stop Mode | 2 | CoastStop (FreeRun) | 0 | | | | 1302h | |
| | | 3 | Reserved | - | | | | | |
| | | 4 | Power Braking | | | | | | |
| 03 10 | DC Start | | 0.01-60.00 | 1 00 | SAC | | 5212 | 1303h | 9306h |
| 00 | Time | | 0.01-00.00 | 1.00 | 300 | | 0.2.1.2 | 0.01 | 0.01 |
| 0/ 10 | DC Start | | 1-200 | 50 % 🛆 | % | | 5242 | 1304h | 9308h |
| 0- | Level | | 1-200 | | | 5.2.4.2 | 1 | 1 | |
| 05 11 | DC Brake | | 0.00-60.00 | 0.10 | sec | | 5252 | 1305h | 930ah |
| 00 | Block Time | | 0.00-00.00 | 0.10 | | | 0.2.0.2 | 0.01 | 0.01 |
| 06 11 | DC Brake | | 0.01-60.00 | 1.00 | 500 | | 5252 | 1306h | 930ch |
| 00 | Time | | 0.01-00.00 | 1.00 | JSec | | 0.2.0.2 | 0.01 | 0.01 |
| 07 11 | DC Brake | | 1-200 | 50 | 0/2 | | 5252 | 1307h | 930eh |
| 07 | Level | Level 1-200 30 76 2 | | 5.2.5.2 | 1 | 1 | | | |
| 08 11 | DC Brake | | 0.00-60.00 | 5.00 | Hz | | 5.2.5.2 | 1308h | 9310h |
| 08 11 | Frequency | | 0.00-00.00 | 5.00 | ΗZ | \bigtriangleup | | 0.01 | 0.01 |

⁹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

¹⁰ Activated when the BAS-1 (Start Mode) value is 1 (DC Start).

¹¹ Activated when the BAS-02(Stop Mode) value is 1 (DC Brake).

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| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁹ | operty ⁹ Ref. | Communication address/scale | | |
|-------|---------------------|----------|----------------|---------|------|-----------------------|--------------------------|-----------------------------|--------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 00 12 | DC Brake | | 0 1900 | 150 13 | rom | _ | 5252 | 1309h | 9312h | |
| 09 | Speed | | 0-1600 | 150 10 | трп | | 5.2.5.2 | 1 | 1 | |
| 10 14 | DC Injection | | 1 200 | 50 | % | | 7.04 | 130ah | 9314h | |
| 10 | Level | | 1-200 | 50 | | | 1.24 | 1 | 1 | |
| 44 15 | PwrBrk | | 0.500 | 100 | 0/ | | 5.2.5.4 | 130bh | 9316h | |
| 11 10 | BandWidth | andWidth | 0-500 | 100 | 70 | | | 1 | 1 | |
| 10 15 | PwrBrk | | 0.200 | 100 | % | | 5.2.5.4 | 130ch | 9318h | |
| 12 10 | FluxBrkGain | | 0-200 | | | | | 1 | 1 | |
| | | 0 | Keypad | | | | | | 9316h | |
| | | 1 | Analog Input 1 | | | | 6.6.1 | | | |
| | | 2 | Analog Input 2 | | | | | | | |
| | | 3 | Analog Input 3 | | | | | | | |
| 16 | Torque Limit Src | 4 | Pulse Input | 0 | - | \triangle | | 130bh | | |
| | 510 | 5 | Up Down Drive | - | | | | | | |
| | | 6 | Internal Comm. | | | | | | | |
| | | 7 | USB Comm. | | | | | | | |
| | | 8 | Option Comm | | | | | | | |

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- ¹² Activated when the BAS-2 (Stop Mode) value is 1 (DC Brake) and the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).
- ¹³ The rpm value varies according to the motor rating pole number (MOT1, 2-25).
- ¹⁴ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 28 (DC Injection).
- ¹⁵ Activated when the BAS-2 (Stop Mode) value is 4 (Power Braking).

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| Code LCD Display | | Setting Range | | Initial Value | Unit | Property ⁹ | operty ⁹ Ref. | Communication address/scale | | |
|------------------|------------------------|------------------------|--------------------|----------------------|----------------|-----------------------|--------------------------|-----------------------------|--------|-------|
| | | | | value | | | | 16-Bit | 32-Bit | |
| | | 0 | Keypad | | | | | | | |
| | | 1 | Analog Input 1 | | | | | | | |
| | | 2 | Analog Input 2 | | | | | | | |
| | | 3 | Analog Input 3 | | | | | | | |
| 17 ¹⁶ | TrqMode SpdI mt Src | 4 | Pulse Input | 0 | - | \triangle | 6.6.2 | 130ch | 9318h | |
| | opuzini oro | 5 | Up Down Drive | | | | | | | |
| | | 6 | Internal Comm. | | | | | | | |
| | | 7 | USB Comm. | | | | | | | |
| | | 8 | Option Comm | | | | | | | |
| 20 | Auto Tuning | 0 | None | 0 | | <u>^</u> | 3.4 | 120fb | 021ab | |
| 20 | Auto Tuning | 1 | Auto Tuning | 0 | - | | | 13010 | 93 Ten | |
| 22 | Ldq Tune | | 90 150 | 150 | 0/ | ~ | | 1318h | 9330h | |
| | Freq Perc | | 80-150 | 150 | 70 | | - | 1 | 1 | |
| 23 | Ldq Tune | | 20.50 | 25 | 0/2 | | | 1319h | 9332h | |
| 23 | Curr Perc | 20-50 | | | 70 | | - | 1 | 1 | |
| 31 | Step | 0.0 | 0.00 1 | | 10.00 | Ц ₇ | 0 | 5121 | 131fh | 933eh |
| 51 | Frequency-01 | 0.0 | | 10.00 | 112 | | 0.1.2.4 | 0.01 | 0.01 | |
| 32 | Step | 0.0 | 0-Max Frequency | 20.00 | Hz | 0 | 5.1.2.4 | 1320h | 9340h | |
| 52 | Frequency-02 | 0.0 | o-max r requercy | | | | | 0.01 | 0.01 | |
| 33 | Step | 0.0 | | 30.00 | Н7 | 0 | 5121 | 1321h | 9342h | |
| 55 | Frequency-03 | 0.0 | o-max r requercy | 30.00 HZ | | 5.1.2.4 | 0.01 | 0.01 | | |
| 34 | Step | 0.0 | | 40.00 | Ц ₇ | 0 | 5121 | 1322h | 9344h | |
| 54 | Frequency-04 | 0.0 | 0-INIAX I Tequency | 40.00 | | | 5.1.2.4 | 0.01 | 0.01 | |
| 35 | Step | 0.0 | | 50.00 | Ц ₇ | 0 | 5121 | 1323h | 9346h | |
| - 35 | Frequency-05 | 0.0 | 0-INIAX I Tequency | 30.00 | | 0 | 5.1.2.4 | 0.01 | 0.01 | |
| 36 | Step | 0.0 | | 60.00 | Н7 | 0 | 5121 | 1324h | 9348h | |
| 50 | Frequency-06 | 0.0 | | 00.00 | ΠZ | | J.1.Z.4 | 0.01 | 0.01 | |
| 37 | Step | Step 0.00 Mars Frances | 60.00 | Ц-7 | | 5121 | 1325h | 934ah | | |
| 31 | Frequency-07 | requency-07 | 0.0 | J.UU-IVIAX Frequency | 60.00 | ΠZ | 0 | 5.1.2.4 | 0.01 | 0.01 |

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¹⁶ Activated when the MOT1-8 (Torque Control En) value is 1 (Yes).

| Code | LCD Display | blay Setting Range | | Unit | Property ⁹ | Ref. | Communication address/scale | | |
|--------------|--------------|----------------------|-----------------|------------|-----------------------|---------|-----------------------------|--------|---|
| | | | value | | | | 16-Bit | 32-Bit | |
| 20 | Step | 0.00 Max Fraguenay | 55.00 | 11- | | E 1 0 1 | 1326h | 934ch | |
| 30 | Frequency-08 | 0.00-Max Frequency | | пΖ | 0 | 5.1.2.4 | 0.01 | 0.01 | |
| 20 | Step | 0.00 Max Fraguenay | 50.00 | 11- | | E 1 0 1 | 1327h | 934eh | |
| 39 | Frequency-09 | 0.00-iviax Frequency | 50.00 | пг | 0 | 3.1.2.4 | 0.01 | 0.01 | |
| 40 | Step | | 15.00 | <u>Ц</u> 7 | 0 | 5121 | 1328h | 9350h | |
| 40 | Frequency-10 | | 43.00 | | | 5.1.2.4 | 0.01 | 0.01 | |
| 11 | Step | | 10.00 | <u>Ц</u> 7 | 0 | 5121 | 1329h | 9352h | |
| 41 | Frequency-11 | | 40.00 | 112 | 0 | 5.1.2.4 | 0.01 | 0.01 | |
| 12 | Step | | 35.00 | Ц-7 | 0 | 5121 | 132ah | 9354h | |
| 42 | Frequency-12 | | 55.00 | 112 | | 5.1.2.4 | 0.01 | 0.01 | |
| 13 | Step | | 25.00 | Hт | 0 | 5121 | 132bh | 9356h | |
| | Frequency-13 | | 20.00 | 112 | | 5.1.2.4 | 0.01 | 0.01 | |
| 11 | Step | | 15.00 | Цт | 0 | 5124 | 132ch | 9358h | |
| ++ | Frequency-14 | | 13.00 | 112 | | 5.1.2.4 | 0.01 | 0.01 | |
| 15 | Step | | 5.00 | Hт | 0 | 5124 | 132dh | 935ah | |
| | Frequency-15 | | 0.00 | 112 | | 0.1.2.4 | 0.01 | 0.01 | |
| 16 12 | Step | 0-Maximum Speed | 300 13 | rom | 0 | 5121 | 132eh | 935ch | |
| 40 | Speed-01 | | 500 | ipin | | 0.1.2.4 | 1 | 1 | |
| 17 12 | Step | 0-Maximum Speed | 600 13 | rom | 0 | 5121 | 132fh | 935eh | |
| 47 | Speed-02 | | 000 | трп | | 5.1.2.4 | 1 | 1 | |
| 18 12 | Step | 0-Maximum Speed | 000 13 | rom | 0 | 5121 | 1330h | 9360h | |
| 40 | Speed-03 | 0-Maximum Opeed | 300 | трп | | 5.1.2.4 | 1 | 1 | |
| 10 12 | Step | 0-Maximum Speed | 1200 | rom | 0 | 5121 | 1331h | 9362h | |
| -5 | Speed-04 | | 13 | ipin | | 0.1.2.4 | 1 | 1 | |
| 50 12 | Step | 0-Maximum Speed | 1500 | rom | 0 | 5121 | 1332h | 9364h | |
| 50 | Speed-05 | 0-Maximum Opeed | 13 | трп | | 5.1.2.4 | 1 | 1 | |
| 51 12 | Step | 0-Maximum Speed | 1800 | rpm | 0 | 5121 | 1333h | 9366h | |
| | Speed-06 | | 13 | 1pm | 0 | 5.1.2.4 | 1 | 1 | |
| 52 12 | Step | 0-Maximum Speed | 1800 | rom | 0 | 5121 | 1334h | 9368h | |
| 52 12 5 | Speed-07 | Speed-07 | o-maximum speed | 13 | 1pm | 0 | 5.1.2.4 | 1 | 1 |

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| Code | LCD Display | LCD Display | | Setting Range | Initial Value Uni | | Property ⁹ | Ref. | Communication address/scale | |
|------------------|------------------|-------------------|-------------------|----------------------|----------------------|------------------|-----------------------|---------|-----------------------------|---|
| | | value | | | | 16-Bit | 32-Bit | | | |
| EO 12 | Step | 0 | Maximum Croad | 1650 | | | E 1 0 4 | 1335h | 936ah | |
| 53 12 | Speed-08 | 0-1 | Maximum Speed | 13 | rpm | 0 | 5.1.2.4 | 1 | 1 | |
| 5 1 12 | Step | 0 | Movimum Spood | 1500 | rom | 0 | 5121 | 1336h | 936ch | |
| 54 | Speed-09 | 0-1 | | 13 | трп | | 5.1.2.4 | 1 | 1 | |
| 55 12 | Step | 0_ | Maximum Speed | 1350 | rom | 0 | 5121 | 1337h | 936eh | |
| 55 | Speed-10 | 0-1 | | 13 | трп | | 5.1.2.4 | 1 | 1 | |
| 56 12 | Step | 0_ | Maximum Speed | 1200 | rom | 0 | 5121 | 1338h | 9370h | |
| 50 | Speed-11 | 0-1 | | 13 | трп | | 5.1.2.4 | 1 | 1 | |
| 57 12 | Step | 0 | Maximum Spood | 1050 | rom | 0 | 5104 | 1339h | 9372h | |
| 57 | Speed-12 | 0-1 | 0-iviaximum Speed | | трш | 0 | 5.1.2.4 | 1 | 1 | |
| 50 12 | Step | 0 | 0 Maximum Speed | | rom | 0 | 5121 | 133ah | 9374h | |
| 50 | Speed-13 | 0-iviaximum Speed | | 750 1011 | 0 | 0.1.2.4 | 1 | 1 | | |
| 50 12 | Step | 0 | 0 Maximum Speed | | rom | 0 | 5124 | 133bh | 9376h | |
| 59 | Speed-14 | 0-iviaximum Speed | | 450 ¹⁰ TP | трп | 0 | J. I.Z.4 | 1 | 1 | |
| 60 12 | Step | 0 | Maximum Spood | 150 13 | rom | 0 | 5121 | 133ch | 9378h | |
| 00 | Speed-15 | 0- | | 150 13 | трп | | 5.1.2.4 | 1 | 1 | |
| 66 | Acc Pattern | ottern 0 Linear | | 5221 | 13/12h | 038/h | | | | |
| 00 | | 1 | S-Curve | 0 | - | | 5.3.2.1 | 134211 | 930411 | |
| 67 17 | Acc S-Curve | | 1 100 | 40 | 40 0/ | | 5321 | 1343h | 9386h | |
| 07 | Start | Start | | 1-100 40 | 40 | 70 | | 0.0.Z.T | 1 | 1 |
| 69 17 | Acc S-Curve | | 1 100 | 40 | 0/_ | | 5221 | 1344h | 9388h | |
| 00 | End | 1-100 | | 40 | 70 | | 5.5.2.1 | 1 | 1 | |
| 00 | Dee Dettern | 0 | Linear | 0 | | 5221 | 1015h | 020ab | | |
| 09 | Dec Pattern | 1 S-Curve | - | - | 5.3.Z.1 | 134311 | 930811 | | | |
| | Dec | | | | | | 5.3.2.1 | 1346h | 938ch | |
| 70 ¹⁸ | S-Curve Start | | 1-100 | 40 | % | \bigtriangleup | | 1 | 1 | |

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Activated when the BAS-66 (Acc Pattern) value is 1 (S-Curve).
Activated when the BAS-69 (Dec Pattern) value is 1 (S-Curve).
| Code | LCD Display | | Setting Range | | Unit | Property ⁹ | Ref. | Commu addres | nication s/scale |
|------------------|----------------|---|-----------------|-------|------|-----------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | Dec | | | | | | | 1347h | 938eh |
| 71 ¹⁸ | S-Curve End | | 1-100 | 40 | % | | 5.3.2.1 | 1 | 1 |
| 76 | Ramp Time | 0 | Max Frequency | 0 | | | 5321 | 13/ch | 0308h |
| 10 | Mode | 1 | Delta Frequency | 0 | | | 0.0.2.1 | 10-1011 | 303011 |
| 77 | Pattern | | 0010 | 0.2 | Ц | | 5221 | 134dh | 939ah |
| 11 | UpdateBand | | 0.0-1.0 | 0.5 | | | J.J.Z. I | 0.1 | 0.1 |
| 79 19 | Acc Time 1 | | 0 00 6000 00 | 20.00 | 500 | 0 | 5313 | 134eh | 939ch |
| 70.0 | Acc mile-1 | | 0.00-0000.00 | 20.00 | Sec | | 0.0.1.0 | 0.1 | 0.01 |
| 70 19 | Dec Time-1 | | 0.00-6000.00 | 20.00 | 500 | 0 | 5313 | 134fh | 939eh |
| 13 | Dec IIIIe-I | | 0.00-0000.00 | 20.00 | 360 | | 0.0.1.0 | 0.1 | 0.01 |
| 80 19 | Acc Time-2 | | 0.00-6000.00 | 30.00 | 500 | 0 | 5313 | 1350h | 93a0h |
| 00 13 | Acc mile-2 | | 0.00-0000.00 | 30.00 | Sec | | 0.0.1.0 | 0.1 | 0.01 |
| Q1 19 | Doc Timo 2 | | 0 00 6000 00 | 30.00 | 500 | 0 | 5313 | 1351h | 93a2h |
| 01.0 | Dec nine-2 | | 0.00-0000.00 | 30.00 | Sec | | 0.0.1.0 | 0.1 | 0.01 |
| 82 19 | Acc Time-3 | | 0.00-6000.00 | 10 00 | 500 | 0 | 5313 | 1352h | 93a4h |
| 02 ** | Acc mile-5 | | 0.00-0000.00 | 40.00 | Sec | | 0.0.1.0 | 0.1 | 0.01 |
| 83 19 | Dec Time-3 | | 0.00-6000.00 | 10 00 | 500 | 0 | 5313 | 1353h | 93a6h |
| 00 | Dec nine-0 | | 0.00-0000.00 | 40.00 | 360 | | 5.5.1.5 | 0.1 | 0.01 |
| Q / 19 | Acc Time 1 | | 0 00 6000 00 | 50.00 | 500 | 0 | 5313 | 1354h | 93a8h |
| 04 | | | 0.00-0000.00 | 50.00 | 360 | | 0.0.1.0 | 0.1 | 0.01 |
| 85 19 | Dec Time-1 | | 0.00-6000.00 | 50.00 | 500 | 0 | 5313 | 1355h | 93aah |
| 00 | Dec IIIIe-4 | | 0.00-0000.00 | 50.00 | 360 | | 5.5.1.5 | 0.1 | 0.01 |
| 86 19 | Acc Time-5 | | 0.00-6000.00 | 60.00 | 500 | 0 | 5313 | 1356h | 93ach |
| 00 13 | Acc mile-5 | | 0.00-0000.00 | 00.00 | Sec | | 0.0.1.0 | 0.1 | 0.01 |
| 97 19 | Doc Timo 5 | | 0 00 6000 00 | 60.00 | 500 | 0 | 5313 | 1357h | 93aeh |
| 01.3 | Dec nine-3 | | 0.00-0000.00 | 00.00 | 360 | | 5.5.1.5 | 0.1 | 0.01 |
| 00 19 | Aco Timo 6 | | 0.00.6000.00 | 70.00 | | 0 | 5212 | 1358h | 93b0h |
| 00 10 | Acc nine-0 | | 0.00-0000.00 | 70.00 | sec | 0 | 5.5.1.5 | 0.1 | 0.01 |

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¹⁹ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 14, 15, and 16 (XCEL_L, XCEL_M, XCEL_H).

| Code | LCD Display | Setting Range | Setting Range | Initial Value | Unit | : Property ⁹ Ref. | | Communication address/scale | |
|-------|-------------|---------------|---------------|------------------|------|------------------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 19 | | | 0.00.6000.00 | 70.00 | | | E 2 4 2 | 1359h | 93b2h |
| 09 10 | Dec Ime-o | | 0.00-6000.00 | 70.00 | sec | 0 | 5.5.1.5 | 0.1 | 0.01 |
| 00 10 | | 0.00.6000.00 | 20.00 | | 0 | 5313 | 135ah | 93b4h | |
| 90 10 | Acc nme-/ | | 0.00-6000.00 | 80.00 | sec | 0 | 5.3.1.3 | 0.1 | 0.01 |
| 01 19 | Dee Time 7 | | 0.00.6000.00 | 00.00 | | | 5040 | 135bh | 93b6h |
| 91 10 | Dec Ime-7 | 0.00-6000.00 | | 80.00 | sec | 0 | 5.3.1.3 | 0.1 | 0.01 |
| 0.5 | Flux Brake | 0 | No | | | | 045 | 405fb | 026.46 |
| 95 | Enable | 1 | Yes | U | - | 0 | 9.1.5 | 135fh | nease |

13.3 First Motor Group (MOT1)

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The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | Setting Range | | | ial ue Unit | Property ²⁰ | Ref. | Communication address/scale | |
|-------|--------------|------------------|----------------------|-------------------|----------------|------------------------|----------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 35 | - | 0 | 4.3.3 | 1400h | 9400h |
| | | 0 | Induction Motor | | | | | | |
| 04 | Motor Type | 1 | Perm Magnet Motor | 0 | - | \bigtriangleup | 3.1 | 1404h | 9408h |
| | | 0 | V/F | | | | | | |
| | | 1 | Slip Comp. | | | | | | 940ah |
| 05 | Control Mode | 2 | V/F PG | 0 | - | \triangle | 3.1 | 1405h | |
| | | 3 | Sensorless | | | | | | |
| | | 4 | Vector | | | | | | |
| 00 21 | Torque | 0 | No | 0 | _ | ~ | 2.0 | 11006 | 04106 |
| 00 -1 | Control En | 1 | Yes | 0 | - | | 3.2 | 140011 | 941011 |
| 15 | Start | | 0.00-10.00 | 0.50 | | ~ | 5125 | 140fh | 941eh |
| 15 | Frequency | | 0.00-10.00 | 0.50 | | | 5.1.2.5 | 0.01 | 0.01 |
| 16 22 | Start Speed | | 0-300 | 15 23 | rnm | | 5125 | 1410h | 9420h |
| 10 | Start Speed | | 0-300 | 10 | трп | | 0.1.2.0 | 1 | 1 |
| 17 | Stop | | 0.00.10.00 | 0.00 | <u>Ц</u> 7 | ~ | 5 2 5 1 | 1411h | 9422h |
| 17 | Frequency | | 0.00-10.00 | 0.00 | | | J.Z.J. I | 0.01 | 0.01 |
| 18 22 | Stop Spood | Stop Speed 0.200 | 0-300 | 0.23 | rpm | | 5251 | 1412h | 9424h |
| 10 - | otop opeed | 0-300 0 23 | 0 | ^{.3} rpm | pm 🗠 | 5.2.5.1 | 1 | 1 | |

able of Inctions

²⁰ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

- ²¹ Activated when the MOT1-05 (Control Mode) value is 3 (Sensorless) or 4 (Vector).
- ²² Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).
- $^{23}\,$ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ²⁰ | Ref. | Commu addres | nication s/scale |
|------|---|----|---------------|------------------|------|------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | 0.2 kW | | | | | | |
| | | 1 | 0.4 kW | | | | | | |
| | | 2 | 0.75 kW | | | | | | |
| | | 3 | 1.5 kW | | | | | | |
| | | 4 | 2.2 kW | | | | | | |
| | 4 2.2 kW 5 4 kW 6 5.5 kW 7 7.5 kW 8 11 kW 9 15 kW 10 18.5 kW 11 22 kW 12 30 kW 13 37 kW | | | | | | | | |
| | | | | | | | | | |
| | | 7 | 7.5 kW | | | | | | |
| | | 8 | 11 kW | - | | | | | |
| | | 9 | 15 kW | | | | | | |
| | | 10 | 18.5 kW | | | | | | |
| | | 11 | 22 kW | | | | | | |
| | | 12 | 30 kW | | | | | | |
| 21 | Motor Capacity | 13 | 37 kW | | | ~ | 2.4 | 11156 | 042ab |
| 21 | | 14 | 45 kW | - | - | | 3.1 | 14150 | 942an |
| | | 15 | 55 kW | | | | | | |
| | | 16 | 75 kW | | | | | | |
| | | 17 | 90 kW | | | | | | |
| | | 18 | 110 kW | | | | | | |
| | | 19 | 132 kW | | | | | | |
| | | 20 | 160 kW | | | | | | |
| | | 21 | 185 kW | | | | | | |
| | | 22 | 200 kW | | | | | | |
| | | 23 | 220 kW | | | | | | |
| | | 24 | 280 kW | | | | | | |
| | | 25 | 315 kW | | | | | | |
| | | 26 | 375 kW | - | | | | | |
| | | 27 | 450 kW | | | | | | |
| 23 | Base | | 30 00-590 00 | 60.00 | H7 | | 31 | 1417h | 942eh |
| 20 | Frequency | | 00.00-030.00 | 00.00 | 112 | | 5.1 | 0.01 | 0.01 |

| Code | LCD Display | Setting Range | | Unit | Property ²⁰ | Ref. | Commu addres | nication s/scale |
|---------------|--------------|----------------|--------|--------|------------------------|------|----------------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 24 22 | Dated Speed | 000 24000 | 16.8 | rom | | 2.4 | 1418h | 9430h |
| 24 | Raled Speed | 900-24000 | Note | грп | | 3.1 | 1 | 1 |
| 25 | Number of | 2 100 | 1 | Polo | ~ | 3 1 | 1419h | 9432h |
| 20 | Poles | 2-100 | 4 | | | 0.1 | 1 | 1 |
| 26 | Rated | 1 0-1000 0 | 16.8 | Δ | | 3 1 | 141ah | 9434h |
| 20 | Current | 1.0-1000.0 | Note | | | 0.1 | 0.1 | 0.1 |
| 27 | Rated | 0 180-480 | 0 | V | | 3 1 | 141bh | 9436h |
| 21 | Voltage | 0, 100-400 | 0 | ľ v | | 0.1 | 1 | 1 |
| 28 | Efficiency | 70-100 | 16.8 | 0/2 | | 3.1 | 141ch | 9438h |
| 20 | Linciency | 70-100 | Note | 70 | | 5.1 | 1 | 1 |
| 35 | No-load | 0.5-1000.0 | 16.8 | Δ | | 3.1 | 1423h | 9446h |
| | Current | 0.0-1000.0 | Note | | | 0.1 | 0.1 | 0.1 |
| 36 | Stator | 0 0000-99 9999 | 16.8 | 0 | | 34 | 1424h | 9448h |
| | Resistance | 0.0000-00.0000 | Note | 32 | | 0.4 | 0.0001 ²⁴ | 0.0001 |
| 37 | Leakage | 0 000-99 999 | 16.8 | mH | | 34 | 1425h | 944ah |
| | Inductance | 0.000 00.000 | Note | | | 0.4 | 0.001 ²⁴ | 0.001 |
| 38 | Stator | 0 000-999 999 | 16.8 | mH | | 34 | 1426h | 944ch |
| | Inductance | 0.000 000.000 | Note | | | 0.1 | 0.001 ²⁴ | 0.001 |
| 39 | Rotor | 25-5000 | 16.8 | msec | | 34 | 1427h | 944eh |
| | TimeConstant | 20 0000 | Note | 111000 | | 0.4 | 1 | 1 |
| 4 0 25 | q-axis | 0 000-99 999 | 10 000 | mH | | 34 | 1428h | 9450h |
| | Inductance | | 10.000 | | | 0.4 | 0.01 | 0.001 |
| 41 25 | d-axis | 0 000-99 999 | 10 000 | mH | | 34 | 1429h | 9452h |
| | Inductance | 0.000 00.000 | 10.000 | | | 0.1 | 0.01 | 0.001 |
| 42 25 | PM Rotor | 0.000-65.000 | 0 100 | _ | | 34 | 142ah | 9454h |
| 72 | Flux | 0.000-00.000 | 0.100 | | | 0.4 | 0.001 | 0.001 |

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- ²⁴ For products with 200 V 15 kW or more or 400 V 18.5 kW or more. For other capacities, refer to **Table 1**.
- ²⁵ Activated when the MOT1-04 (Motor Type) value is 1 (Perm Magnet Motor).

Table of Functions

| Code | LCD Display | | Setting Range | | Unit | Property ²⁰ | Ref. | Commu addres | nication s/scale |
|------------------|---------------------|--------|------------------------|-------|------|------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| F 4 | ACR | | F0 400 | 100 | 0/ | | <u> </u> | 1433h | 9466h |
| 51 | Bandwidth | | 50-400 | 100 | 70 | 0 | 0.2 | 1 | 1 |
| 52 | Active | 0-1000 | | 0 | 0/_ | 0 | 6.2 | 1434h | 9468h |
| 52 | Resistance | | 0-1000 | 0 | 70 | | 0.2 | 1 | 1 |
| 54 | ASR Adjust Gain | | 1-10 | 4 | - | 0 | 6.2 | 1436h 1 | 946ch 1 |
| | | 0 | No | | | | | | |
| 61 ²⁵ | IPPE Enable | 1 | Yes | 1 | - | 0 | 6.5.1 | 143dh | 947ah |
| 00.25 | IPPE Volt Ref | | 40.400 | 50 | 0(| | 0.5.4 | 143eh | 947ch |
| 62 25 | Perc | | 10-100 | 50 | % | 0 | 6.5.1 | 1 | 1 |
| 62 25 | IPPE Curr | | 10 150 | 120 | 0/ | 0 | 651 | 143fh | 947eh |
| 03 20 | Peak Per | | 10-150 | 120 | 70 | 0 | 0.3.1 | 1 | 1 |
| | | 0 | None | | | | | | |
| 75 | ETH Enable | 1 | CoastStop (FreeRun) | 0 | - | 0 | 9.1.1 | 144bh | 9496h |
| | | 2 | Dec | | | | | | |
| 76 | Motor Cooling | 0 | Self-Cool | 0 | | 0 | 0 011 | 144ob | 01096 |
| 70 | | 1 | Forced-Cool | 0 | - | 0 | 9.1.1 | 144011 | 949011 |
| 77 | ETH Cont | | 50-150 | 120 | % | 0 | 911 | 144dh | 949ah |
| | Current | | 00-100 | 120 | 70 | | 0.1.1 | 1 | 1 |
| 78 | ETH 1min | | 120-200 | 150 | % | 0 | 911 | 144eh | 949ch |
| | Current | | 120 200 | 100 | 70 | | 0.1.1 | 1 | 1 |
| 96 | Load Speed | | 0.1-6000.0 | 100.0 | % | 0 | 7.21 | 1460h | 94c0h |
| | Gain | | | | | | | 0.1 | 0.1 |
| | | 0 | x 1 | | | | | | |
| | Lood Crood | 1 | x 0.1 | 0 | | | | | |
| 97 | Load Speed Scale | 2 | x 0.01 | | - | 0 | 7.21 | 1461h | 94c2h |
| | Scale _ | 3 | x 0.001 | | | | | | |
| | | 4 | x 0.0001 | | | | | | |

| Code | LCD Display | Setting Range | | Initial Value | Unit | Property ²⁰ | Ref. | Communication address/scale | |
|------|--------------------|---------------|-----|------------------|------|------------------------|------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 98 | Load Speed Unit | 0 | rpm | 0 | - | | 7.01 | 14606 | 01016 |
| | | 1 | mpm | | | - | 0 | 1.21 | 140211 |

Note

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Table 1. Parameter with different scales depending on the motor capacity when accessing with a 16-bit parameter data

| Voltage category | Motor capacity | MOT1,2-36 (Stator Resistance) | MOT1,2-37 (Leakage Inductance) | MOT1,2-38 (Stator Inductance) |
|---------------------|-----------------|-------------------------------------|--------------------------------------|-------------------------------------|
| | Below 0.4 kW | 0.01 | 0.1 | 0.1 |
| 200 V | 0.75-11 kW | 0.001 | 0.01 | 0.01 |
| | Above 15 kW | 0.0001 | 0.001 | 0.001 |
| | Below 1.5 kW | 0.01 | 0.1 | 0.1 |
| 400 V | 2.2-15 kW | 0.001 | 0.01 | 0.01 |
| | 18.5 kW or more | 0.0001 | 0.001 | 0.001 |

13.4 The First Motor V/F Group (VF1)

This group is activated when the MOT1-05 (Control Mode) value is 0 (V/F) or 1 (Slip Comp.).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | ode LCD Display | | y Setting Range | | Initial Value Unit F | Unit Property ²⁶ | | Ref. | Communication address/scale | |
|-------|-----------------|----|------------------|------------------------|-------------------------|-----------------------------|-------|--------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 00 | Jump Code | | 1-99 | 31 | - | 0 | 4.3.3 | 1500h | 9500h | |
| | | 0 | Linear | | | | | | | |
| 01 | V/E Dottorn | 1 | Square | 0 | | _ | 612 | 1501h | 05026 | |
| 01 | V/F Pallem | 2 | User V/F | 0 | | | 0.1.3 | 150111 | 90020 | |
| | | 3 | Square 2 | | | | | | | |
| 02 | User | | 0.00- | 15.00 | Нz | | 613 | 1502h | 9504h | |
| 02 | Frequency-1 | U | ser Frequency-2 | 10.00 | 112 | | 0.1.0 | 0.01 | 0.01 | |
| 03 27 | User Speed-1 | 0 | - User Speed-2 | ed-2 450 ²⁸ | rpm | | 613 | 1503h | 9506h | |
| | | Ŭ | | 400 | ipin | | 0.1.0 | 1 | 1 | |
| 04 | User | | 0-100 | 25 | % | | 6.1.3 | 1504h | 9508h | |
| | Voltage-1 | | 0.00 | | | | 0.110 | 1 | 1 | |
| 05 | User | U | ser Frequency-1- | 30.00 | Hz | | 613 | 1505h | 950ah | |
| | Frequency-2 | 0 | ser Frequency-3 | | | | | 0.01 | 0.01 | |
| 06 27 | User Speed-2 | Us | er Speed-1-User | 900 ²⁸ | rnm | | 613 | 1506h | 950ch | |
| 00 | | | Speed-3 | 500 | ipin | | 0.1.0 | 1 | 1 | |
| 07 | User | | 0.100 | 50 | 0/. | _ | 612 | 1507h | 950eh | |
| 07 | Voltage-2 | | 0-100 | 50 | 70 | | 0.1.5 | 1 | 1 | |
| 08 | User | U | ser Frequency-2- | 45.00 | <u>Ц</u> 7 | _ | 613 | 1508h | 9510h | |
| 00 | Frequency-3 | U | ser Frequency-4 | 43.00 | | | 0.1.5 | 0.01 | 0.01 | |
| 00 27 | User Sneed 3 | | User Speed-2- | 1350 28 | rnm | | 613 | 1509h | 9512h | |
| 09 | User Speed-S | | User Speed-4 | | ²⁰ rpm △ | | 0.1.5 | 1 | 1 | |

²⁶ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

²⁷ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).

²⁸ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

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| Code | LCD Display | | Setting Range | Initial | Unit | Property ²⁶ | Ref. | Commu addres | nication s/scale |
|------------------|---------------------|----------|-----------------------------------|-------------------|------|------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 10 | User | | 0-100 | 75 | 0/2 | | 613 | 150ah | 9514h |
| 10 | Voltage-3 | | 0-100 | 75 | 70 | | 0.1.5 | 1 | 1 |
| 11 | User Frequency-4 | U: I | ser Frequency-3- Max Frequency | 60.00 | Hz | \bigtriangleup | 6.1.3 | 150bh 0.01 | 9516h 0.01 |
| 12 ²⁷ | User Speed-4 | N | User Speed-3- Maximum Speed | | rpm | \bigtriangleup | 6.1.3 | 150ch 1 | 9518h 1 |
| 13 | User Voltage-4 | | 0-100 | 100 | % | | 6.1.3 | 150dh 1 | 951ah 1 |
| | Slip Comp | 0 | Basic Comp. | | | | | | |
| 21 | Mode | 1 | Advanced Comp. | 0 | - | \triangle | 6.1.4.2 | 1515h | 952ah |
| | SlipGain | | | | | _ | | 1516h | 952ch |
| 22 | Mot-Low | | 0-300 | 100 | % | 0 | 6.1.4.2 | 1 | 1 |
| 22 | SlipGain | | 0.200 | 100 | 0/ | 0 | 6110 | 1517h | 952eh |
| 23 | Mot-High | | 0-300 | 100 | 70 | 0 | 0.1.4.2 | 1 | 1 |
| 24 | SlipGain | | 0-300 | 100 | % | 0 | 6142 | 1518h | 9530h |
| | Gen-Low | | 0.000 | | ,,, | | 0.11.1.2 | 1 | 1 |
| 25 | SlipGain | | 0-300 | 100 | % | 0 | 6.1.4.2 | 1519h | 9532h |
| | Gen-High | | | | | | | 1 | 1 |
| 26 | SlipComp | | 1-10000 | 300 | msec | 0 | 6.1.4.2 | 151ah | 9534h |
| | LPF Gain | | | | | | _ | 1 | 1 |
| 27 | SlipGain | | 0.00-20.00 | 9.00 | Hz | 0 | 6.1.4.2 | 151bh | 9536h |
| | SwOv Freq | | | | | | | 0.01 | 0.01 |
| 28 ²⁷ | SlipGain | | 0-600 | 270 ²⁸ | rpm | 0 | 6.1.4.2 | 151ch | 9538h |
| | SwOv Spa | - | | | | | | 1 | 1 |
| 31 | Torque Boost | 0 | Manual | 0 | _ | \triangle | 7.6 | 151fh | 953eh |
| | Iviode | 1 | Auto | | | | | | |
| 32 | Forward Boost | Forward | Forward | 2.0 ²⁹ | 0/2 | | 76 | 1520h | 9540h |
| 32 | | 0-15.0 % | _ % | | 7.0 | 0.1 | 0.1 | | |

²⁹ For an inverter capacity of 75 kW or less (Refer to <u>**16.8 Parameter Default Values**</u> <u>**Based on the Motor Capacity**)</u>

³⁰ For an inverter capacity 90 kW or more (Refer to <u>16.8 Parameter Default Values</u> Based on the Motor Capacity)

| Code | LCD Display | ay Setting Range | | Initial Value | Unit | Property ²⁶ | Ref. | Commu addres | nication s/scale |
|--------------|---------------|------------------|-----------|-------------------|--------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0.0 | Reverse | | 0.45.0 | 2.0 ²⁹ | 0(| | 7.0 | 1521h | 9542h |
| 33 | Boost | | 0-15.0 | 1.0 ³⁰ | % | \square | 7.6 | 0.1 | 0.1 |
| 34 | ATB Mot- | | 0.0-300.0 | 100.0 | 0/2 | 0 | 762 | 1522h | 9544h |
| -04 | Gain | | 0.0-300.0 | 100.0 | 70 | | 1.0.2 | 0.1 | 0.1 |
| 35 | ATB Gen- | | 0.0-300.0 | 100.0 | % | 0 | 762 | 1523h | 9546h |
| | Gain | | 0.0-000.0 | 100.0 | 70 | | 1.0.2 | 0.1 | 0.1 |
| 36 | ATB LPF | | 1-10000 | 3 | msec | | 762 | 1524h | 9548h |
| | Gain | | 1 10000 | 0 | 111000 | | 1.0.2 | 1 | 1 |
| 5/ 31 | PM V/F | | 0-1.0 | 0.7 | | 0 | _ | 1536h | 956ch |
| 54 | HPF Gain | | 0-1.0 | 0.7 | _ | | | 0.1 | 0.1 |
| 55 31 | PM V/F | | 0.0-3 | 1 | Hz | 0 | _ | 1537h | 956eh |
| 55 | HPF Wcut | | 0.0-3 | - | 112 | | | 1 | 1 |
| 56 31 | PM V/F | | 0-200 | 150 | % | 0 | _ | 1538h | 9570h |
| 00 | CurrLmtGain | | 0-200 | 100 | 70 | | | 1 | 1 |
| 57 31 | PM VF DC Inj | | 0-150 | 100 | 0/2 | 0 | _ | 1539h | 9572h |
| 57 | Perc | | 0-100 | 100 | 70 | | | 1 | 1 |
| 58 31 | PM VF Idse | | 0-150 | 70 | 0/2 | 0 | _ | 153ah | 9574h |
| 50 | Limit | | 0-100 | 70 | 70 | | | 1 | 1 |
| 71 | AHR Enable | 0 | No | 1 | | 0 | 7 10 | 15/17h | 058oh |
| / 1 | | 1 | Yes | - | | | 7.10 | 10-711 | 30001 |
| 72 | | | 0-1000 | 50 | 0/2 | 0 | 7 10 | 1548h | 9590h |
| 12 | | | 0-1000 | 50 | 70 | | 7.10 | 1 | 1 |
| 73 | AHR Limit | | 0-100 | 2 | 0/2 | 0 | 7 10 | 1549h | 9592h |
| 75 | 3 AHR Limit | | 0-100 | 2 | 70 | | 7.10 | 1 | 1 |
| 76 | Stall Prevent | 0 | No | No | ~ | 011 | 15/ch | 0508h | |
| 70 | Acc | 1 | Yes | 0 | - | | 9.1.4 | 10401 | 909011 |
| 77 | Stall Prevent | 0 | No | - 0 - | | | 011 | 15146 | 050ab |
| 77 | Dec | 1 | Yes | | - △ | 9.1.4 | 10401 | 909an | |

³¹ Activated when the MOT1-04 (Motor Type) value is 1 (Perm Magnet Motor).

| Code | LCD Display Setting Range | | Setting Range | Initial Value Unit | Unit Property ²⁶ | | Ref. | Commu addres | nication s/scale | | | | |
|------------------|---------------------------|---------------|-------------------|-----------------------|---|---|-------|-----------------|---------------------|--|-------|---|---|
| | | | | value | | | | 16-Bit | 32-Bit | | | | |
| 70 | Stall Prevent | 0 | No | 0 | | ~ | 011 | 151ob | 050ab | | | | |
| 10 | Std | 1 | Yes | 0 | - | | 9.1.4 | 104en | 90901 | | | | |
| 70 | Stall | | 0.00- | 15.00 | Ц7 | 0 | 011 | 154fh | 959eh | | | | |
| 15 | Frequency-1 | S | tall Frequency-2 | 10.00 | 112 | 0 | 5.1.4 | 0.01 | 0.01 | | | | |
| 80 27 | Stall Speed-1 | | 0-Stall Speed-2 | 450 ²⁸ | rnm | 0 | 914 | 1550h | 95a0h | | | | |
| 00 | | | | -00 | ipin | | 0.1.4 | 1 | 1 | | | | |
| 81 | Stall Level-1 | | 30-250 | 180 | % | 0 | 914 | 1551h | 95a2h | | | | |
| 01 | | | 00 200 | | ,,, | | 0.1.1 | 1 | 1 | | | | |
| 82 | Stall | St | all Frequency-1 - | 30.00 | Hz | 0 | 914 | 1552h | 95a4h | | | | |
| -02 | Frequency-2 | S | tall Frequency-3 | 00.00 | 112 | Ŭ | 0.1.4 | 0.01 | 0.01 | | | | |
| 83 27 | Stall Speed-2 | St | all Speed-1-Stall | 900 28 | rnm | 0 | 914 | 1553h | 95a6h | | | | |
| | | | Speed-3 | | ipiii | Ŭ | 0.1.1 | 1 | 1 | | | | |
| 84 | Stall Level-2 | | 30-250 | 180 | % | 0 | 914 | 1554h | 95a8h | | | | |
| | | | 00 200 | | ,,, | | 0.1.1 | 1 | 1 | | | | |
| 85 | Stall | St | tall Frequency-2- | 45 00 | Hz | 0 | 914 | 1555h | 95aah | | | | |
| | Frequency-3 | S | tall Frequency-4 | | | | | 0.01 | 0.01 | | | | |
| 86 ²⁷ | Stall Speed-3 | St | all Speed-2-Stall | 1350 ²⁸ | rom | 0 | 9.1.4 | 1556h | 95ach | | | | |
| | | | Speed-4 | | | | | 1 | 1 | | | | |
| 87 | Stall Level-3 | | 30-250 | 180 | % | 0 | 9.1.4 | 1557h | 95aeh | | | | |
| | | | 00 200 | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | 0 | 1 | 1 | | | | |
| 88 | Stall | S | tall Frequency-3- | 60.00 | Hz | 0 | 9.1.4 | 1558h | 95b0h | | | | |
| | Frequency-4 | | Max Frequency | | | | | 0.01 | 0.01 | | | | |
| 89 ²⁷ | Stall Speed-4 | _ | Stall Speed-3- | 1800 28 | rom | 0 | 9.1.4 | 1559h | 95b2h | | | | |
| | | Λ | laximum Speed | | | | 0.111 | 1 | 1 | | | | |
| 90 | Stall Level-4 | | 30-250 | 180 | % | 0 | 9,14 | 155ah | 95b4h | | | | |
| 00 | 0 Stall Level-4 | Stall Level-4 | Stall Level-4 | Stall Level-4 | Stall Level-4 | | | | ,0 | | 0.1.4 | 1 | 1 |

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Table of Functions

13.5 First Motor Control Group (VEC1)

This group is activated when the MOT1-05 (Control Mode) value is 3 (Sensorless) or 4 (Vector).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | | Setting Range | | Unit | Property ³² | Ref. | Commu addres | nication s/scale |
|------|---|---|----------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 21 | - | 0 | 4.3.3 | 1600h | 9600h |
| 00 | Hold Time | | 0.00.60.00 | 1 00 | 500 | 0 | 6.2 | 1609h | 9612h |
| 09 | | | 0.00-00.00 | 1.00 | 360 | 0 | 0.2 | 0.01 | 0.01 |
| 14 | Pre-Excite | | 0.00-60.00 | 1 00 | SAC | 0 | 62 | 160eh | 961ch |
| | Time | | 0.00-00.00 | 1.00 | 300 | | 0.2 | 0.01 | 0.01 |
| 15 | FluxCtrl | | 50-400 | 100 | 0/2 | 0 | 62 | 160fh | 961eh |
| 15 | Bandwidth | | 30-400 | 100 | 70 | | 0.2 | 1 | 1 |
| 16 | Elux Eoroing | | 100 0 200 0 | 150.0 | 0/. | 0 | 6.2 | 1610h | 9620h |
| 10 | Flux Forcing | | 100.0-200.0 | 150.0 | 70 | 0 | 0.2 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 18 | FluxWeak Ctrl Mode | 1 | Adjust by Freq | 2 | - | 0 | 6.2 | 1612h | 9624h |
| | • | 2 | Adjust by Volt | | | | | | |
| 10 | FW Volt Ref | | 95.0.100.0 | 05.0 | 0/ | | 6.0 | 1613h | 9626h |
| 19 | Ratio | | 85.0-100.0 | 95.0 | 70 | 0 | 0.2 | 0.1 | 0.1 |
| 20 | FW Control | | 10 1000 | 100 | 0/ | | 6.0 | 1614h | 9628h |
| 20 | Gain | | 10-1000 | 100 | 70 | 0 | 0.2 | 1 | 1 |
| 21 | Fwd +Torque | | 0 0 220 0 | 190.0 | 0/ | | 661 | 1615h | 962ah |
| 21 | Limit | | 0.0-320.0 | 160.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |
| 22 | Fwd -Torque | | 0 0 220 0 | 100.0 | 0/ | | 661 | 1616h | 962ch |
| 22 | Limit | | 0.0-320.0 | 100.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |

³² O: Writable during operation, \triangle : Writable when stopped, X: Not writable

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| Code | LCD Display | Setting Range | Initial | Unit | Property ³² | Ref. | Commu addres | nication s/scale |
|--------------|-------------|--------------------|---------|------|------------------------|-------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 22 | Rev +Torque | 0.0.220.0 | 190.0 | 0/ | 0 | 661 | 1617h | 962eh |
| 23 | Limit | 0.0-320.0 | 160.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |
| 24 | Rev -Torque | 0 0-320 0 | 180.0 | 0/2 | 0 | 661 | 1618h | 9630h |
| 24 | Limit | 0.0-320.0 | 100.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |
| 26 | TrqMode | 0.00-Max Frequency | 60.00 | Hz | 0 | 662 | 161ah | 9634h |
| 20 | FwdFreqLmt | | 00.00 | 112 | Ŭ | 0.0.2 | 0.01 | 0.01 |
| 27 | TrqMode | 0.00-Max Frequency | 60.00 | Hz | 0 | 662 | 161bh | 9636h |
| 21 | RevFreqLmt | | 00.00 | 112 | Ŭ | 0.0.2 | 0.01 | 0.01 |
| 28 33 | TrqMode Fwd | 0-Maximum Speed | 1800 34 | rnm | 0 | 662 | 161ch | 9638h |
| 20 | SpdLmt | | 1000 | ipin | | 0.0.2 | 1 | 1 |
| 20 33 | TrqMode Rev | 0-Maximum Speed | 1800 34 | rnm | 0 | 662 | 161dh | 963ah |
| 20 | SpdLmt | | 1000 | ipin | Ŭ | 0.0.2 | 1 | 1 |
| 30 | TrqMode | 1 0-100 0 | 20.0 | % | 0 | 662 | 161eh | 963ch |
| | SpdLmtGain | 1.0 100.0 | 20.0 | 70 | Ŭ | 0.0.2 | 0.1 | 0.1 |
| 34 | IMSD Trq | 10-500 | 100 | % | 0 | 622 | 1622h | 9644h |
| | Comp | 10 000 | 100 | ,,, | | 0.2.2 | 1 | 1 |
| 07 | IMSL | 05 440 | 100 | 0/ | | 0.0.4 | 1625h | 964Ah |
| 37 | Noload | 95-110 | 100 | % | 0 | 6.2.1 | 1 | 1 |
| 20 | IMSL Torque | 10 500 | 100 | 0/ | | 601 | 1626h | 964Ch |
| 30 | Comp | 10-500 | 100 | 70 | 0 | 0.2.1 | 1 | 1 |
| 20 | IMSL Speed | 10 500 | 100 | 0/. | 0 | 621 | 1627h | 964Eh |
| - 39 | Comp | 10-500 | 100 | 70 | 0 | 0.2.1 | 1 | 1 |
| 40 | IMSL LSpd | 10-500 | 105 | 0/2 | | 621 | 1628h | 9650h |
| 40 | Trq Comp | 10-300 | 105 | 70 | | 0.2.1 | 1 | 1 |
| 63 | Droop | 0.0~100.0 | 0.0 | 0/2 | | 7 30 | 163fh | 967eh |
| 05 | Percent | 0.0 - 100.0 | 0.0 | 70 | | 1.52 | 0.1 | 0.1 |

Table of Functions

³³ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display).
 ³⁴ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | Setting Range | Initial Value Unit Pro | | Property ³² | Ref. | Communication address/scale | | |
|----------------------|--------------|---------------|---------------------------|------|------------------------|-------|-----------------------------|--------|--|
| | | | value | | | | 16-Bit | 32-Bit | |
| 64 | Droop Start | 0.0.100.0 | 50.0 | 0/ | | 7 2 2 | 1640h | 9680h | |
| 04 | Torque | 0.0~100.0 | 50.0 | 70 | 0 | 1.32 | 0.1 | 0.1 | |
| 05 | Droop | 0 4000 | 500 | | | 7 00 | 1641h | 9682h | |
| 65 | FreqLpf Gain | 0~1000 | 500 | msec | 0 | 1.32 | 1 | 1 | |
| 66 | Droop Start | 0.00, 600.00 | 10.00 | 11- | | 7 2 2 | 1642h | 9684h | |
| 00 | Freq | 0.00~600.00 | 10.00 | п2 | | 1.32 | 0.01 | 0.01 | |
| C7 33 | Droop Start | 0.0000 | 200 34 | | | 7 00 | 1643h | 9686h | |
| 67 ³³ Spd | Spd | 0~36000 | 300 34 | rpm | | 7.32 | 1 | 1 | |

13.6 Second Motor Group (MOT2)

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This group is activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 27 (2nd Motor).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | | Setting Range | | Unit | Property ³⁵ | Ref. | Commu addres | nication s/scale |
|------------------|-------------|-----|----------------------|-------|------|------------------------|---------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 35 | - | 0 | 4.3.3 | 1700h | 9400h |
| 01 | Command | 0.0 | | 0.00 | | | E 1 1 0 | 1701h | 9702h |
| 01 | Frequency | 0.0 | J~Max Frequency | 0.00 | | 0 | J.I.I.Z | 0.01 | 0.01 |
| 00.26 | Command | • | | 0.27 | | | | 1702h | 9704h |
| 02 30 | Speed | 0~ | Maximum Speed | 0 37 | rpm | 0 | 5.1.1.2 | 1 | 1 |
| 03 | Command | | 180.0~180.0 | 250.0 | 0/_ | 0 | 6321 | 1703h | 9706h |
| 03 | Torque | | -180.0~180.0 | 250.0 | 70 | 0 | 0.3.2.1 | 0.1 | 0.1 |
| | | 0 | Induction Motor | | | | | | |
| 04 | Motor Type | 1 | Perm Magnet Motor | 0 | - | \bigtriangleup | 3.1 | 1704h | 9708h |
| | | 0 | V/F | | | | | | |
| 05 | Control | 1 | Slip Comp. | 0 | | _ | 2.1 | 1705h | 070ab |
| 05 | Mode | 2 | V/F PG | 0 | - | | 3.1 | 170511 | 970an |
| | | 3 | Sensorless | | | | | | |
| 00 | Torque | 0 | No | 0 | | _ | 2.0 | 17006 | 07106 |
| 08 | Control En | 1 | Yes | 0 | - | | 3.2 | 170011 | 97100 |
| 15 | Start | | 0.00-10.00 | 0 50 | Н7 | | 5125 | 170fh | 971eh |
| 15 | Frequency | | 0.00-10.00 | 0.50 | | | 5.1.2.5 | 0.01 | 0.01 |
| 16 ³⁶ | Start Sneed | | 0-300 | 15 37 | rom | | 5125 | 1710h | 9720h |
| | otart opeed | | 0-000 | 10 | ipin | | 0.1.2.0 | 1 | 1 |
| 17 | Stop | | 0 00-10 00 | 0 00 | Hz | | 5251 | 1711h | 9722h |
| | Frequency | | 0.00-10.00 | 0.00 | 112 | | 0.2.0.1 | 0.01 | 0.01 |

³⁵ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

³⁶ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

³⁷ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ³⁵ | Ref. | Commu addres | nication s/scale |
|-------|-------------|----|---------------|------------------|------|------------------------|---------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 18 36 | Stop Speed | | 0-300 | 0.37 | rnm | | 5251 | 1712h | 9724h |
| 10 ** | Stop Speed | | 0-300 | 0.5 | трш | | 5.2.5.1 | 1 | 1 |
| | | 0 | 0.2 kW | | | | | | |
| | | 1 | 0.4 kW | | | | | | |
| | | 2 | 0.75 kW | | | | | | |
| | | 3 | 1.5 kW | | | | | | |
| | | 4 | 2.2 kW | | | | | | |
| | | 5 | 4 kW | | | | | | |
| | | 6 | 5.5 kW | | | | | | |
| | | 7 | 7.5 kW | | | | | | |
| | | 8 | 11 kW | | | | | | |
| | | 9 | 15 kW | | | | | | |
| | | 10 | 18.5 kW | | | | | | |
| | | 11 | 22 kW | | | | | | |
| | | 12 | 30 kW | | | | | | |
| 04 | Motor | 13 | 37 kW | | | <u>,</u> | 0.4 | | 070-1- |
| 21 | Capacity | 14 | 45 kW | - | - | | 3.1 | 17150 | 972an |
| | | 15 | 55 kW | | | | | | |
| | | 16 | 75 kW | | | | | | |
| | | 17 | 90 kW | | | | | | |
| | | 18 | 110 kW | | | | | | |
| | | 19 | 132 kW | | | | | | |
| | | 20 | 160 kW | | | | | | |
| | | 21 | 185 kW | | | | | | |
| | | 22 | 200 kW | | | | | | |
| | | 23 | 220 kW | | | | | | |
| | | 24 | 280 kW | | | | | | |
| | | 25 | 315 kW | | | | | | |
| | | 26 | 375 kW | | | | | | |
| | | 27 | 450 kW | | | | | | |

| Code | LCD Display | Setting Range | | Unit | Property ³⁵ F | Ref. | Commu addres | nication s/scale |
|------------------|-----------------------|----------------|--------------|------|--------------------------|------|-------------------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 22 | Base | 20.00.500.00 | 60.00 | | _ | 2.1 | 1717h | 972eh |
| 23 | Frequency | 30.00-390.00 | 00.00 | | | 3.1 | 0.01 | 0.01 |
| 2/ 36 | Rated | 900-24000 | 16.8 | rnm | | 3.1 | 1718h | 9730h |
| 27 | Speed | 300-24000 | Note | ipin | | 0.1 | 1 | 1 |
| 25 | Number of | 2-100 | 4 | Pole | | 31 | 1719h | 9732h |
| 20 | Poles | 2-100 | | | | 0.1 | 1 | 1 |
| 26 | Rated | 1 0-1000 0 | 16.8 | А | \wedge | 31 | 171ah | 9734h |
| 20 | Current | 1.0 1000.0 | Note | | | 0.1 | 0.1 | 0.1 |
| 27 | Rated | 0 180-480 | 0 | V | \wedge | 3.1 | 171bh | 9736h |
| 21 | Voltage | 0, 100 400 | Ŭ | • | | 0.1 | 1 | 1 |
| 28 | Efficiency | 70-100 | 16.8 | % | | 3 1 | 171ch | 9738h |
| 20 | Enciency | 70-100 | Note | 70 | | 0.1 | 1 | 1 |
| 35 | No-load | 0.5-1000.0 | 16.8 | Δ | ~ | 3 1 | 1723h | 9746h |
| | Current | 0.0-1000.0 | Note | ~ | | 0.1 | 0.1 | 0.1 |
| | Stator | | 16.8 | | | | 1724h | 9748h |
| 36 | Resistance | 0.0000-99.9999 | Note | Ω | \bigtriangleup | 3.4 | 0.0001 ³⁸ | 0.0001 |
| | Lookaga | | 16.8 | | | | 1725h | 974ah |
| 37 | Inductance | 0.000-99.999 | Note | mΗ | \bigtriangleup | 3.4 | 0.001 38 | 0.001 |
| | Stator | | 16.9 | | | | 1726h | 974ch |
| 38 | Inductance | 0.000-999.999 | Note | mH | \bigtriangleup | 3.4 | 0.001 38 | 0.001 |
| 39 | Rotor TimeConstant | 25-5000 | 16.8 Note | msec | \bigtriangleup | 3.4 | 1727h | 974eh |
| 40.39 | q-axis | 0.000.00.000 | 10.000 | mL | | 2.4 | 1728h | 9750h |
| 40 33 | Inductance | 0.000-99.999 | 10.000 | | | 5.4 | 0.01 | 0.001 |
| 41 ³⁹ | d-axis Inductance | 0.000-99.999 | 10.000 | mH | \bigtriangleup | 3.4 | 1729h | 9752h |

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³⁸ For products that are 200 V class 15 kW or 400 V class 18.5 kW or more. For other capacities, refer to **Table 1** in <u>13.3 First Motor Group (MOT1)</u>.

³⁹ Activated when the MOT2-04 (Motor Type) value is 1 (Perm Magnet Motor).

| Code | LCD Display | | Setting Range | | Unit | Property ³⁵ | Ref. | Commu addres | nication s/scale |
|------------------|--------------------|-----------|------------------------|-------|------|------------------------|-------|---|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 42 39 | PM Rotor | | 0 000-65 000 | 0 100 | | | 3.4 | 172ah | 9754h |
| -72 | Flux | | 0.000-00.000 | 0.100 | _ | | 0.4 | 0.001 | 0.0001 |
| 51 | ACR | | 50-400 | 100 | % | 0 | 6.2 | 1733h | 9766h |
| | Bandwidth | | | | | | | 1 | 1 |
| 54 | ASR Adjust Gain | | 1-10 | 4 | - | 0 | 6.2 | 1736h 1 | 976ch 1 |
| a 4 20 | | 0 | No | | | | 0 = 4 | 470.11 | |
| 61 ³⁹ | IPPE Enable | 1 | Yes | 1 | - | 0 | 6.5.1 | 1/3dh | 977ah |
| CO 30 | IPPE Volt | | 10,100 | 50 | 0/ | | 0 5 4 | 173eh | 977ch |
| 62 39 | Ref Perc | | 10-100 | 50 | % | 0 | 6.5.1 | 1 | 1 |
| 63 39 | IPPE Curr | | 10-150 | 120 | % | 0 | 651 | 173fh | 977eh |
| 00 | Peak Per | | 10-100 | 120 | 70 | | 0.0.1 | 1 | 1 |
| | | 0 | None | | | | | | |
| 75 | ETH Enable | 1 | CoastStop (FreeRun) | 0 | - | 0 | 9.1.1 | 174bh | 9796h |
| | | 2 | Dec | | | | | Communation addres 16-Bit 172ah 0.001 173ah 1 1736h 1 1736h 1 1736h 1 173dh 173ch 1 173ch 1 173ch 1 173ch 1 174bh 174ch 1 174ch 1 174ch 1 174ch 1 1760h 0.1 1760h 1761h | |
| 76 | Motor | 0 | Self-Cool | 0 | | 0 | 011 | 171ab | 07006 |
| 70 | Cooling | 1 | Forced-Cool | 0 | - | 0 | 9.1.1 | 17401 | 97900 |
| 77 | ETH Cont | | 50-150 | 120 | 0/2 | 0 | 011 | 174dh | 979ah |
| | Current | | 30-130 | 120 | 70 | 0 | 9.1.1 | 1 | 1 |
| 78 | ETH 1min | | 120-200 | 150 | % | 0 | 9.1.1 | 174eh | 979ch |
| | Current | | | | | | ••••• | 1 | 1 |
| 96 | Load Speed | | 0.1-6000.0 | 100.0 | % | 0 | 7.21 | 1760h | 97c0h |
| | Gain | • | | | | | | 0.1 | 0.1 |
| | | 0 | x 1 | | | | | | |
| | Load Speed | 1 | x 0.1 | | | | | | |
| 97 | Scale | 2 | x 0.01 | 0 | - | 0 | 7.21 | 1761h | 97c2h |
| | | 3 x 0.001 | | | | | | | |
| | | 4 | x 0.0001 | | | | | | |
| 98 | Load Speed | 0 | rpm | 0 | - | 0 | 7.21 | 1762h | 97c4h |
| | Unit | 1 | mpm | | | | | | |

13.7 Second Motor V/F Group (VF2)

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This group is activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 27 (2nd Motor) and the MOT2-05 (Control Mode) value is 0 (V/F) or 1 (Slip Comp.).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁴⁰ | Ref. | Commu addres | nication s/scale |
|-------|--------------|----------|------------------|---------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 31 | - | 0 | 4.3.3 | 1800h | 9800h |
| | | 0 | Linear | | | | | | |
| 01 | V//E Dottorp | 1 Square | | 0 | | ~ | 612 | 10016 | 00006 |
| 01 | V/F Pallem | 2 | User V/F | 0 | - | | 0.1.3 | 100111 | 900211 |
| | | 3 | Square 2 | | | | | | |
| 02 | User | | 0.00 - User | 10.00 | | _ | 612 | 1802h | 9804h |
| 02 | Frequency-1 | | Frequency-2 | 10.00 | ΠΖ | | 0.1.3 | 0.01 | 0.01 |
| 03 41 | User Speed 1 | 0 | User Speed 2 | 450 42 | rom | ~ | 613 | 1803h | 9806h |
| 05 | User Speed-1 | 0 | - User Speed-2 | 430 - | трш | | 0.1.5 | 1 | 1 |
| 04 | User | | 0 100 | 25 | 0/_ | | 613 | 1804h | 9808h |
| 04 | Voltage-1 | | 0-100 | 25 | 70 | | 0.1.3 | 1 | 1 |
| 05 | User | U | ser Frequency-1- | 20.00 | | _ | 612 | 1805h | 980ah |
| 05 | Frequency-2 | U | ser Frequency-3 | 30.00 | | | 0.1.3 | 0.01 | 0.01 |
| 06 41 | User Speed 2 | | User Speed-1 - | 000 42 | rom | ~ | 613 | 1806h | 980ch |
| 00 | User Speed-2 | | User Speed-3 | 900 - | трш | | 0.1.5 | 1 | 1 |
| 07 | User | | 0-100 | 50 | 0/2 | | 613 | 1807h | 980eh |
| 07 | Voltage-2 | | 0-100 | 50 | 70 | | 0.1.3 | 1 | 1 |

⁴⁰ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

⁴¹ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

⁴² The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | | Setting Range | | Unit | Property ⁴⁰ | Ref. | Commu addres | nication s/scale |
|-------------------------|----------------------|---|------------------|-------------------|--------|------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | User | U | ser Frequency-2- | 15.00 | | ~ | 612 | 1808h | 9810h |
| 08 | Frequency-3 | U | ser Frequency-4 | 45.00 | | | 0.1.5 | 0.01 | 0.01 |
| 00 41 | User Speed-3 | | User Speed-2- | 1350 42 | rom | | 613 | 1809h | 9812h |
| 03 | | | User Speed-4 | 1550 | ipin | | 0.1.0 | 1 | 1 |
| 10 | User | | 0-100 | 75 | % | ~ | 613 | 180ah | 9814h |
| | Voltage-3 | | 0 100 | 10 | 70 | | 0.1.0 | 1 | 1 |
| 11 | User | U | ser Frequency-3- | 60.00 | Hz | \wedge | 613 | 180bh | 9816h |
| | Frequency-4 | | Max Frequency | | | | 0.110 | 0.01 | 0.01 |
| 12 ⁴¹ | User Speed-4 | | User Speed-3- | 1800 42 | rom | \wedge | 613 | 180ch | 9818h |
| 12 | | Ν | laximum Speed | 1000 | ipin | | 0.1.0 | 1 | 1 |
| 18 | User | | 0-100 | 100 | % | \wedge | 613 | 180dh | 981ah |
| | Voltage-4 | | 0.100 | 100 | ,,, | | 0.1.0 | 1 | 1 |
| 21 | Slip Comp | 0 | Basic Comp. | 0 | _ | \wedge | 6142 | 1815h | 982ah |
| 21 | Mode | 1 | Advanced Comp. | 0 | | | 0.1.4.2 | 101011 | |
| 22 | SlipGain | | 0-300 | 100 | % | 0 | 6142 | 1816h | 982ch |
| | Mot-Low | | 0.000 | 100 | ,,, | | 0.11.1.2 | 1 | 1 |
| 23 | SlipGain | | 0-300 | 100 | % | 0 | 6142 | 1817h | 982eh |
| | Mot-High | | 0.000 | 100 | ,,, | | 0.1.1.2 | 1 | 1 |
| 24 | SlipGain | | 0-300 | 100 | % | 0 | 6142 | 1818h | 9830h |
| 27 | Gen-Low | | 0 000 | 100 | 70 | 0 | 0.1.4.2 | 1 | 1 |
| 25 | SlipGain | | 0-300 | 100 | % | 0 | 6142 | 1819h | 9832h |
| | Gen-High | | 0.000 | 100 | 70 | | 0.1.4.2 | 1 | 1 |
| 26 | SlipComp | | 1-10000 | 300 | msec | 0 | 6142 | 181ah | 9834h |
| 20 | LPF Gain | | 1-10000 | 000 | 111300 | 0 | 0.1.4.2 | 1 | 1 |
| 27 | SlipGain | | 0 00-20 00 | 9 00 | Hz | 0 | 6142 | 181bh | 9836h |
| 21 | SwOv Freq | | 0.00-20.00 | 3.00 | 112 | | 0.1.4.2 | 0.01 | 0.01 |
| 28 ⁴¹ | SlipGain SwOv Spd | | 0-600 | 270 ⁴² | rpm | 0 | 6.1.4.2 | 181ch | 9838h |
| 31 | Torque Boost | 0 | Manual | 0 | | | 76 | 101fb | 08206 |
| 51 | Mode | 1 | Auto | U | - | | 0.1 | 101111 | 303611 |

| Code | LCD Display | | Setting Range | | Unit | Property ⁴⁰ | Ref. | Commu addres | nication s/scale |
|--------------|--------------|---|---------------|-------------------|----------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 20 | Forward | | 0.0.45.0 | 2.0 ⁴³ | 0/ | | 7.0 | 1820h | 9840h |
| 32 | Boost | | 0.0-15.0 | 1.0 44 | % | | 0.1 | 0.1 | 0.1 |
| 0.0 | Reverse | | 0.0.45.0 | 2.0 ⁴³ | 0/ | | 7.0 | 1821h | 9842h |
| 33 | Boost | | 0.0-15.0 | 1.0 44 | % | \square | 0.1 | 0.1 | 0.1 |
| 34 | ATB Mot- | | 0.0-300.0 | 100.0 | 0/2 | 0 | 762 | 1822h | 9844h |
| -04 | Gain | | 0.0-300.0 | 100.0 | 70 | | 1.0.2 | 0.1 | 0.1 |
| 35 | ATB Gen- | | 0.0-300.0 | 100.0 | % | 0 | 762 | 1823h | 9846h |
| | Gain | | 0.0-000.0 | 100.0 | 70 | | 1.0.2 | 0.1 | 0.1 |
| 36 | ATB LPF | | 1_10000 | З | msoc | _ | 762 | 1824h | 9848h |
| - 50 | Gain | | 1-10000 | 5 | msec | | 1.0.2 | 1 | 1 |
| 51 45 | PM V/F | | 0.0-1.0 | 07 | | 0 | 64 | 1836h | 986ch |
| 54 | HPF Gain | | 0.0-1.0 | 0.7 | | | 0.4 | 0.1 | 0.1 |
| 55 45 | PM V/F | | 0-3 | 1 | H7 | 0 | 64 | 1837h | 986eh |
| | HPF Wcut | | | | 112 | | 0.4 | 1 | 1 |
| 56 45 | PM V/F | | 0-200 | 150 | 0/2 | 0 | 64 | 1838h | 9870h |
| 50 | CurrLmtGain | | 0-200 | 100 | 70 | | 0.4 | 1 | 1 |
| 57 45 | PM VF DC Inj | | 0-150 | 100 | % | 0 | 64 | 1839h | 9872h |
| 01 | Perc | | | 100 | 70 | | 0.4 | 1 | 1 |
| 58 45 | PM VF Idse | | 0-150 | 70 | 0/2 | 0 | 64 | 183ah | 9874h |
| 50 | Limit | | 0-100 | 70 | 70 | 0 | 0.4 | 1 | 1 |
| 71 | AHR Enable | 0 | No | 1 | | 0 | 7 10 | 18/17h | 088ah |
| 7 1 | | 1 | Yes | 1 | | 0 | 7.10 | 104711 | 900611 |
| 70 | | | 0 1000 | 50 | 0/ | 0 | 7 10 | 1848h | 9890h |
| 12 | | | 0-1000 | 50 | /0 | | 1.10 | 1 | 1 |
| 73 | AUD Limit | | 0 100 | 2 | 0/ | | 7 10 | 1849h | 9892h |
| 13 | | | 0-100 | 2 | 70 | | 7.10 | 1 | 1 |

Γ

⁴³ For 75 kW or less (Refer to <u>16.8 Parameter Default Values Based on the Motor</u> <u>Capacity</u>)

- ⁴⁴ For 90 kW or less (Refer to <u>16.8 Parameter Default Values Based on the Motor</u> <u>Capacity</u>)
- ⁴⁵ Activated when the MOT1-04 (Motor Type) value is 1 (Perm Magnet Motor).

| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ⁴⁰ | Ref. | Commu addres | nication s/scale |
|------------------|---------------|----|-------------------|--------------------|-------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 76 | Stall Prevent | 0 | No | 0 | | ~ | 014 | 101ah | 00006 |
| 70 | Acc | 1 | Yes | 0 | - | | 9.1.4 | 104011 | 909011 |
| 77 | Stall Prevent | 0 | No | 0 | | ~ | 014 | 10146 | 000ab |
| // | Dec | 1 | Yes | 0 | - | | 9.1.4 | 104011 | 909811 |
| 70 | Stall Prevent | 0 | No | 0 | | ~ | 011 | 101ob | 090ab |
| 10 | Std | 1 | Yes | 0 | - | | 9.1.4 | 104611 | 90901 |
| 70 | Stall | | 0.00- | 15.00 | Ц7 | 0 | 011 | 184fh | 989eh |
| 19 | Frequency-1 | S | tall Frequency-2 | 13.00 | | 0 | 9.1.4 | 0.01 | 0.01 |
| 80 41 | Stall Speed_1 | | D-Stall Speed-2 | 150 42 | rnm | 0 | Q 1 / | 1850h | 98a0h |
| 00 | Stall Speed-1 | | o-otali opeeu-z | 400 | ipin | 0 | 9.1.4 | 1 | 1 |
| 81 | Stall Loval-1 | | 30-250 | 180 | % | 0 | Q 1 / | 1851h | 98a2h |
| | | | 00-200 | 100 | 70 | | 0.1.4 | 1 | 1 |
| 82 | Stall | St | all Frequency-1 - | 30.00 | Нz | 0 | Q 1 / | 1852h | 98a4h |
| 02 | Frequency-2 | S | tall Frequency-3 | 50.00 | 112 | | 5.1.4 | 0.01 | 0.01 |
| 83 41 | Stall Speed-2 | | Stall Speed-1- | 900 42 | rnm | 0 | 914 | 1853h | 98a6h |
| 00 | | | Stall Speed-3 | 000 | ipin | | 0.1.4 | 1 | 1 |
| 84 | Stall Level-2 | | 30-250 | 180 | % | 0 | 914 | 1854h | 98a8h |
| | | | 00 200 | 100 | 70 | | 0.1.4 | 1 | 1 |
| 85 | Stall | St | all Frequency-2 - | 45 00 | Hz | 0 | 914 | 1855h | 98aah |
| | Frequency-3 | S | tall Frequency-4 | +0.00 | 112 | | 0.1.4 | 0.01 | 0.01 |
| 86 ⁴¹ | Stall Speed-3 | | Stall Speed-2- | 1350 ⁴² | rnm | 0 | 914 | 1856h | 98ach |
| 00 | | | Stall Speed-4 | 1000 | ipin | | 0.1.4 | 1 | 1 |
| 87 | Stall Level-3 | | 30-250 | 180 | % | 0 | 914 | 1857h | 98aeh |
| | | | 00 200 | 100 | 70 | | 0.1.4 | 1 | 1 |
| 88 | Stall | St | all Frequency-3 - | 60.00 | Hz | 0 | 914 | 1858h | 98b0h |
| | Frequency-4 | | Max Frequency | 00.00 | 112 | 0 | 0.1.4 | 0.01 | 0.01 |
| 89 41 | Stall Speed-4 | | Stall Speed-3 - | 1800 42 | rpm | 0 | 914 | 1859h | 98b2h |
| | otan opoou-4 | Ν | laximum Speed | 1000 | ιpiii | | 0.1.4 | 1 | 1 |
| 90 | Stall Level-A | | 30-250 | 180 | % | | 914 | 185ah | 98b4h |
| 30 | | | 00-200 | 100 | 70 | | 5.1.4 | 1 | 1 |

13.8 Second Motor Control Group (VEC2)

Г

This group is activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 27 (2nd Motor) and the MOT2-05 (Control Mode) value is 3 (Sensorless).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | | Setting Range | | Unit | Property ⁴⁶ | Ref. | Commu addres | nication s/scale |
|------|---|---|----------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 21 | - | 0 | 4.3.3 | 1900h | 9600h |
| 00 | Hold Time | | 0.00.60.00 | 1.00 | | | 6.0 | 1909h | 9912h |
| 09 | | | 0.00-00.00 | 1.00 | sec | 0 | 0.2 | 0.01 | 0.01 |
| 14 | Pre-Excite | | 0.00-60.00 | 1 00 | soc | 0 | 6.2 | 190eh | 991ch |
| 14 | Time | | 0.00-00.00 | 1.00 | 360 | | 0.2 | 0.01 | 0.01 |
| 15 | FluxCtrl | | 50-400 | 100 | % | 0 | 62 | 190fh | 991eh |
| 15 | Bandwidth | | 30-400 | 100 | 70 | | 0.2 | 1 | 1 |
| 16 | Elux Forcing | | 100 0-200 0 | 150.0 | 0/2 | | 62 | 1910h | 9920h |
| 10 | T IUX T OFCILING | | 100.0-200.0 | 150.0 | 70 | | 0.2 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 18 | FluxWeak Ctrl Mode | 1 | Adjust by Freq | 2 | - | 0 | 6.2 | 1912h | 9924h |
| | • | 2 | Adjust by Volt | | | | | | |
| 10 | FW Volt Ref | | 95.0.100.0 | 05.0 | 0/ | | 6.0 | 1913h | 9926h |
| 19 | Ratio | | 85.0-100.0 | 95.0 | 70 | 0 | 0.2 | 0.1 | 0.1 |
| 20 | FW Control | | 10 1000 | 100 | 0/. | | 6.2 | 1914h | 9928h |
| 20 | Gain | | 10-1000 | 100 | 70 | 0 | 0.2 | 1 | 1 |
| 21 | Fwd +Torque | | 0 0 320 0 | 180.0 | 0/_ | | 661 | 1915h | 992ah |
| 21 | Limit | | 0.0-320.0 | 100.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |
| 22 | Fwd -Torque | | 0 0-320 0 | 180.0 | 0/2 | | 661 | 1916h | 992ch |
| 22 | Limit | | 0.0-320.0 | 100.0 | 70 | | 0.0.1 | 0.1 | 0.1 |

⁴⁶ O: Writable during operation, △: Writable when stopped, X: Not writable

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| Code | ode LCD Display | Setting Range | | Unit | Property ⁴⁶ | Ref. | Communication address/scale | | |
|-------|-------------------|--------------------|---------|------|------------------------|-------|-----------------------------|--------|--|
| | | | value | | | | 16-Bit | 32-Bit | |
| 23 | Rev +Torque | 0 0 320 0 | 180.0 | 0/_ | 0 | 661 | 1917h | 992eh | |
| 23 | Limit | 0.0-320.0 | 100.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 | |
| 24 | Rev -Torque | 0 0-320 0 | 180.0 | % | 0 | 661 | 1918h | 9930h | |
| 27 | Limit | 0.0-320.0 | 100.0 | 70 | Ŭ | 0.0.1 | 0.1 | 0.1 | |
| 26 | TrqMode | 0.00-Max Frequency | 60.00 | Hz | 0 | 662 | 191ah | 9934h | |
| 20 | FwdFreqLmt | | 00.00 | 112 | Ŭ | 0.0.2 | 0.01 | 0.01 | |
| 27 | TrqMode | 0.00-Max Frequency | 60.00 | Hz | 0 | 662 | 191bh | 9936h | |
| 21 | RevFreqLmt | | 00.00 | 112 | Ŭ | 0.0.2 | 0.01 | 0.01 | |
| 28 47 | TrqMode Fwd | 0-Maximum Speed | 1800 48 | rnm | 0 | 662 | 191ch | 9938h | |
| 20 | SpdLmt | | 1000 | ipin | Ŭ | 0.0.2 | 1 | 1 | |
| 29 47 | TrqMode Rev | 0-Maximum Speed | 1800 48 | rnm | 0 | 662 | 191dh | 993ah | |
| 20 | SpdLmt | | 1000 | ipin | Ŭ | 0.0.2 | 1 | 1 | |
| 30 | TrqMode | 1 0-100 0 | 20.0 | % | 0 | 662 | 191eh | 993ch | |
| | SpdLmtGain | 1.0 100.0 | 20.0 | 70 | Ŭ | 0.0.2 | 0.1 | 0.1 | |
| 34 | IMSD Trq | 10-500 | 100 | % | 0 | 622 | 1922h | 9944h | |
| | Comp | 10 000 | 100 | 70 | Ŭ | 0.2.2 | 1 | 1 | |
| 36 | IMSL Gain | 30-200 | 100 | % | 0 | 621 | 1924h | 9948h | |
| | | | 100 | 70 | Ŭ | 0.2.1 | 1 | 1 | |
| | IMSL | //- | | | | | 1925h | 994Ah | |
| 37 | SpdComp Noload | 95-110 | 100 | % | 0 | 6.2.1 | 1 | 1 | |
| 20 | IMSL Torque | 10 500 | 100 | 0/ | | 6.0.4 | 1926h | 994Ch | |
| 30 | Comp | 10-500 | 100 | 70 | 0 | 0.2.1 | 1 | 1 | |
| 20 | IMSL Speed | 10 500 | 100 | 0/ | | 621 | 1927h | 994Eh | |
| 39 | Comp | 10-000 | 100 | 70 | | 0.2.1 | 1 | 1 | |
| 40 | IMSL LSpd | 10 500 | 105 | 0/- | | 621 | 1928h | 9950h | |
| 40 | Trq Comp | 10-300 | 105 | 70 | | 0.2.1 | 1 | 1 | |

- ⁴⁷ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)
- ⁴⁸ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

13.9 Advanced Function Group (ADV)

Г

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | Code LCD Display | | Setting Range | | Unit | it Property ⁴⁹ | Ref. | Communication address/scale | |
|--------------|-----------------------|--------------------|-----------------|---------------|------|---------------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 50 | - | 0 | 4.3.3 | 1a00h | 9a00h |
| | | 0 | None | | | | | | |
| 01 | Run Prevent Select | 1 | Forward Prevent | 0 | - | \triangle | 5.2.3.1 | 1a01h | 9a02h |
| | | 2 | Reverse Prevent | | | | | | |
| | | 0 | None | | | | | | |
| 02 | Power-on Run | 1 | Start Mode | 0 | - | 0 | 5.2.3.2 | 1a02h | 9a04h |
| | | | Speed Search | | | | | | |
| 05 | AccDwell | | | F 00 | 11- | _ | 7 5 | 1a05h | 9a0ah |
| 05 | Frequency | 0.00-Max Frequency | | 5.00 | п | | C. 1 | 0.01 | 0.01 |
| 06 50 | AccDwell | 0 | | | rom | | 75 | 1a06h | 9a0ch |
| 00 ** | Speed | 0- | | 130 ** | трп | | 7.5 | 1 | 1 |
| 07 | AccDwell | | 0.0-60.0 | 0.0 | ser | | 75 | 1a07h | 9a0eh |
| | Time | | 0.0-00.0 | 0.0 | 300 | | 1.0 | 0.1 | 0.1 |
| 08 | DecDwell | 0.0 | 0-Max Frequency | 5.00 | H7 | | 75 | 1a08h | 9a10h |
| | Frequency | 0.0 | | 0.00 | 112 | | 7.5 | 0.01 | 0.01 |
| ng 50 | DecDwell | 0_ | Maximum Speed | 150 51 | rom | | 75 | 1a09h | 9a12h |
| 03 | Speed | 0-Maximum Speed | | 150 | ipin | | 7.5 | 1 | 1 |
| 10 | DecDwell | 0.0-60.0 | | 0.0 | ser | | 75 | 1a0ah | 9a14h |
| | Time | 0.0-60.0 | | 0.0 | 300 | | 1.0 | 0.1 | 0.1 |
| 14 | Cmd Freq | 0 | No | 0 | | | 5125 | 120ab | 0a1ch |
| 14 | Limit En | 1 | Yes | 0 | - | | 5.1.2.5 | | Jaion |

⁴⁹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

⁵⁰ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

⁵¹ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code LCD Disp | LCD Display | Setting Range Initial Unit Property ⁴⁵ | | Property ⁴⁹ | Ref. | Commu addres | nication s/scale | | |
|---------------|-------------|---|-------------------|------------------------|----------------|-----------------|-----------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 15 52 | Cmd Freq | (| 0.00-Cmd Freq | 0.50 | | 0 | E 1 0 E | 1a0fh | 9a1eh |
| 15 % | Limit Lo | | Limit Hi | 0.50 | ΠΖ | 0 | 5.1.2.5 | 0.01 | 0.01 |
| 16 52 | Cmd Freq | Cr | nd Freq Limit Lo- | 60.00 | Ц ₇ | | 5125 | 1a10h | 9a20h |
| 10 | Limit Hi | 1 | Max Frequency | 00.00 | ΠZ | | 5.1.2.5 | 0.01 | 0.01 |
| 17 53 | Cmd Speed | | 0-Cmd Speed | 15 51 | rom | 0 | 5125 | 1a11h | 9a22h |
| 17 00 | Limit Lo | Limit Hi | | 15 ** | трш | | 5.1.2.5 | 1 | 1 |
| 18 53 | Cmd Speed | Cmd Speed Limit Lo- | | 1800 51 | rnm | | 5125 | 1a12h | 9a24h |
| 10 ** | Limit Hi | N | laximum Speed | 1000 - | ipin | | 5.1.2.5 | 1 | 1 |
| 10 | Jog Freq | 0 | No | 1 | | 0 | 723 | 1013h | 0226h |
| 19 | Limit En | 1 | Yes | I | - | 0 | 1.2.5 | Taton | 942011 |
| 20 | Jump Cmd | 0 | No | 0 | | | F 4 0 F | 1-114 | 0-006 |
| 20 | Freq En | 1 | Yes | 0 | - | | 5.1.2.5 | 1a14n | 9a28n |
| 04 54 | Jump Cmd | 0 | .00 - Jump Cmd | 10.00 | | | F 4 0 F | 1a15h | 9a2ah |
| 21 01 | Freq Lo1 | | Freq Hi 1 | 10.00 | ΠΖ | 0 | 5.1.2.5 | 0.01 | 0.01 |
| 22 54 | Jump Cmd | J | ump Cmd Freq | 15.00 | | 0 | 5125 | 1a16h | 9a2ch |
| 22 01 | Freq Hi1 | Lo | 1-Max Frequency | 15.00 | ΠΖ | 0 | 5.1.2.5 | 0.01 | 0.01 |
| 22 54 | Jump Cmd | 0 |).00-Jump Cmd | 20.00 | | | 5125 | 1a17h | 9a2eh |
| 23 01 | Freq Lo2 | | Freq Hi 2 | 20.00 | ΠΖ | 0 | 5.1.2.5 | 0.01 | 0.01 |
| 24 54 | Jump Cmd | J | ump Cmd Freq | 25.00 | | 0 | 5125 | 1a18h | 9a30h |
| 24 ** | Freq Hi2 | Lo 2-Max Frequency | | 25.00 | ΠΖ | 0 | 5.1.2.5 | 0.01 | 0.01 |
| 25 54 | Jump Cmd | 0.00 - Jump Cmd | | 30.00 | | 0 | 5125 | 1a19h | 9a32h |
| 25 51 | Freq Lo3 | | Freq Hi 3 | 30.00 | ΠΖ | | 5.1.2.5 | 0.01 | 0.01 |
| 26 54 | Jump Cmd | J | ump Cmd Freq | 25.00 | | 0 | 5125 | 1a1ah | 9a34h |
| 20 04 | Freq Hi3 | Lo 3-Max Frequency | | 35.00 | ΠΖ | | 5.1.2.5 | 0.01 | 0.01 |

- ⁵² Activated when the ADV-14 (Cmd Freq Limit En) value is 1 (Yes) and the DRV-32 (Hz/ rpm Select) value is 0 (Hz Display).
- ⁵³ Activated when the ADV-14 (Cmd Freq Limit En) value is 1 (Yes) and the DRV-32 (Hz/ rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)
- ⁵⁴ Activated when the ADV-20 (Jump Cmd Freq En) value is 1 (Yes) and the DRV-32 (Hz/ rpm Select) value is 0 (Hz Display).

| Code | LCD Display | | Setting Range | Initial | Unit | t Property ⁴⁹ | Ref. | Commu addres | nication s/scale |
|------------------|-------------|------|-------------------|--------------------------|---------|--------------------------|---------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 07 55 | Jump Cmd | 0 - | Jump Cmd Speed | 200 51 | F10 100 | | E 1 0 E | 1a1bh | 9a36h |
| 27 00 | Speed Lo1 | | Hi 1 | 300 % | rpm | 0 | 5.1.2.5 | 1 | 1 |
| 28 55 | Jump Cmd | Jı | ump Cmd Speed | 150 51 | rnm | 0 | 5125 | 1a1ch | 9a38h |
| 20 | Speed Hi1 | Lo ' | 1-Maximum Speed | 430 | трп | | 5.1.2.5 | 1 | 1 |
| 29 55 | Jump Cmd | 0 - | Jump Cmd Speed | 600 ⁵¹ | rnm | 0 | 5125 | 1a1dh | 9a3ah |
| 20 | Speed Lo2 | | Hi 2 | 000 | 1pm | | 0.1.2.0 | 1 | 1 |
| 30 55 | Jump Cmd | Ju | ump Cmd Speed | 750 ⁵¹ | rom | 0 | 5125 | 1a1eh | 9a3ch |
| 00 | Speed Hi2 | Lo 2 | 2-Maximum Speed | 100 | | | 0.1.2.0 | 1 | 1 |
| 31 55 | Jump Cmd | 0 | Jump Cmd Speed | 900 ⁵¹ | rom | 0 | 5125 | 1a1fh | 9a3eh |
| | Speed Lo3 | | Hi 3 | | | | 0.1.2.0 | 1 | 1 |
| 32 55 | Jump Cmd | Jı | Jump Cmd Speed | | rnm | 0 | 5125 | 1a20h | 9a40h |
| 02 | Speed Hi3 | Lo : | 3-Maximum Speed | 1000 | ipin | | 0.1.2.0 | 1 | 1 |
| | | 0 | DISABLE | | | | | | |
| | Pr Control | 1 | RELEASE | | | | | | |
| 40 ⁵⁶ | State | 2 | RELEASING | - | - | X | 7.25 | 1a28h | 9a50h |
| | | 3 | ENGAGE | | | | | | |
| | | 4 | ENGASING | | | | | | |
| ⊿1 56 | Br Release | | 0 00-180 00 | 50.00 | % | 0 | 7 25 | 1a29h | 9a52h |
| | Load | | 0.00-100.00 | 00.00 | 70 | | 1.20 | 0.01 | 0.01 |
| 12 56 | Br Load Req | | 0.00-10.00 | 1 00 | sec | 0 | 7 25 | 1a2ah | 9a54h |
| -12 | Delay | | 0.00 10.00 | 1.00 | 000 | | 1.20 | 0.01 | 0.01 |
| 43 56 | Br Release | | 0.00-10.00 | 1 00 | sec | 0 | 7 25 | 1a2bh | 9a56h |
| -10 | Delay | | 0.00 10.00 | 1.00 | 000 | | 1.20 | 0.01 | 0.01 |
| AA 57 | Br Release | 0.0 | 0-Max Frequency | 1.00 | Hz | 0 | 7 25 | 1a2ch | 9a58h |
| -7-7 | FwdFreq | 0.0 | o max r requertey | 1.00 | 112 | Ŭ | 1.20 | 0.01 | 0.01 |

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Table of Functions

- ⁵⁵ Activated when the ADV-20 (Jump Cmd Freq En) value is 1 (Yes) and the DRV-32 (Hz/ rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)
- ⁵⁶ Activated when the APP-43 (Brake Enable) value is 1 (Yes).
- ⁵⁷ Activated when the APP-43 (Brake Enable) value is 1 (Yes) and the DRV-32 (Hz/rpm Select) value is 0 (Hz Display).

| Code LCD Display | | Setting Range | | Unit | Property ⁴⁹ | Ref. | Communication address/scale | | |
|------------------|---------------------|--------------------|-----------------|-----------|------------------------|-------------|-----------------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| AE 58 | Br Release | 0 | Maximum Chand | 20 51 | - | | 7.05 | 1a2dh | 9a5ah |
| 40 00 | Fwd Spd | 0- | Maximum Speed | 30 % | rpm | 0 | 7.25 | 1 | 1 |
| 46 57 | Br Release | 0.0 | | 1.00 | | 0 | 7.25 | 1a2eh | 9a5ch |
| 40 ** | RevFreq | 0.0 | | 1.00 | | 0 | 1.25 | 0.01 | 0.01 |
| 17 58 | Br Release | 0_ | Maximum Speed | 30 51 | rom | 0 | 7 25 | 1a2fh | 9a5eh |
| 47 | Rev Spd | 0- | | | 1pm | | 1.20 | 1 | 1 |
| 18 56 | Br Engage | | 0.00-10.00 | 1.00 | sac | 0 | 7 25 | 1a30h | 9a60h |
| -0 | Delay | | | 1.00 | 300 | | 1.20 | 0.01 | 0.01 |
| 10 57 | Br Engage | 0.00-Max Frequency | | 2.00 | Hz | 0 | 7 25 | 1a31h | 9a62h |
| 43 | Freq | | | 2.00 | | | 1.25 | 0.01 | 0.01 |
| 50 58 | Br Engage | 0-Maximum Speed | | 60 51 | rom | 0 | 7 25 | 1a32h | 9a64h |
| 50 | Speed | 0-Maximum Speed | | 00 * | ipin | | 1.25 | 1 | 1 |
| | - | 0 | None | | | | | | |
| 52 | Energy Save Mode | 1 | Manual | 0 | - | \triangle | 7.12 | 1a34h | 9a68h |
| | modo | 2 | Auto | | | | | | |
| 50 | Energy Save | | 0.20 | 0 | 0/ | 0 | 7 40 | 1a35h | 9a6ah |
| 53 | Gain | | 0-30 | 0 | 70 | 0 | 1.12 | 1 | 1 |
| 55 | Acc Change | 0.0 | | 0.00 | Ц ₇ | 0 | 5311 | 1a37h | 9a6eh |
| - 55 | Freq | 0.0 | | 0.00 | | 0 | 5.5.1.4 | 0.01 | 0.01 |
| 56 ⁵⁰ | Acc Change | 0- | Maximum Speed | 0 51 | rpm | 0 | 5314 | 1a38h | 9a70h |
| | Speed | Ŭ | | 0 | 1pm | | 0.0.1.4 | 1 | 1 |
| 57 | Acc Change | | 0.00-6000.00 | 20.00 | sec | 0 | 5.3.1.4 | 1a39h | 9a72h |
| | AccTime | | | | | | | 0.1 | 0.01 |
| 58 | Dec Change | 0.0 | 0-Max Frequency | 0.00 | Hz | 0 | 5.3.1.4 | 1a3ah | 9a74h |
| _ | Freq | 0.00-max Frequency | | | | | | 0.01 | 0.01 |
| 59 ⁵⁰ | Dec Change | 0-Maximum Speed | | 0 51 | rpm O | | 5.3.1.4 | 1a3bh | 9a76h |
| | Speed | 0-Maximum Speed | | | | | | 1 | 1 |
| 60 | Dec Change | | 0.00-6000.00 | 20.00 | sec | 0 | 5.3.1.4 | 1a3ch | 9a/8h |
| | Dectime | 0.00-6000.00 | | 20.00 300 | | | | 0.1 | 0.01 |

⁵⁸ Activated when the APP-43 (Brake Enable) value is 1 (Yes) and the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

| Code | LCD Display | Setting Range | | | Unit | t Property ⁴⁹ | Ref. | Communication address/scale | |
|------------------|---------------------|--------------------|------------------------|-------------|------------|--------------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 70 59 | Dun Enabla | 0 | No | 0 | | | 7 / | 10/6h | 0a9ab |
| 70 00 | Run Enable | 1 | Yes | 0 | - | | 7.4 | 184011 | 980011 |
| | | 0 | CoastStop (FreeRun) | | | | | | |
| 71 ⁵⁹ | Run Disable Stop | 1 | Quick Stop | 0 | - | \triangle | 7.4 | 1a47h | 9a8eh |
| | | 2 | Quick Stop Resume | | | | | | |
| 72 59 | Quick Stop | | 0 00 6000 00 | 5.00 | 500 | 0 | 7 / | 1a48h | 9a90h |
| 12 ** | Time | 0.00-6000.00 | | 5.00 | 560 | | 7.4 | 0.1 | 0.01 |
| | | 0 | U/D Normal | | | | | | |
| 75 ⁶⁰ | Up/Down Mode | 1 | U/D Step | 0 | - | 0 | 5.1.1.7 | 1a4bh | 9a96h |
| | modo | 2 | U/D Step+Norm | | | | | | |
| 76 60 | Up/Down | 0 | No | 0 | | | E 4 4 7 | 10100 | 0-006 |
| 70 00 | Save Mode | 1 | Yes | 0 | - | | 5.1.1.7 | Ta4CII | 989011 |
| 77 61 | Up/Down | 0.0 | | 0.00 | <u>Ц</u> 7 | 0 | 5117 | 1a4dh | 9a9ah |
| 11 | Step Freq | 0.0 | | 0.00 | | | 5.1.1.7 | 0.01 | 0.01 |
| 78 62 | Up/Down | 0- | Maximum Speed | ∩ 51 | rnm | 0 | 5117 | 1a4eh | 9a9ch |
| 10 | Step Speed | 0- | | 0 | 1pm | | 0.1.1.7 | 1 | 1 |
| 79 61 | Up/Down | 0.00-Max Frequency | | 0.00 | Hz | x | 5117 | 1a4fh | 9a9eh |
| | Save Freq | 0.0 | e maxi requeriey | 0.00 | | | 0 | 0.01 | 0.01 |
| 80 62 | Up/Down | 0- | Maximum Speed | 0 51 | rpm | X | 5117 | 1a50h | 9aa0h |
| 00 | Save Speed | 0- | maximum opood | U | - pm | | 0.1.1.7 | 1 | 1 |

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- ⁵⁹ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 18 (Run Enable).
- ⁶⁰ Activated when the DRV-11 (1st Freq Ref Src) or DRV-41 (2nd Freq Ref Src) value is 5 (Up Down Drive).
- ⁶¹ Activated when the DRV-11 (1st Freq Ref Src) or DRV-41 (2nd Freq Ref Src) value is 5 (Up Down Drive) and the DRV-32 (Hz/rpm Select) value is 0 (Hz Display).
- ⁶² Activated when the DRV-11 (1st Freq Ref Src) or DRV-41 (2nd Freq Ref Src) value is 5 (Up Down Drive) and the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

13.10 Application Function Group (APP)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

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| Code | le LCD Display | | Setting Range | | Unit | Property ⁶³ | Ref. | Communication address/scale | |
|-------|----------------|-------------------|------------------------|-------|------|------------------------|-------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 25 | - | 0 | 4.3.3 | 1b00h | 9b00h |
| 01 | Process PID | 0 | No | 0 | | | 771 | 16016 | 06026 |
| 01 | Enable | 1 | Yes | 0 | - | 0 | 1.1.1 | moun | 90020 |
| 02 | ExternalPID | 0 | No | 0 | | 0 | 701 | 16026 | 06046 |
| 02 | Enable | 1 | Yes | 0 | - | 0 | 1.0.1 | 10020 | 900411 |
| 02 | UserSeq | 0 | No | 0 | | | 7 07 | 16026 | 06066 |
| 03 | Enable | 1 | Yes | 0 | - | 0 | 1.21 | 100311 | 900011 |
| 05 | SpeedSearch | 0 | Current Detect | 0 | | | 7 13 | 1605b | 0b0ab |
| 05 | Mode | 1 Speed Estimate | | 0 | - | | 7.15 | 100311 | BDUall |
| 06 | SS Block | | 0.0.60.0 | | 500 | | 7 13 | 1b06h | 9b0ch |
| | Time | | 0.0-60.0 | | 300 | | 7.15 | 0.1 | 0.1 |
| 07 | SS Sup- | | 0-200 | 90 | % | 0 | 7 13 | 1b07h | 9b0eh |
| | Current | | 0-200 | 50 | 70 | Ŭ | 7.10 | 1 | 1 |
| 09 | SS | | 1-300 | 100 | % | 0 | 7 13 | 1b09h | 9b12h |
| | Bandwidth | | | 100 | ,,, | Ŭ | 1.10 | 1 | 1 |
| 10 | PM SS Curr | | 10-100 | 15 | % | 0 | 7 13 | 1b0ah | 9b14h |
| | Peak | | | | | | | 1 | 1 |
| | | 0 | None | | | | | | |
| 15 | KEB Mode | 1 | 1 KEB Ride- Through | | - | \bigtriangleup | 7.9 | 1b0fh | 9b1eh |
| | | 2 KEB Safety Stop | | | | | | | |
| 16 64 | KEB Start | 70.0 - | | 80.0 | 0/_ | | 7.0 | 1b10h | 9b20h |
| 10 ** | Level | (KE | B Stop Level - 5.0) | 00.0 | 70 | | 1.9 | 0.1 | 0.1 |
| 17 64 | KEB Stop | (KEB Start Level | | 90.0 | % | | 79 | 1b11h | 9b22h |
| 17 | Level | + 5.0)-95.0 | | 30.0 | 70 | | 1.5 | 0.1 | 0.1 |

 $^{63}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

⁶⁴ Activated when the APP-15 (KEB Mode) value is not 0 (None).

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| Code | LCD Display | Setting Range | | Initial | Unit | t Property ⁶³ | Ref. | Commu addres | nication s/scale | |
|--------------|-----------------|---------------|---------|---------|--------|--------------------------|-----------|-----------------|---------------------|--------|
| | | | | | value | | | | 16-Bit | 32-Bit |
| 10 64 | KEB Control | | 0.0.100 | | 100.0 | 0/ | | 7.0 | 1b12h | 9b24h |
| 10 04 | Gain | | 0.0-100 | 0.0 | 100.0 | 70 | 0 | 7.9 | 0.1 | 0.1 |
| | KEB | | | | | | | | 1b13h | 9b26h |
| 19 64 | Damping Gain | | 0-30 | 0 | 100 | % | 0 | 7.9 | 1 | 1 |
| 20 64 | KEB Acc | | 0.00.60 | 0.00 | 10.00 | 500 | | 7.0 | 1b14h | 9b28h |
| 20 ** | Time | | 0.00-00 | 5.00 | 10.00 | Sec | 0 | 1.9 | 0.1 | 0.01 |
| 25 | RegenAvd | 0 | Ν | No | 0 | | | 7 20 | 1h10h | 06226 |
| 25 | Enable | 1 | Y | es | 0 | - | | 7.20 | петат | 903211 |
| 26 65 | RegenAvd | 0 | ١ | No | 0 | | ~ | 7 20 | 1h1ah | 06216 |
| 20 ** | Acc En | 1 | 1 Yes | | 0 | - | | 7.20 | IDTall | 903411 |
| 27 65 | RegenAvd | 0 | Ν | No | 0 | | ~ | 7 20 | 16166 | 06266 |
| 21 00 | Steady En | 1 | Y | 'es | 0 | - | \square | 7.20 | וומדמד | 903011 |
| 20 65 | RegenAvd | 0 | ١ | lo | 0 | | ~ | 7 20 | 16106 | 06206 |
| 20 00 | Dec En | 1 | Y | es | 0 | - | | 7.20 | TDTCH | 902011 |
| 00.65 | RegenAvd | 200 | V class | 300-400 | 350 | | | 7.00 | 1b1dh | 9b3ah |
| 29 00 | Level | 400 | V class | 600-800 | 700 | V | | 7.20 | 1 | 1 |
| 20 66 | RegenAvd | | 0.00.10 | 0.00 | 10.00 | | ~ | 7 20 | 1b1eh | 9b3ch |
| 30 *** | FreqLimit | | 0.00-10 | 5.00 | 10.00 | ΠΖ | | 7.20 | 0.01 | 0.01 |
| 21 67 | RegenAvd | | 0.200 | 68 | 200.68 | rom | ~ | 7 20 | 1b1fh | 9b3eh |
| 31 % | Spd Limit | | 0-300 | | 300 ** | трп | \square | 7.20 | 1 | 1 |
| 22 65 | RegenAvd | | 0.20 | 0 | 100 | 0/ | | 7 20 | 1b20h | 9b40h |
| 32 00 | Gain | 0-200 | | 100 | 70 | 0 | 7.20 | 1 | 1 | |
| 22 65 | RegenAvd FF | | 0.20 | 0 | 100 | 0/ | 0 | 7 20 | 1b21h | 9b42h |
| 33 00 | Gain | | 0-20 | 0 | 100 | 70 | 0 | 7.20 | 1 | 1 |

⁶⁵ Activated when the APP-25 (RegenAvd Enable) value is 1 (Yes).

- ⁶⁶ Activated when the APP-25 (RegenAvd Enable) value is 1 (Yes) and the DRV-32 (Hz/ rpm Select) value is 0 (Hz Display).
- ⁶⁷ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)
- ⁶⁸ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | Setting Range | | | Unit | Property ⁶³ | Ref. | Communication address/scale | | |
|------|--------------|---------------|---------|---------|-------|------------------------|-------|-----------------------------|--------|--------|
| | | | | | value | | | | 16-Bit | 32-Bit |
| 25 | DB Turn On | 200 | V class | 350-400 | 390 | V | ~ | 0.0.0 | 1b23h | 9b46h |
| 35 | Level | 400 | V class | 600-800 | 780 | V | | 9.2.0 | 1 | 1 |
| 26 | DB Warn | 0 | Ν | 10 | 0 | | 0 | 0.2.6 | 16016 | 06406 |
| 30 | %ED Enable | 1 | Y | es | 0 | - | 0 | 9.2.0 | 102411 | 904011 |
| 27 | DB Warn | | 1 20 | | Б | 0/. | 0 | 0.2.6 | 1b25h | 9b4ah |
| 57 | %ED | 1-30 | | 5 | 70 | 0 | 9.2.0 | 1 | 1 | |
| 40 | Pre-Heat | 1-100 | | 0 | 20 | 0/. | ~ | 7 99 | 1b28h | 9b50h |
| 40 | Level | 1-100 | | 20 | 70 | | 1.23 | 1 | 1 | |
| 11 | Pre-Heat | | 1 100 | | 20 | 0/. | _ | 7 99 | 1b29h | 9b52h |
| 41 | Duty | | 1-10 | 0 | 30 | 70 | | 1.23 | 1 | 1 |
| 40 | Per-Heat | | 0.0.60 | 0.0 | 0.0 | | 0 | 7 99 | 1b2ah | 9b54h |
| 42 | Delay T | | 0.0-00 | 0.0 | 0.0 | sec | 0 | 1.23 | 0.1 | 0.1 |
| 12 | Praka Enabla | 0 | Ν | 10 | 0 | | 0 | 7 95 | 16066 | 06566 |
| 43 | | 1 | Y | es | 0 | - | 0 | 7.20 | ποζοπ | 90001 |
| 4.4 | Pos Ctrl | 0 | Ν | 10 | 0 | | | 7 00 0 | 160ab | 06506 |
| 44 | Enable | 1 | Y | es | 0 | - | 0 | 1.20.2 | TDZCN | 90000 |
| 45 | Tension Ctrl | 0 | Ν | 10 | 0 | | 0 | 7 00 44 | 46046 | 065-6 |
| 45 | En | 1 Yes | | es | U | - | 0 | 1.28.11 | nozan | necae |
| 46 | O Stan Das T | | 0.0.000 | 0.00 | F 00 | | | 7.00 | 1b2eh | 9b5ch |
| 40 | | 0.0~6000.00 | | 0.UU | sec | 0 | 1.29 | 0.1 | 0.01 | |

13.11 Digital Input Terminal Block Group (DIN)

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| Code | LCD Display | | Setting Range | | Uni <u>t</u> | Property ⁶⁹ | Ref | Commu addres | nication s/scale |
|------|-------------|----|-----------------|-------|--------------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 20 | - | 0 | 4.3.3 | 1c00h | 9c00h |
| | | 0 | NONE | | | | | | |
| | | 1 | FX | | | | | | |
| | | 2 | RX | | | | | | |
| | | 3 | RST | | | | | | |
| | | 4 | BX | | | | | | |
| | | 5 | External Trip-1 | | | | | | |
| | | 6 | External Trip-2 | | | | | | |
| | | 7 | External Trip-3 | | | | | | |
| | | 8 | External Trip-4 | | | | | | |
| | | 9 | JOG | | | | | | |
| | DI1 Define | 10 | SPEED_L | 1 | | | | | |
| 01 | | 11 | SPEED_M | 1 | - | | - | 1c01h | 9c02h |
| | | 12 | SPEED_H | | | | | | |
| | | 13 | SPEED_X | | | | | | |
| | | 14 | XCEL_L | | | | | | |
| | | 15 | XCEL_M | | | | | | |
| | | 16 | XCEL_H | | | | | | |
| | | 17 | XCEL Stop | | | | | | |
| | | 18 | RUN Enable | | | | | | |
| | | 19 | 3-Wire | | | | | | |
| | | 20 | 2nd Source | | | | | | |
| | | 21 | Exchange | | | | | | |
| | | 22 | Up | | | | | | |

 $^{69}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

LSELECTRIC 5

| Code | LCD Display | | Setting Range | | Unit | Property ⁶⁹ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|-----------------------|-------|------|------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 23 | Down | | | | | | |
| | | 24 | Up/Down Clear | | | | | | |
| | | 25 | Up/Down Save | | | | | | |
| | | 26 | Cmd Frequency Hold | | | | | | |
| | | 27 | 2nd Motor | | | | | | |
| | | 28 | Dc Injection | | | | | | |
| | | 29 | Spd/Trq Change | | | | | | |
| | | 30 | Reserved | | | | | | |
| | | 31 | Reserved | | | | | | |
| | | 32 | Timer Input | | | | | | |
| | DI1 Define | 33 | Reserved | | | | | | |
| | | 34 | Disable Aux Ref | | | | | | |
| 01 | | 35 | Forward JOG | 1 | - | \triangle | - | 1c01h | 9c02h |
| | | 36 | Reverse JOG | | | | | | |
| | | 37 | PPID Run Enable | | | | | | |
| | | 38 | PPID Open Loop | | | | | | |
| | | 39 | PPID Ref Change | | | | | | |
| | | 40 | PPID Gain Change | | | | | | |
| | | 41 | PPID I-Term Clear | | | | | | |
| | | 42 | PPID Output Hold | | | | | | |
| | | 43 | PPID Sleep ON | | | | | | |
| | | 44 | PPID Sleep Change | | | | | | |
| | | 45 | PPID Step Ref-L | | | | | | |
| | | 46 | PPID Step Ref-M | | | | | | |

Table of Functions - Digital Input Terminal Block Group (DIN)

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| Code | LCD Display | | Setting Range | | Unit | Property ⁶⁹ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|-----------------------|-------|------|------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 47 | PPID Step Ref-H | | | | | | |
| | | 48 | Fire Mode Fwd | | | | | | |
| | | 49 | Fire Mode Rev | | | | | | |
| | | 50 | Pre Heat | | | | | | |
| | | 51 | EPID1 Run | | | | | | |
| | | 52 | EPID1 I-Term Clear | | | | | | |
| | | 53 | EPID2 Run | | | | | | |
| | | 54 | EPID2 I-Term Clear | | | | | | |
| | | 55 | Brake Monitor Sel | | | | | | |
| | | 56 | POS Home | | | | | | |
| | | 57 | POS POS Run Home | | | | | | |
| 01 | DI1 Define | 58 | POS HW Lmt L | 1 | - | \triangle | - | 1c01h | 9c02h |
| | | 59 | POS HW Lmt H | | | | | | |
| | | 60 | POS Pattern-L | | | | | | |
| | | 61 | POS Pattern-M | | | | | | |
| | | 62 | POS Pattern-H | | | | | | |
| | | 63 | POS Pattern-X | | | | | | |
| | | 64 | POS Run | | | | | | |
| | | 65 | POS Run Pre-Posi | | | | | | |
| | | 66 | POS Run Relative | | | | | | |
| | | 67 | Modbus Master En | | | | | | |
| | | 68 | UserSeqCtrl OnOff | | | | | | |
| | | 69 | Quick Stop | | | | | | |

Table of Functions

| Code | LCD Display | Setting Range | | Initial Value | Unit | Property ⁶⁹ | Ref. | Communication address/scale | |
|------|-------------|---------------|-----------------------|------------------|------|------------------------|------|-----------------------------|--------|
| | | | | | | | | 16-Bit | 32-Bit |
| 01 | DI1 Define | 70 | WebCtrl Fwd Run | 1 | _ | | | 1c01h | 9c02h |
| | | 71 | WebCtrl Rev Run | | | | | | |
| | | 72 | Web Splice | | | | | | |
| | | 73 | WPID Gain Change | | | | | | |
| | | 74 | Web Bobbin-L | | | | | | |
| | | 75 | Web Bobbin-H | | | | | | |
| | | 76 | Web Preset | | | | | | |
| | | 77 | Disable WPID | | | | | | |
| | | 78 | Web I-Term Clear | | | | | | |
| | | 79 | Diameter Calc Hold | | | | | | |
| | | 80 | Web Tns Up En | | | | | | |
| | | 81 | Web Tns Down En | | | | | | |
| | | 82 | Web Taper Disable | | | | | | |
| Code | LCD Display | LCD Display | Setting Range | | Unit | Property ⁶⁹ | Ref. | Commu addres | nication s/scale |
|------|------------------|---------------------------------|---------------|--------|------------------|------------------------|--------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit | |
| 02 | DI1 Status | | - | - | Х | 8.1.3 | 1c02h | 9c04h | |
| 03 | DI2 Define | | 2 | - | \bigtriangleup | - | 1c03h | 9c06h | |
| 04 | DI2 Status | | - | - | Х | 8.1.3 | 1c04h | 9c08h | |
| 05 | DI3 Define | | 4 | - | \triangle | - | 1c05h | 9c0ah | |
| 06 | DI3 Status | | - | - | Х | 8.1.3 | 1c06h | 9c0ch | |
| 07 | DI4 Define | | 5 | - | \triangle | - | 1c07h | 9c0eh | |
| 08 | DI4 Status | | - | - | Х | 8.1.3 | 1c08h | 9c10h | |
| 09 | DI5 Define | Same as DI Define | 10 | - | \triangle | - | 1c09h | 9c12h | |
| 10 | DI5 Status | | - | - | Х | 8.1.3 | 1c0ah | 9c14h | |
| 11 | DI6 Define | | 11 | - | \triangle | - | 1c0bh | 9c16h | |
| 12 | DI6 Status | | - | - | Х | 8.1.3 | 1c0ch | 9c18h | |
| 13 | DI7 Define | | 12 | - | \triangle | - | 1c0dh | 9c1ah | |
| 14 | DI7 Status | | - | - | Х | 8.1.3 | 1c0eh | 9c1ch | |
| 15 | DI8 Define | | 9 | - | \triangle | - | 1c0fh | 9c1eh | |
| 16 | DI8 Status | | - | - | Х | 8.1.3 | 1c10h | 9c20h | |
| 20 | Step DI | 1-60000 | 1 | msec | 0 | 5121 | 1c14h | 9c28h | |
| 20 | Check Time | 1-00000 | - | msec | 0 | 5.1.2.4 | 1 | 1 | |
| 25 | DI1 On Delay | 0-100000 | 0 | msec | 0 | 811 | 1c19h | 9c32h | |
| 20 | Dirion Dolay | 0 100000 | Ŭ | 111000 | | 0.1.1 | 1 | 1 | |
| 26 | DI1 Off Delay | 0-100000 | 0 | msec | 0 | 811 | 1c1ah | 9c34h | |
| | | | | | | 0.1.1 | 1 | 1 | |
| 27 | DI1 NC/NO Sel | 0 Normal Open 1 Normal Close | 0 | - | 0 | 8.1.2 | 1c1bh | 9c36h | |
| 20 | | 0 100000 | 0 | | 0 | 011 | 1c1ch | 9c38h | |
| 20 | | 0-100000 | 0 | msec | | 0.1.1 | 1 | 1 | |
| 20 | | 0 100000 | 0 | mean | | Q 1 1 | 1c1dh | 9c3ah | |
| 29 | | 0-100000 | U | msec | | 0.1.1 | 1 | 1 | |

| Code | ode LCD Display | | Setting Range | | Unit | Property ⁶⁹ Ref. | | erty ⁶⁹ Ref. Communication | |
|------|-----------------|---|---------------|-------|--------|-----------------------------|-------------|---------------------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 20 | DI2 NC/NO | 0 | Normal Open | 0 | | 0 | 010 | 1010h | 0o2ob |
| 30 | Sel | 1 | Normal Close | 0 | - | 0 | 0.1.2 | TCTEN | 903011 |
| 21 | DI2 On Dolov | | 0 100000 | 0 | maaa | | 011 | 1c1fh | 9c3eh |
| 51 | | | 0-100000 | 0 | msec | 0 | 0.1.1 | 1 | 1 |
| 32 | | | 0-10000 | 0 | msoc | 0 | <u>8</u> 11 | 1c20h | 9c40h |
| 52 | | | 0-100000 | 0 | msec | Ŭ | 0.1.1 | 1 | 1 |
| 33 | DI3 NC/NO | 0 | Normal Open | 0 | | 0 | 812 | 1c21h | 0c/12h |
| | Sel | 1 | Normal Close | 0 | | | 0.1.2 | 102 111 | 304211 |
| 34 | DI4 On Delav | | 0-100000 | 0 | msec | 0 | 811 | 1c22h | 9c44h |
| 04 | | | 0-100000 | 0 | 111300 | Ŭ | 0.1.1 | 1 | 1 |
| 35 | DI4 Off Delay | | 0-100000 | 0 | msec | 0 | 811 | 1c23h | 9c46h |
| | | | | | | Ŭ | 0.1.1 | 1 | 1 |
| 36 | DI4 NC/NO | 0 | Normal Open | 0 | | 0 | 812 | 1c24h | 9c48h |
| | Sel | 1 | Normal Close | Ŭ | | Ŭ | 0.1.2 | 102 111 | |
| 37 | DI5 On Delav | | 0-100000 | 0 | msec | 0 | 811 | 1c25h | 9c4ah |
| | | | | | | Ŭ | 0.1.1 | 1 | 1 |
| 38 | DI5 Off Delay | | 0-100000 | 0 | msec | 0 | 811 | 1c26h | 9c4ch |
| | | | | | | | 0 | 1 | 1 |
| 39 | DI5 NC/NO | 0 | Normal Open | 0 | _ | 0 | 812 | 1c27h | 9c4eh |
| | Sel | 1 | Normal Close | | | Ŭ | 0.1.2 | | |
| 40 | DI6 On Delav | | 0-100000 | 0 | msec | 0 | 812 | 1c28h | 9c50h |
| | | | 0 100000 | | | | 0.1.2 | 1 | 1 |
| 41 | DI6 Off Delay | | 0-100000 | 0 | msec | 0 | 811 | 1c29h | 9c52h |
| | | | | | | | 0 | 1 | 1 |
| 42 | DI6 NC/NO | 0 | Normal Open | 0 | _ | 0 | 8.1.2 | 1c2ah | 9c54h |
| | Sel | 1 | Normal Close | | | | | | |
| 43 | DI7 On Delav | | 0-100000 | 0 | msec | 0 | 8.1.1 | 1c2bh | 9c56h |
| | | | | | | - | | 1 | 1 |
| 44 | DI7 Off Delav | | 0-100000 | 0 | msec | 0 | 8.1.1 | 1c2ch | 9c58h |
| | en bolay | | 5 100000 | | | | 0.1.1 | 1 | 1 |

| Code | LCD Display | y Setting Range | | Initial Value | Unit | Property ⁶⁹ | Ref. | Communication address/scale | |
|------|--------------|------------------|--------------|------------------|------|------------------------|-------|---|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 45 | DI7 NC/NO | 0 | Normal Open | 0 | | | 0 1 0 | 1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 | Octob |
| 45 | Sel | 1 | Normal Close | 0 | - | 0 | 0.1.Z | TCZUN | acoan |
| 46 | | | 0.100000 | 0 | | | 011 | 1c2eh | 9c5ch |
| 40 | DIS ON Delay | | 0-100000 | 0 | msec | | 0.1.1 | 1 | 1 |
| 47 | | | 0.400000 | 0 | | | 044 | 1c2fh | 9c5eh |
| 47 | | | 0-100000 | 0 | msec | 0 | 8.1.1 | 1 | 1 |
| 40 | DI8 NC/NO | 0 | Normal Open | 0 | | | 040 | 1-204 | 0-00 |
| 48 | Sel | 1 Normal Close 0 | | - 0 | | ö.1.2 | 10300 | 900U | |

13.12 Analog Input Terminal Block Group (AIN)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

٦

| Code | Code LCD Display | | Setting Range | Initial | Unit | Property ⁷⁰ | Ref. | Commu addres | nication s/scale |
|--------|-------------------------|---|---|---------|------|------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 31 | - | 0 | 4.3.3 | 1d00h | 9d00h |
| | | 0 | Unipolar Voltage | | | | | | |
| 01 | Al1 Type Select | 1 | Bipolar Voltage | 0 | - | \triangle | 8.2.1 | 1d01h | 9d02h |
| | 001001 | 2 | Current | | | | | | |
| 02 | | | -10.00-10.00 | - | V | v | 0 0 1 | 1d02h | 9d04h |
| 02 | All value | | 0.00-20.00 | - | mA | ^ | 0.2.1 | 0.01 | 0.01 |
| 02 | Al1 | | 0.00.100.00 | | 0/. | v | 0 2 1 | 1d03h | 9d06h |
| 03 | Monitor[%] | | 0.00-100.00 | - | 70 | ^ | 0.2.1 | 0.01 | 0.01 |
| 04 | | | 0 10000 | 10 | maaa | 0 | 0 2 1 | 1d04h | 9d08h |
| 04 | | | 0-10000 | 10 | msec | 0 | 0.2.4 | 1 | 1 |
| 05 | $\Lambda 1 \pm v1 \ln$ | (| $0.00 \text{ A} 11 \pm \sqrt{2} \ln 10$ | 0.00 | V | | Q | 1d05h | 9d0ah |
| 05 | | | 0.00-ATT + X2 III | 4.00 | mA | 0 | 0.2.2 | 0.01 | 0.01 |
| 06 | Al1 + y1 | | 100 00 100 00 | 0.00 | 0/. | | 0 7 7 | 1d06h | 9d0ch |
| 00 | Percent | | -100.00-100.00 | 0.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 07 | | A | l1 + x1 In-10.00 | 10.00 | V | | 0 0 0 | 1d07h | 9d0eh |
| 07 | ALL + XZ III | A | l1 + x1 ln-20.00 | 20.00 | mA | | 0.2.2 | 0.01 | 0.01 |
| 00 | Al1 + y2 | | 100 00 100 00 | 100.00 | 0/ | | 000 | 1d08h | 9d10h |
| 08 | Percent | | -100.00-100.00 | 100.00 | % | 0 | 8.Z.Z | 0.01 | 0.01 |
| 00 71 | | | | 0.00 | | | 0 7 7 | 1d09h | 9d12h |
| 09 / 1 | AIT - XI IN | 1 | ATT - X2 IN-0.00 | 0.00 | V | 0 | 0.2.2 | 0.01 | 0.01 |
| 10 71 | Al1 - y1 | | 100 00 100 00 | 0.00 | 0/ | | 000 | 1d0ah | 9d14h |
| 10 / 1 | Percent | | -100.00-100.00 | 0.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 11 71 | A11 x2 lm | | 10.00 411 | 10.00 | | 0 | 0 0 0 | 1d0bh | 9d16h |
| 11 / 1 | AIT - XZ IN | | 10.00-ATT - XT IN | -10.00 | V | 0 | 8.2.2 | 0.01 | 0.01 |

 $^{70}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

⁷¹ Activated when the AIN-01 (AI1 Type Select) value is 1 (Bipolar Voltage).

Γ

| Code | de LCD Display | | Setting Range | | Unit | Property ⁷⁰ | Ref. | Commu addres | nication s/scale |
|---------------|---------------------------------|----|---------------------------|---------|------|------------------------|--------------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 10 71 | Al1 - y2 | | 100 00 100 00 | 100.00 | 0/ | | 000 | 1d0ch | 9d18h |
| 12 ' ' | Percent | | -100.00-100.00 | -100.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 12 | Al1 | | 0.04.10.00 | 0.04 | 0/. | 0 | 0 7 2 | 1d0dh | 9d1ah |
| 15 | Quantizing | | 0.04-10.00 | 0.04 | 70 | 0 | 0.2.3 | 0.01 | 0.01 |
| | | 0 | Unipolar Voltage | | | | | | |
| 16 | Al2 Type Select | 1 | Bipolar Voltage | 0 | - | \triangle | 8.2.1 | 1d10h | 9d20h |
| | | 2 | Current | | | | | | |
| 17 | | | -10.00-10.00 | - | V | v | 0.0.4 | 1d11h | 9d22h |
| 17 | AIZ Value | | 0.00-20.00 | - | mA | | 0.2.1 | 0.01 | 0.01 |
| 10 | Al2 | | 0.00.100.00 | | 0/ | v | 0.0.4 | 1d12h | 9d24h |
| 10 | Monitor[%] | | 0.00-100.00 | - | 70 | ^ | 0.2.1 | 0.01 | 0.01 |
| 10 | | | 0 10000 | 10 | mean | 0 | 821 | 1d13h | 9d26h |
| 19 | | | 0-10000 | 10 | msec | 0 | 0.2.4 | 1 | 1 |
| 20 | Δl2 + v1 ln | (| $0.00-0.02 + x2 \ln 0.00$ | 0.00 | V | 0 | 822 | 1d1/b | 0d28h |
| 20 | | | | 4.00 | mA | | 0.2.2 | 101411 | 302011 |
| 21 | Al2 + y1 | | -100 00-100 00 | 0.00 | % | 0 | 822 | 1d15h | 9d2ah |
| 21 | Percent | | 100.00-100.00 | 0.00 | 70 | Ŭ | 0.2.2 | 0.01 | 0.01 |
| 22 | $\Lambda 12 \pm \sqrt{2} \ln 1$ | Α | l2 + x1 In-10.00 | 10.00 | V | | 0 7 7 | 1d16h | 9d2ch |
| ~~~ | | A | l2 + x1 ln-20.00 | 20.00 | mA | | 0.2.2 | 0.01 | 0.01 |
| 23 | Al2 + y2 | | 100 00 100 00 | 100.00 | 0/_ | | Q J J | 1d17h | 9d2eh |
| 23 | Percent | | -100.00-100.00 | 100.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 2 4 72 | Δ12 - x1 ln | | Δ12 - x2 In-0 00 | 0.00 | V | 0 | 822 | 1d18h | 9d30h |
| 27 | | | | 0.00 | v | | 0.2.2 | 0.01 | 0.01 |
| 25 72 | Al2 - y1 | | -100 00-100 00 | 0.00 | % | 0 | 822 | 1d19h | 9d32h |
| 20 | Percent | | 100.00-100.00 | 0.00 | 70 | | 0.2.2 | 0.01 | 0.01 |
| 26 72 | Al2 - x2 In | _^ | 10 00-AI2 - x1 In | -10.00 | V | 0 | 822 | 1d1ah | 9d34h |
| 20 | | | | 10.00 | v | | 0.2.2 | 0.01 | 0.01 |

⁷² Activated when the AIN-16 (AI2 Type Select) value is 1 (Bipolar Voltage).

| Code LCD Display | | | Setting Range | | Unit | Property ⁷⁰ | Ref. | Commu addres | nication s/scale |
|------------------|------------------------|---|-------------------|---------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 07 72 | Al2 - y2 | | 100 00 100 00 | 100.00 | 0/ | | 000 | 1d1bh | 9d36h |
| 21 12 | Percent | | -100.00-100.00 | -100.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 20 | Al2 | | 0.04.10.00 | 0.04 | 0/ | | 0 7 7 | 1d1ch | 9d38h |
| 20 | Quantizing | | 0.04-10.00 | 0.04 | 70 | 0 | 0.2.3 | 0.01 | 0.01 |
| | | 0 | Unipolar Voltage | | | | | | |
| 31 | AI3 Type Select | 1 | Bipolar Voltage | 0 | - | \triangle | 8.2.1 | 1d1fh | 9d3eh |
| | | 2 | Current | | | | | | |
| 22 | | | -10.00-10.00 | - | V | v | 0.0.4 | 1d20h | 9d40h |
| 32 | AI3 value | | 0.00-20.00 | - | mA | | 8.2.1 | 0.01 | 0.01 |
| 22 | AI3 | | 0.00.400.00 | | 0/ | v | 0.0.4 | 1d21h | 9d42h |
| 33 | Monitor[%] | | 0.00-100.00 | - | % | | 8.2.1 | 0.01 | 0.01 |
| 34 | | | 0-10000 | 10 | msoc | 0 | 821 | 1d22h | 9d44h |
| 54 | | | 0-10000 | 10 | msec | Ŭ | 0.2.4 | 1 | 1 |
| 35 | Δ 3 + v1 ln | 0 | 0.00-Al2 + x2 ln | 0.00 | V | 0 | 822 | 1d23h | 9d46h |
| 55 | | | | 4.00 | mA | 0 | 0.2.2 | 0.01 | 0.01 |
| 36 | Al3 + y1 | | -100 00-100 00 | 0.00 | % | 0 | 822 | 1d24h | 9d48h |
| | Percent | | 100.00 100.00 | 0.00 | 70 | Ŭ | 0.2.2 | 0.01 | 0.01 |
| 37 | $\Delta I3 \pm v2 \ln$ | A | l1 + x1 In-10.00 | 10.00 | V | | 822 | 1d25h | 9d4ah |
| 57 | | А | l1 + x1 ln-20.00 | 20.00 | mA | | 0.2.2 | 0.01 | 0.01 |
| 20 | Al3 + y2 | | 100 00 100 00 | 100.00 | 0/_ | 0 | 0 7 7 | 1d26h | 9d4ch |
| 30 | Percent | | -100.00-100.00 | 100.00 | 70 | 0 | 0.2.2 | 0.01 | 0.01 |
| 30 73 | Al3 - x1 ln | | AI3 - x2 In-0 00 | 0.00 | V | 0 | 822 | 1d27h | 9d4eh |
| | | | | 0.00 | | | 0.2.2 | 0.01 | 0.01 |
| 40 ⁷³ | Al3 - y1 | | -100.00-100.00 | 0.00 | % | 0 | 8.2.2 | 1d28h | 9d50h |
| - | Percent | | | | | | | 0.01 | 0.01 |
| 41 ⁷³ | Al3 - x2 ln | - | 10.00-Al3 - x1 ln | -10.00 | V | 0 | 8.2.2 | 1d29h | 9d52h |
| | | | | | | | | 0.01 | 0.01 |
| 42 ⁷³ | Al3 - | | -100.00-100.00 | -100.00 | % | 0 | 8.2.2 | 1d2ah | 9d54h |
| 42 /3 y2Percent | y2Percent | | | | | | | 0.01 | 0.01 |

⁷³ Activated when the AIN-31 (AI3 Type Select) value is 1 (Bipolar Voltage).

| Code | LCD Display Setting Range Initial Value | Unit | Property ⁷⁰ | Ref. | Communication address/scale | | | |
|------|---|----------------|------------------------|------|-----------------------------|-------|--------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 12 | AI3 | 0.04.10.00 | 0.04 | 0/_ | 0 | 0 7 2 | 1d2bh | 9d56h |
| 43 | Quantizing | 0.04-10.00 | 0.04 | 70 | 0 | 0.2.3 | 0.01 | 0.01 |
| 45 | PTI | 0 00 32 00 | | | v | Q / 1 | 1d2dh | 9d5ah |
| 43 | Monitor[kHz] | 0.00-32.00 | - | | ^ | 0.4.1 | 0.01 | 0.01 |
| 46 | PTI | 100 00 100 00 | | 0/_ | v | 011 | 1d2eh | 9d5ch |
| 40 | Monitor[%] | -100.00-100.00 | - | 70 | ^ | 0.4.1 | 0.01 | 0.01 |
| 47 | PTI LPF Gain | 10-10000 | 10 | msec | 0 | 8.4.2 | 1d2fh | 9d5eh |
| 40 | | 0.00.22.00 | 0 | | _ | 0 1 1 | 1d30h | 9d60h |
| 40 | P11 + X1 III | 0.00-32.00 | 0 | КПС | 0 | 0.4.1 | 0.01 | 0.01 |
| 40 | PTI + y1 | 100 00 100 00 | 0.00 | 0/ | 0 | 011 | 1d31h | 9d62h |
| 49 | Percent | -100.00-100.00 | 0.00 | 70 | 0 | 0.4.1 | 0.01 | 0.01 |
| 50 | | 0 00 22 00 | 22.00 | | 0 | 011 | 1d32h | 9d64h |
| 50 | P11 + X2 III | 0.00-32.00 | 32.00 | КПС | 0 | 0.4.1 | 0.01 | 0.01 |
| 51 | PTI + y2 | 100 00 100 00 | 100.00 | 0/ | 0 | 011 | 1d33h | 9d66h |
| 51 | Percent | -100.00-100.00 | 100.00 | 70 | 0 | 0.4.1 | 0.01 | 0.01 |
| 52 | PTI | 0.04.10.00 | 0.04 | 0/_ | 0 | 012 | 1d34h | 9d68h |
| 52 | Quantizing | 0.04-10.00 | 0.04 | 70 | | 0.4.3 | 0.01 | 0.01 |

13.13 Output Terminal Block Group (OUT)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

٦

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | | Setting Range | | Uni <u>t</u> | Property ⁷⁴ | Ref. | Commu addres | nication s/scale |
|------|--------------------|----|------------------------|-------|--------------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 50 | - | 0 | 4.3.3 | 1e00h | 9e00h |
| | | 0 | Frequency | | | | | | |
| | | 1 | Output Current | | | | | | |
| | | 2 | Output Voltage | | | | | | |
| | | 3 | DC Link Voltage | | | | | | |
| | | 4 | Torque | | | | | | |
| | | 5 | Output Power | | | | | | |
| | | 6 | Target Frequency | | | | | | |
| 01 | | 7 | Ramp Frequency | | | | | | |
| | AO1 Define | 8 | Speed Feedback | 0 | | | | | |
| | | 9 | Speed Deviation: | | - | 0 | 8.5 | 1e01h | 9e02h |
| | | 10 | PPID Reference | | | | | | |
| | | 11 | PPID Feedback | | | | | | |
| | | 12 | PPID Output | | | | | | |
| | | 13 | EPID1 Output | | | | | | |
| | | 14 | EPID2 Output | | | | | | |
| | | 15 | Constant | | | | | | |
| | | 16 | Web MainSpeed | | | | | | |
| | | 17 | Web MainSpeed +WPID | | | | | | |
| | | 0 | Unipolar Voltage | | | | | | |
| 02 | AO1 Type Select | 1 | Bipolar Voltage | 0 | - | 0 | 8.5 | 1e02h | 9e04h |
| 02 | Select | 2 | Current | | | | | | |

⁷⁴ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

| Code | ode LCD Display | | Setting Range | Initial Value | Unit | Property ⁷⁴ | Ref. | Commu addres | nication s/scale |
|-------------|--------------------|---------|------------------|------------------|------|------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 02 | | | | 100.00 | 0/ | 0 | 0 5 | 1e03h | 9e06h |
| 03 | AUT Gain | - | 1000.00-1000.00 | 100.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 04 | | | 100 00 100 00 | 0.00 | 0/. | 0 | 95 | 1e04h | 9e08h |
| 04 | AUT DIAS | | -100.00-100.00 | 0.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 05 | AO1 LPF | | 0 10000 | 5 | msoc | 0 | 85 | 1e05h | 9e0ah |
| 05 | Gain | 0-10000 | | 5 | msec | 0 | 0.0 | 1 | 1 |
| 06 | AO1 | | 100 00-100 00 | 0.00 | 0/2 | 0 | 85 | 1e06h | 9e0ch |
| 00 | Constant % | | -100.00-100.00 | 0.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 07 | AO1 Monitor | | 100 00 100 00 | | 0/_ | v | 85 | 1e07h | 9e0eh |
| 07 | AO I MONILOI | | -100.00-100.00 | - | 70 | ^ | 0.0 | 0.01 | 0.01 |
| 10 | AO2 Define | Sa | me as AO1 Define | 0 | - | 0 | 8.5 | 1e0ah | 9e14h |
| | 100 T | 0 | Unipolar Voltage | | | | | | |
| 11 | AO2 Type Select | 1 | Bipolar Voltage | 0 | - | 0 | 8.5 | 1e0bh | 9e16h |
| | 001001 | 2 | Current | | | | | | |
| 10 | | | | 100.00 | 0/ | ~ | 0 5 | 1e0ch | 9e18h |
| 12 | AUZ Galli | - | 1000.00-1000.00 | 100.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 12 | AO2 Bios | | 100 00 100 00 | 0.00 | 0/. | 0 | 95 | 1e0dh | 9e1ah |
| 15 | AUZ DIAS | | -100.00-100.00 | 0.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 11 | AO2 LPF | | 0.10000 | F | maaa | 0 | 0 5 | 1e0eh | 9e1ch |
| 14 | Gain | | 0-10000 | 5 | msec | 0 | 0.0 | 1 | 1 |
| 15 | AO2 | | 100 00 100 00 | 0.00 | 0/ | 0 | 95 | 1e0fh | 9e1eh |
| 15 | Constant % | | -100.00-100.00 | 0.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 16 | AO2 Monitor | | 100 00 100 00 | | 0/_ | v | 85 | 1e10h | 9e20h |
| 10 | AO2 INIONILOI | | -100.00-100.00 | - | 70 | ^ | 0.0 | 0.01 | 0.01 |
| 20 | PTO Define | Sa | me as AO1 Define | 0 | - | 0 | 8.5 | 1e14h | 9e28h |
| 21 | | | | 100.00 | 0/_ | | 85 | 1e15h | 9e2ah |
| 21 | | - | 1000.00-1000.00 | 100.00 | /0 | | 8.5 | 0.01 | 0.01 |
| 22 | | | 100 00 100 00 | 0.00 | 0/ | 0 | 0 5 | 1e16h | 9e2ch |
| 22 PTO Bias | PTO Bias | | - 100.00- 100.00 | 0.00 | 70 | | 0.0 | 0.01 | 0.01 |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁷⁴ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|-------------------------|---------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | PTO LPF | | 0.40000 | F | | | 0.5 | 1e17h | 9e2eh |
| 23 | Gain | | 0-10000 | Э | msec | 0 | 8.5 | 1 | 1 |
| 24 | PTO | | 0.00.100.00 | 0.00 | 0/ | 0 | 0 5 | 1e18h | 9e30h |
| 24 | Constant % | | 0.00-100.00 | 0.00 | 70 | 0 | 0.0 | 0.01 | 0.01 |
| 25 | PTO Monitor | | 0.00-100.00 | - | % | х | 8.5 | 1e19h | 9e32h |
| | | 0 | None | | | | | 0.01 | 0.01 |
| | | 1 | FDT-1 | | | | | | |
| | | 2 | FDT-2 | | | | | | |
| | | 3 | FDT-3 | | | | | | |
| | | 4 | FDT-4 | | | | | | 9e64h |
| | | 5 | Over Load Warn | | | | | | |
| | | 6 | Drv Over Load Warn | | | | | | |
| | | 7 | Under Load Warn | | | | | | |
| | | 8 | MainFan Warn | | | | | | |
| | | 9 | Stall | | | | | | |
| 50 | DO1 Define | 10 | Over Voltage Trip | 24 | - | 0 | 8.3.1 | 1e32h | |
| | | 11 | Low Voltage | | | | | | |
| | | 12 | Drive Over Heat Trip | | | | | | |
| | | 13 | Lost Int Comm Warn | | | | | | |
| | | 14 | Run | | | | | | |
| | | 15 | Stop | | | | | | |
| | | 16 | Steady | | | | | | |
| | | 17 | Drive Output Line | | | | | | |
| | | 18 | Supply Power Line | | | | | | |
| | 19 | 19 | Speed Search | | | | | | |

| Code | LCD Display | | Setting Range | | Unit | Property ⁷⁴ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|-------------------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 20 | Ready | | | | | | |
| | | 21 | Zero Speed Detect | | | | | | |
| | | 22 | Torque Detect | | | | | | |
| | | 23 | Timer Output | | | | | | |
| | | 24 | Trip | | | | | | |
| | | 25 | Lost Keypad Warn | - | | | | | |
| | | 26 | DB Warn %ED | | | | | | |
| | | 27 | Encoder Tune Warn | | | | | | 9e64h |
| | | 28 | Encoder Dir Warn | | | | | | |
| | DO1 Define | 29 | On/Off Control | | | | | | |
| | | 30 | Brake Control | | | | | | |
| 50 | | 31 | Run with Zero Spd | 24 | - | 0 | 8.3.1 | 1e32h | |
| | | 32 | STO Monitor | | | | | | |
| | | 33 | Reset Restart F Trip | | | | | | |
| | | 34 | Lost USB Warn | | | | | | |
| | | 35 | KEB Operating | | | | | | |
| | | 36 | Lost Al-1 Warn | | | | | | |
| | | 37 | Lost AI-2 Warn | | | | | | |
| | | 38 | Lost AI-3 Warn | | | | | | |
| | | 39 | E24V Monitor | | | | | | |
| | | 40 | Main Cap Repl Warn | | | | | | |
| | | 41 | MainFan Repl Warn | | | | | | |
| | | 42 | AuxFan Repl Warn | | | | | | |

Table of Functions

| Code | LCD Display | | Setting Range | | Unit | it Property ⁷² | Ref. | Communication address/scale | | |
|---------------------|-------------|--------------|-----------------------|-------|--------|---------------------------|-------|-----------------------------|----------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| | | 43 | MainCap Diag Alarm | | | | | | | |
| | | 44 | Pos Tar Bound Err | | | | | | | |
| 50 | DO1 Define | 45 | Pos Max Track Err | 24 | - | 0 | 8.3.1 | 1e32h | 9e64h | |
| | | 46 | OCS Run | | | | | | | |
| | | 47 | FWD Run | | | | | | | |
| | | 48 | REV Run | | | | | | | |
| | | 49 | Fire Mode | | | | | | | |
| E 4 | | 0 | OFF | 0 | | V | 0.0.4 | 4 - 0.01- | 0 - 001- | |
| 51 | DOT Status | 1 | ON | 0 | - | X | 8.3.1 | 1e33n | 9e66n | |
| 52 | DO2 Define | Sar | Same as DO1 Define | | - | 0 | 8.3.1 | 1e34h | 9e68h | |
| = 0 | | 0 | OFF | _ | | | | | | |
| 53 | DO2 Status | 1 | ON | 0 | - | X | 8.3.1 | 1e35h | 9e6ah | |
| 54 | DO3 Define | Sar | me as DO1 Define | 0 | - | 0 | 8.3.1 | 1e36h | 9e6ch | |
| | | 0 | OFF | _ | | N N | 0.0.4 | 4 07 | | |
| 55 | DO3 Status | 1 | ON | 0 | - | X | 8.3.1 | 1e3/h | 9e6eh | |
| 60 | DO1 On | | 0 100000 | 0 | maaa | 0 | 022 | 1e3ch | 9e78h | |
| 00 | Delay | | 0-100000 | 0 | msec | 0 | 0.3.2 | 1 | 1 | |
| 61 | DO1 Off | | 0-10000 | 0 | msec | 0 | 832 | 1e3dh | 9e7ah | |
| | Delay | | 0-100000 | 0 | 111300 | | 0.0.2 | 1 | 1 | |
| 62 | DO1 NC/NO | 0 | Normal Open | 0 | | 0 | 833 | 1e3eh | 9e7ch | |
| -02 | Sel | 1 | Normal Close | 0 | | | 0.0.0 | | | |
| 63 | DO2 On | | 0-100000 | 0 | msec | 0 | 832 | 1e3fh | 9e7eh | |
| | Delay | | 0 100000 | | | | 0.0.2 | 1 | 1 | |
| 64 | DO2 Off | | 0-100000 | 0 | msec | 0 | 8.3.2 | 1e40h | 9e80h | |
| | Delay | | | | | | 0.012 | 1 | 1 | |
| 65 DO2 NC/NO | 0 | Normal Open | 0 | _ | 0 | 8.3.3 | 1e41h | 9e82h | | |
| 65 DO2 NC/NO Sel | 1 | Normal Close | 0 | - | 0 | O 8.3.3 | | JULI | | |

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| Code | ode LCD Display | | Setting Range | | Unit | Property ⁷⁴ | Ref. | Communication address/scale | |
|-------|-----------------|-----|-----------------|--------|------|------------------------|-------|-----------------------------|----------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 66 | DO3 On | | 0.100000 | 0 | | | 0 2 2 | 1e42h | 9e84h |
| 00 | Delay | | 0-100000 | 0 | msec | 0 | 0.3.2 | 1 | 1 |
| 67 | DO3 Off | | 0 100000 | 0 | maaa | 0 | 020 | 1e43h | 9e86h |
| 07 | Delay | | 0-100000 | 0 | msec | 0 | 0.3.2 | 1 | 1 |
| 68 | DO3 NC/NO | 0 | Normal Open | 0 | _ | 0 | 833 | 1₀//h | 0 <u>0</u> 88h |
| 00 | Sel | 1 | Normal Close | 0 | _ | 0 | 0.0.0 | 104411 | 300011 |
| 70 | DO1 | 0 | Off | 0 | _ | 0 | 836 | 10/6h | 0o8ch |
| 70 | Constant | 1 | On | 0 | _ | 0 | 0.5.0 | 104011 | 360011 |
| 71 | DO2 | 0 | Off | 0 | | 0 | 836 | 10/7h | 0o8ob |
| 11 | Constant | 1 | On | 0 | - | 0 | 0.3.0 | 164711 | 960611 |
| 70 | DO3 | 0 | Off | 0 | | 0 | 026 | 1019h | 0~00h |
| 12 | Constant | 1 | On | 0 | - | 0 | 0.3.0 | 164011 | 969011 |
| 75 | FDT | 0.0 | | 30.00 | | | Q | 1e4bh | 9e96h |
| 75 | Frequency | 0.0 | | 30.00 | | 0 | 0.3.1 | 0.01 | 0.01 |
| 70 | FDT | ~ ~ | | 40.00 | | | 0.0.4 | 1e4ch | 9e98h |
| 76 | Band | 0.0 | U-Max Frequency | 10.00 | - | 0 | 8.3.1 | 0.01 | 0.01 |
| 77 75 | EDT Spood | 0 | Maximum Spood | 000 76 | rom | | Q | 1e4dh | 9e9ah |
| 11.0 | FDT Speed | 0- | | 900 | трш | 0 | 0.3.1 | 1 | 1 |
| 79 75 | FDT Speed | 0 | Maximum Spood | 300 76 | rom | 0 | Q | 1e4eh | 9e9ch |
| 70.0 | Band | 0- | | 300.10 | трш | 0 | 0.3.1 | 1 | 1 |
| 80 77 | TorqueDetect | | 0 0 150 0 | 100.0 | 0/_ | | Q | 1e50h | 9ea0h |
| 00 | Level | | 0.0-130.0 | 100.0 | 70 | 0 | 0.3.1 | 0.1 | 0.1 |
| 81 77 | TorqueDetect | | 0.0-10.0 | 5.0 | 0/2 | 0 | 831 | 1e51h | 9ea2h |
| 01 | Band | | 0.0-10.0 | 5.0 | 70 | 0 | 0.0.1 | 0.1 | 0.1 |

⁷⁵ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

- ⁷⁶ The rpm value varies according to the motor rating pole number (MOT1, 2-25).
- ⁷⁷ Activated when the MOT1-08 (Torque Control En) value is 1 (Yes).

13.14 Process PID Group (PPID)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

The values below have the following meanings:

- Unit Max: Unit at 100% (PPID-93)
- Unit Min: 2 * Unit at 0% (PPID-92) Unit at 100% (PPID-93)
- Unit Default: (Unit at 100% Unit at 0%) / 2
- PID Unit: Unit Select (PPID-90)

| Code LCD Display | Setting Range | | Initial Value Unit | | Property ⁷⁸ | Ref | Communication address/scale | | |
|------------------|---------------|---|-----------------------|---------------|------------------------|-------|-----------------------------|-------------|-------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 60 | - | 0 | 4.3.3 | 2200h | a200h |
| | | 0 | Idle | | | | | | |
| | | 1 | Pre-PID | | | | | | |
| 01 | Control State | 2 | RUN | 0 | - | X | 7.7.1 | 2201h | a202h |
| | | 3 | Sleep Boost | | | | | | |
| | | 4 | Sleep | | | | | | |
| 02 | Output Value | | -100.00-100.00 0.00 % | 0/_ | v | 771 | 2202h | a204h | |
| 02 | Output value | | -100.00-100.00 | 0.00 | 70 | ^ | 1.1.1 | 0.01 | 0.01 |
| | Poforonco | | | | חום | | | 2203h | a206h |
| 03 | Value | Ur | nit Min - Unit Max | - | Unit | Х | 7.7.1 | PID Unit | PID Unit |
| | Foodbook | | | | חום | | | 2204h | a208h |
| 04 | Value | Ur | nit Min - Unit Max | - | Unit | Х | 7.7.1 | PID Unit | PID Unit |
| | | | | | חום | | | 2205h | a20ah |
| 05 Err | Error Value | r Value Unit Min - Unit Max - PID Unit | | PID Unit X | | 7.7.1 | PID Unit | PID Unit | |

⁷⁸ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

| Code | LCD Display | | Setting Range | | Unit | Property ⁷⁸ | Ref. | Communication address/scale | |
|------|----------------------|----|------------------|-------|------|------------------------|-------|-----------------------------|-------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | 220ah | |
| | | 5 | Internal Comm. | | | | | | |
| 10 | Reference1 Source | 6 | USB Comm. | 0 | - | 0 | 7.7.1 | | a214h |
| | Course | 7 | Option Comm. | | | | | | |
| | | 8 | UserSequence | | | | | | |
| | | 9 | Ext PID-1 Output | | | | | | |
| | | 10 | X-Analog Input 1 | _ | | | | | |
| | | 11 | X-Analog Input 2 | | | | | | |
| | | 12 | X-Analog Input 3 | | | | | | |
| | Pof1 Kovpad | | Lipit Mox | | חום | | | 220bh | a216h |
| 11 | Set | | Unit Max | 0 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | | 0 | None | | | | | | |
| | | 1 | Analog In 1 | | | | | | |
| | | 2 | Analog In 2 | | | | | | |
| 12 | Ref1 Auxiliary | 3 | Analog In 3 | 0 | | | 774 | 220ah | -010h |
| | Src | 4 | Pulse Input | U | - | | 1.1.1 | | azion |
| | | 5 | X-Analog Input 1 | | | | | | |
| | | 6 | X-Analog Input 2 | 3 | | | | | |
| | | 7 | X-Analog Input 3 | | | | | | |

| Code | LCD Display | | Setting Range | | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale |
|------|----------------|----|-------------------------------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | M + (G * A) | | | | | | |
| | | 1 | M * (G * A) | | | | | | |
| | | 2 | M / (G * A) | | | | | | |
| | | 3 | M+(M*(G*A)) | | | | | | |
| | | 4 | M+G*2*(A-50) | | | | | | |
| | | 5 | M*(G*2*(A-50)) | | | | | | |
| | Ref1 Auxiliary | 6 | M/(G*2*(A-50)) | | | | | | |
| 13 | Mode | 7 | M+M*G*2*(A-50) | 0 | - | 0 | 7.7.1 | 220dh | a21ah |
| | | 8 | (M-A)^2 | | | | | | |
| | | 9 | M^2 + A^2 | | | | | | |
| | | 10 | MAX(M,A) | | | | | | |
| | | 11 | MIN(M,A) | | | | | | |
| | | 12 | dle 100% nit MAX] (M + A) / 2 | | | | | | |
| 11 | Ref1 Auxiliary | | 200.00.200.00 | 0.00 | 0/ | | 774 | 220eh | a21ch |
| 14 | Gain | | -200.00-200.00 | 0.00 | 70 | 0 | 1.1.1 | 0.01 | 0.01 |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| 15 | Reference2 | 3 | Analog Input 3 | 0 | - | 0 | 7.7.1 | 220fh | a21eh |
| | Source | 4 | Pulse Input | | | | | | |
| | | 5 | Internal Comm. | | | | | | |
| | | 6 | USB Comm. | | | | | | |
| | Def2 Keymed | | | | חום | | | 2210h | a220h |
| 16 | Set | Ur | nit Min - Unit Max | 0 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁷⁸ | Ref. | Communication address/scale | |
|--------------------------|------------------------|--------------|----------------|---------|------|------------------------|-------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | None | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| 17 | Ref2 Auxiliary Src | 2 | Analog Input 2 | 0 | - | 0 | 7.7.1 | 2211h | a222h |
| | 010 | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| | | 0 | M + (G * A) | | | | | | |
| | | 1 | M * (G * A) | | | | | | |
| | | 2 | M / (G * A) | | | | | | |
| | | 3 | M+(M*(G*A)) | | | | | | |
| 18 | | 4 | M+G*2*(A-50) | | | | | | |
| | Ref2 Auxiliary Mode | 5 | M*(G*2*(A-50)) | | | | | | |
| | | 6 | M/(G*2*(A-50)) | 0 | - | 0 | 7.7.1 | 2212h | a224h |
| | | 7 | M+M*G*2*(A-50) | | | | | | |
| | | 8 | (M-A)^2 | | | | | | |
| | | 9 | M^2 + A^2 | | | | | | |
| | | 10 | MAXIMUM(M,A) | | | | | | |
| | | 11 | MINIMUM(M,A) | | | | | | |
| | | 12 | (M+A)/2 | | | | | | |
| 10 | Ref2 | | 200 00 200 00 | 0.00 | 0/ | 0 | 771 | 2213h | a226h |
| 19 | AuxiliaryGain | | -200.00-200.00 | 0.00 | 70 | 0 | 1.1.1 | 0.01 | 0.01 |
| 20 | Reference | | 0.00.6000.00 | 20.00 | | 0 | 771 | 2214h | a228h |
| 20 | Acc Time | 0.00-6000.00 | | 20.00 | sec | 0 | 7.7.1 | 0.01 | 0.01 |
| 21 | Reference | | 0.00-6000.00 | 30.00 | 500 | 0 | 771 | 2215h | a22ah |
| 21 Reference Dec Time | 0.00-6000.00 | | 30.00 | sec | 0 | 7.7.1 | 0.01 | 0.01 | |

| Code | LCD Display | | Setting Range | | Unit Property ⁷⁸ | | Ref. | Communication address/scale | |
|------|----------------------|----|------------------|-------|-----------------------------|---|-------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Analog Input 1 | | | | | | |
| | | 1 | Analog Input 2 | | | | | | |
| | | 2 | Analog Input 3 | | | | | 2219h | |
| | | 3 | Pulse Input | | | | | | |
| | | 4 | Internal Comm. | 0 | | | | | a232h |
| 25 | Feedback | 5 | USB Comm. | | - | 0 | 7.7.1 | | |
| 25 | Source | 6 | Option Comm. | | | | | | |
| | | 7 | UserSequence | | | | | | |
| | | 8 | Ext PID-1 Output | | | | | | |
| | | 9 | X-Analog Input 1 | | | | | | |
| | | 10 | X-Analog Input 2 | | | | | | |
| | | 11 | X-Analog Input 3 | | | | | | |
| | | 0 | None | | | | | | |
| 26 | | 1 | Analog Input 1 | | | | | | |
| | Fdb Auxiliary Src | 2 | Analog Input 2 | 0 | - | 0 | 7.7.1 | 221ah | a234h |
| | Src | 3 | Analog Input 3 | - | | | | | |
| | | 4 | Pulse Input | | | | | | |

| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale |
|------|-----------------------|----|------------------|------------------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | M + (G * A) | | | | | | |
| | | 1 | M * (G * A) | | | | | | |
| | | 2 | M / (G * A) | | | | | | |
| | | 3 | M+(M*(G*A)) | | | | | | |
| | | 4 | M+G*2*(A-50) | | | | | | |
| | | 5 | M*(G*2*(A-50)) | | | | | | |
| 27 | Fdb Auxiliary Mode | 6 | M/(G*2*(A-50)) | 0 | - | 0 | 7.7.1 | 221bh | a236h |
| | mode | 7 | M+M*G*2*(A-50) | | | | | | |
| | | 8 | (M-A)^2 | | | | | | |
| | | 9 | M^2 + A^2 | | | | | | |
| | | 10 | MAXIMUM(M,A) | | | | | | |
| | | 11 | MINIMUM(M,A) | | | | | | |
| | _ | 12 | (M+A)/2 | | | | | | |
| 28 | Fdb Auxiliary | | | 0.00 | 0/2 | 0 | 771 | 221ch | a238h |
| 20 | Gain | -2 | 200.00-200.0070 | 0.00 | 70 | Ŭ | 1.1.1 | 0.01 | 0.01 |
| | Deadband | | | | חופ | | | 221dh | a23ah |
| 29 | Width | | 0 - Unit Default | 0 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| 20 | Deadband | | 0.00.600.00 | 0.00 | | | 774 | 221eh | a23ch |
| 30 | Delay | | 0.00-600.00 | 0.00 | sec | 0 | 1.1.1 | 0.01 | 0.01 |
| 25 | Proportional | | 0.0.1000.0 | 50.0 | 0/_ | 0 | 771 | 2223h | a246h |
| 35 | Gain1 | | 0.0-1000.0 | 50.0 | 70 | 0 | 1.1.1 | 0.1 | 0.1 |
| 36 | Integral | | 0 00 200 00 | 10.00 | 500 | 0 | 771 | 2224h | a248h |
| 50 | Time1 | | 0.00-200.00 | 10.00 | 360 | Ŭ | 1.1.1 | 0.01 | 0.01 |
| 37 | Derivative | | 0-1000 | 0 | msec | 0 | 771 | 2225h | a24ah |
| | Time1 | | 0 1000 | | | Ŭ | | 1 | 1 |
| 38 | FeedForward | | 0.0-1000.0 | 0.0 | % | 0 | 7.7.1 | 2226h | a24ch |
| | Gain | | | | | | | 0.1 | 0.1 |
| 40 | Proportional | | 0.0-1000.0% | 50.0 | % | 0 | 7.7.1 | 2228h | a250h |
| | Gain2 | | | | | | | 0.1 | 0.1 |

| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale |
|-------|--------------|-------------------|--------------------|------------------|--------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 11 | Integral | | 0 00 200 00 | 10.00 | | | 771 | 2229h | a252h |
| 41 | Time2 | | 0.00-200.00 | 10.00 | sec | 0 | 1.1.1 | 0.01 | 0.01 |
| 10 | Derivative | | 0 1000 | 0 | mean | 0 | 771 | 222ah | a254h |
| 42 | Time2 | | 0-1000 | 0 | msec | 0 | 1.1.1 | 1 | 1 |
| | | 0 | Not Use Output | | | | | | |
| | | 1 | Only PID Out | | | | | | a25ah |
| 45 | Output Mode | 2 | PID + Main Freq | 2 | _ | 0 | 7.7.1 | 222dh | |
| | | 3 | Only PID Trq Out | | | | | | |
| | | 4 | PID+EPID1 Out | | | | | | |
| | | 5 | PID+EPID1+Main | | | | | | |
| 46 | Output Limit | | -100.00 - | | 0/ | | 771 | 222eh | a25ch |
| 40 | Low | Output Limit High | | 0.00 | 70 | 0 | 1.1.1 | 0.01 | 0.01 |
| 17 | Output Limit | 0 | utput Limit Low - | 100.00 | 0/_ | 0 | 771 | 222fh | a25eh |
| 47 | High | | 100.00 | 100.00 | 70 | 0 | 1.1.1 | 0.01 | 0.01 |
| 18 | Output Scale | | 0.1-1000.0 | 100.0 | 0/2 | 0 | 771 | 2230h | a260h |
| 40 | | | 0.1-1000.0 | 100.0 | 70 | 0 | 1.1.1 | 0.1 | 0.1 |
| 10 | Output LPF | | 0-10000 | 0 | msec | 0 | 771 | 2231h | a262h |
| | Gain | | 0-10000 | 0 | 111300 | Ŭ | 7.7.1 | 1 | 1 |
| 50 | Output | 0 | No | 0 | | 0 | 771 | 2232h | a26/h |
| | Inverse | 1 | Yes | 0 | | | 1.1.1 | 220211 | a20411 |
| 55 | Pre-PID Set | 0.0 | 0-Max Frequency | 0 00 | Hz | 0 | 773 | 2237h | a26eh |
| | Freq | 0.0 | lo max r requertoy | 0.00 | 112 | Ŭ | 1.1.0 | 0.01 | 0.01 |
| 56 79 | Pre-PID Set | 0- | Maximum Speed | ∩ ⁸⁰ | rom | 0 | 773 | 2238h | a270h |
| 50 | Spd | 0- | | 0 | ipin | Ŭ | 1.1.0 | 1 | 1 |
| | | | Linit Min - | | חוס | | | 2239h | a272h |
| 57 | Pre-PID Exit | | Unit Max | 0.00 | Unit | 0 | 7.7.3 | PID Unit | PID Unit |

⁷⁹ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

⁸⁰ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | | Setting Range | | Unit | Property ⁷⁸ | Ref. | Communication address/scale | |
|-------|--------------------|---------------------|------------------|-----------------|------------|------------------------|-------|-----------------------------|-------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 50 | Pre-PID | | 0.0.000.0 | <u> </u> | | | 770 | 223ah | a274h |
| 58 | Delay | | 0.0-600.0 | 60.0 | sec | 0 | 1.1.3 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 60 | Sleep Mode | 1 | Always Enable | 0 | - | 0 | 7.7.2 | 223ch | a278h |
| | | 2 | DI Dependent | | | | | | |
| | Sloop Poost | | | | | | | 223dh | a27ah |
| 61 | Sieep Boost Set | 0.00 - Unit Max / 2 | | 0.00 | % | 0 | 7.7.2 | PID Unit | PID Unit |
| 62 | Sleep Boost | 0.0 | | 0.00 | <u>Ц</u> 7 | | 770 | 223eh | a27ch |
| 02 | Freq | 0.0 | | 0.00 | | 0 | 1.1.2 | 0.01 | 0.01 |
| 63 79 | Sleep Boost | 0_ | Maximum Speed | ∩ 80 | rnm | | 770 | 223fh | a27eh |
| 05 | Spd | 0-iviaximum Speed | | 0 | трш | U | 1.1.2 | 1 | 1 |
| 64 | Sleep Check | | | 0.00 | Hт | 0 | 772 | 2240h | a280h |
| | Freq1 | | | 0.00 | | | 1.1.2 | 0.01 | 0.01 |
| 65 79 | Sleep Check | 0- | Maximum Speed | ∩ ⁸⁰ | rnm | 0 | 772 | 2241h | a282h |
| 00 | Spd1 | 0- | | 0 | ipin | Ŭ | 1.1.2 | 1 | 1 |
| 66 | Sleen Delav1 | | 0.0-600.0 | 60.0 | sec | 0 | 772 | 2242h | a284h |
| | | | 0.0-000.0 | 00.0 | 300 | | 1.1.2 | 0.1 | 0.1 |
| | | | | | ріп | | | 2243h | a286h |
| 67 | WakeUp Set1 | | 0 - Unit Default | 0 | Unit | 0 | 7.7.2 | PID Unit | PID Unit |
| 69 | WakeUp | | 0.0.600.0 | 60.0 | | | 770 | 2244h | a288h |
| 00 | Delay1 | | 0.0-000.0 | 00.0 | Sec | 0 | 1.1.2 | 0.1 | 0.1 |
| 70 | Sleep Check | 0.0 | | 0.00 | <u>Ц</u> 7 | | 770 | 2246h | a28ch |
| 70 | Freq2 | 0.0 | | 0.00 | | 0 | 1.1.2 | 0.01 | 0.01 |
| 71 79 | Sleep Check | 0_ | Maximum Speed | ∩ 80 | rnm | | 770 | 2247h | a28eh |
| 11. | Spd2 | 0- | Maximum opeed | 0 | ipin | 0 | 1.1.2 | 1 | 1 |
| 72 | Sleen Delav? | | 0.0-600.0 | 60.0 | ser | | 772 | 2248h | a290h |
| 12 | | | 0.0-000.0 | 00.0 | 360 | | 1.1.2 | 0.1 | 0.1 |

| Code | LCD Display | Setting Range | | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale |
|------|-------------|---------------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| | | | | חוח | | | 2249h | a292h |
| 73 | WakeUp Set2 | 0 - Unit Default | 0 | Unit | 0 | 7.7.2 | PID Unit | PID Unit |
| 74 | WakeUp | 0 0 600 0 | 60.0 | 500 | 0 | 770 | 224ah | a294h |
| 74 | Delay2 | 0.0-000.0 | 00.0 | Sec | 0 | 1.1.2 | 0.1 | 0.1 |
| | Stop | | | חום | | | 2250h | a2a0h |
| 80 | Reference 1 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stop | | | חום | | | 2251h | a2a2h |
| 81 | Reference 2 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stop | | | חום | | | 2252h | a2a4h |
| 82 | Reference 3 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stan | | | חוח | | | 2253h | a2a6h |
| 83 | Reference 4 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stan | | | חוח | | | 2254h | a2a8h |
| 84 | Reference 5 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stop | | | חום | | | 2255h | a2aah |
| 85 | Reference 6 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |
| | Stop | | | חום | | | 2256h | a2ach |
| 86 | Reference 7 | Unit Min - Unit Max | 0.00 | Unit | 0 | 7.7.1 | PID Unit | PID Unit |

| Code | LCD Display | | Setting Range | | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|---------------|-------|------|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | CUST | | | | | | |
| | | 1 | % | | | | | | |
| | | 2 | PSI | | | | | | |
| | | 3 | °F | | | | | | |
| | | 4 | °C | | | | | | |
| | Unit Select | 5 | inWC | - | | | | | |
| | | 6 | inM | | | | | | |
| | | 7 | Bar | | | | | | |
| | | 8 | mBar | | | | | | |
| | | 9 | Pa | | | | | | |
| 00 | | 10 | kPa | | | | 774 | 005-h | - 0h 4h |
| 90 | | 11 | Hz | | - | | 1.1.1 | ZZSAN | az0411 |
| | | 12 | rpm | | | | | | |
| | | 13 | V | | | | | | |
| | | 14 | А | | | | | | |
| | | 15 | kW | | | | | | |
| | | 16 | HP | | | | | | |
| | | 17 | mpm | | | | | | |
| | | 18 | ft | | | | | | |
| | | 19 | m/s | | | | | | |
| | | 20 | m³/s | | | | | | |
| | | 21 | m³/m | | | | | | |

| Code | LCD Display | Setting Range | Initial Value | Unit | Property ⁷⁸ | Ref. | Commu addres | nication s/scale | |
|------|-----------------|---------------|-------------------|--------|------------------------|------|-----------------|---------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 22 | m³/h | | | | | | |
| | | 23 | l/s | | | | | | |
| | | 24 | l/m | | | | | | |
| | | 25 | l/h | | | | | | |
| | | 26 | kg/s | | | | | | |
| | | 27 | kg/m | | | | | | |
| | | 28 | kg/h | | | | | | |
| | | 29 | gl/s | | | | | 225ah | |
| | | 30 | gl/m | | | | 7.7.1 | | |
| 90 | Unit Select | 31 | gl/h | - 1 | - | 0 | | | a2b4h |
| | | 32 | ft/s | | | | | | |
| | | 33 | f³/s | | | | | | |
| | | 34 | f³/m | | | | | | |
| | | 35 | f³/h | | | | | | |
| | | 36 | lb/s | | | | | | |
| | | 37 | lb/m | | | | | | |
| | | 38 | lb/h | | | | | | |
| | | 39 | ppm | | | | | | |
| | | 40 | pps | | | | | | |
| | | 0 | X100 | | | | | | |
| | | 1 | X10 | | | | | | |
| 91 | Unit Scale | 2 | X1 | 2 | - | 0 | 7.7.1 | 225bh | a2b6h |
| | | 3 | X0.1 | | | | | | |
| | | 4 | X0.01 | | | | | | |
| 02 | Linit at 00/ | 0.0 | 20 Upit at $100%$ | 0.00 | 0/ | | 774 | 225ch | a2b8h |
| 92 | Unit at 0% | 0.0 | 00 - Unit at 100% | 0.00 | 70 | | 1.1.1 | 0.01 | 0.01 |
| 03 | Unit at 100% | | nit at 0% 200 00 | 100.00 | 0/- | 0 | 771 | 225dh | a2bah |
| 93 | Unit at 100% | U | nit at 0%-300.00 | 100.00 | 70 | 0 | 1.1.1 | 0.01 | 0.01 |

13.15 Protection Function Group (PRT)

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The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | Setting Range | | Initial Value | Unit | Property ⁸¹ | Ref. | Communication address/scale | |
|------------------|---------------|----------------|--------------|------------------|------|------------------------|---|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 35 | - | 0 | 4.3.3 | 2400h | a400h |
| 01 | | | 0.00.6000.00 | 20.00 | | 0 | 7.9 7.26.3 9.1.1 9.1.3 9.1.6 | 2401h | a402h |
| 01 Trip Dec Time | | | 0.00-6000.00 | 30.00 | | 0 | 9.2.5.1 9.2.5.2 9.2.5.3 9.2.7 10.2.4 9.2.5.3 | 0.1 | 0.1 |
| 02 | LV Trip Mode | 0 | Latch | 0 | | 0 | 0/1 | 2402h | 2404b |
| 02 | | 1 | Level | - 0 | - | 0 | 3.4.1 | 240211 | a40411 |
| | | 0 | None | | | | | | |
| 03 ⁸² | Intrp Restart | 1 | Start Mode | 0 | - | 0 | 7.13.3 | 2403h | a406h |
| | | 2 | Speed Search | | | | | | |
| 04 82 | Intro Timo | | 10.0.600.0 | 60.0 | | 0 | 7 1 2 2 | 2404h | a408h |
| 04 | inup nine | | 10.0-000.0 | 00.0 | Sec | 0 | 7.13.3 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 05 | Reset Restart | 1 Start Mode | | 0 | - | 0 | 7.14.1 | 2405h | a40ah |
| | | 2 Speed Search | | | | | | | |
| 06 | Dota Number | | 1 10 | 4 | | 0 | 7 1 4 4 | 2406h | a40ch |
| 00 | Relly Number | | 1-10 | I | - | 0 | 1.14.1 | 1 | 1 |

⁸¹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

⁸² Activated when the PRT-02 (LV Trip Mode) value is 1 (Level).

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁸¹ | Ref. | Commu addres | nication s/scale |
|-------|--------------|-----|------------------------|---------|------|------------------------|---------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 07 | Potry Doloy | | 0.0.60.0 | 1.0 | | 0 | 7 1 / 1 | 2407h | a40eh |
| 07 | Relly Delay | | 0.0-00.0 | 1.0 | sec | 0 | 7.14.1 | 0.1 | 0.1 |
| 10 | In Phase | 0 | No | 0 | | 0 | 0211 | 240ab | 0/1/h |
| 10 | Open Chk | 1 | Yes | 0 | | | 9.2.1.1 | 240411 | |
| 11 | IPO Voltage | | 1 100 | 20 | V | 0 | 0211 | 240bh | a416h |
| | Band | | 1-100 | 20 | v | 0 | 9.2.1.1 | 1 | 1 |
| 10 | Out Phase | 0 | No | 0 | | 0 | 0212 | 240ch | 0/18h |
| 12 | Open Chk | 1 | Yes | 0 | - | 0 | 9.2.1.2 | 240011 | a4 1011 |
| 11 | Lost Preset | 0.0 | | 0.00 | LI-7 | 0 | 025 | 240eh | a41ch |
| 14 | Freq | 0.0 | U-IVIAX Flequency | 0.00 | | 0 | 9.2.5 | 0.01 | 0.01 |
| 15 83 | Lost Preset | 0 | Maximum Spood | ∩ 84 | rom | 0 | 025 | 240fh | a41eh |
| 15 ** | Speed | 0- | | 0.54 | трш | 0 | 9.2.5 | 1 | 1 |
| | | 0 | None | | | | | | |
| | Lost Keypad | 1 | CoastStop (FreeRun) | | | | | 0.4.4.01 | |
| 16 | Mode | 2 | Trip Dec Stop | 0 | - | 0 | 9.2.5 | 2410h | a420h |
| | | 3 | Warning | | | | | | |
| | | 4 | Lost Preset | | | | | | |
| | | 0 | None | | | | | | |
| | Lost IntComm | 1 | CoastStop (FreeRun) | | | | | | |
| 17 | Mode | 2 | Trip Dec Stop | 0 | - | 0 | 9.2.5.1 | 2411h | a422h |
| | | 3 | Warning | | | | | | |
| | | 4 | Lost Preset | | | | | | |
| 10 | Lost IntComm | | 0 1 120 0 | 1.0 | | 0 | 0 2 5 4 | 2412h | a424h |
| 10 | Time | | 0.1-120.0 | 1.0 | sec | | 9.2.3.1 | 0.1 | 0.1 |

⁸³ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

⁸⁴ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display Setting Range | Initial | Unit | it Property ⁸⁴ | Ref. | Communication address/scale | | | |
|------|---------------------------|---------|------------------------|---------------------------|------|-----------------------------|---------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | None | | | | | | |
| | Lost USB | 1 | CoastStop (FreeRun) | | | | | | |
| 19 | Mode | 2 | Trip Dec Stop | 0 | - | 0 | 9.2.5.2 | 2413h | a426h |
| | | 3 | Warning | | | | | | |
| | | 4 | Lost Preset | | | | | | |
| | | | | | | | | 2414h | a428h |
| | | | | | | | | 0.1 | 0.1 |
| 20 | Lost USB | | 0 1-120 0 | 10 | 500 | 0 | 0252 | 2415h | a42ah |
| Time | | | 0.1-120.0 | 1.0 | 360 | | 9.2.3.2 | 0.1 | 0.1 |
| | | | | | | | | 2416h | a42ch |
| | | | | | | | | 0.1 | 0.1 |
| | Lost OptComm Mode | 0 | None | | | | | | |
| | | 1 | CoastStop (FreeRun) | | - | 0 | - | | |
| 21 | | 2 | Trip Dec Stop | 0 | | | | 2415h | a42ah |
| | mede | 3 | Warning | | | | | | |
| | | 4 | Lost Preset | | | | | | |
| 22 | Lost OptComm | | 0 1-120 0 | 1 0 | sec | 0 | _ | 2416h | a42ch |
| | Time | | 0.1 120.0 | 1.0 | 000 | | | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| | | 1 | CoastStop (FreeRun) | | | | | | |
| 25 | Lost Al1 | 2 | Trip Dec Stop | 0 | _ | 0 | 9.2.5.3 | 2419h | a432h |
| | IVIODE | 3 | Hold Input | | | | | | |
| | | 4 | Hold Output | | | | | | |
| | | 5 | Lost Preset | | | | | | |

| Code | Code LCD Display | | Setting Range | | Unit | t Property ⁸¹ | Ref. | Communication address/scale | |
|------|------------------|---|------------------------|-------|------|--------------------------|---------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Half of Low Limit | | | | | | |
| 26 | Lost Al1 Chk | 1 | Below Low Limit | 0 | _ | 0 | 9.2.5.3 | 241ah | a434h |
| | Level | 2 | Below Or Maximum | | | | | | |
| 27 | Lost Δ11 Time | | 0 1-120 0 | 10 | sec | 0 | 0253 | 241bh | a436h |
| 21 | | | 0.1-120.0 | 1.0 | 300 | | 9.2.0.0 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| | | 1 | CoastStop (FreeRun) | | | | | | |
| 28 | Lost Al2 | 2 | Trip Dec Stop | 0 | - | 0 | 9.2.5.3 | 241ch | a438h |
| | Mode | 3 | Hold Input | | | | | | |
| | | 4 | Hold Output | | | | | | |
| | | | Lost Preset | | | | | | |
| 29 | Lost Al2 Chk | 0 | Half of Low Limit | | | | | | |
| | | 1 | Below Low Limit | - 0 | _ | 0 | 9.2.5.3 | 241dh | a43ah |
| 20 | Level | 2 | Below Or Maximum | | | | | 211011 | |
| 30 | Lost Al2 | | 0 1 120 0 | 1.0 | 500 | 0 | 0253 | 241eh | a43ch |
| - 30 | TIME | | 0.1-120.0 | 1.0 | 560 | 0 | 9.2.3.3 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| | | 1 | CoastStop (FreeRun) | | | | | | |
| 31 | Lost Al3 | 2 | Trip Dec Stop | 0 | - | 0 | 9.2.5.3 | 241fh | a43eh |
| | Mode | 3 | Hold Input | | | | | | |
| | | 4 | Hold Output | | | | | | |
| | | 5 | Lost Preset | | | | | | |
| | | 0 | Half of Low Limit | | | | | | |
| 32 | Lost Al3 Chk | 1 | Below Low Limit | 0 | _ | 0 | 9.2.5.3 | 2420h | a440h |
| 32 | Level | 2 | Below Or Maximum | 5 | | | | | |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁸¹ | Ref. | Commu addres | nication s/scale |
|------|-------------------|-----------------|------------------------|---------|------|------------------------|---------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 22 | Loot AI2 Time | | 0 1 120 0 | 1.0 | | 0 | 0 2 5 2 | 2421h | a442h |
| 33 | LOSI AIS TIME | | 0.1-120.0 | 1.0 | sec | 0 | 9.2.3.3 | 0.1 | 0.1 |
| 35 | OL Warn | 0 | No | 0 | | 0 | 012 | 2/23h | 2116h |
| - 55 | Select | 1 | Yes | 0 | _ | | 9.1.2 | 242311 | a++011 |
| 36 | OL Warn | | 30-200 | 150 | % | 0 | 912 | 2424h | a448h |
| | Level | | 00-200 | 100 | /0 | | 0.1.2 | 1 | 1 |
| 37 | OL Warn | | 0 0-600 0 | 10.0 | sec | 0 | 912 | 2425h | a44ah |
| | Time | | 0.0 000.0 | 10.0 | | | 0.1.2 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 38 | OL Trip Select | 1 | CoastStop (FreeRun) | 1 | - O | | 9.1.2 | 2426h | a44ch |
| | | 2 Trip Dec Stop | | | | | | | |
| 30 | OL Trip Lovel | 30-200 | | 180 | 0/_ | 0 | 012 | 2427h | a44eh |
| 39 | | 30-200 | | 100 | 70 | 0 | 9.1.2 | 1 | 1 |
| 40 | | | 0.0-60.0 | 60.0 | sec | 0 | 012 | 2428h | a450h |
| | | | 0.0-00.0 | 00.0 | 300 | | 0.1.2 | 0.1 | 0.1 |
| 45 | UL Warn | 0 | No | 0 | _ | 0 | 913 | 242dh | a45ah |
| | Select | 1 | Yes | 0 | | | 0.1.0 | ZHZUII | |
| 46 | UL Warn | | 0 0-600 0 | 10.0 | sec | 0 | 913 | 242eh | a45ch |
| | Time | | 0.0 000.0 | 10.0 | | | 0.1.0 | 0.1 | 0.1 |
| | | 0 | None | | | | | | |
| 47 | UL Trip Select | 1 | CoastStop (FreeRun) | 0 | - | 0 | 9.1.3 | 242fh | a45eh |
| | | 2 | Trip Dec Stop | | | | | | |
| 10 | LII Trin Timo | | 0 0 600 0 | 30.0 | 500 | 0 | 013 | 2430h | a460h |
| 40 | | 0.0-600.0 | | 50.0 | 360 | 0 | 9.1.0 | 0.1 | 0.1 |
| 40 | | | | 30 | % | 0 | 913 | 2431h | a462h |
| | | 10-UL BF Level | | 00 | /0 | | 0.1.0 | 1 | 1 |
| 50 | | | | 30 | % | 0 | 913 | 2432h | a464h |
| 00 | | 0 | | 00 | /0 | | 0.1.0 | 1 | 1 |

| Code LCD Display | Setting Range | | | Unit | Property ⁸¹ | Ref. | Communication address/scale | | |
|------------------|---------------|------------------|------------------------|--------|------------------------|-------|-----------------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | None | | | | | | |
| | Thermal-T | 1 | CoastStop (FreeRun) | | | | | | |
| 60 | Mode | 2 | Trip Dec Stop | 0 | - | 0 | 9.1.6 | 243ch | a478h |
| | | 3 | Warning | | | | | | |
| | | 4 | Lost Preset | | | | | | |
| | | 0 | None | | | | | | |
| 61 85 | Thermal-T | 1 | Analog Input 1 | 0 | | ~ | 016 | 242db | 017ch |
| 01 00 | Source | 2 | Analog Input 2 | 0 | - | | 9.1.0 | 24300 | a47an |
| | | 3 | Analog Input 3 | | | | | | |
| 60.85 | Thermal-T | | 0.0.100.0 | 500 | 0/ | 0 | 016 | 243eh | a47ch |
| 02 00 | Level | | 0.0-100.0 | 0.00 | 70 | 0 | 9.1.0 | 0.1 | 0.1 |
| 62 85 | Thermal-T | 0 | Under Level | 0 - | | | 016 | 242fb | 0/7ch |
| 03 ** | Area | 1 | Over Level | | - 0 | 9.1.0 | 243111 | a47 en | |
| 64 86 | Over Speed | | 20.0.130.0 | 120.0 | 0/2 | 0 | 0.2.8 | 2440h | a480h |
| 04 | Level | | 20.0-130.0 | 120.0 | 70 | | 9.2.0 | 0.1 | 0.1 |
| 65 86 | Over Speed | | 0.01-10.00 | 0.01 | sac | 0 | 028 | 2441h | a482h |
| | Time | | 0.01-10.00 | 0.01 | 300 | | 0.2.0 | 0.01 | 0.01 |
| 66 86 | Speed | 0 | No | 0 | | 0 | 020 | 2442h | 2/8/h |
| 00 | Deviation En | 1 | Yes | 0 | _ | | 9.2.9 | 244211 | a40411 |
| 67 ⁸⁶ | Speed Dev | 20 | 0-Max Frequency | 20.00 | Hz | 0 | 929 | 2443h | a486h |
| 07 | BandFreq | 2.0 | | 20.00 | 112 | | 5.2.5 | 0.01 | 0.01 |
| 68 ⁸⁷ | Speed Dev | 60. | Maximum Speed | 600 84 | rom | 0 | 929 | 2444h | a488h |
| | Band Spd | 60-Maximum Speed | | 000 | 1pm | | 0.2.0 | 1 | 1 |
| 69 86 | Speed Dev | | 0 1-1000 0 | 10 | sec | 0 | 929 | 2445h | a48ah |
| 00 | Time | | 0.1-1000.0 | 1.0 | 000 | | 0.2.0 | 0.1 | 0.1 |

⁸⁵ Activated when the PRT-60 (Thermal-T Mode) value is not 0 (None).

⁸⁶ Activated when the MOT1-05 (Control Mode) value is 3 (Sensorless) or 4 (Vector).

⁸⁷ Activated when the MOT1-05 (Control Mode) value is 3 (Sensorless) or 4 (Vector) and the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

Γ

| Code | LCD Display | Setting Range | | Initial Value | Unit | Property ⁸¹ | ¹ Ref. | Communication address/scale | |
|------------------|--------------|---------------|------------------------|------------------|------|------------------------|-------------------|-----------------------------|-----------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 75 | MainFan Trip | 0 | Trip | 0 | | 0 | 0 2 11 | 21166 | 0106h |
| 75 | Mode | 1 | Warning | 0 | - | 0 | 9.2.11 | 244011 | a49011 |
| 77 88 | AuxFan Trip | 0 | Trip | 0 | | 0 | 0 2 11 | 244db | 0/00h |
| 11 00 | Mode | 1 | Warning | 0 | - | 0 | 9.2.11 | 244un | a49a11 |
| 79 | Ext-Trip 1 | 0 | Latch | 0 | | 0 | 022 | 244ob | o/loch |
| 10 | Mode | 1 | Level | 0 | - | 0 | 9.2.2 | 244611 | a49011 |
| 70 | Ext-Trip 2 | 0 | Latch | 0 | | 0 | 022 | 244fb | 240ob |
| 19 | Mode | 1 | Level | 0 | - | 0 | 9.2.2 | 244111 | a49611 |
| 00 | Ext-Trip 3 | 0 | Latch | 0 | | 0 | 0 2 2 | 2150h | 0100h |
| 00 | Mode | 1 | Level | 0 | - | 0 | 9.2.2 | 240011 | a4a011 |
| 01 | Ext-Trip 4 | 0 | Latch | 0 | | 0 | 0 2 2 | 0151h | 0102h |
| 01 | Mode | 1 | Level | | - | 0 | 9.2.2 | 243111 | a4a211 |
| 00 | Safety Trip | 0 | Latch | 0 | | 0 | 012 | 24526 | 0/0/h |
| 02 | Mode | 1 | Level | 0 | - | 0 | 9.4.2 | 240211 | a4a411 |
| 02 | BX Stop | 0 | CoastStop (FreeRun) | 0 | | | 0.0.7 | 04505 | o 4 o C b |
| 03 | Mode | 1 | Trip Dec Time Stop | 0 | - | 0 | 9.2.7 | 24030 | a4a0n |
| 84 | BX Dec Time | | 1.00~6000.00 | 3.00 | sec | 0 | 9.2.7 | 2454h | a4a8h |
| | | 0 | None | | | | | | |
| 85 | BX Restart | 1 | Start Mode | 1 | - | 0 | 9.2.7 | 2455h | a4aah |
| | Mode | 2 | Speed Search | | | | | | |
| 00 | Ext 24V Pwr | 0 | No | 0 | | | 0.0.4 | 04505 | - 41-01- |
| 89 | Lost | 1 Yes | | U | _ | 0 | 9.2.4 | 24590 | a4p2n |
| 00.80 | Fire Mode | | | 0 | | | 7 44 | 245ah | a4b4h |
| 90 ₀₉ | Password | | - | 0 | - | | 7.11 | 1 | 1 |

⁸⁸ Activated when an inverter is equipped with an auxiliary fan (Aux Fan).

⁸⁹ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 48 (Fire Mode Fwd) or 49 (Fire Mode Rev).

Table of Functions

| Code | LCD Display | Setting Range | | | Unit | Property ⁸¹ | Ref. | Communication address/scale | |
|------------------|-----------------------|---------------|-----------------|----------|------|------------------------|------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | None | | | | | | |
| 91 ⁸⁹ | Fire Mode Select | 1 | Test Mode | 0 | - | \triangle | 7.11 | 245bh | a4b6h |
| | 001001 | 2 | Fire Mode | | | | | | |
| 00.80 | FireMode | 0.0 | | <u> </u> | | | 7 44 | 245dh | a4bah |
| 93 00 | Frequency | 0.0 | U-Max Frequency | 60.00 | Hz | 0 | 7.11 | 0.01 | 0.01 |
| 04.90 | FireMode | 0 | Mawima On a ad | 4000 84 | | | 7 44 | 245eh | a4bch |
| 94 50 | 4 ⁹⁰ Speed | | Maximum Speed | 1800 04 | rpm | 0 | 7.11 | 1 | 1 |
| | Fire Mode | | | | 0 | V | 7 44 | 245fh | a4beh |
| 90 09 | Count | | - | - | 0 | X | 7.11 | 1 | 1 |

⁹⁰ Activated when one of the DIN-01, 03, 05, 07, 09, 11, 13, and 15 (DI1-DI8 Define) values is 48 (Fire Mode Fwd) or 49 (Fire Mode Rev) and the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

13.16 Diagnosis Function Group (DIAG)

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The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁹¹ | Ref. | Commu addres | nication s/scale |
|------|---------------------|---|-----------------------|---------|---|------------------------|-------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 35 | - | 0 | 4.3.3 | 2500h | a500h |
| 01 | MainCap | 0 | No | 0 | | 0 | 021 | 2501h | 0502h |
| 01 | Diag En | 1 | Yes | 0 | - | 0 | 9.3.1 | 250111 | abuzn |
| | MainCan | 0 | None | | | | | | |
| 02 | Diag Mode | 1 | Diagnosed Capacity | 0 | - | \bigtriangleup | 9.3.1 | 2502h | a504h |
| | | 0 | None | | | | | | |
| | | 1 | Need To Check | | | | | | |
| 03 | MainCap Diag Sts | 2 | Need To Exchange | - | - | Х | 9.3.1 | 2503h | a506h |
| | | 3 | Power Off Please | | | | | | |
| | | | Diagnostic Cap | | | | | | |
| 04 | MainCap | | 0.0-100.0 | 0.0 | 0/2 | x | 031 | 2504h | a508h |
| 04 | MeasuredLv | | 0.0-100.0 | 0.0 | 70 | ~ | 5.0.1 | 0.01 | 0.01 |
| 05 | MainCap | | _ | _ | Time ⁹² | x | 931 | 2505h | a50ah |
| | Diag Time | | | | | | 0.0.1 | 1 | 1 |
| 06 | MainCap | | 50 0-90 0 | 70.0 | % | 0 | 931 | 2506h | a50ch |
| | Warn Level | | | . 0.0 | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | 0.011 | 0.01 | 0.01 |
| 07 | Cap Check | 0 | No | 0 | _ | 0 | 9.3.2 | 2507h | a50eh |
| | Alarm En | 1 | Yes | | | | | | |
| 08 | Cap Chk | | 2000-50000 | 18000 | hour | 0 | 9.3.2 | 2508h | a510h |
| | AlarmCycle | | 2000 00000 | | | | 0.012 | 1 | 1 |
| 11 | MainCap | 0 | No | 0 | _ | 0 | 9.3.3 | 250bh | a516h |
| | 11 Repl En | 1 | 1 Yes | | - | 0 | 0.0.0 | 200511 | |

⁹¹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

⁹² The information is displayed in the form of "day, hour, minute (0 days 00:00)."

| Code | LCD Display | | Setting Range | | Initial Value Unit Proper | | Ref. | Communication address/scale | |
|--------------|--------------|--------------|---------------|-------|---|---|-------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 10 | MainCap | | 10.0.100.0 | 00.0 | 0/ | | 0 2 2 | 250ch | a518h |
| 12 | Repl Level | | 10.0-100.0 | 90.0 | 70 | 0 | 9.3.3 | 0.01 | 0.01 |
| 12 | MainCap | | 0.0.100.0 | | 0/_ | v | 033 | 250dh | a51ah |
| 15 | Used Level | | 0.0-100.0 | - | 70 | ^ | 9.0.0 | 0.01 | 0.01 |
| 40 | PreCharger | 0 | No | 0 | _ | 0 | 936 | 2528h | a550h |
| | Warn Sel | 1 | Yes | 0 | | Ŭ | 0.0.0 | 202011 | 400011 |
| 41 | PreCharger | | 10 00-100 00 | 90 00 | % | 0 | 936 | 2529h | a552h |
| | Repl Lvl | | 10.00-100.00 | 00.00 | 70 | Ŭ | 0.0.0 | 0.01 | 0.01 |
| 42 | PreCharger | | 0 00-100 00 | _ | % | x | 936 | 252ah | a554h |
| | Used Lv | | | | ,,, | | 0.0.0 | 0.01 | 0.01 |
| 52 | MainFan | 0 | No | 0 | _ | 0 | 934 | 2534h | a568h |
| | Repl En | 1 Yes | | | | | 0.0.1 | 200 111 | |
| 53 | MainFan Repl | 10.00-100.00 | | 90.00 | % | 0 | 9.3.4 | 2535h | a56ah |
| | Level | | | | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | | | 0.01 | 0.01 |
| 54 | MainFan | | 0.00-100.00 | 0.00 | % | x | 9.3.4 | 2536h | a56ch |
| | Used Level | | | | | | | 0.01 | 0.01 |
| 62 93 | AuxFan Repl | 0 | No | 0 | | | 031 | 253ob | a57ch |
| 02 | En | 1 | Yes | 0 | - | | 9.0.4 | 200011 | a57 cm |
| 60 93 | AuxFan Repl | | 10.00.100.00 | 00.00 | 0/ | | 0.2.4 | 253fh | a57eh |
| 03 | Level | | 10.00-100.00 | 90.00 | 70 | 0 | 9.3.4 | 0.01 | 0.01 |
| 64.93 | AuxFan Used | | 0.00.100.00 | 0.00 | 0/. | v | 024 | 2540h | a580h |
| 04 ** | Level | | 0.00-100.00 | 0.00 | 70 | ^ | 9.3.4 | 0.01 | 0.01 |
| 90 | MainFan | | | _ | Time92 | x | 037 | 255ah | a5b4h |
| 90 | Time | - | | - | | ^ | 9.3.7 | 1 | 1 |
| 91 | MainFan | 0 No | | 0 | _ | | 937 | 255bb | a5h6h |
| | Time Reset | 1 Yes | | 0 | | | 0.0.1 | 200011 | |
| 05 03 | | | | | Time = 02 | V | 0.0.7 | 255fh | a5beh |
| 90 00 | Auxran nme | | - | - | nmesz | ~ | 9.3.7 | 1 | 1 |

⁹³ Activated when an inverter is equipped with an auxiliary fan (Aux Fan).

| Code | LCD Display | Setting Range | | | Unit | Property ⁹¹ | Ref. | Communication address/scale | |
|------------------|----------------------|---------------|----|-------|------|------------------------|-------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 96 ⁹³ | AuxFan Time Reset | 0 | No | 0 | - | \bigtriangleup | 9.3.7 | 2560h | a5c0h |
| 00 | Drive On | | | | | V | 0 0 7 | 2562h | a5c4h |
| 98 | Time | | - | - | - | X | 9.3.7 | 1 | 1 |
| 00 | Drive Run | | | | | v | 0 2 7 | 2563h | a5c6h |
| 99 | Time | Time | | - | - | X | 9.3.7 | 1 | 1 |

13.17 Internal Communication Group (INTC)

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | ay Setting Range Initial Unit Property ⁹⁴ Ref. | | Setting Range V | Commu addres | nication s/scale | | | | |
|------|-------------|---|----------------------|---------------------|-----------------|---------------------|---|--------|--------|---------|
| | | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | | 30 | - | 0 | 4.3.3 | 2700h | a700h |
| | | Мос | lbus RTU | 1-250 ⁹⁵ | | | | | 2701h | o702h |
| 01 | Station ID | LS | inv 485 | 1-31 ⁹⁶ | 1 | - | 0 | 10.2.2 | 270111 | a/ 0211 |
| | | RT | U Master | 1-250 ⁹⁵ | | | | | 1 | 1 |
| | | 0 | Modbus | s RTU | | | | | | |
| 02 | Protocol | 1 | LS Inv | 485 | 0 | _ | 0 | 10.2.2 | 2702h | a704h |
| - | | 2 | Modbus RTU Master | | - | | | - | | - |
| | | 0 | 1200 | 1200bps 2400bps | | | | | | |
| | David Data | 1 | 2400 | | | | | | | |
| | | 2 | 4800bps | | | | | | | |
| 02 | | 3 | 9600bps | | 2 | | 0 | 10.2.2 | 2703h | 2706h |
| 03 | Daug Rale | 4 | 19200 | Obps | 3 | - | 0 | 10.2.2 | 2703h | a/06h |
| | | 5 | 38400 |)bps | | | | | | |
| | | 6 | 56000 |)bps | | | | | | |
| | | 7 | 115k | bps | | | | | | |
| | | 0 | D8/PI | N/S1 | | | | | | |
| 04 | DC405 Mada | 1 | D8/P1 | N/S2 | 0 | | | 10 0 0 | 27046 | 0700h |
| 04 | K5465 MODE | 2 | D8/PE/S1 | | 0 | - | 0 | 10.2.2 | 27040 | a7060 |
| | | 3 | D8/P0 | D/S1 | | | | | | |
| 05 | Response | | 0.4000 | | F | mean | 0 | 10 2 2 | 2705h | a70ah |
| 05 | Delay | | 0-1000 | | 5 | msec | 0 | 10.2.2 | 1 | 1 |

⁹⁴ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

⁹⁵ Shown when the communication protocol (INTC-02 Protocol) is 0 (Modbus RTU).

⁹⁶ Shown when the communication protocol (INTC-02 Protocol) is other than 0 (Modbus RTU).
| Code | LCD Display | | Setting Range | Initial Value Unit Prop | Property ⁹⁴ | Ref. | Commu addres | nication s/scale | |
|------|---------------|---|---------------|----------------------------|------------------------|------|-----------------|---------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 06 | Modbus Addr | 0 | No | 1 | | | 10.0.0 | 0706h | a70ah |
| 06 | Mode | 1 | Yes | | - | 0 | 10.2.2 | 27060 | aruch |
| 07 | Termi | 0 | Off | 0 | | | 10.0.0 | 0707h | 070ah |
| 07 | Resistor En | 1 | On | 0 | - | 0 | 10.2.2 | 270711 | aruen |
| 11 | Doro Status 1 | | 0000 EEEE | 00046 | Hoy | _ | 10.2.6 | 270bh | a716h |
| | Fala Status-T | | 0000-FFFF | UUUAII | пех | | 10.3.0 | 1 | 1 |
| 10 | Para Status 2 | | | 000Eb | Hoy | ~ | 1036 | 270ch | a718h |
| 12 | Fala Status-2 | | 0000-1111 | 000LI | TIEX | | 10.3.0 | 1 | 1 |
| 12 | Para Status 3 | | | 000Eb | Hoy | ~ | 1036 | 270dh | a71ah |
| 15 | | | 0000-1111 | 000111 | TIEX | | 10.5.0 | 1 | 1 |
| 1/ | Para Status-A | | | 0000 | Ηον | | 1036 | 270eh | a71ch |
| 14 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 15 | Para Status-5 | | | 0000 | Ηον | | 1036 | 270fh | a71eh |
| 15 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 16 | Para Status-6 | | 0000-EEEE | 0000 | Hey | | 1036 | 2710h | a720h |
| 10 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 17 | Para Status-7 | | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2711h | a722h |
| | | | | | | | 10.0.0 | 1 | 1 |
| 18 | Para Status-8 | | 0000-EEEE | 0000 | Hey | | 1036 | 2712h | a724h |
| 10 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 19 | Para Status-9 | | 0000-EEEE | 0000 | Hey | | 1036 | 2713h | a726h |
| 10 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 20 | Para | | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2714h | a728h |
| 20 | Status-10 | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 21 | Para | | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2715h | a72ah |
| | Status-11 | | | | | | 10.0.0 | 1 | 1 |
| 22 | Para | | 0000-FFFF | 0000 | Hex | | 10.3 6 | 2716h | a72ch |
| | Status-12 | | | | | | | 1 | 1 |
| 23 | Para | | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2717h | a72eh |
| 20 | Status-13 | | 00001111 | 0000 | | | 10.0.0 | 1 | 1 |

LSELECTRIC 615

| Code | Code LCD Display | Setting Range | | Unit | Property ⁹⁴ | Ref. | Communication address/scale | | |
|------|------------------|---------------|-------|------|------------------------|--------|-----------------------------|--------|--|
| | | | value | | | | 16-Bit | 32-Bit | |
| 24 | Para | | 0000 | Llov | | 10.2.6 | 2718h | a730h | |
| 24 | Status-14 | 0000-FFFF | 0000 | пех | | 10.3.0 | 1 | 1 | |
| 25 | Para | | 0000 | Hoy | | 1036 | 2719h | a732h | |
| 25 | Status-15 | 0000-1111 | 0000 | TIEX | | 10.5.0 | 1 | 1 | |
| 26 | Para | | 0000 | Hov | | 1036 | 271ah | a734h | |
| 20 | Status-16 | | 0000 | TIEX | | 10.5.0 | 1 | 1 | |
| 31 | Para | | 0005 | Hov | | 1036 | 271fh | a73eh | |
| 51 | Control-1 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 32 | Para | 0000-FFFF | 0006 | Hey | | 1036 | 2720h | a740h | |
| 02 | Control-2 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 33 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2721h | a742h | |
| | Control-3 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 34 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2722h | a744h | |
| 04 | Control-4 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 35 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2723h | a746h | |
| | Control-5 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 36 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2724h | a748h | |
| 00 | Control-6 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 37 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2725h | a74ah | |
| 01 | Control-7 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 38 | Para | 0000-FFFF | 0000 | Hex | | 10.3.6 | 2726h | a74ch | |
| 00 | Control-8 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 39 | Para | 0000-EEEE | 0000 | Hey | | 10.3.6 | 2727h | a74eh | |
| 00 | Control-9 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 | |
| 40 | Para | | 0000 | Hov | | 1036 | 2728h | a750h | |
| | Control-10 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 41 | Para | 0000-EEEE | 0000 | Hey | | 1036 | 2729h | a752h | |
| - 1 | Control-11 | | 0000 | | | 10.0.0 | 1 | 1 | |
| 42 | Para | | 0000 | Hev | | 1036 | 272ah | a754h | |
| 72 | Control-12 | | 0000 | | | 10.5.0 | 1 | 1 | |

| Code | LCD Display | Setting Range Value | | | Unit | Property ⁹⁴ | Ref. | Communication address/scale | |
|------|-------------|---------------------|-----------|-------|------|------------------------|--------|-----------------------------|-----------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 40 | Para | | | 0000 | Llov | ~ | 10.2.6 | 272bh | a756h |
| 43 | Control-13 | | 0000-FFFF | 0000 | пех | \square | 10.3.0 | 1 | 1 |
| 4.4 | Para | | | 0000 | | | 10.0.0 | 272ch | a758h |
| 44 | Control-14 | | 0000-FFFF | 0000 | нех | | 10.3.0 | 1 | 1 |
| 45 | Para | | | 0000 | Llav | | 10.0.0 | 272dh | a75ah |
| 45 | Control-15 | | 0000-FFFF | 0000 | нех | | 10.3.6 | 1 | 1 |
| 40 | Para | | | 0000 | | | 40.0.0 | 272eh | a75ch |
| 46 | Control-16 | | 0000-FFFF | 0000 | нех | | 10.3.6 | 1 | 1 |
| 00 | | | | | | V | 40.0.0 | 2762h | a7c4h |
| 98 | Error Count | | - | - | - | X | 10.2.2 | 1 | 1 |
| 00 | Error Count | 0 | No | | | | 40.0.0 | 0700 | - 7 - 01- |
| 99 | Reset | 1 | Yes | | - | 0 | 10.2.2 | 27631 | a/c6n |

13.18 Modbus Master Group (INTM)

This group is only activated when the INTC-02 (Protocol) value is 2 (Modbus RTU Master).

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| Code | LCD Display | | Setting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale |
|------|------------------------|---|-----------------|-------|------|------------------------|-----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 30 | - | 0 | 4.3.3 | 2800h | a800h |
| | | 0 | None | | | | | | |
| 1 | Comm Enable Mode | 1 | Always Enable | 0 | - | 0 | 7.27.6.2 | 2801h | a802h |
| | | 2 | DI Dependent | | | | | | |
| | | 0 | Not Used | | | | | | 2804b |
| 2 | P01 - Slave | 1 | Read Mode | 0 | | 0 | 7 7 7 6 7 | 2802h | |
| 2 | 2 RW Mode | 2 | Write Mode | 0 | - | | 1.21.0.2 | 200211 | aou411 |
| | | 3 | Broadcast Write | | | | | | |
| 3 | P01 - Slave | | 1.64 | 1 | | 0 | 7 7 7 6 7 | 2803h | a806h |
| 3 | StationID | | 1-04 | | - | 0 | 7.27.6.2 | 1 | 1 |
| 1 | P01 - Data | | 1 / | 1 | | 0 | 7 27 6 2 | 2804h | a808h |
| 4 | Count | | 1-4 | - | - | 0 | 1.21.0.2 | 1 | 1 |
| 5 | P01 - Slave | | | 0000 | Нох | 0 | 7 27 6 2 | 2805h | a80ah |
| 5 | DataAddr | | 0000-1111 | 0000 | TIEX | 0 | 1.21.0.2 | 1 | 1 |
| 6 | P01 - Master | | | 0000 | Ηον | 0 | 7 27 6 2 | 2806h | a80ch |
| 0 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 7 | P01 - Time | | 0 10-1 00 | 0 10 | 500 | | 7 27 6 2 | 2807h | a80eh |
| ' | 7 P01 - Time Period | | 0.10-1.00 | 0.10 | 300 | | 1.21.0.2 | 0.01 | 0.01 |

 $^{97}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

| Code | LCD Display | Setting Range | | Unit | Property ⁹⁷ | Ref. | Communication address/scale | | |
|------|-----------------------|---------------|---------------------|-----------------------------|------------------------|------|-----------------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 8 | P01 - Comm | 4 | ILLEGAL DATA | 0 | _ | X | - | 2808h | a810h |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P02-Slave RW Mode | 0 | Not Used | | | | | | |
| 0 | | 1 | Read Mode | ode 0 - 0 7.27 ode Write | | | 7 07 6 0 | 20006 | -010h |
| 9 | | 2 | Write Mode | | - | - 0 | 1.21.0.2 | 200911 | a01211 |
| | | 3 | Broadcast Write | | | | | | |
| 10 | P02 - Slave | | 1_6/ | 1 | _ | 0 | 7 27 6 2 | 280ah | a814h |
| 10 | StationID | | 1-04 | - | - | | 1.21.0.2 | 1 | 1 |
| 11 | P02 - Data | | 1_1 | 1 | _ | 0 | 7 27 6 2 | 280bh | a816h |
| | Count | | 1-4 | | | | 1.21.0.2 | 1 | 1 |
| 12 | P02 - Slave | | | 0000 | Ηργ | 0 | 7 27 6 2 | 280ch | a818h |
| 12 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 13 | P02 - Master | | | 0000 | Ηργ | 0 | 7 27 6 2 | 280dh | a81ah |
| 15 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 14 | P02-Time | | 0 10-1 00 | 0 10 | sec | 0 | 7 27 6 2 | 280eh | a81ch |
| 14 | 14 P02-Time Period | | 0.10-1.00 | 0.10 | 300 | | 1.21.0.2 | 0.01 | 0.01 |

| Code | LCD Display | Setting Ra | setting Range | | Unit | Property ⁹⁷ | roperty ⁹⁷ Ref. | Communication address/scale | |
|------|-----------------------|------------|---------------------|-------|------|------------------------|----------------------------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 15 | P02 - Comm | 4 | ILLEGAL DATA | 0 | _ | X | - | 280fh | a81eh |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P03-Slave RW Mode | 0 | Not Used | | | | | | |
| 16 | | 1 | Read Mode | 0 | | 0 | 7 77 6 7 | 20106 | -020h |
| 10 | | 2 | Write Mode | | - | | 1.21.6.2 | 20100 | a02011 |
| | | 3 | Broadcast Write | | | | | | |
| 17 | P03 - Slave | | 1.64 | 1 | | 0 | 7 27 6 2 | 2811h | a822h |
| 17 | StationID | | 1-04 | | - | 0 | 1.21.0.2 | 1 | 1 |
| 18 | P03 - Data | | 1_1 | 1 | | 0 | 7 27 6 2 | 2812h | a824h |
| 10 | Count | | 1-4 | - | - | | 1.21.0.2 | 1 | 1 |
| 10 | P03 - Slave | | | 0000 | Hoy | 0 | 7 27 6 2 | 2813h | a826h |
| 19 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 20 | P03 - Master | | | 0000 | Hoy | 0 | 7 27 6 2 | 2814h | a828h |
| 20 | DataAddr | | 0000-1111 | 0000 | TIEX | 0 | 1.21.0.2 | 1 | 1 |
| 21 | P03-Time | | 0 10-1 00 | 0 10 | sec | | 7 27 6 2 | 2815h | a82ah |
| 21 | 21 P03-Time Period | | 0.10-1.00 | 0.10 | Sec | | 1.21.0.2 | 0.01 | 0.01 |

| Code | LCD Display | Setting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale | |
|------|----------------------|---------------|---------------------|-------|------------------------|------|-----------------|---------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 22 | P03-Comm | 4 | ILLEGAL DATA | 0 | _ | X | - | 2816h | a82ch |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | T | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P04-Slave RW Mode | 0 | Not Used | | | | | | |
| 22 | | 1 | Read Mode | 0 | | | 7 07 6 0 | 2017h | -00-h |
| 23 | | 2 | Write Mode | | - | | 1.21.0.2 | 201711 | a02011 |
| | | 3 | Broadcast Write | | | | | | |
| 24 | P04 - Slave | | 1_6/ | 1 | _ | 0 | 7 27 6 2 | 2818h | a830h |
| 24 | StationID | | 1-04 | - | - | 0 | 1.21.0.2 | 1 | 1 |
| 25 | P04 - Data | | 1_1 | 1 | _ | 0 | 7 27 6 2 | 2819h | a832h |
| 20 | Count | | 1-4 | | | | 1.21.0.2 | 1 | 1 |
| 26 | P04 - Slave | | | 0000 | Hov | 0 | 7 27 6 2 | 281ah | a834h |
| 20 | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 |
| 27 | P04 - Master | | 0000-EEEE | 0000 | Hey | 0 | 7 27 6 2 | 281bh | a836h |
| 21 | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 |
| 28 | P04-Time | | 0 10-1 00 | 0 10 | sec | 0 | 7 27 6 2 | 281ch | a838h |
| 20 | Period | | 0.10-1.00 | 0.10 | 300 | | 1.21.0.2 | 0.01 | 0.01 |

| Code | LCD Display | s | setting Range | | Unit | Property ⁹⁷ Ref. | communication rty ⁹⁷ Ref. address/scal | | nication s/scale |
|------|-----------------------|-------------|---------------------|-------|------|-----------------------------|--|--------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 29 | P04-Comm | 4 | ILLEGAL DATA | 0 | - | X | - | 281dh | a83ah |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P05-Slave RW Mode | 0 | Not Used | | | | | | |
| 20 | | 1 | Read Mode | 0 | | | 7 07 6 0 | 201ah | 002ab |
| 30 | | 2 | Write Mode | | - | | 1.21.0.2 | 281en | aosun |
| | | 3 | Broadcast Write | | | | | | |
| 31 | P05 - Slave | | 1.64 | 1 | | 0 | 7 27 6 2 | 281fh | a83eh |
| 51 | StationID | | 1-04 | 1 | - | 0 | 1.21.0.2 | 1 | 1 |
| 30 | P05 - Data | | 1 / | 1 | | 0 | 7 27 6 2 | 2820h | a840h |
| 52 | Count | | 1-4 | I | - | | 1.21.0.2 | 1 | 1 |
| 33 | P05 - Slave | | | 0000 | Hoy | 0 | 7 27 6 2 | 2821h | a842h |
| 55 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 34 | P05 - Master | | | 0000 | Hov | 0 | 7 27 6 2 | 2822h | a844h |
| 54 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 35 | P05-Time | | 0 10-1 00 | 0 10 | sec | | 7 27 6 2 | 2823h | a846h |
| 55 | 35 P05-Time Period | 0.10-1.00 (| | 0.10 | sec | ; O | 7.27.6.2 | 0.01 | 0.01 |

| Code | LCD Display | Setting Range | etting Range | | Unit | Property ⁹⁷ | operty ⁹⁷ Ref. | | Communication address/scale | |
|------|-----------------------|---------------|---------------------|-------|------|------------------------|---------------------------|--------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| | | 0 | Not Used | | | | | | | |
| | | 1 | IDLE | | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | | |
| 36 | P05-Comm | 4 | ILLEGAL DATA | 0 | _ | X | - | 2824h | a848h | |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | | |
| | | 6 | UNDEF CONDITION | T | | | | | | |
| | | 7 | DISCONNECT | | | | | | | |
| | P06-Slave RW Mode | 0 | Not Used | | | | | | | |
| 27 | | 1 | Read Mode | 0 | | | 7 07 6 0 | 2025h | 001ab | |
| 37 | | 2 | Write Mode | | - | | 1.21.6.2 | 202011 | a04a11 | |
| | | 3 | Broadcast Write | | | | | | | |
| 38 | P06 - Slave | | 1_6/ | 1 | _ | 0 | 7 27 6 2 | 2826h | a84ch | |
| 50 | StationID | | 1-04 | - | - | 0 | 1.21.0.2 | 1 | 1 | |
| 30 | P06 - Data | | 1_/ | 1 | | 0 | 7 27 6 2 | 2827h | a84eh | |
| - 59 | Count | | 1-4 | | | | 1.21.0.2 | 1 | 1 | |
| 40 | P06 - Slave | | | 0000 | Ηργ | 0 | 7 27 6 2 | 2828h | a850h | |
| | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 | |
| /1 | P06 - Master | | | 0000 | Ηργ | 0 | 7 27 6 2 | 2829h | a852h | |
| - 1 | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 | |
| 42 | P06-Time | | 0 10-1 00 | 0 10 | sec | 0 | 7 27 6 2 | 282ah | a854h | |
| 42 | 42 P06-Time Period | 0.10-1.00 | | 0.10 | sec | ; O | 1.21.0.2 | 0.01 | 0.01 | |

Table of Functions

| Code | LCD Display | Setting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale | |
|------|-----------------------|---------------|---------------------|-------|------------------------|------|-----------------|---------------------|----------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 43 | P06-Comm | 4 | ILLEGAL DATA | 0 | _ | x | - | 282bh | a856h |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P07-Slave RW Mode | 0 | Not Used | | | | | | |
| 4.4 | | 1 | Read Mode | 0 | | | 7 07 6 0 | 202ah | ~0 <i>5</i> 0h |
| 44 | | 2 | Write Mode | | - | | 1.27.6.2 | 282CN | a00011 |
| | | 3 | Broadcast Write | | | | | | |
| 45 | P07 - Slave | | 1.64 | 1 | | 0 | 7 27 6 2 | 282dh | a85ah |
| 45 | StationID | | 1-04 | I | - | 0 | 1.21.0.2 | 1 | 1 |
| 46 | P07 - Data | | 1_1 | 1 | | 0 | 7 27 6 2 | 282eh | a85ch |
| 40 | Count | | 1-4 | | _ | | 1.21.0.2 | 1 | 1 |
| 47 | P07 - Slave | | | 0000 | Hov | 0 | 7 27 6 2 | 282fh | a85eh |
| 47 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 18 | P07 - Master | | | 0000 | Ηργ | 0 | 7 27 6 2 | 2830h | a860h |
| 40 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 40 | P07-Time | | 0 10-1 00 | 0 10 | ser | 0 | 7 27 6 2 | 2831h | a862h |
| 49 | 49 P07-Time Period | 0.10-1.00 | | 0.10 | sec | 0 | 7.27.6.2 | 0.01 | 0.01 |

| Code | LCD Display | S | etting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale |
|------|----------------------|---|---------------------|-------|------|------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 50 | P07-Comm | 4 | ILLEGAL DATA | 0 | - | X | - | 2832h | a864h |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P08-Slave RW Mode | 0 | Not Used | | | | | | |
| 51 | | 1 | Read Mode | 0 | | | 7 77 6 7 | 20226 | 0966h |
| 51 | | 2 | Write Mode | | - | | 1.21.0.2 | 20330 | a00011 |
| | | 3 | Broadcast Write | | | | | | |
| 52 | P08 - Slave | | 1_6/ | 1 | _ | 0 | 7 27 6 2 | 2834h | a868h |
| 52 | StationID | | 1-04 | 1 | _ | | 1.21.0.2 | 1 | 1 |
| 53 | P08 - Data | | 1_/ | 1 | | 0 | 7 27 6 2 | 2835h | a86ah |
| | Count | | 1-4 | I | | | 1.21.0.2 | 1 | 1 |
| 54 | P08 - Slave | | 0000-EEEE | 0000 | Hey | 0 | 7 27 6 2 | 2836h | a86ch |
| | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 |
| 55 | P08 - Master | | 0000-EEEE | 0000 | Hey | 0 | 7 27 6 2 | 2837h | a86eh |
| | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 |
| 56 | P08-Time | | 0 10-1 00 | 0 10 | sec | 0 | 7 27 6 2 | 2838h | a870h |
| 00 | Period | | 0.10-1.00 | 0.10 | 360 | | 1.21.0.2 | 0.01 | 0.01 |

| Code | LCD Display | Setting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale | |
|------|-----------------------|---------------|---------------------|-------|------------------------|------|-----------------|---------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 57 | P08-Comm | 4 | ILLEGAL DATA | 0 | _ | x | - | 2839h | a872h |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | P09-Slave RW Mode | 0 | Not Used | | | | | | |
| E 0 | | 1 | Read Mode | 0 | | | 7.27.6.2 | 202ah | 071h |
| 00 | | 2 | Write Mode | | - | | | 283an | a0/4/1 |
| | | 3 | Broadcast Write | | | | | | |
| 50 | P09 - Slave | | 1.64 | 1 | | 0 | 7 27 6 2 | 283bh | a876h |
| 59 | StationID | | 1-04 | - | - | 0 | 1.21.0.2 | 1 | 1 |
| 60 | P09 - Data | | 1 / | 1 | | 0 | 7 27 6 2 | 283ch | a878h |
| 00 | Count | | 1-4 | I | - | | 1.21.0.2 | 1 | 1 |
| 61 | P09 - Slave | | | 0000 | Hoy | 0 | 7 27 6 2 | 283dh | a87ah |
| 01 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 62 | P09 - Master | | | 0000 | Hov | 0 | 7 27 6 2 | 283eh | a87ch |
| 02 | DataAddr | | 0000-1111 | 0000 | TIEX | | 1.21.0.2 | 1 | 1 |
| 63 | P09-Time | | 0 10-1 00 | 0 10 | sec | | 7 27 6 2 | 283fh | a87eh |
| 03 | 63 P09-Time Period | | 0.10-1.00 | 0.10 | sec | 0 | 7.27.6.2 | 0.01 | 0.01 |

| Code | LCD Display | S | etting Range | | Unit | Property ⁹⁷ | Ref. | Commu addres | nication s/scale |
|------------|--------------|---|---------------------|-------|------|------------------------|----------|---|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Not Used | | | | | | |
| | | 1 | IDLE | | | | | Commu addres 16-Bit 2840h 2840h 2841h 2842h 1 2843h 1 2843h 1 2844h 1 2844h 1 2844h 1 2844h 1 2844h 1 2844h 1 2844h 1 2844h | |
| | | 2 | ILLEGAL FUNC | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | |
| 64 | P09-Comm | 4 | ILLEGAL DATA | 0 | _ | x | - | 2840h | a880h |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | |
| | | 7 | DISCONNECT | | | | | | |
| | | 0 | Not Used | | | | | | |
| <u>c</u> e | P10-Slave | 1 | Read Mode | 0 | - | | 7 07 6 0 | 20116 | -000h |
| 60 | RW Mode | 2 | Write Mode | 0 | | | 1.21.0.2 | 284 IN | aoo2n |
| | | 3 | Broadcast Write | | | | | | |
| 66 | P10 - Slave | | 1_6/ | 1 | _ | 0 | 7 27 6 2 | 2842h | a884h |
| 00 | StationID | | 1-04 | - | - | 0 | 1.21.0.2 | 1 | 1 |
| 67 | P10 - Data | | 1_1 | 1 | _ | 0 | 7 27 6 2 | 2843h | a886h |
| -07 | Count | | 1-4 | | | | 1.21.0.2 | 1 | 1 |
| 68 | P10 - Slave | | | 0000 | Ηργ | 0 | 7 27 6 2 | 2844h | a888h |
| | DataAddr | | 0000-1111 | 0000 | | | 1.21.0.2 | 1 | 1 |
| 69 | P10 - Master | | 0000-EEEE | 0000 | Hey | 0 | 7 27 6 2 | 2845h | a88ah |
| 03 | DataAddr | | 0000-1111 | 0000 | TICA | | 1.21.0.2 | 1 | 1 |
| 70 | P10-Time | | 0 10-1 00 | 0 10 | sec | 0 | 7 27 6 2 | 2846h | a88ch |
| 10 | Period | | 0.10-1.00 | 0.10 | 300 | | 1.21.0.2 | 0.01 | 0.01 |

| Code | LCD Display | S | etting Range | | Unit Proper | Unit | Unit Property ^s | Unit Property ⁹⁷ | Unit Property ⁹⁷ | Unit Property | Property ⁹⁷ | Ref. | Commu addres | nication s/scale |
|------|-------------|---|---------------------|--|-------------|------|----------------------------|-----------------------------|-----------------------------|---------------|------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit | | | | | |
| | | 0 | Not Used | | | | | | | | | | | |
| | | 1 | IDLE | Initial ValueUnitProperty97Ref.Communadores address0-X-2847h | | | | | | | | | | |
| | | 2 | ILLEGAL FUNC | | | | | | | | | | | |
| | | 3 | ILLEGAL ADDR | | | | | | | | | | | |
| 71 | P10-Comm | 4 | ILLEGAL DATA | 0 | - | X | - | 2847h | a88eh | | | | | |
| | Diagnostic | 5 | WRITE PERMISSION | | | | | | | | | | | |
| | | 6 | UNDEF CONDITION | | | | | | | | | | | |
| | | 7 | DISCONNECT | | | | | | | | | | | |

13.19 USB Communication Group (USBC)

Г

| Code | LCD Display | | Setting Range | | Unit | Property ⁹⁸ | Ref. | Commu addres | nication s/scale |
|------|---------------|---|---------------|-------|------|------------------------|--------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 30 | - | 0 | 4.3.3 | 2a00h | aa00h |
| 05 | Response | | 0.1000 | F | | 0 | 10 2 2 | 2a05h | aa0ah |
| 05 | Delay | | 0-1000 | 5 | msec | 0 | 10.2.2 | 1 | 1 |
| 06 | Modbus Addr | 0 | No | 1 | _ | ~ | 10 2 2 | 2206h | aa0ch |
| 00 | Mode | 1 | Yes | I | _ | | 10.2.2 | 240011 | aaucii |
| 11 | Para Status-1 | | 0000-FFFF | 0004 | Hey | ~ | 10 3 5 | 2a0bh | aa16h |
| | | | 0000-1111 | 000/1 | | | 10.0.0 | 1 | 1 |
| 12 | Para Status-2 | | 0000-FFFF | 000F | Hex | \wedge | 10 3 5 | 2a0ch | aa18h |
| | | | 00001111 | OOOL | | | 10.0.0 | 1 | 1 |
| 13 | Para Status-3 | | 0000-FFFF | 000F | Hex | \wedge | 10.3.5 | 2a0dh | aa1ah |
| 10 | | | 0000-1111 | 0001 | | | 10.0.0 | 1 | 1 |
| 14 | Para Status-4 | | 0000-FFFF | 0000 | Hey | ~ | 10 3 5 | 2a0eh | aa1ch |
| | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 15 | Para Status-5 | | 0000-FFFF | 0000 | Hey | ~ | 10 3 5 | 2a0fh | aa1eh |
| 10 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 16 | Para Status-6 | | 0000-EEEE | 0000 | Ηργ | ~ | 1035 | 2a10h | aa20h |
| 10 | | | 0000-1111 | 0000 | TICA | | 10.0.0 | 1 | 1 |
| 17 | Para Status-7 | | 0000-EEEE | 0000 | Ηργ | ~ | 10 3 5 | 2a11h | aa22h |
| | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 18 | Para Status-8 | | 0000-EEEE | 0000 | Ηργ | ~ | 10 3 5 | 2a12h | aa24h |
| 10 | | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 10 | Para Status-0 | | 0000-EEEE | 0000 | Ηργ | ~ | 10 3 5 | 2a13h | aa26h |
| 19 | | | 0000-1111 | 0000 | TIEX | | 10.5.5 | 1 | 1 |
| 20 | Para | | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a14h | aa28h |
| 20 | Status-10 | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 21 | Para | | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a15h | aa2ah |
| 21 | Status-11 | | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |

 $^{98}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

LSELECTRIC 629

| Code | LCD Display | Setting Range | | Unit | Property ⁹⁸ | Ref. | Commu addres | nication s/scale |
|------|-------------|---------------|-------|-------|------------------------|--------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 00 | Para | | 0000 | | | 40 0 F | 2a16h | aa2ch |
| 22 | Status-12 | 0000-FFFF | 0000 | Hex | | 10.3.5 | 1 | 1 |
| 22 | Para | | 0000 | Hoy | _ | 10.2.5 | 2a17h | aa2eh |
| 23 | Status-13 | 0000-FFFF | 0000 | пех | | 10.3.3 | 1 | 1 |
| 24 | Para | | 0000 | Hov | | 10 3 5 | 2a18h | aa30h |
| 27 | Status-14 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 25 | Para | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a19h | aa32h |
| | Status-15 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 26 | Para | 0000-FFFF | 0000 | Hex | | 10 3 5 | 2a1ah | aa34h |
| 20 | Status-16 | | 0000 | ПОХ | | 10.0.0 | 1 | 1 |
| 31 | Para | 0000-FFFF | 0005 | Hex | | 10 3 5 | 2a1fh | aa3eh |
| | Control-1 | | | | | 10.0.0 | 1 | 1 |
| 32 | Para | 0000-FFFF | 0006 | Hex | | 10.3.5 | 2a20h | aa40h |
| -02 | Control-2 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 33 | Para | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a21h | aa42h |
| | Control-3 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 34 | Para | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a22h | aa44h |
| | Control-4 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 35 | Para | | 0000 | Hev | | 10 3 5 | 2a23h | aa46h |
| | Control-5 | 0000-1111 | 0000 | | | 10.0.0 | 1 | 1 |
| 36 | Para | | 0000 | Hev | | 10 3 5 | 2a24h | aa48h |
| - 50 | Control-6 | 0000-1111 | 0000 | TIEX | | 10.5.5 | 1 | 1 |
| 37 | Para | | 0000 | Hov | | 10 3 5 | 2a25h | aa4ah |
| 57 | Control-7 | 0000-1111 | 0000 | TIEX | | 10.5.5 | 1 | 1 |
| 38 | Para | | 0000 | Hev | | 10 3 5 | 2a26h | aa4ch |
| - 50 | Control-8 | | 0000 | | | 10.0.0 | 1 | 1 |
| 39 | Para | 0000-FFFF | 0000 | Hey | | 10 3 5 | 2a27h | aa4eh |
| | Control-9 | 0000-1111 | 0000 | I ICA | | 10.0.0 | 1 | 1 |
| 40 | Para | | 0000 | Hev | | 10 3 5 | 2a28h | aa50h |
| 40 | Control-10 | | 0000 | | | 10.5.5 | 1 | 1 |

| Code | LCD Display | S | Setting Range | | Unit | Property ⁹⁸ | Ref. | Commu addres | nication s/scale |
|------|--------------|---|---------------|-------|------|------------------------|--------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 4.4 | Para | | | 0000 | | _ | 40.05 | 2a29h | aa52h |
| 41 | Control-11 | | 0000-FFFF | 0000 | нех | \square | 10.3.5 | 1 | 1 |
| 40 | Para | | | 0000 | | | 10 2 E | 2a2ah | aa54h |
| 42 | Control-12 | | 0000-FFFF | 0000 | пех | | 10.3.5 | 1 | 1 |
| 13 | Para | | | 0000 | Hov | | 10 3 5 | 2a2bh | aa56h |
| 40 | Control-13 | | 0000-1111 | 0000 | TIEX | | 10.5.5 | 1 | 1 |
| ΔΔ | Para | | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a2ch | aa58h |
| | Control-14 | | | 0000 | | | 10.0.0 | 1 | 1 |
| 45 | Para | | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a2dh | aa5ah |
| | Control-15 | | 0000-1111 | 0000 | TICA | | 10.0.0 | 1 | 1 |
| 46 | Para | | 0000-EEEE | 0000 | Hey | | 10 3 5 | 2a2eh | aa5ch |
| | Control-16 | | | 0000 | | | 10.0.0 | 1 | 1 |
| 50 | S.Scope | 0 | No | 0 | | 0 | _ | 2a32h | aa64h |
| 00 | Enable | 1 | Yes | 0 | | | _ | 200211 | |
| 51 | S.Scope | | 1-1000 | 5 | _ | 0 | _ | 2a33h | aa66h |
| | SamplingT | | 1 1000 | 0 | | | | 1 | 1 |
| 52 | S.Scope Para | | 1-8 | 4 | _ | 0 | _ | 2a34h | aa68h |
| -02 | Count | | | | | | | 1 | 1 |
| 53 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | - | 2a35h | aa6ah |
| | ParaAddr 1 | | | | | | | 1 | 1 |
| 54 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | - | 2a36h | aa6ch |
| | ParaAddr 2 | | | | | | | 1 | 1 |
| 55 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | - | 2a37h | aa6eh |
| | ParaAddr 3 | | | | | | | 1 | 1 |
| 56 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | - | 2a38h | aa70h |
| | ParaAddr 4 | | | | | | | 1 | 1 |
| 57 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | - | 2a39h | aa72h |
| | ParaAddr 5 | | | | | | | 1 | 1 |
| 58 | S.Scope | | 0000-FFFF | 0000 | Hex | 0 | _ | 2a3ah | aa74h |
| 00 | ParaAddr 6 | | | | | | | 1 | 1 |

| Code | LCD Display | S | etting Range | | al Je Unit Property ⁹⁸ | | Ref. | Commu addres | nication s/scale |
|----------|-------------|---|--------------|-------|--------------------------------------|-----|------|--|---------------------|
| | | | | value | | | | Commu address 16-Bit 2a3bh 1 2a3ch 1 2a62h 1 | 32-Bit |
| 50 | S.Scope | | | 0000 | Llov | | | 2a3bh | aa76h |
| 59 | ParaAddr 7 | | 0000-FFFF | 0000 | пех | 0 | - | 1 | 1 |
| <u> </u> | S.Scope | | | 0000 | | | | 2a3ch | aa78h |
| 60 | ParaAddr 8 | | 0000-FFFF | 0000 | Hex | 0 | - | 1 | 1 |
| 00 | | | | | | V | | 2a62h | aac4h |
| 98 | Error Count | | - | - | - | | - | 1 | 1 |
| 00 | Error Count | 0 | No | 0 | | | | 0-00 | 01- |
| 99 | Reset | 1 | Yes | U | - | · 0 | - | 2a63h | aacon |

13.20 Virtual Terminal Block Group (VIRT)

Г

| Code | LCD Displ <u>ay</u> | Setting Range | | Initial | Uni <u>t</u> | Property ⁹⁹ | Ref | Commu addres | nication s/scale |
|------|-----------------------|---------------|-----------------|---------|--------------|------------------------|--------|------------------------------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 2c00h | ac00h |
| | | 0 | NONE | | | | | | |
| | | 1 | FX | | | | | | |
| | | 2 | RX | | | | | | |
| | | 3 | RST | | | | | | |
| | | 4 | BX | | | | | | |
| | | 5 | External Trip-1 | - | | | | | |
| | | 6 | External Trip-2 | | | | | | |
| | | 7 | External Trip-3 | | | | | | |
| | | 8 | External Trip-4 | | | | | | |
| | | 9 | JOG | 0 | | | | | ac04h |
| | | 10 | SPEED_L | | | | | | |
| 01 | Virtual DI01Define | 11 | SPEED_M | | - | | 10.3.3 | 2c02h | |
| | BiorBonnio | 12 | SPEED_H | | | | | | |
| | | 13 | SPEED_X | | | | | | |
| | | 14 | XCEL_L | | | | | | |
| | | 15 | XCEL_M | | | | | | |
| | | 16 | XCEL_H | | | | | | |
| | | 17 | XCEL Stop | | | | | | |
| | | 18 | RUN Enable | | | | | 2c02h | |
| | | 19 | 3-Wire | | | | | | |
| | | 20 | 2nd Source | | | | | 2c02h | |
| | | 21 | Exchange | | | | | Commu addres 16-Bit 2c00h | |
| | | 22 | Up | | | | | | |

 $^{99}\,$ O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

LSELECTRIC 633

| Code | LCD Display | Setting Range | | | Unit | Property ⁹⁹ | Ref. | Communication address/scale | | | | | | |
|------|-------------|---------------|-----------------------|-------|------|------------------------|--------|-----------------------------|--------|--|--|--|--|--|
| | | | | value | | | | 16-Bit | 32-Bit | | | | | |
| | | 23 | Down | | | | | | | | | | | |
| | | 24 | Up/Down Clear | | | | | | | | | | | |
| | | 25 | Up/Down Save | | | | | | | | | | | |
| | | 26 | Cmd Frequency Hold | - | | | | Commu addres 16-Bit | | | | | | |
| | | 27 | 2nd Motor | | | | | | | | | | | |
| | | 28 | Dc Injection | | | | | | | | | | | |
| | | 29 | Spd/Trq Change | | | | | | | | | | | |
| | | 30 | Reserved | | | | | | | | | | | |
| | | 31 | Reserved | | | | | | | | | | | |
| | | 32 | Timer Input | | | | | | | | | | | |
| | | 33 | Reserved | | | | | | | | | | | |
| | | 34 | Disable Aux Ref | | | | | | | | | | | |
| 01 | Virtual | 35 | Forward JOG | 0 | _ | | 10.3.3 | 2c02h | ac04h | | | | | |
| • | DI01Define | 36 | Reverse JOG | · | | | | | | | | | | |
| | | 37 | PPID Run Enable | | | | | | | | | | | |
| | | 38 | PPID Open Loop | | | | | | | | | | | |
| | | 39 | PPID Ref Change | | | | | | | | | | | |
| | | 40 | PPID Gain Change | | | | | | | | | | | |
| | | 41 | PPID I-Term Clear | | | | | | | | | | | |
| | | 42 | PPID Output Hold | | | | | | | | | | | |
| | | 43 | PPID Sleep ON | | | | | | | | | | | |
| | | 44 | PPID Sleep Change | | | | | | | | | | | |
| | | 45 | PPID Step Ref-L | | | | | | | | | | | |
| | | 46 | PPID Step Ref-M | | Λ | N | 1 | |] | | | | | |
| | | 47 | PPID Step Ref-H | | | | | | | | | | | |

| Code | LCD Display | Setting Range | | Initial | Unit | Property ⁹⁹ | Ref. | Communication address/scale | |
|------|-----------------------|---|-----------------------|---------|------|------------------------|--|--------------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 48 | Fire Mode Fwd | | | | | | |
| | | 49 | Fire Mode Rev | | | | Communadoress 16-Bit 16-Bit 10.3.3 2c02h 10.3.3 2c02h 10.3.3 2c02h | | |
| | | splateSetting RangeInitial ValueUnitProperty 99Ref.Commutaddress48Fire Mode Fwd49Fire Mode Rev50Pre Heat51EPID1 Run52EPID2 Run53EPID2 Run54EPID2 I-Term Clear55Brake Monitor Sel56POS HW Home57POS POS Run | | | | | | | |
| | | 51 | EPID1 Run | | | | | | |
| | | 52 | EPID1 I-Term Clear | | | | | | |
| | | 53 | EPID2 Run | | | | | | |
| | | 54 | EPID2 I-Term Clear | | | | | | |
| | | 55 | Brake Monitor Sel | | | | | | |
| | | 56 | POS Home | | | | | | |
| | | 57 | POS POS Run Home | | | | | .3 2c02h | ac04h |
| 01 | Virtual DI01Define | 58 | POS HW Lmt L | 0 | - | \triangle | 10.3.3 | | |
| | Dio i Donnio | 59 | POS HW Lmt H | | | | 10.3.3 2c02h | | |
| | | 60 | POS Pattern-L | | | | | | |
| | | 61 | POS Pattern-M | | | | | | |
| | | 62 | POS Pattern-H | | | | | | |
| | | 63 | POS Pattern-X | | | | | | |
| | | 64 | POS Run | | | | | | |
| | | 65 | POS Run Pre-Posi | | | | | | |
| | | 66 | POS Run Relative | | | | | | |
| | | 67 | Modbus Master En | | | | | | |
| | | 68 | UserSeqCtrl OnOff | | | | | | |
| 02 | Virtual | 0 | Off | 0 | | v | 10 2 2 | 20026 | 2004b |
| 02 | DI1Status | 1 | On | U | - | | 10.3.3 | 200211 | ac0411 |
| 03 | Virtual DI1 | 0 | Off | 0 | | | 10 2 2 | 20026 | 2006h |
| 03 | Const | 1 | On | U | - | | 10.3.3 | 200311 | acuun |

| Code | LCD Display | Setting Range | Initial | Unit | Propertv ⁹⁹ | Ref. | Commu addres | nication s/scale |
|------|-----------------------|------------------------------|--|-----------------|------------------------|-------|-----------------|---------------------|
| | | | Value | | | | 16-Bit | 32-Bit |
| 4 | Virtual DI2 Define | | | | | | 2c04h | ac08h |
| 5 | Virtual DI2 Status | | | | | | 2c05h | ac0ah |
| 6 | Virtual DI2 Const | | | | | | 2c06h | ac0ch |
| 7 | Virtual DI3 Define | | | | | | 2c07h | ac0eh |
| 8 | Virtual DI3 Status | | | | | | 2c08h | ac10h |
| 9 | Virtual DI3 Const | | | | | | 2c09h | ac12h |
| 10 | Virtual DI4 Define | | | | | | 2c0ah | ac14h |
| 11 | Virtual DI4 Status | Same as Virtual DI and Vi | 1 Define, tual DI1 | Virtua Const | al DI1 Sta t | atus, | 2c0bh | ac16h |
| 12 | Virtual DI4 Const | | ne as Virtual DI1 Define, Virtual DI1 Status, and Virtual DI1 Const | 2c0ch | ac18h | | | |
| 13 | Virtual DI5 Define | | | | | | 2c0dh | ac1ah |
| 14 | Virtual DI5 Status | | | | | | 2c0eh | ac1ch |
| 15 | Virtual DI5 Const | | | | | | 2c0fh | ac1eh |
| 16 | Virtual DI6 Define | | | | | | 2c10h | ac20h |
| 17 | Virtual DI6 Status | | | | | | 2c11h | ac22h |
| 18 | Virtual DI6 Const | | | | | | 2c12h | ac24h |

| Code | LCD Display | Setting Range | Initial | Unit | Propertv ⁹⁹ | Ref. | Commu addres | nunication ess/scale | |
|------|------------------------|--------------------|-----------|--------|------------------------|-------|-----------------|-------------------------|--|
| | | | Value | | | | 16-Bit | 32-Bit | |
| 19 | Virtual DI7 Define | | | | | | 2c13h | ac26h | |
| 20 | Virtual DI7 Status | | | | | | 2c14h | ac28h | |
| 21 | Virtual DI7 Const | | | | | | 2c15h | ac2ah | |
| 22 | Virtual DI8 Define | | | | | | 2c16h | ac2ch | |
| 23 | Virtual DI8 Status | | | | | | 2c17h | ac2eh | |
| 24 | Virtual DI8 Const | | | | | | 2c18h | ac30h | |
| 25 | Virtual DI9 Define | | | | | | 2c19h | ac32h | |
| 26 | Virtual DI9 Status | Same as Virtual DI | 1 Define, | Virtua | al DI1 Sta | atus, | 2c1ah | ac34h | |
| 27 | Virtual DI9 Const | and Vi | rtual DI1 | Const | t | | 2c1bh | ac36h | |
| 28 | Virtual DI10 Define | | | | | | 2c1ch | ac38h | |
| 29 | Virtual DI10 Status | | | | | | 2c1dh | ac3ah | |
| 30 | Virtual DI10 Const | | | | | | 2c1eh | ac3ch | |
| 31 | Virtual DI11 Define | | | | | | | ac3eh | |
| 32 | Virtual DI11 Status | | | | | | 2c20h | ac40h | |
| 33 | Virtual DI11 Const | | | | | | 2c21h | ac42h | |
| 34 | Virtual DI12 Define | | | | | | 2c22h | ac44h | |

Table of Functions

| Code | LCD Display | Setting Range | Initial | Unit | Property ⁹⁹ | Ref. | Commu addres | nication s/scale |
|------|------------------------|--------------------|---|-------|------------------------|------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 35 | Virtual DI12 Status | | | | | | 2c23h | ac46h |
| 36 | Virtual DI12 Const | | | | | | 2c24 | ac48h |
| 37 | Virtual DI13 Define | | | | | | 2c25h | ac4ah |
| 38 | Virtual DI13 Status | | | | | | 2c26h | ac4ch |
| 39 | Virtual DI13 Const | | | | | | 2c27h | ac4eh |
| 40 | Virtual DI14 Define | | | | | | 2c28h | ac50h |
| 41 | Virtual DI14 Status | Same as Virtual DI | Same as Virtual DI1 Define, Virtual DI1 Status, | | | | | ac52h |
| 42 | Virtual DI14 Const | and Vi | rtual DI1 | Const | t | | 2c2ah | ac54h |
| 43 | Virtual DI15 Define | | | | | | 2c2bh | ac56h |
| 44 | Virtual DI15 Status | | | | | | 2c2ch | ac58h |
| 45 | Virtual DI15 Const | | | | | | 2c2dh | ac5ah |
| 46 | Virtual DI16 Define | | | | | | 2c2eh | ac5ch |
| 47 | Virtual DI16 Status | | | | | | 2c2fh | ac5eh |
| 48 | Virtual DI16 Const | | | | | | 2c30h | ac60h |

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| Code | LCD Display | | Setting Range | Initial Value | Unit | Property ⁹⁹ | Ref. | Communic Ref. address/s | |
|------|-----------------------|----|-----------------------|------------------|------|------------------------|--------|----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | None | | | | | | |
| | | 1 | FDT-1 | | | | | | |
| | | 2 | FDT-2 | | | | | | |
| | | 3 | FDT-3 | | | | | | |
| | | 4 | FDT-4 | | | | | | |
| | | 5 | Over Load Warn | | | | | | |
| | | 6 | Drv Over Load Warn | | | | | | |
| | | 7 | Under Load Warn | | | | | | |
| | | 8 | MainFan Warn | | | | | | |
| | | 9 | Stall | | | | | | |
| | | 10 | Over Voltage Trip | | | | | | |
| | | 11 | Low Voltage | | | | | | |
| 50 | Virtual DO1 Define | 12 | Drv Over Heat Trip | 0 | - | 0 | 10.3.4 | 2c32h | ac64h |
| | | 13 | Lost Int Comm Warn | | | | | | |
| | | 14 | Run | | | | | | |
| | | 15 | Stop | | | | | | |
| | | 16 | Steady | | | | | | |
| | | 17 | Drive Output Line | | | | | | |
| | | 18 | Supply Power Line | | | | | | |
| | | 19 | Speed Search | | | | | | |
| | | 20 | Ready | | | | | | |
| | | 21 | Zero speed Detect | | | | | | |
| | | 22 | Torque Detect | | | | | | |
| | | 23 | Timer Output | | | | | | |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ⁹⁹ | Ref. | Commu addres | nication s/scale |
|------|-----------------------|----|-----------------------|---------|------|------------------------|--------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 24 | Trip | | | | | | |
| | | 25 | Lost Keypad Warn | | | | | | |
| | | 26 | DB Warn %ED | | | | | | |
| | | 27 | Encoder Tune Warn | | | | | | |
| | | 28 | Encoder Dir Warn | | | | | | |
| | | 29 | On/Off Control | | | | | | |
| | | 30 | Brake Control | | | | | | |
| | | 31 | Run with Zero Spd | | | | | | |
| | | 32 | STO Monitor | | | | | | |
| | | 33 | Rst Restart F Trip | | | | | | |
| | | 34 | Lost USB Warn | | | | | | |
| | | 35 | KEB Operating | | | | | | |
| 50 | Virtual DO1 Define | 36 | Lost Al-1 Warn | 0 | - | 0 | 10.3.4 | 2c32h | ac64h |
| | | 37 | Lost Al-2 Warn | | | | | | |
| | | 38 | Lost Al-3 Warn | | | | | | |
| | | 39 | E24V Monitor | | | | | | |
| | | 40 | Main Cap Repl Warn | | | | | | |
| | | 41 | MainFan Repl Warn | | | | | | |
| | | 42 | AuxFan Repl Warn | | | | | | |
| | | 43 | MainCap Diag Alarm | | | | | | |
| | | 44 | Pos Tar Bound Err | | | | | | |
| | | 45 | Pos Max Track Err | | | | | | |
| | | 46 | OCS Run | | | | | | |

| Code | LCD Display | Setting Range | | Initial Value Unit Pi | | Property ⁹⁹ | Ref. | Communication address/scale | |
|------|-----------------------|---------------|-----------|--------------------------|-------|------------------------|--------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 50 | Virtual DO1 | 47 | FWD Run | 0 | _ | 0 | 10 3 / | 2c32h | ac6/h |
| - 50 | Define | 48 | REV Run | 0 | | | 10.0.4 | 200211 | 00411 |
| 51 | Virtual DO1 | 0 | Off | 0 | _ | x | 10 3 / | 2c33h | ac66h |
| 51 | Status | 1 | On | 0 | _ | 200011 | accon | | |
| 52 | Virtual DO2 Define | | | 2c34h | ac68h | | | | |
| 53 | Virtual DO2 Status | | | 2c35h | ac6ah | | | | |
| 54 | Virtual DO3 Define | | Same as V | 2c36h | ac6ch | | | | |
| 55 | Virtual DO3 Status | | and Virt | 2c37h | ac6eh | | | | |
| 56 | Virtual DO4 Define | | | | | | | 2c38h | ac70h |
| 57 | Virtual DO4 Status | | | | | | | 2c39h | ac72h |
| F 0 | Virtual DO1 | 0 | Off | 0 | | | 10.2.4 | Jalah | 0074h |
| 90 | Const | 1 | On | 0 | - | 0 | 10.3.4 | ZCSan | ac740 |
| 50 | Virtual DO2 | 0 | Off | 0 | | 0 | 10.2.4 | Joshh | 0076h |
| - 59 | Const | 1 | On | 0 | - | 0 | 10.3.4 | 20301 | acron |
| 60 | Virtual DO3 | 0 | Off | 0 | | 0 | 1034 | 2c3ch | 2078h |
| 60 | Const | 1 | On | 0 | - | 0 | 10.3.4 | 203011 | acron |
| 61 | Virtual DO4 | 0 | Off | 0 | | | 1034 | 203db | ac7ab |
| 61 | Const | 1 | On | U | - | | 10.3.4 | ZUSUN | auran |

Table of Functions

13.21 Encoder Group (ENC)

This group is only activated when the encoder card (optional) is installed.

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | | Setting Range | RangeInitial ValueUnitProperty 100933-O933-O500.000.00HzX50000 0^{101} rpmX50000 0^{101} rpmX 30000 1^{101} rpmX $\frac{No}{7es}$ 1-X $\frac{+B)}{3+B}$ 0 - \triangle 96 1024 - \triangle 9003msecO | Ref. | Communication address/scale | | | |
|----------------|------------------------|---------------|--------------------|--|------|-----------------------------|-------|--------|-----------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 2d00h | ad00h |
| 02 | Enc | 600 00 600 00 | | 0.00 | | v | 2.2 | 2d02h | ad04h |
| 02 | Monitor[Hz] | | -000.00-000.00 | 0.00 | п | ^ | 3.3 | 0.01 | 0.01 |
| 03 | Enc | | 60000 60000 | O 101 | rom | v | 33 | 2d03h | ad06h |
| 03 | Monitor[rpm] | | -00000-00000 | 0.01 | трп | ^ | 3.3 | 1 | 1 |
| 10 | Auto Flying | 0 | No | 1 | | 2.2 | 2d0ab | od14b | |
| | Start | 1 | Yes | I | - | ^ | 3.3 | Zuuan | au 1411 |
| 44 | Enc Output | 0 | (A+B) | 0 | | | 0.0 | 04066 | a d 4 C h |
| 11 | Phase | 1 | - (A + B) | 0 | - | | 3.3 | Zaubn | ad 160 |
| 10 | Resolution/ | 10,4006 | 1004 | | ~ | <u>.</u> | 2d0ch | ad18h | |
| 12 | Pulse | | 10-4096 | 1024 | - | | 3.3 | 1 | 1 |
| 12 | Engl DE Cain | | 0 10000 | 2 | maaa | | 2.2 | 2d0dh | ad1ah |
| 13 | | | 0-10000 | 5 | msec | 0 | 3.3 | 1 | 1 |
| 16 102 | Wire Check | 0 | No | 0 | | | 2.2 | 2d10h | ad20h |
| 10 102 | Trip En | 1 | Yes | 0 | - | 0 | 3.3 | 201011 | auzon |
| 1 7 102 | 102 Wire Check Time | | 0.1.10.0 | 10 | | | 0.0 | 2d11h | ad22h |
| 17 102 | | | 0.1-10.0 | 1.0 | sec | 0 | 3.3 | 0.1 | 0.1 |
| 10 | Lo Enc Pulse | | 500 5000 | 1000 | | | 2.2 | 2d12h | ad24h |
| 18 | Chk Time | | 500-5000 1000 msec | | | 3.3 | 1 | 1 | |

¹⁰⁰ O: Writable during operation, \triangle : Writable when stopped, X: Not writable ¹⁰¹ The rpm value varies according to the motor rating pole number (MOT1, 2-25). ¹⁰² Only activated when a line driver encoder card is installed.

13.22 External PID 1 Group (EPI1)

This group is only activated when the APP-02 (ExternalPID Enable) value is 1 (Yes). The values below have the following meanings:

• Unit Max: Unit at 100% (EPI1-93)

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- Unit Min: 2 * Unit at 0% (EPI1-92) Unit at 100% (EPI1-93)
- PID Unit: Unit Select (EPI1-90)

| Code | LCD Display | Setting Range | | Initial | Unit | Property ¹⁰³ | Ref. | Communication address/scale | |
|------|-----------------|---------------------|--------------------|---------|------|-------------------------|-------|---|-------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 1 | - | 0 | 4.3.3 | 2e00h | ae00h |
| | | 0 | Idle | | | | | | |
| | | 1 | Pre-PID | | | | | | |
| 01 | Control State | 2 | RUN | 0 | - | Х | 7.8 | 2e01h | ae02h |
| | | 3 | Sleep Boost | | | | | | |
| | | 4 | Sleep | | | | | | |
| 02 |)2 Output Value | | 100 00 100 00 | | 0/ | v | 70 | 2e02h | ae04h |
| 02 | | | 100.00-100.00 | - | 70 | ^ | 7.0 | 0.01 | 0.01 |
| | Poforonco | | | | חום | | | 2e02h ae04 0.01 0.01 2e03h ae06 PID PID Unit Unit | ae06h |
| 03 | Value | Unit Min - Unit Max | | - | Unit | Х | 7.8 | PID Unit | PID Unit |
| | Foodbook | | | | | | | 2e04h | ae08h |
| 04 | Value | Unit Min - Unit Max | | - | Unit | Х | 7.8 | PID Unit | PID Unit |
| | | | | | חום | | | 2e05h | ae0ah |
| 05 | Error Value | Ur | nit Min - Unit Max | - | Unit | Х | 7.8 | PID Unit | PID Unit |
| | | 0 | None | | | | | | |
| 06 | 1 | 1 | Always Enable | 0 | | | 7.0 | 0-006 | a a O a b |
| | wode | 2 | Run In Drv Run | | - | 0 | 7.8 | Zeuon | ae0ch |
| | | 3 DI Dependent | | | | | | | |

 103 O: Writable during operation, \bigtriangleup : Writable when stopped, X: Not writable

LSELECTRIC 643

| Code | Code LCD Display | | Setting Range Initial Ur | | Unit | Proper <u>ty¹⁰³</u> | Ref. | Communication address/scale | |
|------|---|------------------|--------------------------|-------|--|--------------------------------|------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| | | 5 | Up Down Drive | | | | | | |
| 10 | Reference Source | 6 | Internal Comm. | 0 | - | 0 | 7.8 | 2e0ah | ae14h |
| | eedree | 7 | USB Comm. | | | | | | |
| | | 8 | Option Comm. | | | | | | |
| | | 9 | UserSequence | | | | | | |
| | | 10 | X-Analog Input 1 | | | | | | |
| | Image: series Settine 0 1 1 Ana 2 Ana 2 Ana 3 Ana 3 Ana 4 Propertional 7 US 8 Option 10 X-Ana 11 X-Ana 12 X-Ana 11 X-Ana 12 X-Ana 11 X-Ana 12 X-Ana 13 Propertional 14 Inter 15 US 16 Inter 17 VS 18 Propertional 10 X-Ana 10 X-Ana 10 X-Ana 10 X-Ana 10 X-Ana 11 X-Ana 11 X-Ana 11 X-Ana 11 X-Ana 11 X-Ana < | X-Analog Input 2 | | | | | | | |
| | | 12 | X-Analog Input 3 | | | | | | |
| 11 | Ref Keypad | - Unit at 100% - | | 0 | PID | 0 | 78 | 2e0bh | ae16h |
| | Set | | Unit at 100% | 0 | Unit | | 7.0 | Unit | Unit |
| | | 0 | Analog Input 1 | | | | | | |
| | | 1 | Analog Input 2 | | | | | | |
| | | 2 | Analog Input 3 | | | | | | |
| | | 3 | Pulse Input | | | | | | |
| | | 4 | Internal Comm. | | | | | | |
| 25 | Feedback | 5 | USB Comm. | 0 | | | 70 | 2010h | 0020h |
| 20 | Source | 6 | Option Comm. | 0 | - | | 1.0 | 201911 | aeszn |
| | | 7 | UserSequence | | | | | | |
| | | 8 | Ext PID-1 Output | | | | | | |
| | | 9 | X-Analog Input 1 | | | | | | |
| | | 10 | X-Analog Input 2 | | $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | |
| | | 11 | X-Analog Input 3 | | | | | | |
| 35 | Proportional | 0.0-1000.0 | | 50.0 | 0/_ | 0 | 7 8 | 2e23h | ae46h |
| 55 | 35 Gain | | 0.0-1000.0 | 50.0 | % | 0 | 1.0 | 0.1 | 0.1 |

| Code | LCD Display | Setting Range | | Unit | t Property ¹⁰³ | Property ¹⁰³ | Ref. | Communication address/scale | |
|------|----------------|--------------------|--------|------|---------------------------|-------------------------|--------|-----------------------------|--|
| | | | value | | | | 16-Bit | 32-Bit | |
| 26 | Into gral Time | 0.0.200.0 | 10.0 | | | 7.0 | 2e24h | ae48h | |
| 30 | integral time | 0.0-200.0 | 10.0 | sec | 0 | 1.0 | 0.1 | 0.1 | |
| 27 | Derivative | 0 4000 | 0 | | 0 | 7.0 | 2e25h | ae4ah | |
| 37 | Time | 0-1000 | 0 | msec | 0 | 7.8 | 1 | 1 | |
| 20 | | 0 1000 0 | | 7.0 | 2e26h | ae4ch | | | |
| 30 | Gain | 0-1000.0 | 0.0 | 70 | | 1.0 | 0.1 | 0.1 | |
| 40 | Output Limit | -100.00 - | 0.00 | 0/ | | 7.0 | 2e2eh | ae5ch | |
| 40 | Low | Output Limit High | 0.00 | % | 0 | 7.8 | 0.01 | 0.01 | |
| 47 | Output Limit | Output Limit Low - | 100.00 | 0/ | | 7.0 | 2e2fh | ae5eh | |
| 47 | 47 High | 100.00 | 100.00 | % | 0 | 7.8 | 0.01 | 0.01 | |
| 40 | Output LPF | 0 10000 | 0 | | | 7.0 | 2e31h | ae62h | |
| 49 | Gain | 0-10000 | U | msec | 0 | 0. <i>\</i> | 1 | 1 | |

| Code | LCD Display | | Setting Range | | Unit | Property ¹⁰³ R | Ref. | Communication address/scale | |
|------|-------------|----|---------------|-------|------|---------------------------|------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | CUST | | | | | | |
| | | 1 | % | | | | | | |
| | | 2 | PSI | | | | | | |
| | | 3 | °F | | | | | | |
| | | 4 | °C | | | | | | |
| | | 5 | inWC | | | | | | |
| | | 6 | inM | | | | | | |
| | | 7 | Bar | | | | | | |
| | | 8 | mBar | | | | | | |
| | | 9 | Pa | | | | | | |
| | | 10 | kPa | | | | | | |
| | | 11 | Hz | | | | | | |
| | | 12 | rpm | | | | | | |
| 90 | Unit Select | 13 | V | 1 | - | 0 | 7.8 | 2e5ah | aeb4h |
| | | 14 | А | | | | | | |
| | | 15 | kW | | | | | | |
| | | 16 | HP | | | | | | |
| | | 17 | mpm | | | | | | |
| | | 18 | Ft | | | | | | |
| | | 19 | m/s | | | | | | |
| | | 20 | m³/s | | | | | | |
| | | 21 | m³/m | | | | | | |
| | | 22 | m³/h | | | | | | |
| | | 23 | l/s | | | | | | |
| | | 24 | l/m | | | | | | |
| | | 25 | l/h | | | | | | |
| | | 26 | kg/s | | | | | | |

| Code | Code LCD Display | | Setting Range | | Unit | Property ¹⁰³ | Ref. | Communication address/scale | |
|------|------------------|-----|-------------------|--------|-------------|-------------------------|------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 27 | kg/m | | | | | | |
| | | 28 | kg/h | | | | | | |
| | | 29 | gl/s | | | | | | |
| | | 30 | gl/m | | | | | | |
| | | 31 | gl/h | | | | | | |
| | | 32 | ft/s | | | | | | |
| 00 | Linit Soloot | 33 | f³/s | 1 | | | 70 | 2oEob | aah/h |
| 90 | Unit Select | 34 | f³/m | | - | 0 | 1.0 | Zeban | aep4n |
| | | 35 | f³/h | | | | | | |
| | | 36 | lb/s | | | | | | |
| | | 37 | lb/m | | | | | | |
| | | 38 | lb/h | | | | | | |
| | | 39 | ppm | | | | | | |
| | | 40 | pps | - | | | | | |
| | | 0 | X100 | | | | | | |
| | | 1 | X10 | | | | | | |
| 91 | Unit Scale | 2 | X1 | 2 | - | 0 | 7.8 | 2e5bh | aeb6h |
| | | 3 | X0.1 | | | | | | |
| | | 4 | X0.01 | | | | | | |
| 92 | Unit at 0% | 0.0 | 00 - Unit at 100% | 0.00 | PID Unit | 0 | 7.8 | 2e5ch | aeb8h |
| 93 | Unit at 100% | U | nit at 0%-300.00 | 100.00 | PID Unit | 0 | 7.8 | 2e5dh | Aebah |

Table of Functions

13.23 External PID 2 Group (EPI2)

This group is only activated when the APP-02 (ExternalPID Enable) value is 1 (Yes). The values below have the following meanings:

٦

- Unit Max: Unit at 100% (EPI2-93)
- Unit Min: 2 x Unit at 0% (EPI2-92) Unit at 100% (EPI2-93)
- PID Unit: Unit Select (EPI2-90)

| Code | LCD Display | Setting Range | | | Unit | Property ¹⁰⁴ | ¹ Ref. | Communication address/scale | |
|------|-------------------|---------------------|--------------------|-------|-------------|-------------------------|-------------------|---|-------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | | 1-99 | 60 | - | 0 | 4.3.3 | 2f00 | af00 |
| | | 0 | Idle | | | | | | |
| | | 1 | Pre-PID | | | | | | |
| 01 | Control State | 2 | RUN | 0 | - | X | 7.8 | 2f01 | af02 |
| | | 3 | Sleep Boost | | | | | | |
| | | 4 | Sleep | | | | | | |
| 02 | Output Value | | 100 00 100 00 | | 0/ | v | 70 | 2f02 | af04 |
| 02 | Output value | -100.00-100.00 | | - | 70 | ^ | 1.0 | | |
| | Poforonco | | | | חום | | | 2f02 af04 2f03 af06 PID PID Unit Unit 2f04 af08 | af06 |
| 03 | Value | Unit Min - Unit Max | | - | Unit | Х | 7.8 | PID Unit | PID Unit |
| | Faadhaal i | | | | | х | 7.8 | 2f04 | af08 |
| 04 | Value | Unit Min - Unit Max | | - | PID Unit | | | PID Unit | PID Unit |
| | | | | | חום | | | 2f05 | af0a |
| 05 | Error Value | Ur | nit Min - Unit Max | - | Unit | Х | 7.8 | PID Unit | PID Unit |
| | | 0 | None | | | | | | |
| 06 | Mada | 1 2 | Always Enable | 0 | | | 70 | 2506 | ofOo |
| | Mode | | Run In Drv Run | | - | 0 | 7.8 | 2100 | aluc |
| | | 3 | DI Dependent | | | | | | |

¹⁰⁴ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

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| Code | LCD Display | Setting Range | | Initial Value Uni | Unit | nit Property ¹⁰⁴ | Ref. | Communication address/scale | |
|------|---------------------|---------------|------------------|----------------------|------|-----------------------------|------|-----------------------------|-------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| | 5 (| 5 | Up Down Drive | | | | | | |
| 10 | Reference Source | 6 | Internal Comm. | 0 | - | 0 | 7.8 | 2f0a | af14 |
| | | 7 | USB Comm. | | | | | | |
| | | 8 | Option Comm. | | | | | | |
| | | 9 | UserSequence | | | | | | |
| | | 10 | X-Analog Input 1 | | | | | | |
| | | 11 | X-Analog Input 2 | | | | | | |
| | | 12 | X-Analog Input 3 | | | | | | |
| | Ref Kevnad | _ | . Unit at 100% - | | PID | | | 2f0b | af16 |
| 11 | Set | | Unit at 100% | 0 | Unit | 0 | 7.8 | PID Unit | PID Unit |
| | | 0 | Analog Input 1 | | | | | | |
| | | 1 | Analog Input 2 | | | | | | |
| | | 2 | Analog Input 3 | | | | | | |
| | | 3 | Pulse Input | | | | | | |
| | | 4 | Internal Comm. | | | | | | |
| 25 | Feedback | 5 | USB Comm. | 0 | _ | 0 | 78 | 2f10 | af ³ 2 |
| 25 | Source | 6 | Option Comm. | 0 | - | | 1.0 | 2113 | |
| | | 7 | UserSequence | | | | | | |
| | | 8 | Ext PID-1 Output | | | | | | |
| | | 9 | X-Analog Input 1 | | | | | | |
| | | 10 | X-Analog Input 2 | | | | | | |
| | | 11 | X-Analog Input 3 | | | | | | |
| 35 | Proportional | | 0 0-1000 0 | 50.0 | % | 0 | 78 | 2f23 | af46 |
| 35 | Gain1 | 0.0-1000.0 | | 50.0 | % | 0 | 7.8 | 0.1 | 0.1 |

Table of Functions

LSELECTRIC 649

| Code | LCD Display | Setting Range | Initial Value | Unit | Property ¹⁰⁴ | Ref. | Communication address/scale | |
|------|----------------------|--------------------------------|------------------|------|-------------------------|------|-----------------------------|--------|
| | | | | | | | 16-Bit | 32-Bit |
| 36 | Integral Time1 | 0.0-200.0 | 10.0 | sec | 0 | 7.8 | 2f24 | af48 |
| | | | | | | | 0.1 | 0.1 |
| 37 | Derivative Time1 | 0-1000 | 0 | msec | 0 | 7.8 | 2f25 | af4a |
| | | | | | | | 1 | 1 |
| 38 | FeedForward Gain | 0.0-1000.0 | 0.0 | % | 0 | 7.8 | 2f26 | af4c |
| | | | | | | | 0.1 | 0.1 |
| 46 | Output Limit Low | -100.00 - Output Limit High | 0.00 | % | 0 | 7.8 | 2f2f | af5c |
| | | | | | | | 0.01 | 0.01 |
| 47 | Output Limit High | Output Limit Low - 100.00 | 100.00 | % | 0 | 7.8 | 2f2f | af5e |
| | | | | | | | 0.01 | 0.01 |
| 49 | Output LPF Gain | 0-10000 | 0 | msec | 0 | 7.8 | 2f 31 | af62 |
| | | | | | | | 1 | 1 |
| Code | LCD Display | | Setting Range | | Unit | Property ¹⁰⁴ | Ref. | Commu addres | nication s/scale |
|------|-------------|----|---------------|-------|------|-------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | CUST | | | | | | |
| | | 1 | % | | | | | | |
| | | 2 | PSI | | | | | | 1 |
| | Unit Select | 3 | °F | | | | | | |
| | | 4 | °C | | | | | | |
| | | 5 | inWC | | | | | | |
| | | 6 | inM | | | | | | |
| | | 7 | Bar | | | | | | |
| | | 8 | mBar | | | | | | |
| | | 9 | Pa | | | | | | |
| 00 | | 10 | kPa | 1 | | | 7 0 | OfFo | ofb (|
| 90 | | 11 | Hz | | | 0 | 1.0 | 2158 | aib4 |
| | | 12 | rpm | | | | | | |
| | | 13 | V | | | | | | |
| | | 14 | А | | | | | | |
| | | 15 | kW | | | | | | |
| | | 16 | HP | | | | | | |
| | | 17 | mpm | | | | | | |
| | | 18 | ft | | | | | | |
| | | 19 | m/s | | | | | | |
| | - | 20 | m³/s | - | | | | | |
| | | 21 | m³/m | | | | | | |

| Code | LCD Display | | Setting Range | | Uni <u>t</u> | Property ¹⁰⁴ | Ref | Commu addres | nication s/scale |
|------|--------------|-----|-------------------|--------|--------------|-------------------------|-----|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 22 | m³/h | | | | | | |
| | | 23 | l/s | | | | | | |
| | | 24 | l/m | | | | | | |
| | | 25 | l/h | | | | | | |
| | | 26 | kg/s | | | | | 2f5ah | |
| | | 27 | kg/m | | | | 7.8 | | |
| | | 28 | kg/h | | | | | | |
| | | 29 | gl/s | | | | | | |
| | | 30 | gl/m | | | | | | afb4h |
| 90 | Unit Select | 31 | gl/h | 1 | - | 0 | | | |
| | | 32 | ft/s | | | | | | |
| | | 33 | f³/s | - | | | | | |
| | | 34 | f³/m | | | | | | |
| | | 35 | f³/h | | | | | | |
| | | 36 | lb/s | | | | | | |
| | | 37 | lb/m | | | | | | |
| | | 38 | lb/h | | | | | | |
| | | 39 | ppm | | | | | | |
| | | 40 | pps | | | | | | |
| | | 0 | X100 | | | | | | |
| | | 1 | X10 | | | | | | |
| 91 | Unit Scale | 2 | X1 | 2 | - | 0 | 7.8 | 2f5b | afb6 |
| | | 3 | X0.1 | | | | | | |
| | | 4 | X0.01 | | | | | | |
| 92 | Unit at 0% | 0.0 | 00 - Unit at 100% | 0.00 | PID Unit | 0 | 7.8 | 2f5c | afb8 |
| 93 | Unit at 100% | U | nit at 0%-300.00 | 100.00 | PID Unit | 0 | 7.8 | 2f5d | afba |

13.24 Position Control Group 1 (POS1)

Г

This group is only activated when the APP-44 (Pos Ctrl Enable) value is 1 (Yes).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | play Setting Range | Initial | Unit | Property ¹⁰⁵ | Ref. | Communication address/scale | | |
|----------|------------------|--------------------|---------------------|-------|-------------------------|------|-----------------------------|--------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 3000h | b000h |
| | | 0 | Stop | | | | | | |
| | | 1 | POS Run | | | | | | |
| | Pos Ctrl | 2 | POS Run Pre-Posi | | | | | 00041 | |
| 1 | State | 3 | POS Run Relative | - | - | X | 7.26 | 3001h | b002h |
| | | 4 | Trip | | | | | | |
| | | 5 | POS Run Home | | | | | | |
| | | 6 | POS Home | | | | | | |
| 2 | Pos Ctrl Mode | 0 | Pos Single | 0 | | | 7 26 | 20026 | 6001b |
| 2 | | 1 | Multi Sync Pos | 0 | - | | 7.20 | 300211 | 000411 |
| 3 | Tar Position | | | _ | | x | 7 26 | 3003h | b006h |
| 5 | | | - | - | 00 | ^ | 1.20 | 1 | 1 |
| Л | Cur Position | | _ | _ | | x | 7 26 | 3004h | b008h |
| - | | | _ | | 00 | ^ | 1.20 | 1 | 1 |
| 5 | Pre Position | | 0-65000 | 0 | | | 7 26 | 3005h | b00ah |
| <u> </u> | | | 0-03000 | 0 | 00 | | 1.20 | 1 | 1 |
| 6 | Error Value | | 0 65000 | | Dulo | v | 7 26 | 3006h | b00ch |
| 6 | Error Value | e 0-65000 - Puls X | X | 7.26 | 1 | 1 | | | |
| 7 | Reference | | | | | 7.00 | 3007h | b00eh | |
| 7 | Value | Value - Puls | s X | 7.26 | 1 | 1 | | | |

¹⁰⁵ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

LSELECTRIC 6

| Code | LCD Display | / Setting Range | | Initial Value | Unit Property ¹⁰⁵ | Property ¹⁰⁵ | Ref. | Commu addres | nication s/scale |
|------|-------------------|-----------------|---------------------|------------------|------------------------------|-------------------------|------|---|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Feedback | | | | Dula | V | 7.00 | Commu address 16-Bit 3008h 1 3009h 0.01 3000h 3000h 3000h 3000h 3000h 3000h 3000h 0.01 3000fh 0.1 3015h 0.1 3015h 0.1 | b010h |
| 8 | Value | | - | - | Puis | | 7.20 | 1 | 1 |
| 0 | Total Move | | 0.00.650.00 | | | v | 7 26 | 3009h | b012h |
| 9 | Time | | 0.00-030.00 | - | Sec | ^ | 7.20 | 0.01 | 0.01 |
| | | 0 | DI Dependent | | | | | | |
| | | 1 | Keypad | | | | | | b014b |
| 10 | Cmd Source | 2 | Internal Comm. | 0 | | _ | 7 26 | 300ab | |
| 10 | | 3 | USB Comm. | 0 | - | | 1.20 | JUUan | 001411 |
| | | 4 | Option Comm. | | | | | | |
| | | 5 | UserSequence | | | | | | |
| | Cmd Keypad Set | 0 | Stop | | | | | | |
| | | 1 | POS Run | | | | | | |
| 11 | | 2 | POS Run Pre-Posi | 0 | - 0 | 0 | 7.26 | 300bh | b016h |
| | | 3 | POS Run Relative | | | | | | |
| 10 | Multi Sync | | 0.00.650.00 | 0.00 | | v | 7 26 | 300ch | b018h |
| 12 | Time | | 0.00-050.00 | 0.00 | Sec | ^ | 7.20 | 0.01 | 0.01 |
| 15 | Stop Homing | 0 | No | 0 | | | 7 26 | 300fb | b01ob |
| 15 | Stop Homing | 1 | Yes | 0 | _ | | 7.20 | 50011 | |
| 20 | Proportional | | 0.0-1000.0 | 50.0 | 0/2 | 0 | 7 26 | 3014h | b028h |
| 20 | Gain | | 0.0-1000.0 | 50.0 | 70 | 0 | 7.20 | 0.1 | 0.1 |
| 21 | FeedForward | | 0.0-1000.0 | 100.0 | 0/2 | 0 | 7 26 | 3015h | b02ah |
| 21 | Gain | | 0.0-1000.0 | 100.0 | 70 | Ŭ | 1.20 | 0.1 | 0.1 |
| 22 | Output LPF | | 0-10000 | 0 | msec | 0 | 7 26 | 3016h | b02ch |
| | Gain | | 0-10000 | 0 | 111300 | | 7.20 | 1 | 1 |
| 30 | SW Limit | 0 | Trip | 0 | | 0 | 7 26 | 301eh | h03ch |
| | Prot Mode | 1 | Warning | 0 | - 0 | 1.20 | | | |
| 31 | SW Limit Hi | 0 | No | 0 | | | 7 26 | 301fb | hN3ah |
| 31 | Enable | 1 | Yes | | - | | 7.26 | | DODEII |

Γ

| Code | LCD Display | Setting Range | | | Unit | Property ¹⁰⁵ | Ref. | Commu addres | nication s/scale |
|---------------|---------------------|------------------------------|------------------------|--------|-------|-------------------------|------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 32 | SW Limit Lo | 0 | No | 0 | _ | 0 | 7 26 | 3020h | 6040b |
| 52 | Enable | 1 | Yes | 0 | | | 1.20 | 502011 | |
| 33 | Pos SW Limit | Po | os SW Limit Low - | 60000 | UC | 0 | 7 26 | 3021h | b042h |
| | High | | 65000 | | | | 1.20 | 1 | 1 |
| 34 | Pos SW Limit | 0-F | os SW Limit High | 5000 | UC | 0 | 7 26 | 3022h | b044h |
| | Low | 01 | | | | | 1.20 | 1 | 1 |
| 35 | HW Limit Prot | 0 | Trip | 0 | _ | 0 | 7 26 | 3023h | b046h |
| 00 | Mode | 1 | Warning | | | Ŭ | 1.20 | 002011 | |
| 36 | Max Track | | 0-65000 | 30000 | Dule | 0 | 7 26 | 3024h | b048h |
| 50 | Pulse | | 0-03000 | 30000 | 1 015 | 0 | 1.20 | 1 | 1 |
| 37 | Tar Bound | | 0 65000 | 200 | Dule | 0 | 7 26 | 3025h | b04ah |
| 57 | Pulse | | 0-03000 | 200 | Fuis | 0 | 7.20 | 1 | 1 |
| 40 | Error Stop Mode | 0 | CoastStop (FreeRun) | 0 | _ | | 7.26 | 3028h | b050h |
| | | 1 | Trip Dec Stop | | | | | | |
| | | 0 | Inverse + index | | | | | | |
| 50 | Homing Type | 1 | Inverse + No Index | 0 | _ | | 7.26 | 3032h | b064h |
| | | 2 | Index | | | | | | |
| | | 3 | No index | | | | | | |
| | Llaurin a Dir | 0 | FWD | 0 | | _ | 7.00 | 20226 | hocch |
| 51 | Homing Dir | 1 | REV | 0 | - | | 7.20 | 30330 | nooua |
| E 2 | Homing Frog | 0.0 | 0 Max Fraguanay | 2.00 | | _ | 7.06 | 3034h | b068h |
| 52 | Homing Freq | 0.0 | 0-INIAX Flequency | 2.00 | ΠΖ | | 7.20 | 0.01 | 0.01 |
| F2 106 Homing | Homing | 0 | Maximum Spaed | 60 107 | rom | | 7.06 | 3035h | b06ah |
| 55 100 | Speed | eed 0-Maximum Speed 60 % rpm | | pm 🛆 | 7.20 | 1 | 1 | | |
| 54 | Homing Ramp Time | | 0.00.6000.00 | 10.00 | | | | 3036h | b06ch |
| | | o Time 0.00-6000.00 10.00 | sec | sec 🛆 | 7.26 | 0.1 | 0.01 | | |

¹⁰⁶ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

¹⁰⁷ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

Table of Functions

LSELECTRIC 655

| Code | LCD Display | lay Setting Range | | | Unit | Property ¹⁰⁵ | perty ¹⁰⁵ Ref. | | Communication address/scale | |
|--------------------|--------------|-------------------|---------|-------|------|-------------------------|---------------------------|--------|-----------------------------|--|
| | | | | Value | | | | 16-Bit | 32-Bit | |
| 55 Run Rela Dir | Run Relative | 0 | FWD | 0 | | | 7.00 | 20276 | 600ab | |
| | Dir | 1 | REV | 0 | - | | 7.20 | 303711 | neoud | |
| 60 | UC | 1 65000 | 4 | | | 7.00 | 303ch | b078h | | |
| 60 | Numerator | | 1-05000 | 1 | - | | 7.26 | 1 | 1 | |
| 61 | UC | | 1 65000 | 4 | | ~ | 7.06 | 303dh | b07ah | |
| | Denominator | | 1-05000 | 1 | - | | 7.26 | 1 | 1 | |

13.25 Position Control Group 2 (POS2)

Г

This group is only activated when the APP-44 (Pos Ctrl Enable) value is 1 (Yes).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

Max Frequency and Maximum Speed refer to the setting values at DRV-20 (Max Frequency) and DRV-21 (Maximum Speed) respectively.

| Code | LCD Display | olay Setting Range Initial Unit Propert | Property ¹⁰⁸ | Ref. | Communication address/scale | | | |
|--------|-------------|---|-------------------------|------------|-----------------------------|-------|--------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 00 | Jump Code | 1-99 | 33 | - | 0 | 4.3.3 | 3100h | b100h |
| 01 | TRJ Tar | 0.65000 | 20000 | | | 7.06 | 3101h | b102h |
| 01 | Pos-01 | 0-05000 | 30000 | 00 | 0 | 7.20 | 1 | 1 |
| 02 | TRJ Tar | | 60.00 | Ц 7 | | 7 26 | 3102h | b104h |
| 02 | Freq-01 | | 00.00 | 112 | 0 | 7.20 | 0.01 | 0.01 |
| 03 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | | 7 26 | 3103h | b106h |
| 03.00 | Spd-01 | 0-imaximum Speed | 1000 | ipin | U | 7.20 | 1 | 1 |
| 04 | TRJ Acc | 0.00-6000.00 | 10.00 | SAC | 0 | 7 26 | 3104h | b108h |
| 04 | Time-01 | 0.00-0000.00 | 10.00 | 360 | 0 | 7.20 | 0.1 | 0.01 |
| 05 | TRJ Dec | 0.00-6000.00 | 10.00 | SAC | 0 | 7 26 | 3105h | b10ah |
| 00 | Time-01 | 0.00-0000.00 | 10.00 | 300 | | 1.20 | 0.1 | 0.01 |
| 07 | TRJ Tar | 0-65000 | 30000 | | 0 | 7 26 | 3107h | b10eh |
| 07 | Pos-02 | 0-03000 | 30000 | 00 | Ŭ | 1.20 | 1 | 1 |
| 08 | TRJ Tar | | 60.00 | Н7 | | 7 26 | 3108h | b110h |
| 00 | Freq-02 | | 00.00 | 112 | 0 | 7.20 | 0.01 | 0.01 |
| 00 109 | TRJ Tar | 0 Maximum Spood | 1800 110 | rom | | 7.26 | 3109h | b112h |
| 09.00 | Spd-02 | | 1000 | ipin | U | 7.20 | 1 | 1 |
| 10 | TRJ Acc | 0.00-6000.00 | 10.00 | 500 | | 7 26 | 310ah | b114h |
| 10 | Time-02 | 0.00-0000.00 | 10.00 | 300 | | 1.20 | 0.1 | 0.01 |

¹⁰⁸ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

¹⁰⁹ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

¹¹⁰ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

LSELECTRIC 657

| Code | LCD Display | Setting Range | Initial Value | Unit | Proper <u>ty¹⁰⁸</u> | Ref. | Commu addres | nication s/scale |
|--------------------------|-------------|--------------------|---------------------|-------|--------------------------------|------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 11 | TRJ Dec | 0 00 6000 00 | 10.00 | | | 7 26 | 310bh | b116h |
| | Time-02 | 0.00-0000.00 | 10.00 | Sec | 0 | 7.20 | 0.1 | 0.01 |
| 13 | TRJ Tar | 0 65000 | 30000 | | 0 | 7 26 | 310dh | b11ah |
| 13 | Pos-03 | 0-03000 | 30000 | 00 | 0 | 7.20 | 1 | 1 |
| 14 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 310eh | b11ch |
| | Freq-03 | | 00.00 | 112 | | 1.20 | 0.01 | 0.01 |
| 15 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 310fh | b11eh |
| 10 | Spd-03 | | 1000 | ipin | Ŭ | 1.20 | 1 | 1 |
| 16 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3110h | b120h |
| 10 | Time-03 | 0.00-0000.00 | 10.00 | 300 | | 1.20 | 0.1 | 0.01 |
| 17 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3111h | b122h |
| | Time-03 | | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 19 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 3113h | b126h |
| | Pos-04 | | 00000 | 00 | Ŭ | 1.20 | 1 | 1 |
| 20 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 3114h | b128h |
| | Freq-04 | | 00.00 | | Ŭ | 1.20 | 0.01 | 0.01 |
| 21 ¹⁰⁹ | TRJ Tar | 0-Maximum Speed | 1800 ¹¹⁰ | rpm | 0 | 7 26 | 3115h | b12ah |
| | Spd-04 | | | ipiii | Ŭ | 1.20 | 1 | 1 |
| 22 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3116h | b12ch |
| | Time-04 | | | | | 1.20 | 0.1 | 0.01 |
| 23 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3117h | b12eh |
| | Time-04 | 0.00 0000.00 | 10.00 | | Ŭ | 1.20 | 0.1 | 0.01 |
| 25 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 3119h | b132h |
| | Pos-05 | | 00000 | | Ŭ | 1.20 | 1 | 1 |
| 26 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 311ah | b134h |
| | Freq-05 | | 00.00 | | Ŭ | 1.20 | 0.01 | 0.01 |
| 27 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rpm | 0 | 7 26 | 311bh | b136h |
| | Spd-05 | | .000 | PIII | | 1.20 | 1 | 1 |
| 28 | TRJ Acc | 0.00-6000.00 | 10.00 | Sec | | 7 26 | 311ch | b138h |
| 20 | Time-05 | 0.00-0000.00 | 10.00 | 360 | | 1.20 | 0.1 | 0.01 |

| Code | LCD Display | Setting Range | | Unit | Property ¹⁰⁸ | Ref. | Commu addres | nication s/scale |
|-------------------|-------------|---------------------|---------------------|------|-------------------------|------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 20 | TRJ Dec | 0.00.6000.00 | 10.00 | | | 7.06 | 311dh | b13ah |
| 29 | Time-05 | 0.00-0000.00 | 10.00 | sec | 0 | 7.20 | 0.1 | 0.01 |
| 21 | TRJ Tar | 0.65000 | 20000 | | 0 | 7 26 | 311fh | b13eh |
| 51 | Pos-06 | 0-03000 | 30000 | 00 | 0 | 7.20 | 1 | 1 |
| 32 | TRJ Tar | | 60.00 | Н7 | 0 | 7 26 | 3120h | b140h |
| 52 | Freq-06 | | 00.00 | 112 | | 1.20 | 0.01 | 0.01 |
| 22 109 | TRJ Tar | 0 Maximum Spood | 1900 110 | rom | | 7.26 | 3121h | b142h |
| 55 | Spd-06 | 0-imaximum Speed | 1000 | трш | U | 1.20 | 1 | 1 |
| 34 | TRJ Acc | 0 00 6000 00 | 10.00 | 500 | 0 | 7 26 | 3122h | b144h |
| 34 | Time-06 | 0.00-0000.00 | 10.00 | Sec | 0 | 7.20 | 0.1 | 0.01 |
| 35 | TRJ Dec | 0.00-6000.00 | 10.00 | 500 | 0 | 7 26 | 3123h | b146h |
| 55 | Time-06 | 0.00-0000.00 | 10.00 | 560 | 0 | 1.20 | 0.1 | 0.01 |
| 37 | TRJ Tar | 0-65000 | 30000 | | 0 | 7 26 | 3125h | b14ah |
| - 57 | Pos-07 | 0-03000 | 50000 | 00 | Ŭ | 1.20 | 1 | 1 |
| 38 | TRJ Tar | 0.00-Max Frequency | 60.00 | H7 | 0 | 7 26 | 3126h | b14ch |
| | Freq-07 | | 00.00 | 112 | | 1.20 | 0.01 | 0.01 |
| 39 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 3127h | b14eh |
| 00 | Spd-07 | | 1000 | ipin | | 1.20 | 1 | 1 |
| 40 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3128h | b150h |
| | Time-07 | | 10.00 | | | 1.20 | 0.1 | 0.01 |
| 41 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3129h | b152h |
| | Time-07 | 0.00 0000.00 | 10.00 | | Ŭ | 1.20 | 0.1 | 0.01 |
| 43 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 312bh | b156h |
| | Pos-08 | | | | | 1.20 | 1 | 1 |
| 44 | TRJ Tar | 0 00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 312ch | b158h |
| | Freq-08 | | 00.00 | | Ŭ | 1.20 | 0.01 | 0.01 |
| 45 ¹⁰⁹ | TRJ Tar | 0-Maximum Speed | 1800 ¹¹⁰ | rpm | 0 | 7.26 | 312dh | b15ah |
| | Spd-08 | e contraction opeou | | | | | 1 | 1 |
| 46 | TRJ Acc | 0.00-6000 00 | 10.00 | sec | 0 | 7.26 | 312eh | b15ch |
| | Time-08 | | | | | | 0.1 | 0.01 |

| Code | LCD Display | Setting Range | Initial Value | Unit | Proper <u>ty¹⁰⁸</u> | Ref. | Commu addres | nication s/scale |
|--------|-------------|--------------------|------------------|------|--------------------------------|------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 47 | TRJ Dec | 0.00.6000.00 | 10.00 | | 0 | 7 26 | 312fh | b15eh |
| 47 | Time-08 | 0.00-0000.00 | 10.00 | Sec | 0 | 7.20 | 0.1 | 0.01 |
| 10 | TRJ Tar | 0-65000 | 30000 | | 0 | 7 26 | 3131h | b162h |
| +5 | Pos-09 | 0-03000 | 30000 | 00 | Ŭ | 7.20 | 1 | 1 |
| 50 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 3132h | b164h |
| | Freq-09 | | 00.00 | 112 | Ŭ | 7.20 | 0.01 | 0.01 |
| 51 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 3133h | b166h |
| | Spd-09 | | 1000 | ipin | Ŭ | 1.20 | 1 | 1 |
| 52 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3134h | b168h |
| | Time-09 | 0.00-0000.00 | 10.00 | 300 | Ŭ | 1.20 | 0.1 | 0.01 |
| 53 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3135h | b16ah |
| | Time-09 | 0.00 0000.00 | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 55 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 3137h | b16eh |
| | Pos-10 | 0-00000 | 00000 | 00 | Ŭ | 7.20 | 1 | 1 |
| 56 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 3138h | b170h |
| | Freq-10 | | 00.00 | 112 | Ŭ | 7.20 | 0.01 | 0.01 |
| 57 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 3139h | b172h |
| 57 | Spd-10 | | 1000 | ipin | Ŭ | 1.20 | 1 | 1 |
| 58 | TRJ Acc | 0.00-6000.00 | 10.00 | sec | 0 | 7 26 | 313ah | b174h |
| | Time-10 | 0.00-0000.00 | 10.00 | 300 | | 1.20 | 0.1 | 0.01 |
| 50 | TRJ Dec | 0.00-6000.00 | 10.00 | SAC | 0 | 7 26 | 313bh | b176h |
| 55 | Time-10 | 0.00-0000.00 | 10.00 | 300 | | 7.20 | 0.1 | 0.01 |
| 61 | TRJ Tar | 0-65000 | 30000 | | 0 | 7 26 | 313dh | b17ah |
| 01 | Pos-11 | 0-03000 | 30000 | 00 | 0 | 7.20 | 1 | 1 |
| 62 | TRJ Tar | | 60.00 | Н7 | | 7 26 | 313eh | b17ch |
| 02 | Freq-11 | | 00.00 | TIZ | 0 | 7.20 | 0.01 | 0.01 |
| 63 109 | TRJ Tar | 0 Maximum Speed | 1800 110 | rom | | 7 26 | 313fh | b17eh |
| 00.00 | Spd-11 | | 1000 | ipin | 0 | 1.20 | 1 | 1 |
| 64 | TRJ Acc | 0.00-6000.00 | 10.00 | 800 | | 7 26 | 3140h | b180h |
| 04 | Time-11 | 0.00-0000.00 | 10.00 | 260 | | 1.20 | 0.1 | 0.01 |

| Code | LCD Display | Setting Range | | Unit | Property ¹⁰⁸ | Ref. | Commu addres | nication s/scale |
|---------------|-------------|--------------------|----------|-------|-------------------------|------|-----------------|---------------------|
| | | | value | | | | 16-Bit | 32-Bit |
| 65 | TRJ Dec | 0.00.6000.00 | 10.00 | | | 7 26 | 3141h | b182h |
| 05 | Time-11 | 0.00-6000.00 | 10.00 | sec | 0 | 7.20 | 0.1 | 0.01 |
| 67 | TRJ Tar | 0.65000 | 20000 | | 0 | 7 26 | 3143h | b186h |
| 07 | Pos-12 | 0-03000 | 30000 | 00 | 0 | 7.20 | 1 | 1 |
| 68 | TRJ Tar | | 60.00 | Нz | 0 | 7 26 | 3144h | b188h |
| 00 | Freq-12 | | 00.00 | 112 | | 1.20 | 0.01 | 0.01 |
| 69 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 3145h | b18ah |
| | Spd-12 | | 1000 | ipin | Ŭ | 1.20 | 1 | 1 |
| 70 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3146h | b18ch |
| | Time-12 | 0.00 0000.00 | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 71 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3147h | b18eh |
| | Time-12 | | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 72 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 3148h | b190h |
| | Pos-13 | | 00000 | 00 | Ŭ | 1.20 | 1 | 1 |
| 73 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 3149h | b192h |
| 10 | Freq-13 | | 00.00 | 112 | 0 | 1.20 | 0.01 | 0.01 |
| 7∆ 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rpm | 0 | 7 26 | 314ah | b194h |
| 1 - | Spd-13 | | 1000 | ipiii | Ŭ | 1.20 | 1 | 1 |
| 75 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 314bh | b196h |
| | Time-13 | | 10.00 | | Ŭ | 1.20 | 0.1 | 0.01 |
| 76 | TRJ Dec | 0 00-6000 00 | 10.00 | Sec | 0 | 7 26 | 314ch | b198h |
| | Time-13 | 0.00 0000.00 | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 78 | TRJ Tar | 0-65000 | 30000 | LIC | 0 | 7 26 | 314eh | b19ch |
| 10 | Pos-14 | 0-00000 | 00000 | 00 | Ŭ | 1.20 | 1 | 1 |
| 79 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 314fh | b19eh |
| 10 | Freq-14 | | 00.00 | 112 | Ŭ | 1.20 | 0.01 | 0.01 |
| 80 109 | TRJ Tar | 0-Maximum Speed | 1800 110 | rnm | 0 | 7 26 | 3150h | b1a0h |
| 00 | Spd-14 | o maximum opeed | 1000 | ipin | | 1.20 | 1 | 1 |
| 81 | TRJ Acc | 0.00-6000.00 | 10.00 | Sec | | 7 26 | 3151h | b1a2h |
| 01 | Time-14 | 0.00-0000.00 | 10.00 | 360 | | 1.20 | 0.1 | 0.01 |

LSELECTRIC 661

| Code | LCD Display | Setting Range | | Unit | Property ¹⁰⁸ | Ref. | Communication address/scale | |
|-------------------|-------------------|--------------------|----------|------|-------------------------|------|-----------------------------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 82 | TRJ Dec | 0.00-6000.00 | 10.00 | sec | 0 | 7 26 | 3152h | b1a4h |
| | Time-14 | 0.00-0000.00 | 10.00 | 300 | | 1.20 | 0.1 | 0.01 |
| 84 | TRJ Tar | 0-65000 | 30000 | UC | 0 | 7 26 | 3154h | b1a8h |
| | Pos-15 | | 00000 | | Ŭ | 1.20 | 1 | 1 |
| 85 | TRJ Tar | 0.00-Max Frequency | 60.00 | Hz | 0 | 7 26 | 3155h | b1aah |
| | Freq-15 | | 00.00 | | Ŭ | 1.20 | 0.01 | 0.01 |
| 86 ¹⁰⁹ | TRJ Tar | 0-Maximum Speed | 1800 110 | rpm | 0 | 7 26 | 3156h | b1ach |
| | Spd-15 | | 1000 | ipin | Ŭ | 1.20 | 1 | 1 |
| 87 | TRJ Acc | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3157h | b1aeh |
| | Time-15 | 0.00 0000.00 | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 88 | TRJ Dec | 0 00-6000 00 | 10.00 | sec | 0 | 7 26 | 3158h | b1b0h |
| | Time-15 | | 10.00 | 000 | Ŭ | 1.20 | 0.1 | 0.01 |
| 90 | TRJ Tar Pos-16 | 0-65000 | 30000 | UC | 0 | 7.26 | 315ah | b1b4h |
| 01 | TRJ Tar | 0.00 Max Fraguenay | 60.00 | ⊔, | | 7.06 | 315bh | b1b6h |
| 91 | Freq-16 | 0.00-Max Frequency | 60.00 | ΠΖ | 0 | 7.20 | 0.01 | 0.01 |
| 02 109 | TRJ Tar | 0 Maximum Spood | 1900 110 | rom | | 7.26 | 315ch | b1b8h |
| 92.00 | Spd-16 | | 1000 | трш | 0 | 7.20 | 1 | 1 |
| 02 | TRJ Acc | 0 00 6000 00 | 10.00 | | | 7 26 | 315dh | b1bah |
| 93 | Time-16 | 0.00-0000.00 | 10.00 | Sec | | 1.20 | 0.1 | 0.01 |
| 04 | TRJ Dec | 0.00.6000.00 | 10.00 | 600 | | 7 26 | 315eh | b1bch |
| 94 | Time-16 | 0.00-0000.00 | 10.00 | 260 | | 1.20 | 0.1 | 0.01 |

13.26 WEB1 Group (WEB1)

Г

This group is only activated when the APP-45 (Tension Ctrl Enable) value is 1 (Yes).

| Code | LCD Display | Setting Range | Initial | Unit | Property ¹¹¹ | Ref. | Communication address/scale | |
|------------|--------------|---------------|---------|------|-------------------------|----------|-----------------------------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | 1-99 | 1 | - | 0 | 4.3.3 | 3200h | b200h |
| 2 | Output Value | | | 0/ | v | 7 00 5 1 | 3202h | b204h |
| 2 | Output value | - | - | 70 | | 7.20.3.1 | 0.01 | 0.01 |
| | Reference | | | 0/ | X | 7 00 5 4 | 3203h | b206h |
| 3 | Value | - | - | % | X | 7.28.5.1 | 0.01 | 0.01 |
| А | Feedback | | | 0/ | V | 7 00 5 4 | 3204h | b208h |
| 4 | Value | - | - | 70 | | 7.20.3.1 | 0.01 | 0.01 |
| F | Error Value | | | 0/ | v | 7 00 5 4 | 3205h | b20ah |
| 5 | Error value | - | - | % | | 7.28.5.1 | 0.01 | 0.01 |
| 10 | Main Spd | | | 0/ | v | 7 0 0 1 | 320ah | b214h |
| 10 Monitor | Monitor - | - | - | % | X | 7.28.2.1 | 0.01 | 0.01 |

¹¹¹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

LSELECTRIC 663

| Code | LCD Display | CD Display Setting Range | | | Unit | Property ¹¹¹ | Ref. | Commu addres | nication s/scale |
|------|-----------------------|----------------------------|------------------------------------|-----------|----------|-------------------------|----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | Main Spd | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | 7.28.2.1 | 320bh | |
| | | 5 | Internal comm. | 0 | | | | | |
| 11 | | 6 | USB Comm. | | _ | 0 | | | b216b |
| | Source | 7 | Option Comm. ¹¹² | | | | | | |
| | | 8 | User Sequence | | | | | | |
| | | 9 | X-Analog Input 1 ¹¹³ | | | | | | |
| | | 10 | X-Analog Input 2 ¹¹³ | | | | | | |
| | | 11 | X-Analog Input 3 ¹¹³ | | | | | | |
| 12 | Main Spd | | 0.0-100.0 | 0 | % | 0 | 7 28 2 1 | 320ch | b218h |
| 12 | Kpd Set | | 0.0-100.0 | 0 | 70 | | 1.20.2.1 | 0.01 | 0.01 |
| 13 | Main | 0 | No | 0 | _ | 0 | 7 28 2 1 | 320dh | h21ah |
| 13 | XcelTime En | 1 | Yes | 0 | | | 1.20.2.1 | 020dii | |
| 14 | Main Spd | | 0.00-300 00 | 10.00 | sec | 0 | 7.28 2 1 | 320eh | b21ch |
| | AccTime | | 0.00 000.00 | 10.00 sec | 0 | 1.28.2.1 | 0.1 | 0.01 | |
| 15 | 5 Main Spd DecTime | Main Spd 0.00-300.00 20.00 | 0.00-300.00 | 20.00 | sec | 0 | 7.28.2.1 | 320fh | b21eh |
| 15 | | | sec | | 1.28.2.1 | 0.1 | 0.01 | | |

¹¹² Available only when the communication option is installed.¹¹³ Available only when the extension IO option is installed.

| Code | LCD Display | | Setting Range | Initial | Unit | Property ¹¹¹ | Ref. | Communication address/scale | |
|-------|---------------------|--------------------------|------------------------------------|---------|----------|-------------------------|----------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| | | 0 | Keypad | | | | | | |
| | | 1 | Analog Input 1 | | | | | | |
| | | 2 | Analog Input 2 | | | | | | |
| | | 3 | Analog Input 3 | | | | | | |
| | | 4 | Pulse Input | | | | | | |
| | | 5 | Internal comm. | | | | | | |
| 20 | Reference Source | 6 | USB Comm. | 0 | _ | 0 | 7.28.4 | 3214h | b228h |
| | | 7 | Option Comm. ¹¹² | 2 | | | | | |
| | | 8 | User Sequence | | | | | | |
| | | 9 | X-Analog Input 1 ¹¹³ | | | | | | |
| | | 10 | X-Analog Input 2 ¹¹³ | | | | | | |
| | | 11 | X-Analog Input 3 ¹¹³ | | | | | | |
| 21 | Ref Keypad | | -100 00-100 00 | 20.00 | % | 0 | 7 28 / | 3215h | b22ah |
| 21 | Set | | 100.00-100.00 | 20.00 | 70 | | 7.20.4 | 0.01 | 0.01 |
| 22 | PID Ref | | 0 00-300 00 | 50.0 | sec | 0 | 7 28 4 3 | 3216h | b22ch |
| | Ramp Time | | 0.00 000.00 | 00.0 | 000 | | 7.20.4.0 | 0.01 | 0.01 |
| | - | 0 | None | | | | | | |
| 23 | Selection | 1 | Linear | 0 | - | 0 | - | 3217h | b22eh |
| | | 2 | Hyperbolic | | | | | | |
| 24 | 24 Taper Set | | -100 00-100 00 | 0 | % | 0 | 7 28 4 1 | 3218h | b230h |
| | 24 Taper Set | | | | | | | 0.01 | 0.01 |
| 25 | Tension Up | 0 | Fixed | 0 - | 0 | 7.28.4.2 | 3219h | b232h | |
| | Туре | 1 | Proportional | 0 | | 0 | 1.28.4.2 | | |
| 26 Te | Tension Up In | Tension Up In 0.00-50.00 | 0.00-50.00 | 0 | % | 6 O | 7.28.4.2 | 321ah | b234h |
| | | | | 0.00 | <u>%</u> | | 1.28.4.2 | 0.01 | 0.01 |

| Code | ode LCD Display | | Setting Range | | Unit | Property ¹¹¹ | Ref. | Communication address/scale | |
|--------------|--------------------|--------|-------------------|-------|----------|-------------------------|----------|-----------------------------|-----------|
| | | | 000 | value | | | | 16-Bit | 32-Bit |
| 07 | Tension | 0 | Fixed | 0 | | | 7 00 4 0 | 20466 | h o o c h |
| 21 | Down Type | 1 | Proportional | 0 | - | 0 | 1.28.4.2 | 32 IDN | D230N |
| 28 | Tension | | 0.00-50.00 | 0 | 0/2 | 0 | 7 28 / 2 | 321ch | b238h |
| | Down In | | 0.00-30.00 | 0 | 70 | | 1.20.4.2 | 0.01 | 0.01 |
| 30 | Web PID | 0 | No | 0 | | | 7 28 5 1 | 321ah | h23ch |
| - 50 | Enable | 1 | Yes | 0 | | | 7.20.3.1 | 521611 | 02001 |
| | | 0 | Analog Input 1 | | | | | | |
| | | 1 | Analog Input 2 | | | | | | |
| | | 2 | Analog Input 3 | | | | | | |
| | | 3 | Pulse Input | | | | | | |
| 31 Fee So | | 4 | Internal Comm. | | | | | | |
| | Feedback Source | 5 | USB Comm. | 0 | - | 0 | 7.28.5.1 | 321eh | b23eh |
| | | 6 | Option Comm. 2 | | | | | | |
| | | 7 | UserSequence | | | | | | |
| | | 8- | X-Analog Input 13 | | | | | | |
| | | | X-Analog Input 23 | | | | | | |
| | | 10 | X-Analog Input 33 | | | | | | |
| 32 | Proportional | | 0 00-100 00 | 50.0 | % | 0 | 7 28 5 2 | 3220h | b240h |
| -02 | Gain1 | | | 00.0 | /0 | | 1.20.0.2 | 0.01 | 0.01 |
| 33 | Integral | | 0.00-200.00 | 10.00 | sec | 0 | 7.28.5.2 | 3221h | b242h |
| | Time1 | | | | | | | 0.01 | 0.01 |
| 34 | Proportional | | 0 00-100 00 | 100 0 | % | 0 | 7 28 5 2 | 3222h | b244h |
| • • | Gain2 | | | | | | | 0.01 | 0.01 |
| 35 | Integral | | 0 00-200 00 | 20.00 | sec | 0 | 7 28 5 2 | 3223h | b246h |
| | Time2 | | 0.00-200.00 | 20.00 | 360 | | 1.28.5.2 | 0.01 | 0.01 |
| 36 | Derivative | | 0-1000 | 0 | msec 0 7 | 7 28 5 2 | 3224h | b248h | |
| 36 Time | | 0 1000 | 0 msec | | C O | 0 7.28.5.2 | 1 | 1 | |

| Code | LCD Display | | Setting Range | Initial | Unit | it Property ¹¹¹ | Ref. | Commu addres | nication s/scale |
|------|------------------------|---|----------------|---------|------|----------------------------|-----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 27 | Outlimitle | | 100 00 100 00 | 100.00 | 0/ | 0 | 7 00 5 4 | 321eh | b24ah |
| 57 | | | -100.00-100.00 | 100.00 | 70 | 0 | 7.20.3.1 | 0.01 | 0.01 |
| 38 | Out Limit Hi | | -100 00-100 00 | 100.00 | 0/2 | 0 | 7 28 5 1 | 321eh | b24ch |
| - 50 | | | 100.00-100.00 | 100.00 | 70 | | 7.20.3.1 | 0.01 | 0.01 |
| 39 | Output Scale | | 0.00-100.00 | 100.0 | % | 0 | 7 28 5 1 | 321eh | b24eh |
| | Output Obaic | | 0.00-100.00 | 100.0 | 70 | | 7.20.0.1 | 0.01 | 0.01 |
| 40 | Output LPF | | 0-10000 | 0 | msec | 0 | 7 28 5 1 | 321eh | b250h |
| | Gain | | 0 10000 | | | | .20.0.1 | 1 | 1 |
| 11 | Output | 0 | 500.00 | 0 | | | 7 20 5 1 | 221ob | 6252h |
| 41 | Inverse | 1 | Yes | | - | | 1.20.3.1 | SZTEN | DZGZH |
| 40 | PID Start | | 0.00.000.00 | 0.00 | | | 7 00 5 4 | 321eh | b254h |
| 42 | Ramp | | 0.00-300.00 | 0.00 | sec | 0 | 7.28.5.1 | 0.01 | 0.01 |
| 40 | 43 PI Gain Chg Mode | 0 | Ramp | 0 | - 0 | 0 7.2 | 7 00 5 0 | 00011 | 1.0501 |
| 43 | | 1 | MainSpeed | 0 | - | | 7.28.5.2 | 322bh | b256h |
| 4.4 | PI Change | | 0.00.100.00 | 20.00 | 0/ | | 7 00 5 0 | 322ch | b258h |
| 44 | Speed1 | | 0.00-100.00 | 20.00 | % | 0 | 1.28.3.2 | 0.01 | 0.01 |
| 45 | PI Change | | 0.00.100.00 | 80.00 | 0/2 | 0 | 7 2 2 5 2 | 322dh | b25ah |
| 43 | Speed2 | | 0.00-100.00 | 00.00 | 70 | | 1.20.3.2 | 0.01 | 0.01 |
| 46 | PI Gain | | 0 00-300 00 | 0.00 | sec | 0 | 7 28 5 2 | 322eh | b25ch |
| | Ramp Time | | 0.00-000.00 | 0.00 | 300 | | 1.20.0.2 | 0.01 | 0.01 |
| | | 0 | None | | | | | | |
| 47 | Profile P Mode | 1 | Linear | 0 | - | 0 | 7.28.5.2 | 322fh | b25eh |
| | Mode | 2 | Square | | | | | | |
| | | | / / | | | _ | | 3230h | b260h |
| 48 | Profile P Gain | | 0.01-10.00 | 1.00 | % | 0 | 7.28.5.2 | 0.01 | 0.01 |
| 50 | Curr | | 0.00.400.00 | | 0/ | X | 7 00 0 0 | 3232h | b264h |
| 50 | Diameter | | 0.00-100.00 | - | % | X | 1.28.6.2 | 0.01 | 0.01 |
| 51 | Curr Bobbin | | 1-4 | - | - | Х | 7.28.6.1 | 3233h1 | b266h1 |

| Code | LCD Display | | Setting Range | | Unit | Property ¹¹¹ | Ref. | Commu addres | nication s/scale | | | |
|------|-----------------|--------------|---------------|-------------|------|-------------------------|----------|-----------------|---------------------|----------|-------|-------|
| | | | | value | | | | 16-Bit | 32-Bit | | | |
| 52 | Bobbin1 | | 0.00-100.00 | 10.00 | 0/_ | ~ | 7 22 6 1 | 3234h | b268h | | | |
| 52 | Diameter | | 0.00-100.00 | 10.00 | 70 | | 1.20.0.1 | 0.01 | 0.01 | | | |
| 53 | Bobbin2 | | 0.00-100.00 | 15.00 | 0/2 | | 7 28 6 1 | 3235h | b26ah | | | |
| | Diameter | | 0.00-100.00 | 10.00 | 70 | | 7.20.0.1 | 0.01 | 0.01 | | | |
| 54 | Bobbin3 | | 0 00-100 00 | 20.00 | % | | 7 28 6 1 | 3236h | b26ch | | | |
| | Diameter | | 0.00 100.00 | 20.00 | 70 | | 1.20.0.1 | 0.01 | 0.01 | | | |
| 55 | Bobbin4 | | 0 00-100 00 | 25 00 | % | | 7 28 6 1 | 3237h | b26eh | | | |
| | Diameter | | | 20.00 | | | | 0.01 | 0.01 | | | |
| 56 | Diameter | 0 | No | 1 | | | 7 20 6 1 | 2020h | h270h | | | |
| 50 | Calc Mode | 1 | Yes | I | - | | 1.20.0.4 | 323011 | 027011 | | | |
| | | | | | | | 7 00 0 0 | 3239h | b272h | | | |
| 57 | Diameter LPF | | 0.00-300.00 | 30.00 | sec | 0 | 7.28.6.2 | 0.1 | 0.01 | | | |
| 50 | Dia Calc Hold | | 0.00.20.00 | F 00 | | _ | 7 00 0 0 | 323ah | b274h | | | |
| 58 | Freq | | 0.00-30.00 | 5.00 | HZ | | 1.28.0.3 | 0.01 | 0.01 | | | |
| 50 | Max Main | | 0.00.60.00 | 60.00 | | | 7 20 6 2 | 323bh | b276h | | | |
| - 59 | Freq | | 0.00-00.00 | 00.00 | п | | 1.20.0.2 | 0.01 | 0.01 | | | |
| 60 | Min Main | | 0.00-100.00 | 1 00 | 0/2 | | 7 28 6 3 | 323ch | b278h | | | |
| - 00 | Speed | | 0.00-100.00 | 1.00 | 70 | | 1.20.0.3 | 0.01 | 0.01 | | | |
| 61 | Min Diameter | | 5 00-100 00 | 10.00 | 0/2 | | 7 28 6 2 | 323dh | b27ah | | | |
| 01 | | | 3.00-100.00 | 10.00 | 70 | | 1.20.0.2 | 0.01 | 0.01 | | | |
| 70 | Fixed WPID | 0 | No | 4 | | | 7 00 7 4 | 00405 | h 00 - h | | | |
| 70 | Enable | 1 | Yes | | - | | 7.28.7.1 | 32460 | D28CN | | | |
| | Fixed WPID | | | | | | | 3247h | b28eh | | | |
| 71 | Min Spd | | 0.00-50.00 | 10.00 | % | | 7.28.7.1 | 0.01 | 0.01 | | | |
| 70 | Rev Tension | 0 | No | | | | | 00401 | | | | |
| 72 | Enable | 1 | Yes | 1 | - | 0 | 1.28.7.3 | 3248h | b290h | | | |
| 70 | 73 Splice Level | Splice Level | Online | | | 0.00.400.00 | 0 | 0/ | _ | 7 00 7 4 | 3249h | b292h |
| 73 | | | | 0.00-100.00 | U | 70 | | //.20./.4 | 0.01 | 0.01 | | |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ¹¹¹ | Ref. | Commu addres | nication s/scale |
|------|--------------------|-------------|---------------|---------|------------|-------------------------|-----------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 74 | Web Bias | | 0.00.60.00 | 0 | Ц 7 | 0 | 7 28 7 5 | 324ah | b294h |
| 74 | Freq | | 0.00-00.00 | 0 | I IZ | 0 | 1.20.1.5 | 0.01 | 0.01 |
| | | 0 | None | | | | | | |
| 80 | WebBreak Enable | 1 | Trip | 2 | - | 0 | 7.28.9 | 3250h | b2a0h |
| | Enable | 2 | Warning | | | | | | |
| 01 | WebBreak | | 0.00.100.00 | 20.00 | 0/ | 0 | 7 20 0 | 3251h | b2a2h |
| 01 | Level Lo | | 0.00-100.00 | 20.00 | 70 | 0 | 1.20.9 | 0.01 | 0.01 |
| 82 | WebBreak | 0.00-100.00 | 0.00-100.00 | 80.00 | 0/2 | 0 | 7 28 0 | 3252h | b2a4h |
| 02 | Level Hi | | 00.00 | 70 | | 7.20.9 | 0.01 | 0.01 | |
| 83 | WebBreak | | 0 00-300 00 | 5.00 | SAC | 0 | 7 28 9 | 3253h | b2a6h |
| - 00 | Delay | | 0.00-300.00 | 0.00 | 300 | | 7.20.5 | 0.01 | 0.01 |
| 84 | WebBreak | | 0 00-300 00 | 10.00 | 500 | 0 | 7 28 0 | 3254h | b2a8h |
| 04 | Start Dly | | 0.00-300.00 | 10.00 | 300 | | 7.20.9 | 0.01 | 0.01 |
| 00 | Web PID FF | | 0.0.1000.0 | 100.0 | 0/. | 0 | 7 29 0 | 325ah | b2b4h |
| 90 | Gain | | 0.0-1000.0 | 100.0 | 70 | 0 | 7.20.9 | 0.01 | 0.01 |
| 05 | TrqLimit | | 0 10 60 00 | 1.00 | | 0 | 7 28 10 3 | 325fh | b2beh |
| 90 | BoostTime | | 0.10-00.00 | 1.00 | Sec | | 1.20.10.3 | 0.01 | 0.01 |
| 06 | TrqLimit | | 100 00 500 00 | 150.00 | 0/ | | 7 20 10 2 | 3260h | b2c0h |
| 90 | Boost | | 100.00-300.00 | 150.00 | 70 | | 1.20.10.3 | 0.01 | 0.01 |

13.27 WEB2 Group (WEB2)

This group is only activated when the APP-45 (Tension Ctrl Enable) value is 1 (Yes).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | Code LCD Display | | Setting Range | | Unit | Property ¹¹⁴ | Ref. | Communication address/scale | |
|----------|------------------|-------------------|----------------|----------------|--------------|-------------------------|-----------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | | 1-99 | 1 | - | 0 | - | 3300h | b300h |
| 1 | Friction Auto | 0 | No | 0 | | | 7 28 10 2 | 3301h | h302h |
| | Tuning | 1 | Yes | 0 | - | | 7.20.10.2 | 330 111 | 030211 |
| 2 | Fric Comp | | 1.00- | 6.00 | <u>Ц</u> 7 | | 7 28 10 2 | 3302h | b304h |
| 2 | Freq 1 | Fri | ic Comp Freq 2 | 0.00 | | | 7.20.10.2 | 0.01 | 0.01 |
| 3 115 | Fric Comp | | 30- | 180 116 | rnm | | 7 28 10 2 | 3303h | b306h |
| 5 | Spd 1 | Fric Comp Spd 2 | | 100 | трш | | 7.20.10.2 | 1 | 1 |
| 4 | Fric Comp | | 0 00 100 00 | 0.00 | 0/_ | | 7 28 10 2 | 3304h | b308h |
| 4 | Trq 1 | 0.00-100.00 | | 0.00 | 70 | | 7.20.10.2 | 0.01 | 0.01 |
| 5 | Fric Comp | Fric Comp Freq 1- | | 12.00 | <u>Ц</u> 7 | | 7 28 10 2 | 3305h | b30ah |
| 5 | Freq 2 | Fri | ic Comp Freq 3 | 12.00 | 112 | | 7.20.10.2 | 0.01 | 0.01 |
| 6 | Fric Comp | Fri | c Comp Spd 1- | 360 116 | rom | | 7 28 10 2 | 3306h | b30ch |
| 0 | Spd 2 | Fr | ic Comp Spd 3 | 300 | трш | | 7.20.10.2 | 1 | 1 |
| 7 | Fric Comp | | 0 00 100 00 | 0.00 | 0/_ | | 7 28 10 2 | 3307h | b30eh |
| <i>'</i> | Trq 2 | | 0.00-100.00 | 0.00 | 70 | | 7.20.10.2 | 0.01 | 0.01 |
| 0 | Fric Comp | Fri | c Comp Freq 2- | 19.00 | Ц <i>-</i> , | | 7 20 10 2 | 3308h | b310h |
| 0 | Freq 3 | Fri | ic Comp Freq 4 | 10.00 | | | 7.20.10.2 | 0.01 | 0.01 |
| 0 115 | Fric Comp | Fric Comp Spd 2- | | 540 116 | rom | | 7 20 10 2 | 3309h | b312h |
| 9.13 | Spd 3 | Fric Comp Spd 4 | | 540 110 | ipin | | 7.20.10.2 | 1 | 1 |
| 10 | Fric Comp | 0.00.400.00 | | 0.00 | 0/_ | | 7 22 10 2 | 330ah | b314h |
| 10 | Trq 3 | 0.00-100.00 | | 0.00 | % | | 7.28.10.2 | 0.01 | 0.01 |

¹¹⁴ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

¹¹⁵ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

¹¹⁶ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | Setting Range | | Unit | Property ¹¹⁴ | Ref. | Commu addres | nication s/scale | | |
|--------------------------|-------------|-------------------|---------------------|------|-------------------------|------------|-----------------|---------------------|------|------|
| | | | value | | | | 16-Bit | 32-Bit | | |
| 11 | Fric Comp | Fric Comp Freq 3- | 24.00 | ⊔,, | | 7 20 10 2 | 330bh | b316h | | |
| 11 | Freq 4 | Fric Comp Freq 5 | 24.00 | ΠΖ | | 1.20.10.2 | 0.01 | 0.01 | | |
| 10 115 | Fric Comp | Fric Comp Spd 3- | 720 116 | rom | | 7 28 10 2 | 330ch | b318h | | |
| 12 | Spd 4 | Fric Comp Spd 5 | 720 | ipin | | 7.20.10.2 | 1 | 1 | | |
| 13 | Fric Comp | 0.00-100.00 | 0.00 | % | | 7 28 10 2 | 330dh | b31ah | | |
| 10 | Trq 4 | 0.00 100.00 | 0.00 | 70 | | 7.20.10.2 | 0.01 | 0.01 | | |
| 14 | Fric Comp | Fric Comp Freq 4- | 30.00 | Hz | | 7 28 10 2 | 330eh | b31ch | | |
| | Freq 5 | Fric Comp Freq 6 | 00.00 | | | | 0.01 | 0.01 | | |
| 15 ¹¹⁵ | Fric Comp | Fric Comp Spd 4- | 900 116 | rpm | | 7.28.10.2 | 330fh | b31eh | | |
| | Spd 5 | Fric Comp Spd 6 | | . թ | | | 1 | 1 | | |
| 16 | Fric Comp | 0.00-100.00 | 0.00 | % | | 7.28.10.2 | 3310h | b320h | | |
| | Irq 5 | | | | | | 0.01 | 0.01 | | |
| 17 | Fric Comp | Fric Comp Freq 5- | 36.00 | Hz | | 7.28.10.2 | 3311h | b322h | | |
| | Freq 6 | Fric Comp Freq 7 | | | | | 0.01 | 0.01 | | |
| 18 ¹¹⁵ | Fric Comp | Fric Comp Spd 5- | 1080 ¹¹⁶ | rpm | | 7.28.10.2 | 3312h | b324h | | |
| | Spd 6 | Fric Comp Spd 7 | | | | | 1 | 1 | | |
| 19 | Fric Comp | 0.00-100.00 | 0.00 | % | | 7.28.10.2 | 3313h | b326h | | |
| | Irq 6 | | | | | | 0.01 | 0.01 | | |
| 20 | Fric Comp | Fric Comp Freq 6- | 42.00 | Hz | | 7.28.10.2 | 3314h | b328h | | |
| | Freq / | Fric Comp Freq 8 | | | | | 0.01 | 0.01 | | |
| 21 ¹¹⁵ | Fric Comp | Fric Comp Spd 6- | 1260 ¹¹⁶ | rpm | \triangle | 7.28.10.2 | 3315h | b32ah | | |
| | Spa / | Fric Comp Spd 8 | | • | | | 1 | 1 | | |
| 22 | Fric Comp | 0.00-100.00 | 0.00 | % | | 7.28.10.2 | 3316h | b32ch | | |
| | Irq / | | | | | | 0.01 | 0.01 | | |
| 23 | Fric Comp | Fric Comp Freq 7- | 48.00 | Hz | | 7.28.10.2 | 3317h | b32eh | | |
| | Freq 8 | Fric Comp Freq 9 | | | | | 0.01 | 0.01 | | |
| 24 ¹¹⁵ | Fric Comp | Fric Comp Spd 7- | 1440 ¹¹⁶ | rpm | | 7.28.10.2 | 3318h | b330h | | |
| | Spa 8 | Fric Comp Spa 9 | | | | | 1 | 1 | | |
| 25 | Fric Comp | 0.00-100.00 | 0.00 | % | | 7.28.10.2 | 3319h | b332h | | |
| 25 | Trq 8 | Trq 8 0.00 | | 0.00 | % | ∞ ∧ | | | 0.01 | 0.01 |

| Code | LCD Display | Setting Range | Initial | Unit | : Property ¹¹⁴ | ⁴ Ref. | Communication address/scale | | |
|---------------|-------------|-------------------|------------|------------|---------------------------|-------------------|-----------------------------|--------|--|
| | | | value | | | | 16-Bit | 32-Bit | |
| 26 | Fric Comp | Fric Comp Freq 8- | E4 00 | 11- | | 7 00 40 0 | 331ah | b334h | |
| 20 | Freq 9 | Fric Comp Freq 10 | 54.00 | ПΖ | | 1.20.10.2 | 0.01 | 0.01 | |
| 07 115 | Fric Comp | Fric Comp Spd 8- | 4 0 00 116 | rio 100 | | 7 00 40 0 | 331bh | b336h | |
| 27 110 | Spd 9 | Fric Comp Spd 10 | 1620 110 | rpm | | 1.20.10.2 | 1 | 1 | |
| | | | | | | | 331ch | b338h | |
| 28 | Trq 9 | 0.00-100.00 | 0.00 | % | \triangle | 7.28.10.2 | 0.01 | 0.01 | |
| | | | | | | | | | |
| 20 | Fric Comp | Fric Comp Freq 9- | 60.00 | ⊔ , | | 7 20 10 2 | 331dh | b33ah | |
| 29 | Freq 10 | Max Frequency | 00.00 | ΠΖ | | 7.20.10.2 | 0.01 | 0.01 | |
| 20 115 | Fric Comp | Fric Comp Spd 9- | 1000 116 | rio 100 | _ | 7 00 40 0 | 331eh | b33ch | |
| 30 113 | Spd 10 | Maximum Speed | 1800 110 | rpm | | 7.28.10.2 | 1 | 1 | |
| 21 | Fric Comp | 0.00.100.00 | 0.00 | 0/ | | 7 00 10 0 | 331fh | b33eh | |
| 51 | Trq 10 | 0.00-100.00 | 0.00 | % | | / .20. 10.2 | 0.01 | 0.01 | |

13.28 User Sequence Group (US)

Г

This group is only activated when the APP-03 (User Seq Enable) value is 1 (Yes).

The codes in the gray shaded area are hidden when shipped from the factory and shown only when setting the parameter (refer to the footnote).

| Code | LCD Display | | Setting Range | Initial | Unit | Property ¹¹⁷ | Ref. | Commu addres | nication s/scale |
|----------------|--------------|----|---------------|---------|--------|-------------------------|--------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 3400h | b400h |
| 1 | UserSeq | 0 | Off | 0 | | 0 | 7 27 1 | 3401h | h/02h |
| | Control | 1 | On | 0 | - | 0 | 1.21.1 | 540 111 | 040211 |
| 2 | UserSeq | | 10-1000 | 10 | msec | 0 | 7 27 1 | 3402h | b404h |
| 2 | Loop Time | | 10-1000 | 10 | 111300 | | 1.21.1 | 1 | 1 |
| 3 | All Blk Exec | | _ | | usec | х | 7.27.1 | 3403h | b406h |
| | Time | | | | | | | 1 | 1 |
| | | 0 | Standby | | | | | | |
| | | 1 | Starting | | | | | | |
| 4 | | 2 | Init | | | | | | |
| | Status | 3 | Running | 0 | - | Х | 7.27.1 | 3404h | b408h |
| | | 4 | Waiting | | | | | | |
| | | 5 | Stopping | | | | | | |
| | | 6 | Error | | | | | | |
| 5 | Loot Error | | | | | v | 7 07 1 | 3405h | b40ah |
| 5 | Last Enoi | | - | - | - | ^ | 1.21.1 | 1 | 1 |
| 6 | BlockID of | | | | | v | 7 07 1 | 3406h | b40ch |
| 0 | LastErr | | - | - | - | ^ | 1.21.1 | 1 | 1 |
| 7 | LastError | 0 | No | 0 | | 0 | 7 07 1 | 3407h | h40oh |
| 1 | Reset | 1 | Yes | 0 | - | 0 | 1.21.1 | 540711 | 040611 |
| 0 | Check | 0 | Off | 0 | | 0 | 7 07 1 | 24006 | h110h |
| 0 | 8 Validation | 1 | On | 0 - O | 0 | 7.27.1 | 340011 | 041011 | |
| 10 | | 0 | Off | 0 | | | 7 07 4 | 240.04 | L111- |
| 10 Run Forward | 1 | On | U | - | 0 | 1.21.1 | 540an | D4 14N | |

¹¹⁷ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

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| Code | LCD Display | Setting Range | | Initial | Unit | Property ¹¹⁷ | Ref. | Communication address/scale | |
|--------|----------------------|-----------------|--------------------|---------|------|-------------------------|--------|-----------------------------|--------|
| | -13 | | | Value | | .1 | | 16-Bit | 32-Bit |
| 11 | | 0 | Off | 0 | | 0 | 7 07 1 | 24066 | h116h |
| 11 | Rull Reverse | 1 | On | 0 | - | 0 | 1.21.1 | 340011 | 041011 |
| 15 | Command Frequency | 0.0 | 0.00-Max Frequency | | Hz | 0 | 7.27.1 | 340fh | b41eh |
| 16 118 | Command | 0- | 0-Maximum Speed | | rom | 0 | 7 27 1 | 3410h | b420h |
| 10 | Speed | o-maximum opeed | | 0 | ipin | 0 | 1.21.1 | 1 | 1 |
| 17 | Command | | -180.0-180.0 | | % | 0 | 7 27 1 | 3411h | b422h |
| | Torque | | -100.0-100.0 | 0.0 | /0 | | 1.21.1 | 0.1 | 0.1 |
| 18 | Acc Time | | 0 00-6000 00 | 20.00 | sec | 0 | 7 27 1 | 3412h | b424h |
| 10 | | | 0.00 0000.00 | 20.00 | 000 | Ŭ | 1.21.1 | 0.1 | 0.01 |
| 19 | Dec Time | | 0 00-6000 00 | 30.00 | sec | 0 | 7 27 1 | 3413h | b426h |
| 10 | | | 0.00 0000.00 | 00.00 | 000 | | 1.21.1 | 0.1 | 0.01 |
| 20 | Output | | _ | - | _ | x | 7 27 1 | 3414h | b428h |
| 20 | Current | | | | | | 1.21.1 | 0.1 | 0.1 |
| 21 | Output | | _ | _ | _ | x | 7 27 1 | 3415h | b42ah |
| 21 | Frequency | | | | | | 1.21.1 | 0.01 | 0.01 |
| 22 | Output RPM | | _ | - | _ | x | 7 27 1 | 3416h | b42ch |
| | | | | | | | 1.21.1 | 1 | 1 |
| 23 | Output | | _ | _ | | x | 7 27 1 | 3417h | b42eh |
| 20 | Voltage | | - | - | _ | ^ | 1.21.1 | 1 | 1 |
| 24 | DC Link | | | _ | _ | x | 7 27 1 | 3418h | b430h |
| 24 | Voltage | | - | - | | ^ | 1.21.1 | 1 | 1 |
| 25 | Output Power | | _ | _ | | x | 7 27 1 | 3419h | b432h |
| 20 | | | _ | | | | 1.21.1 | 0.1 | 0.1 |
| 26 | Output | | | | | | 7 07 1 | 341ah | b434h |
| 20 | 26 Torque | | - | - | - | | 1.21.1 | 0.1 | 0.1 |

¹¹⁸ Activated when the DRV-32 (Hz/rpm Select) value is 1 (rpm Display). (The unit of rpm is based on 4 poles)

¹¹⁹ The rpm value varies according to the motor rating pole number (MOT1, 2-25).

| Code | LCD Display | Setting Range | | Initial | Unit | t Property ¹¹⁷ | ¹¹⁷ Ref. | Communication address/scale | |
|------|--------------|---------------|-----|---------|------|---------------------------|---------------------|-----------------------------|---------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 40 | Speed | 0 | Off | | | Y | 7 07 1 | 3428h | 6450b |
| 40 | Searching | 1 | On | - | - | ^ | 1.21.1 | 542011 | 043011 |
| 11 | Acceleration | 0 | Off | _ | _ | x | 7 97 1 | 3/20h | h/52h |
| 41 | Acceleration | 1 | On | - | - | | 1.21.1 | 542.511 | 040211 |
| 12 | ConstRate | 0 | Off | _ | _ | x | 7 27 1 | 3/22h | h/15/1h |
| 42 | Operating | 1 | On | - | | ^ | 1.21.1 | 542an | 04040 |
| 13 | Deceleration | 0 | Off | | _ | x | 7 97 1 | 3/2hh | h/56h |
| 40 | Deceleration | 1 | On | - | - | ^ | 1.21.1 | 542011 | 04001 |
| 11 | Dec to stop | 0 | Off | _ | _ | x | 7 97 1 | 342ch | h/58h |
| | | 1 | On | - | - | ^ | 1.21.1 | 042011 | 04001 |
| 45 | | 0 | Off | _ | _ | x | 7 97 1 | 342dh | h/5ah |
| 40 | | 1 | On | - | - | | 1.21.1 | 5420H | 040an |
| 46 | S/W OCS | 0 | Off | _ | _ | x | 7 27 1 | 3/20h | h/15ch |
| 40 | 3/11 003 | 1 | On | - | | | 7.27.1 | 542611 | 04001 |
| 47 | Dwell | 0 | Off | _ | _ | x | 7 97 1 | 3/12fb | h/5oh |
| 47 | Operating | 1 | On | - | - | ^ | 1.21.1 | 542111 | 040611 |
| 18 | Stopped | 0 | Off | _ | _ | x | 7 97 1 | 3/30h | h/coh |
| | | 1 | On | _ | | | 1.21.1 | 0-001 | 040011 |
| 10 | Forward | 0 | Off | _ | _ | x | 7 97 1 | 3/31h | h/62h |
| | Direction | 1 | On | | | | 1.21.1 | 5-5111 | 040211 |
| 50 | Reverse | 0 | Off | _ | _ | x | 7 97 1 | 3/32h | b/6/b |
| | Direction | 1 | On | _ | | | 1.21.1 | 040211 | |
| 51 | DC Operating | 0 | Off | | | v | 7 07 1 | 3/33h | h/66h |
| 51 | | 1 | On | - | | | 1.21.1 | 343311 | 040011 |
| 52 | Warnod | 0 | Off | | | v | 7 07 1 | 3/3/h | 6168b |
| 52 | wanneu | 1 | On | - | - | ^ | 1.21.1 | 343411 | 040011 |
| 53 | Tripped | 0 | Off | | | | 7 97 1 | 31256 | h/fah |
| | mpped | 1 | On | - | - | | 1.21.1 | 545511 | 040all |

Table of Functions

13.29 User Sequence Logical Operation Group (USL)

This group is only activated when the APP-03 (User Seq Enable) value is 1 (Yes).

| Code | LCD Display | | Setting Range | | Property ¹²⁰ | Ref. | Commu addres | nication s/scale | |
|------|----------------|----|------------------------|-------|-------------------------|--------|-----------------|---------------------|--|
| | | | | value | | | 16-Bit | 32-Bit | |
| 0 | Jump Code | | 1-99 | 33 | 0 | 4.3.3 | 3500h | b500h | |
| | | 0 | NOT(A) | | | | | | |
| | | 1 | AND(A,B,C) | | | | | | |
| | | 2 | NAND(A,B,C) | | | | | | |
| | | 3 | OR(A,B,C) | | | | | | |
| | | 4 | NOR(A,B,C) | | | | | | |
| _ | | 5 | XOR(A,B) | - | | | | | |
| 5 | Logic01 Type | 6 | (A AND B) OR C | 0 | 0 | 7.27.2 | 3505h | b50ah | |
| | | 7 | AND(A,B,!C) | | | | | 3505h b50ah | |
| | | 8 | OR(A,B,!C) | | | | | | |
| | | 9 | R-EDGE- DETECT(A) | | | | | | |
| | | 10 | F-EDGE- DETECT(A) | | | | | | |
| 6 | Logic01 InputA | | 0-1 | 0 | 0 | 7.27.2 | 3506h | b50ch | |
| 7 | Logic01 InputB | | 0-1 | 0 | 0 | 7.27.2 | 3507h | b50eh | |
| 8 | Logic01 InputC | | 0-1 | 0 | 0 | 7.27.2 | 3508h | b510h | |
| 9 | Logic01 Output | | 0-1 | 0 | 0 | 7.27.2 | 3509h | b512h | |
| 10 | Logic02 Type | S | ame as Logic01 Type | 0 | 0 | 7.27.2 | 350ah | b514h | |
| 11 | Logic02 InputA | | 0-1 | 0 | 0 | 7.27.2 | 350bh | b516h | |
| 12 | Logic02 InputB | | 0-1 | 0 | 0 | 7.27.2 | 350ch | b518h | |
| 13 | Logic02 InputC | | 0-1 | 0 | 0 | 7.27.2 | 350dh | b51ah | |
| 14 | Logic02 Output | | 0-1 | 0 | 0 | 7.27.2 | 350eh | b51ch | |
| 15 | Logic03 Type | S | ame as Logic01 Type | 0 | 0 | 7.27.2 | 350fh | b51eh | |

¹²⁰ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

| Code | LCD Display | Setting Range | Initial Value Property ¹²⁰ Ref. | Ref. | Communication address/scale | | |
|------|----------------|-------------------------|---|------|-----------------------------|--------|--------|
| | | | value | | | 16-Bit | 32-Bit |
| 16 | Logic03 InputA | 0-1 | 0 | 0 | 7.27.2 | 3510h | b520h |
| 17 | Logic03 InputB | 0-1 | 0 | 0 | 7.27.2 | 3511h | b522h |
| 18 | Logic03 InputC | 0-1 | 0 | 0 | 7.27.2 | 3512h | b524h |
| 19 | Logic03 Output | 0-1 | 0 | 0 | 7.27.2 | 3513h | b526h |
| 20 | Logic04 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3514h | b528h |
| 21 | Logic04 InputA | 0-1 | 0 | 0 | 7.27.2 | 3515h | b52ah |
| 22 | Logic04 InputB | 0-1 | 0 | 0 | 7.27.2 | 3516h | b52ch |
| 23 | Logic04 InputC | 0-1 | 0 | 0 | 7.27.2 | 3517h | b52eh |
| 24 | Logic04 Output | 0-1 | 0 | 0 | 7.27.2 | 3518h | b530h |
| 25 | Logic05 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3519h | b532h |
| 26 | Logic05 InputA | 0-1 | 0 | 0 | 7.27.2 | 351ah | b534h |
| 27 | Logic05 InputB | 0-1 | 0 | 0 | 7.27.2 | 351bh | b536h |
| 28 | Logic05 InputC | 0-1 | 0 | 0 | 7.27.2 | 351ch | b538h |
| 29 | Logic05 Output | 0-1 | 0 | 0 | 7.27.2 | 351dh | b53ah |
| 30 | Logic06 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 351eh | b53ch |
| 31 | Logic06 InputA | 0-1 | 0 | 0 | 7.27.2 | 351fh | b53eh |
| 32 | Logic06 InputB | 0-1 | 0 | 0 | 7.27.2 | 3520h | b540h |
| 33 | Logic06 InputC | 0-1 | 0 | 0 | 7.27.2 | 3521h | b542h |
| 34 | Logic06 Output | 0-1 | 0 | 0 | 7.27.2 | 3522h | b544h |
| 35 | Logic07 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3523h | b546h |
| 36 | Logic07 InputA | 0-1 | 0 | 0 | 7.27.2 | 3524h | b548h |
| 37 | Logic07 InputB | 0-1 | 0 | 0 | 7.27.2 | 3525h | b54ah |
| 38 | Logic07 InputC | 0-1 | 0 | 0 | 7.27.2 | 3526h | b54ch |
| 39 | Logic07 Output | 0-1 | 0 | 0 | 7.27.2 | 3527h | b54eh |
| 40 | Logic08 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3528h | b550h |
| 41 | Logic08 InputA | 0-1 | 0 | 0 | 7.27.2 | 3529h | b552h |

| Code | LCD Display | Setting Range | | Property ¹²⁰ | Ref. | Commu addres | nication s/scale |
|------|----------------|-------------------------|-------|-------------------------|--------|-----------------|---------------------|
| | | | value | | | 16-Bit | 32-Bit |
| 42 | Logic08 InputB | 0-1 | 0 | 0 | 7.27.2 | 352ah | b554h |
| 43 | Logic08 InputC | 0-1 | 0 | 0 | 7.27.2 | 352bh | b556h |
| 44 | Logic08 Output | 0-1 | 0 | 0 | 7.27.2 | 352ch | b558h |
| 45 | Logic09 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 352dh | b55ah |
| 46 | Logic09 InputA | 0-1 | 0 | 0 | 7.27.2 | 352eh | b55ch |
| 47 | Logic09 InputB | 0-1 | 0 | 0 | 7.27.2 | 352fh | b55eh |
| 48 | Logic09 InputC | 0-1 | 0 | 0 | 7.27.2 | 3530h | b560h |
| 49 | Logic09 Output | 0-1 | 0 | 0 | 7.27.2 | 3531h | b562h |
| 50 | Logic10 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3532h | b564h |
| 51 | Logic10 InputA | 0-1 | 0 | 0 | 7.27.2 | 3533h | b566h |
| 52 | Logic10 InputB | 0-1 | 0 | 0 | 7.27.2 | 3534h | b568h |
| 53 | Logic10 InputC | 0-1 | 0 | 0 | 7.27.2 | 3535h | b56ah |
| 54 | Logic10 Output | 0-1 | 0 | 0 | 7.27.2 | 3536h | b56ch |
| 55 | Logic11 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3537h | b56eh |
| 56 | Logic11 InputA | 0-1 | 0 | 0 | 7.27.2 | 3538h | b570h |
| 57 | Logic11 InputB | 0-1 | 0 | 0 | 7.27.2 | 3539h | b572h |
| 58 | Logic11 InputC | 0-1 | 0 | 0 | 7.27.2 | 353ah | b574h |
| 59 | Logic11 Output | 0-1 | 0 | 0 | 7.27.2 | 353bh | b576h |
| 60 | Logic12 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 353ch | b578h |
| 61 | Logic12 InputA | 0-1 | 0 | 0 | 7.27.2 | 353dh | b57ah |
| 62 | Logic12 InputB | 0-1 | 0 | 0 | 7.27.2 | 353eh | b57ch |
| 63 | Logic12 InputC | 0-1 | 0 | 0 | 7.27.2 | 353fh | b57eh |
| 64 | Logic12 Output | 0-1 | 0 | 0 | 7.27.2 | 3540h | b580h |
| 65 | Logic13 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3541h | b582h |
| 66 | Logic13 InputA | 0-1 | 0 | 0 | 7.27.2 | 3542h | b584h |
| 67 | Logic13 InputB | 0-1 | 0 | 0 | 7.27.2 | 3543h | b586h |

| Code | e LCD Display Setting Range | | Initial | Property ¹²⁰ | Ref. | Communication address/scale | |
|------|-----------------------------|-------------------------|---------|-------------------------|--------|-----------------------------|--------|
| | | | value | | | 16-Bit | 32-Bit |
| 68 | Logic13 InputC | 0-1 | 0 | 0 | 7.27.2 | 3544h | b588h |
| 69 | Logic13 Output | 0-1 | 0 | 0 | 7.27.2 | 3545h | b58ah |
| 70 | Logic14 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 3546h | b58ch |
| 71 | Logic14 InputA | 0-1 | 0 | 0 | 7.27.2 | 3547h | b58eh |
| 72 | Logic14 InputB | 0-1 | 0 | 0 | 7.27.2 | 3548h | b590h |
| 73 | Logic14 InputC | 0-1 | 0 | 0 | 7.27.2 | 3549h | b592h |
| 74 | Logic14 Output | 0-1 | 0 | 0 | 7.27.2 | 354ah | b594h |
| 75 | Logic15 Type | Same as Logic01 Type | 0 | 0 | 7.27.2 | 354bh | b596h |
| 76 | Logic15 InputA | 0-1 | 0 | 0 | 7.27.2 | 354ch | b598h |
| 77 | Logic15 InputB | 0-1 | 0 | 0 | 7.27.2 | 354dh | b59ah |
| 78 | Logic15 InputC | 0-1 | 0 | 0 | 7.27.2 | 354eh | b59ch |
| 79 | Logic15 Output | 0-1 | 0 | 0 | 7.27.2 | 354fh | b59eh |

13.30 User Sequence Arithmetic Operation Group (USV)

This group is only activated when the APP-03 (User Seq Enable) value is 1 (Yes).

| Code | LCD Display | | Setting Range | | Unit | Property ¹²¹ | Ref. | Commu addres | nication s/scale |
|------|--------------|----|--------------------------|-------|------|-------------------------|--------|-----------------|---------------------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 3600h | b600h |
| | | 0 | A+B+C | | | | | | |
| | | 1 | A-B-C | | | | | | |
| | | 2 | A+B-C | | | | | | |
| | | 3 | ABS(A,B,C) | | | | | | |
| | | 4 | A mod B | | | | | | |
| | | 5 | (A*B)/C | | | | | | |
| | | 6 | MIN(A,B,C) | | | | | | |
| | | 7 | MAX(A,B,C) | | | | | | |
| | | 8 | SWITCH(A) B/C | | | | | | |
| | | 9 | BitTest(A,B) | | | | | | |
| | | 10 | BitSet(A,B) | | | | | | |
| _ | | 11 | BitClear(A,B) | | | | | | |
| 5 | Value01 Type | 12 | Up Counter | 0 | - | 0 | 7.27.3 | 3605h | b60ah |
| | | 13 | Down Counter | | | | | | |
| | | 14 | BINARY DECODE | | | | | | |
| | | 15 | A>B+/-C | | | | | | |
| | | 16 | A>=B | | | | | | |
| | | 17 | A<=B | | | | | | |
| | | 18 | A(1+B) | | | | | | |
| | | 19 | ((A * B) / 100) + C | | | | | | |
| | | 20 | ABS(A) > ABS(B) +/- C | | | | | | |
| | | 21 | ABS(A) >= ABS(B) | - | | | | | |
| | | 22 | IF(C)-A | | | | | | |

¹²¹ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

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| Code | Code LCD Display | | Setting Range | | Initial Value Unit Property ¹² | | Property ¹²¹ Ref. | | Communication address/scale | |
|------|-------------------|-----|------------------------|-------|--|---|------------------------------|--------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| | | 23 | IF(A==B) | | | | | | | |
| | | 24 | IF(A!=B) | | | | | | | |
| | | 25 | IF(C) HOLD(A) | | | | | | | |
| | | 26 | ON DELAY | | | | | | | |
| | | 27 | OFF DELAY | | | | | | | |
| 5 | Value01 Type | 28 | Timer | 0 | _ | 0 | 7.27.3 | 3605h | b60ah | |
| · · | | 29 | Window | · | | | | | | |
| | | 30 | Window C <= A <= B | | | | | | | |
| | | 31 | Lowpass Filter | | | | | | | |
| | | 32 | LimitA UprB LwrC | | | | | | | |
| | Value01 InputA | 33 | ExtractBits | | | | | | | |
| 6 | Value01 InputA | -99 | -99999999-999999999 | | - | 0 | 7.27.3 | 3606h | b60ch | |
| 7 | Value01 InputB | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 3607h | b60eh | |
| 8 | Value01 InputC | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 3608h | b610h | |
| 9 | Value01 Output | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 3609h | b612h | |
| 10 | Value02 Type | S | ame as Value01 Type | 0 | - | 0 | 7.27.3 | 360ah | b614h | |
| 11 | Value02 InputA | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 360bh | b616h | |
| 12 | Value02 InputB | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 360ch | b618h | |
| 13 | Value02 InputC | -99 | 999999-999999999 | 0 | - | 0 | 7.27.3 | 360dh | b61ah | |
| 14 | Value02 Output | -99 | 999999-9999999999 | 0 | - | 0 | 7.27.3 | 360eh | b61ch | |
| 15 | Value03 Type | S | ame as Value01 Type | 0 | - | 0 | 7.27.3 | 360fh | b61eh | |

| Code | LCD Display | Setting Range | Initial | Unit | Property ¹²¹ | Ref. | Commu addres | nication s/scale |
|------|-------------------|-------------------------|---------|------|-------------------------|--------|-----------------|---------------------|
| | | | Value | | | | 16-Bit | 32-Bit |
| 16 | Value03 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3610h | b620h |
| 17 | Value03 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3611h | b622h |
| 18 | Value03 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3612h | b624h |
| 19 | Value03 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3613h | b626h |
| 20 | Value04 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3614h | b628h |
| 21 | Value04 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3615h | b62ah |
| 22 | Value04 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3616h | b62ch |
| 23 | Value04 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3617h | b62eh |
| 24 | Value04 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3618h | b630h |
| 25 | Value05 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3619h | b632h |
| 26 | Value05 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 361ah | b634h |
| 27 | Value05 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 361bh | b636h |
| 28 | Value05 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 361ch | b638h |
| 29 | Value05 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 361dh | b63ah |
| 30 | Value06 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 361eh | b63ch |
| 31 | Value06 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 361fh | b63eh |
| 32 | Value06 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3620h | b640h |

| Code | e LCD Display | Setting Range Value Unit Property ¹²¹ | | Ref. | Commu addres | nication s/scale | | |
|------|-------------------|--|-------|------|-----------------|---------------------|--------|--------|
| | | | value | | , , | | 16-Bit | 32-Bit |
| 33 | Value06 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3621h | b642h |
| 34 | Value06 Output | -99999999-99999999 | 0 | - | 0 | 7.27.3 | 3622h | b644h |
| 35 | Value07 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3623h | b646h |
| 36 | Value07 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3624h | b648h |
| 37 | Value07 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3625h | b64ah |
| 38 | Value07 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3626h | b64ch |
| 39 | Value07 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3627h | b64eh |
| 40 | Value08 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3628h | b650h |
| 41 | Value08 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3629h | b652h |
| 42 | Value08 InputB | -99999999-99999999 | 0 | - | 0 | 7.27.3 | 362ah | b654h |
| 43 | Value08 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 362bh | b656h |
| 44 | Value08 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 362ch | b658h |
| 45 | Value09 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 362dh | b65ah |
| 46 | Value09 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 362eh | b65ch |
| 47 | Value09 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 362fh | b65eh |
| 48 | Value09 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3630h | b660h |
| 49 | Value09 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3631h | b662h |

| Code | LCD Display | Setting Range | Initial | Unit | Property ¹²¹ | Ref. | Commu addres | nication s/scale |
|------|-------------------|-------------------------|---------|------|-------------------------|--------|-----------------|---------------------|
| | | | value | | , , | | 16-Bit | 32-Bit |
| 50 | Value10 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3632h | b664h |
| 51 | Value10 InputA | -99999999-99999999 | 0 | - | 0 | 7.27.3 | 3633h | b666h |
| 52 | Value10 InputB | -99999999-99999999 | 0 | - | 0 | 7.27.3 | 3634h | b668h |
| 53 | Value10 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3635h | b66ah |
| 54 | Value10 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3636h | b66ch |
| 55 | Value11 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3637h | b66eh |
| 56 | Value11 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3638h | b670h |
| 57 | Value11 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3639h | b672h |
| 58 | Value11 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 363ah | b674h |
| 59 | Value11 Output | -99999999-99999999 | 0 | - | 0 | 7.27.3 | 363bh | b676h |
| 60 | Value12 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 363ch | b678h |
| 61 | Value12 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 363dh | b67ah |
| 62 | Value12 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 363eh | b67ch |
| 63 | Value12 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 363fh | b67eh |
| 64 | Value12 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3640h | b680h |
| 65 | Value13 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3641h | b682h |
| 66 | Value13 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3642h | b684h |

| Code | LCD Display | Setting Range | Initial Unit Property ¹²¹ Ref. Communica | | nication s/scale | | | |
|------|-------------------|-------------------------|---|---|---------------------|--------|--------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 67 | Value13 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3643h | b686h |
| 68 | Value13 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3644h | b688h |
| 69 | Value13 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3645h | b68ah |
| 70 | Value14 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 3646h | b68ch |
| 71 | Value14 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3647h | b68eh |
| 72 | Value14 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3648h | b690h |
| 73 | Value14 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 3649h | b692h |
| 74 | Value14 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 364ah | b694h |
| 75 | Value15 Type | Same as Value01 Type | 0 | - | 0 | 7.27.3 | 364bh | b696h |
| 76 | Value15 InputA | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 364ch | b698h |
| 77 | Value15 InputB | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 364dh | b69ah |
| 78 | Value15 InputC | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 364eh | b69ch |
| 79 | Value15 Output | -99999999-999999999 | 0 | - | 0 | 7.27.3 | 364fh | b69eh |

Table of Functions

13.31 User Sequence Parameter Operation Group (USP)

This group is only activated when the APP-03 (User Seq Enable) value is 1 (Yes).

Note

Please only use a 32-bit address for USP-61-90 (Var 01-30).

| Code | LCD Display | Setting Range | | Initial Value Unit Property | | Property ¹²² | roperty ¹²² Ref. | | Communication address/scale | |
|------|----------------------|---------------|----------|--------------------------------|---|-------------------------|-----------------------------|--------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 0 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 3700h | b700h | |
| 1 | Paraset01 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3701h | b702h | |
| 2 | Paraset01 | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 27026 | h704h | |
| 2 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 370211 | 070411 | |
| 3 | Paraset 01 Result | - | | 0 | - | 0 | 7.27.4 | 3703h | b706h | |
| 4 | Paraset02 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3704h | b708h | |
| F | Paraset02 | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 070Ch | h70h | |
| Э | Туре | 1 | 1-0 EDGE | 0 | - | | 1.21.4 | 37050 | b70an | |
| 6 | Paraset 02 Result | - | | 0 | - | 0 | 7.27.4 | 3706h | b70ch | |
| 7 | Paraset03 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3707h | b70eh | |
| 0 | Paraset03 | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 0700 | L 740L | |
| 8 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 37080 | b/10n | |
| 9 | Paraset 03 Result | | - | 0 | - | 0 | 7.27.4 | 3709h | b712h | |
| 10 | Paraset04 In | | 0-1 | 0 | - | 0 | 7.27.4 | 370ah | b714h | |
| | Paraset04 | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 07011 | 1 7401 | |
| 11 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 7.27.4 | 37000 | b/16h | |
| 12 | Paraset 04 Result | - | | 0 | - | 0 | 7.27.4 | 370ch | b718h | |
| 13 | Paraset05 In | | 0-1 | 0 | - | 0 | 7.27.4 | 370dh | b71ah | |

¹²² O: Writable during operation, \triangle : Writable when stopped, X: Not writable

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| Code | LCD Display Setting Ra | | Setting Range | Initial Value | Initial Value Unit Pr | | property ¹²² Ref. | | Communication address/scale | |
|------|------------------------|------------|---------------|------------------|--------------------------|---|------------------------------|---------|-----------------------------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 4.4 | Paraset05 0 0- | | 0-1 EDGE | 0 | | | 7 07 4 | 070 a b | b71.ab | |
| 14 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 370en | D7 TCN | |
| 15 | Paraset 05 Result | | - | 0 | - | 0 | 7.27.4 | 370fh | b71eh | |
| 16 | Paraset06 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3710h | b720h | |
| 47 | Paraset06 | 0 | 0-1 EDGE | 0 | | 0 | | 07446 | 6700h | |
| 17 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 3/110 | D/ZZN | |
| 18 | Paraset 06 Result | | - | 0 | - | 0 | 7.27.4 | 3712h | b724h | |
| 19 | Paraset07 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3713h | b726h | |
| 20 | Paraset07 | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 27116 | 6700h | |
| 20 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 57 1411 | 072011 | |
| 21 | Paraset 07 Result | | - | 0 | - | 0 | 7.27.4 | 3715h | b72ah | |
| 22 | Paraset08 In | | 0-1 | 0 | - | 0 | 7.27.4 | 3716h | b72ch | |
| 00 | Paraset08 | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 0717h | h70ah | |
| 23 | Туре | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 3/1/11 | b/Zen | |
| 24 | Paraset 08 Result | | - | 0 | - | 0 | 7.27.4 | 3718h | b730h | |
| 25 | Dorocot00 In | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 2710h | h720h | |
| 20 | Paraset09 III | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 57 1911 | 073211 | |
| 26 | Paraset09 Type | | - | 0 | - | 0 | 7.27.4 | 371ah | b734h | |
| 27 | Paraset 09 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 371bh | b736h | |
| 00 | Deres et 10 la | 0 0-1 EDGE | | 0 | | | | 074 ab | 6700h | |
| 20 | Parasetto in | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 37 TCN | 073011 | |
| 29 | Paraset10 Type | | - | 0 | - | 0 | 7.27.4 | 371dh | b73ah | |
| 30 | Paraset 10 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 371eh | b73ch | |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ¹²² | Ref. | Communication address/scale | | |
|------|----------------------|---|---------------|----------|------|-------------------------|--------|-----------------------------|---------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 24 | Dereset11 In | 0 | 0-1 EDGE | 0 | | | | 074fb | h72ah | |
| 31 | Parasetti in | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 37 110 | b/sen | |
| 32 | Paraset11 Type | | - | 0 | - | 0 | 7.27.4 | 3720h | b740h | |
| 33 | Paraset 11 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3721h | b742h | |
| 24 | Paracat12 In | 0 | 0-1 EDGE | 0 | | 0 | 7 77 / | 2700h | h711h | |
| - 34 | | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 572211 | 074411 | |
| 35 | Paraset12 Type | | - | 0 | - | 0 | 7.27.4 | 3723h | b746h | |
| 36 | Paraset 12 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3724h | b748h | |
| 27 | Dereset12 In | 0 | 0-1 EDGE | 0 | _ | 0 | 7 07 4 | 270Eb | h71ah | |
| 37 | Parasetts in | 1 | 1-0 EDGE | | - | 0 | 1.21.4 | 37230 | D74an | |
| 38 | Paraset13 Type | | - | 0 | - | 0 | 7.27.4 | 3726h | b74ch | |
| 39 | Paraset 13 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3727h | b74eh | |
| 40 | Dereset14 In | 0 | 0-1 EDGE | 0-1 EDGE | | | 7 07 4 | 3728h | h750h | |
| 40 | Paraset 14 m | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 372011 | 07500 | |
| 41 | Paraset14 Type | | - | 0 | - | 0 | 7.27.4 | 3729h | b752h | |
| 42 | Paraset 14 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 372ah | b754h | |
| 40 | Democrate La | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 07055 | 1-750h | |
| 43 | Paraset15 In | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 37200 | D/56N | |
| 44 | Paraset15 Type | - | | 0 | - | 0 | 7.27.4 | 372ch | b758h | |
| 45 | Paraset 15 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 372dh | b75ah | |
| 40 | Deresta | 0 | 0-1 EDGE | 0 | | | 7 07 4 | 4 070 | h h75-t | |
| 46 | Paraset 16 In | 1 | 1-0 EDGE | U | - | 0 | 1.21.4 | Jarzen | noc va | |

| Code | LCD Display | | Setting Range | Initial | Unit | Property ¹²² | Ref. | Commu addres | nication s/scale |
|------|----------------------|---|------------------------|---------|------|-------------------------|--------|-----------------|---------------------|
| | | | | value | | . , | | 16-Bit | 32-Bit |
| 47 | Paraset16 Type | | - | 0 | - | 0 | 7.27.4 | 372fh | b75eh |
| 48 | Paraset 16 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3730h | b760h |
| 10 | Parasot17 In | 0 | 0-1 EDGE | 0 | | 0 | 7 27 / | 3731h | h762h |
| 49 | | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 575111 | 070211 |
| 50 | Paraset17 Type | | - | 0 | - | 0 | 7.27.4 | 3732h | b764h |
| 51 | Paraset 17 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3733h | b766h |
| 50 | Demos etd.0 la | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 07046 | h 700h |
| 52 | Paraset18 In | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 3734n | b/68h |
| 53 | Paraset18 Type | | - | 0 | - | 0 | 7.27.4 | 3735h | b76ah |
| 54 | Paraset 18 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3736h | b76ch |
| EE | Dereset10 In | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 0707h | h76ah |
| 55 | Parasetty in | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 373711 | b/ben |
| 56 | Paraset19 Type | | - | 0 | - | 0 | 7.27.4 | 3738h | b770h |
| 57 | Paraset 19 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 3739h | b772h |
| EO | Deresst20 In | 0 | 0-1 EDGE | 0 | | 0 | 7 07 4 | 272ab | h771h |
| 20 | Parasetzo in | 1 | 1-0 EDGE | 0 | - | 0 | 1.21.4 | 37 San | 07740 |
| 59 | Paraset20 Type | | - | 0 | - | 0 | 7.27.4 | 373bh | b776h |
| 60 | Paraset 20 Result | | 0-1 | 0 | - | 0 | 7.27.4 | 373ch | b778h |
| 61 | Var 01 | | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 373dh | b77ah |
| 62 | Var 02 | | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 373eh | b77ch |
| 63 | Var 03 | | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 373fh | b77eh |

| Code | LCD Display | D Display Setting Range Initial Uni | | Unit | Property ¹²² | Ref. | Communication address/scale | | |
|------|-------------|-------------------------------------|-------|------|-------------------------|--------|-----------------------------|--------|--|
| | | | value | | , , | | 16-Bit | 32-Bit | |
| 64 | Var 04 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3740h | b780h | |
| 65 | Var 05 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3741h | b782h | |
| 66 | Var 06 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3742h | b784h | |
| 67 | Var 07 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3743h | b786h | |
| 68 | Var 08 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3744h | b788h | |
| 69 | Var 09 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3745h | b78ah | |
| 70 | Var 10 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3746h | b78ch | |
| 71 | Var 11 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3747h | b78eh | |
| 72 | Var 12 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3748h | b790h | |
| 73 | Var 13 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3749h | b792h | |
| 74 | Var 14 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 374ah | b794h | |
| 75 | Var 15 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 374bh | b796h | |
| 76 | Var 16 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 374ch | b798h | |
| 77 | Var 17 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 374dh | b79ah | |
| 78 | Var 18 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 374eh | b79ch | |
| 79 | Var 19 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 374fh | b79eh | |
| 80 | Var 20 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3750h | b7a0h | |

| Code | LCD Display Setting Range Val | | Initial | Unit | Property ¹²² | Ref. | Communication address/scale | |
|------|-------------------------------|--------------------------|---------|-------|-------------------------|--------|-----------------------------|--------|
| | | | value | Value | | | 16-Bit | 32-Bit |
| 81 | Var 21 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3751h | b7a2h |
| 82 | Var 22 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3752h | b7a4h |
| 83 | Var 23 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3753h | b7a6h |
| 84 | Var 24 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3754h | b7a8h |
| 85 | Var 25 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3755h | b7aah |
| 86 | Var 26 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3756h | b7ach |
| 87 | Var 27 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3757h | b7aeh |
| 88 | Var 28 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 3758h | b7b0h |
| 89 | Var 29 | -999999999- 999999999 | 0 | - | 0 | 7.27.4 | 3759h | b7b2h |
| 90 | Var 30 | -99999999- 99999999 | 0 | - | 0 | 7.27.4 | 375ah | b7b4h |

13.32 User Sequence Special Function Group (USM)

This group is only activated when the APP-03 (User Seq Enable) value is 1 (Yes).

| Code | LCD Display | | Setting Range | | Unit | Property ¹²³ | Ref. | Communication address/scale | |
|--------|----------------|---|---------------|-------|------|-------------------------|--------|-----------------------------|--------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 0 | Jump Code | | 1-99 | 33 | - | 0 | 4.3.3 | 3800h | b800h |
| 1 | Mux1 Input01 | 0 | Off | 0 | | 0 | 7 27 5 | 2801h | 6802b |
| | | 1 | On | 0 | - | 0 | 1.21.3 | 300 111 | 000211 |
| 2 | Mux1 Input02 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3802h | 6004F |
| 2 | | 1 | On | 0 | - | 0 | 1.21.3 | 300211 | 000411 |
| з | Mux1 Input03 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3803h | 68066 |
| 5 | | 1 | On | 0 | - | 0 | 1.21.5 | 300311 | 000011 |
| Λ | Mux1 Input04 | 0 | Off | 0 | | 0 | 7 27 5 | 380/h | 68086 |
| | | 1 | On | 0 | | | 1.21.0 | 500411 | |
| 5 | E Mux1 Ipput0E | 0 | Off | 0 | | 0 | 7 27 5 | 2805h | h80ah |
| 5 | wux i inputos | 1 | On | 0 | - | 0 | 1.21.3 | 300311 | Douali |
| 6 | Mux1 Input06 | 0 | Off | 0 | | 0 | 7 27 5 | 3806h | h80ch |
| 0 | Mux i inputoo | 1 | On | 0 | - | 0 | 1.21.3 | 300011 | |
| 7 | Mux1 Input07 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3807h | h80ah |
| 1 | | 1 | On | 0 | - | | 1.21.3 | 300711 | booen |
| 8 | Muv1 Input08 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3808h | h810h |
| 0 | | 1 | On | 0 | - | 0 | 1.21.5 | 300011 | |
| Q | Mux1 Input00 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3800h | h812h |
| | | 1 | On | 0 | | | 1.21.5 | 500911 | 001211 |
| 10 | Mux1 Input10 | 0 | Off | 0 | _ | 0 | 7 27 5 | 380ah | h81/h |
| 10 | | 1 | On | 0 | - | | 1.21.5 | Jouan | |
| 11 | Mux1 Input11 | 0 | Off | 0 | _ | 0 | 7 07 5 | 380bb | h016h |
| 11 Mux | | 1 | On | U | - | | 1.21.3 | 500011 | 10100 |

¹²³ O: Writable during operation, \triangle : Writable when stopped, X: Not writable

| Code | Code LCD Display | | Setting Range | Initial | Unit | Property ¹²³ | Ref. | Communication address/scale | | |
|----------|------------------|---|---------------|---------|------|-------------------------|--------|-----------------------------|----------|--------|
| | | | 6 6 | value | | . , | | 16-Bit | 32-Bit | |
| 4.0 | M 4 1 140 | 0 | Off | 0 | | | 7 07 5 | 000 1 | | |
| 12 | Mux1 Input12 | 1 | On | 0 | - | 0 | 1.21.5 | 380CN | 08180 | |
| 12 | Mux1 Input12 | 0 | Off | 0 | | 0 | 7 27 5 | 200db | h01ah | |
| 15 | | 1 | On | 0 | - | 0 | 1.21.3 | 300011 | DOTAIL | |
| 1/ | Mux1 Input1/ | 0 | Off | 0 | _ | 0 | 7 27 5 | 380eb | h01ak | |
| 14 | | 1 | On | 0 | - | 0 | 1.21.5 | 500en | DOTOT | |
| 15 | Mux1 Input15 | 0 | Off | 0 | _ | 0 | 7 27 5 | 380fb | h81ah | |
| 15 | | 1 | On | 0 | - | 0 | 1.21.3 | 30011 | Doleii | |
| 16 | Mux1 Input16 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3810h | 6820h | |
| 10 | | 1 | On | 0 | - | | 1.21.5 | 501011 | 002011 | |
| 17 | Mux1 Output | | 0000-FFFF | 0000 | Hex | 0 | 7.27.5 | 3811h | b822h | |
| 18 | Demux1 Input | | 0000-FFFF | 0000 | Hex | 0 | 7.27.5 | 3812h | b824h | |
| 19 | Demux1 | 0 | Off | 0 - | _ | 0 | 7 27 5 | 3813h | b826h | |
| 10 | Out01 | 1 | On | | | | 1.21.0 | 001011 | 502011 | |
| 20 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 381/h | h828h | |
| 20 | Out02 | 1 | On | | | | 1.21.5 | 001411 | | |
| 21 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3815h | h82ah | |
| 21 | Out03 | 1 | On | 0 | _ | | 1.21.0 | 501511 | bozan | |
| 22 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3816h | h82ch | |
| 22 | Out04 | 1 | On | 0 | _ | | 1.21.0 | 501011 | 002011 | |
| 23 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3817h | h82eh | |
| 20 | Out05 | 1 | On | 0 | | | 1.21.0 | 501711 | bozen | |
| 24 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3818h | 6830h | |
| 24 | 24 Out06 | 1 | On | 0 | | | 1.21.5 | 501011 | 000011 | |
| 25 | Demux1 | 0 | Off | 0 | _ | 0 | 7 27 5 | 3810h | h832h | |
| 20 | Out07 | 1 | On | 0 | - | | 7.27.5 | 501911 | 1 b832h | |
| 26 | Demux1 | 0 | Off | 0 | | | 7 27 5 | 204-6 | ah h02/h | |
| 26 Out08 | Out08 | 1 | On | U | - | - | | 1.21.3 | Jorali | 003411 |

Table of Functions

| Code | LCD Display | LCD Display Setting Rang | | Initial | Unit | Property ¹²³ | Ref. | Communication address/scale | | |
|------|---------------|--------------------------|------------------|---------|------|-------------------------|---------|-----------------------------|--------|--|
| | | | | value | | | | 16-Bit | 32-Bit | |
| 07 | Demux1 | 0 | Off | 0 | | | 7 07 5 | 20166 | 600Ch | |
| 21 | Out09 | 1 | On | 0 | - | 0 | C. 12.1 | 101 00 | 00300 | |
| 20 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 201 ob | 6020h | |
| 20 | Out10 | 1 | On | U | - | 0 | C. 12.1 | 30100 | 00300 | |
| 20 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 201db | 602ab | |
| 29 | Out11 | 1 | On | 0 | | 0 | 1.21.3 | 301011 | Dosali | |
| 20 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 201ob | h02ah | |
| 30 | Out12 | 1 | On | 0 | - | 0 | 1.21.3 | Soleli | DOSCI | |
| 21 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 201fb | 602ab | |
| 31 | Out13 | 1 | On | 0 | - | 0 | C. 12.1 | 30110 | bosen | |
| 22 | Demux1 | 0 Off | | 0 | | 0 | 7 07 5 | 20206 | 6010b | |
| 32 | Out14 | 1 | On | | - | 0 | 1.21.3 | 302011 | 004011 | |
| 22 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 20216 | 6010h | |
| 33 | Out15 | 1 | On | | - | 0 | 1.21.5 | 302 111 | 004211 | |
| 24 | Demux1 | 0 | Off | 0 | | 0 | 7 07 5 | 20224 | 6011b | |
| 34 | Out16 | 1 | On | 0 | - | 0 | 1.21.5 | 302211 | 004411 | |
| 25 | PI Run | 0 | Off | 0 | | 0 | 7 07 5 | 20226 | 60166 | |
| - 35 | Enable | 1 | On | 0 | | 0 | 1.21.3 | 302311 | 004011 | |
| 26 | Reference | | 200 00 200 00 | 0.00 | 0/ | 0 | 7 07 5 | 3824h | b848h | |
| 30 | Value | | -300.00-300.00 | 0.00 | 70 | 0 | 1.21.5 | 0.01 | 0.01 | |
| 37 | Feedback | | 300 00 300 00 | 0.00 | 0/_ | 0 | 7 27 5 | 3825h | b84ah | |
| 57 | Value | | -300.00-300.00 | 0.00 | 70 | 0 | 1.21.3 | 0.01 | 0.01 | |
| 38 | Proportional | | 0.0-1000.0 | 50.0 | % | 0 | 7 27 5 | 3826h | b84ch | |
| - 50 | Gain | | 0.0-1000.0 | 50.0 | 70 | | 1.21.5 | 0.1 | 0.1 | |
| 30 | Integral Time | | 0 00-200 00 | 10.00 | sec | 0 | 7 27 5 | 3827h | b84eh | |
| | | | 0.00-200.00 | 10.00 | 300 | | 1.21.0 | 0.1 | 0.1 | |
| 46 | Output Limit | | -100 00-100 00 | 0 00 | % | 0 | 7 27 5 | 382eh | b85ch | |
| -0 | Low | | - 100.00- 100.00 | 0.00 | 70 | % O | 1.21.0 | 0.01 | 0.01 | |

| Code | de LCD Display | | ay Setting Range | | Unit | Property ¹²³ | Ref. | Communication address/scale | |
|------|--------------------|---|------------------|--------|------|-------------------------|--------|-----------------------------|---------|
| | | | | value | | | | 16-Bit | 32-Bit |
| 47 | Output Limit | | 400.00.400.00 | 100.00 | 0/ | | 7 07 5 | 382fh | b85eh |
| 47 | High | | -100.00-100.00 | 100.00 | % | 0 | 1.21.5 | 0.01 | 0.01 |
| 10 | Output Scale | | 0.1-1000.0 | 100.0 | 0/2 | 0 | 7 27 5 | 3831h | b862h |
| 43 | | | 0.1-1000.0 | 100.0 | 70 | 0 | 1.21.5 | 0.1 | 0.1 |
| 50 | I-Term Clear | 0 | Off | 0 | _ | 0 | 7 27 5 | 3832h | b864h |
| 00 | | 1 | On | | | | 1.21.0 | 000211 | 500-111 |
| 51 | Output Value | | -100.00-100.00 | _ | % | x | 7.27.5 | 3833h | b866h |
| | • | | | | | | | 0.01 | 0.01 |
| 52 | Error Value | | -300.00-300.00 | _ | % | x | 7.27.5 | 3834h | b868h |
| | | | | | | | | 0.01 | 0.01 |
| 55 | Block Input 01 | | 0-65535 | 0 | - | 0 | 7.27.5 | 3837h | b86eh |
| 56 | Block Input 02 | | 0-65535 | 0 | - | 0 | 7.27.5 | 3838h | b870h |
| 57 | Block Input 03 | | 0-65535 | 0 | - | 0 | 7.27.5 | 3839h | b872h |
| 58 | Block Input 04 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383ah | b874h |
| 59 | Block Input 05 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383bh | b876h |
| 60 | Block Input 06 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383ch | b878h |
| 61 | Block Input 07 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383dh | b87ah |
| 62 | Block Input 08 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383eh | b87ch |
| 63 | Block Input 09 | | 0-65535 | 0 | - | 0 | 7.27.5 | 383fh | b87eh |
| 64 | Block Input 10 | | 0-65535 | 0 | - | 0 | 7.27.5 | 3840h | b880h |
| 65 | Block Output 01 | | 0-65535 | 0 | - | 0 | 7.27.5 | 3841h | b882h |

| Code | LCD Display Setting Range | | | Unit | Property ¹²³ | Ref. | Communication address/scale | |
|------|---------------------------|---------|-------|------|-------------------------|--------|-----------------------------|--------|
| | | | value | | | | 16-Bit | 32-Bit |
| 66 | Block Output 02 | 0-65535 | 0 | - | 0 | 7.27.5 | 3842h | b884h |
| 67 | Block Output 03 | 0-65535 | 0 | - | 0 | 7.27.5 | 3843h | b886h |
| 68 | Block Output 04 | 0-65535 | 0 | - | 0 | 7.27.5 | 3844h | b888h |
| 69 | Block Output 05 | 0-65535 | 0 | - | 0 | 7.27.5 | 3845h | b88ah |
| 70 | Block Output 06 | 0-65535 | 0 | - | 0 | 7.27.5 | 3846h | b88ch |
| 71 | Block Output 07 | 0-65535 | 0 | - | 0 | 7.27.5 | 3847h | b88eh |
| 72 | Block Output 08 | 0-65535 | 0 | - | 0 | 7.27.5 | 3848h | b890h |
| 73 | Block Output 09 | 0-65535 | 0 | - | 0 | 7.27.5 | 3849h | b892h |
| 74 | Block Output 10 | 0-65535 | 0 | - | 0 | 7.27.5 | 384ah | b894h |
| 80 | Block Input 01 | 0-65535 | 0 | - | 0 | 7.27.5 | 3850h | b8a0h |
| 81 | Block Output 01 | 0-65535 | 0 | - | 0 | 7.27.5 | 3851h | b8a2h |

14 Troubleshooting

14.1 Trip and Warning

When the inverter detects an abnormal condition, it will stop (trip) the operation or display a warning to protect the internal circuit. When a trip or warning occurs, detailed trip information and warning information will be displayed on the Smart Operator. When two or more trips occur, the trip information with the highest priority will be displayed first in the Smart Operator,

and the information for the next trip can be accessed by pressing the $\langle (/) \rangle$ key. Refer to **12.3 Trip Status Monitoring** for details about the trip screen.

The trip conditions can be categorized as follows:

- Level: When the trip is corrected, the trip or warning signal will automatically disappear. The trip will not be saved in the trip history.
- Latch: When the trip is corrected and a reset input signal is provided, the trip or warning signal will disappear. In the event that the trip continues, contact the retailer or our customer service center.

14.1.1 Fault Trips

14.1.1.1 Protection Functions for Output Current and Input Voltage

| LCD Display | Trip condition | Details |
|--------------|-------------------|---|
| Over Load | Latch | Displayed when the motor load is greater than the set overload warning level (PRT-36 OL Warn Level) after selecting the motor overload trip. Operates when the PRT-38 (OL Trip Select) code is set to a value other than 0. |
| Under Load | Latch | Displayed when the motor load is less than the set under load level after selecting the motor underload protection function. Operates when the PRT-47 (UL Trip Select) code is set to a value other than 0. |
| Over Current | Latch | Displayed when the inverter output current exceeds 240% of the rated current. |
| Over Voltage | Latch | Displayed when the internal DC circuit voltage is greater than the specified value. |

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| LCD Display | Trip condition | Details |
|--|-----------------|---|
| Low Voltage | Latch/ Level | Displayed when internal DC circuit voltage is less than the specified value during operation. It is possible to set the trip type (Latch/Level) in the PRT-02 (LV Trip Mode) code. |
| Ground Fault Trip | Latch | Displayed when a ground fault trip occurs on the output side of the inverter and causes the current to exceed the specified value. The specified value varies depending on inverter capacity. |
| E-Thermal | Latch | Occurs according to the inverse time characteristic in order to prevent overheating caused by overloads during motor operation. Operates when the MOT1, MOT2-75 (ETH Enable) code is set to a value other than 0. |
| OutputPhase U Open OutputPhase V Open OutputPhase W Open | Latch | Displayed when a 3-phase inverter output has one or more phases in an open circuit condition. Operates when PRT-12 (Out Phase Open Chk) code is set to 1 (Yes). |
| No Motor Trip | Latch | Displayed when a 3-phase inverter output has two or more phases in an open circuit condition. |
| Input Phase Open | Latch | Displayed when a 3-phase inverter input has one or more phases in an open circuit condition while operating with a load of 50% or more of the inverter's rated current. Operates when PRT-10 (In Phase Open Chk) code is set to 1 (Yes). |
| Drive Over Load | Latch | This is an inverse time characteristic protection function that protects an inverter from overloading. Displayed when a current of 150% or more of the inverter's rated current flows for 1 minute. |
| Over Speed | Latch | Displayed when the motor speed exceeds the maximum speed. |
| Speed Deviation | Latch | Displayed when the difference between the motor speed and the current command speed exceeds the set value of PRT-67 (Speed Dev BandFreq) or PRT- 68 (Speed Dev BandSpd) and is maintained above the set value of PRT-69 (Speed Dev Time). |
| Line To Line Short | Latch | Displayed when the inverter output terminal short- circuits. |
| HW OCS Fail | Latch | Displayed when there is an error with H/W overcurrent suppression. |

14.1.1.2 Protection Functions Using Abnormal Internal Circuit Conditions and External Signals

| Table 2 | Trin | rolated to | intornal | airouit/aytarpal | aignal |
|----------|------|------------|----------|------------------|---------|
| Idule Z. | | related to | ппена | circuit/external | Siuliai |
| | | | | | |

| LCD Display | Trip condition | Details |
|--------------------------------|-------------------|--|
| Data Storage Error | Fatal | Displayed when there is an error in reading/writing parameters due to damage to the inverter's internal storage device. |
| Main System Error Watch Dog | Fatal | Displayed when there is an error with S/W operation. |
| Drive Over Heat | Latch | Displayed when the temperature of the inverter heat sink exceeds the specified value. |
| Arm Short | Latch | Displayed when the DC circuit in the inverter detects the size of the short-circuited current. |
| ParameterReset Err | Latch | Displayed when all parameters stored inside the inverter are incorrectly initialized. |
| Fuse Open | Latch | Displayed when there is an error in the fuse in the power unit of the inverter. |
| ADC OffSet | Latch | Displayed when there is an error in the current sensing circuit (U/V/W terminal, current sensor, etc.). |
| NTC Open | Latch | Displayed when a temperature sensor error has been detected in the Insulated Gate Bipolar Transistor (IGBT) or when there is a problem with the internal sensor connection connector. |
| NTC Short | Latch | Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT). |
| IO Board Trip | Latch | Displayed when the I/O board or external communication card is not connected to the inverter or there is a bad connection. |
| Main Fan Fault | Latch | Displayed when an error is detected in the cooling fan. Operates when the PRT-75 (MainFan Trip mode) code is set to 0 (Trip). |
| AuxiliaryFan Fault | Latch | Displayed when an error is detected in the auxiliary cooling fan. |
| Control Fan Fault | Latch | Displayed when an error is detected in the internal circulation fan. |
| MC Fault | Latch | Displayed when there is an error in the magnetic contactor (MC) or relay used in the pre-charge circuit. |

| LCD Display | Trip condition | Details |
|---------------------|-------------------|--|
| Gate Power Loss | Latch | Displayed when there is an error in the power circuit of the power unit in the inverter. |
| Power Index Error | Level | Displayed when there is an error in the capacity recognition circuit of the power unit in the inverter. |
| STO P24 Fault | Latch | Displayed when there is an error in the safety circuit (24V power). |
| STO P05 Fault | Latch | Displayed when there is an error in the safety circuit (5V power). |
| Option Trip-1, 2, 3 | Latch | Displayed when an option installed in the inverter is not recognized. |
| CAN Bus Error | Latch | Displayed when there is an error with the communication interface with the option installed on the inverter. |

14.1.1.3 External Interface Fault

| Table 3. | Trip | related | to | external | interface |
|----------|------|---------|----|----------|-----------|
|----------|------|---------|----|----------|-----------|

| LCD Display | Trip condition | Details |
|--------------------------|-------------------|---|
| External Trip-1, 2, 3, 4 | Latch/ Level | Displayed when an external trip signal is provided by the multifunction terminal. Operates when DIN-01, 03, 05, 07, 09, 11, 13, 15 (DI1-DI8 Define) codes are set to 5-8 (External Trip-1 to External Trip-4). |
| BX | Level | Displayed when the inverter output is blocked according to the function setting of the multifunction terminal. Operates when DIN-01, 03, 05, 07, 09, 11, 13, 15(DI1-DI8 Define) codes are set to 4 (BX). |
| Lost Analog-1, 2, 3 | Level | Displayed if a trip signal is provided when the analog input is not connected. Operates when PRT-25, 28, 31 (Lost AI1-AI3 Mode) codes are set to a value other than 0. |
| Lost Keypad | Level | Displayed if a trip signal is provided when the Smart Operator is not connected. Operates when PRT-16 (Lost Keypad Mode) is set to a value other than 0. |
| Lost Internal Comm | Level | Displayed if a trip signal is provided when communication is not performed through internal communication. Operates when PRT-17 (Lost IntComm Mode) is set to a value other than 0. |

| LCD Display | Trip condition | Details |
|--------------------------------|-------------------|--|
| Lost USB | Level | Displayed if a trip signal is provided when communication is not performed through the USB connector. Operates when PRT-19 (Lost USB Mode) is set to a value other than 0. |
| Lost Ext Ana In- 1, 2, 3, 4 | Level | Displayed if a trip signal is provided when the analog input in the extended IO is not connected. |
| Lost Option Comm | Level | Displayed if a trip signal is provided when there is an error in the communication of the option card. |
| STO Feedback A/B | Latch/ Level | Displayed when SA or SB input is not in the STO terminal block. Depending on the settings of PRT- 82 (Safety Trip Mode), latch/level operation is determined. |
| Motor Over Heat | Latch | Displayed if the motor overheats when the motor temperature is detected through the PTC. |
| Encoder Error | Latch | Displayed when the polarity of each signal of line drive type encoder is incorrectly connected. |
| Lost External 24V | Level | Displayed if there is no external 24V power input when the PRT-89 (Ext 24V Pwr Lost) setting value is 1 (Yes). If PRT-89 (Ext 24V Pwr Lost) is set to 0 (No), 24V power input is not checked. |
| Encoder Error | Latch | Displayed when the encoder wiring is incorrect. Operates only on line drive-type encoders. |
| Encoder No Connect | Latch | Displayed if there is no encoder when using a function that requires an encoder. |
| Encoder Tuning Err | Latch | Displayed when the Z pulse does not come in abnormally when tuning the encoder. |
| Pole Pos Detect F | Latch | Displayed when there is an error in the PM motor stimulus estimation. |

14.1.1.4 Advanced Functions

Table 4. Trip related to application functions

| LCD Display | Trip condition | Details |
|--------------------|-------------------|---|
| Mechanical Brake | Latch | Displayed when there is an error with the mechanical brake sequence. |
| Reset Restart Fail | Latch | Displayed when the restart function is activated after more than the set number of resets has been performed. |
| Pre-PID Fail | Latch | Displayed when Pre-PID fails. |
| KEB Safety Stop | Latch | Displayed when there is an error with KEB operation. |
| Br Release Invalid | Latch | Displayed when the brake is not released because the load required to release the brake is not reached for a certain period of time. |
| Br Releasing Fail | Latch | Displayed when a request to release the brake is issued and the actual brake is not released after a certain period of time. Operates when the DIN-01, 03, 05, 07, 09, 11, 13, 15 (DI1-DI8 Define) codes are set to 55 (Brake Monitor Sel). |
| Br Engaging Fail | Latch | Displayed when a request to fix the brake is issued and the actual brake is not fixed after a certain period of time. Operates when the DIN-01, 03, 05, 07, 09, 11, 13, 15 (DI1-DI8 Define) codes are set to 55 (Brake Monitor Sel). |
| POS Max Track Err | Latch | Occurs when the difference between the reference pulse and position feedback pulse is bigger than the setting value of POS1-36 (Max Track Pulse). |
| Pos Tar Bound Err | Latch | Displayed when the difference between the target position and the actual position after conducting position control is greater than the set value of POS1- 37 (Tar Bound Pulse). |
| Pos SW Limit High | Latch | Displayed if the current position (POS1-4 Cur Position) is greater than the set value of SW Hight Limit (POS1-33 Pos SW Limit High) when POS1-30 (SW Limit Prot Mode) is set to 1 (Trip) and POS1- 31 (SW Limit Hi Enable) is set to 1 (Yes) in position control mode. |
| Pos SW Limit Low | Latch | Displayed if the current position (POS1-4 Cur Position) exceeds the set value of SW Low Limit (POS1-34 Pos SW Limit Low) when POS1-30 (SW Limit Prot Mode) is set to 1 (Trip) and POS1-32 (SW Limit Lo Enable) is set to 1 (Yes) in position control mode. |

| LCD Display | Trip condition | Details |
|-------------------|-------------------|--|
| Pos HW Limit High | Latch | Displayed when an input signal is input into the multifunction terminal whose DI1-DI8 Define code is set to 59 (POS HW Lmt H). |
| Pos HW Limit Low | Latch | Displayed when an input signal is input into the multifunction terminal whose DI1-DI8 Define code is set to 58 (POS HW Lmt L). |
| Pos Multi Sync F | Latch | Displayed when there is an error with the multiposition sync. |
| Cur Pos Overf Err | Latch | Displayed when there is an error in the firmware internal operation during position control. |

14.1.1.5 Diagnostic Functions

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Table 5. Trip related to diagnostic functions

| LCD Display | Trip condition | Details |
|--------------------|-------------------|---|
| Main Cap Diag Fail | Latch | Displayed when the current input voltage falls below the applicable voltage during the main capacitor diagnostic function, or when the power is not turned off for longer than 10 seconds. |

14.1.1.6 Miscellaneous

Table 6. Miscellaneous trip

| LCD Display | Trip condition | Details |
|---------------------|-------------------|--|
| ParaWrite Trip | Latch | Displayed when communication is not achieved while writing parameters due to a wire error or poor contact in the Smart Operator. Displayed when using the Smart Operator. |
| System Error-1 | Latch | Displayed when there is an error inside the firmware. |
| Lost Power MCU | Latch | Displayed when there is an error in the power unit inside the inverter. |
| Option Trip-1, 2, 3 | Latch | Displayed when an option installed in the inverter is not recognized. |

14.1.2 Warning Messages

14.1.2.1 Fault status

Table 7. Fault status warning

| LCD Display | Details |
|---------------------|---|
| Over Load Warn | Displayed when the motor becomes overloaded. Operates when PRT-35 (OL Warn Select) code is set to 1 (Yes). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 5 (Over Load Warn). |
| Under Load Warn | Displayed when the motor becomes underloaded. Operates when PRT-45 (UL Warn Select) code is set to 1 (Yes). To receive a warning output signal, set OUT-50, 52, 54 (DO1- DO3 Status) codes to 7 (Under Load Warn). |
| Drv Over Load Warn | Displayed when a time equivalent to 60% of the operating time of the inverter overload protection (IOLT) function is accumulated. To receive a warning output signal, set OUT-50, 52, 54 (DO1- DO3 Status) codes to 6 (Drv Over Load Warn). |
| Lost Keypad Warn | Displayed when the Smart Operator (Keypad) connection is lost. Operates when PRT-16 (Lost Keypad Mode) is set to 3 (Warning). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 25 (lost Keypad Warn). |
| Lost Int Comm Warn | Displayed when internal communication is lost. Operates when PRT-17 (Lost IntComm Mode) is set to 3 (Warning). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 13 (Lost Int Comm Warn). |
| Lost USB Warn | Displayed when the USB connection on the main body is lost. Operates when PRT-19 (Lost USB Mode) is set to 3 (Warning). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 34 (Lost USB Warn). |
| Lost Analog InI-1~3 | Displayed when analog input terminal connection is lost. To receive a warning output signal, set OUT-50, 52, 54 (DO1- DO3 Status) codes to 36, 37, 38 (Lost Al-1 - 3 Warn). |
| Main Fan Warning | Displayed when an error is detected in the cooling fan. Operates when PRT-75 (MainFan Trip Mode) code is set to 1 (Warn). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 8 (MainFan Warn). |

| LCD Display | Details |
|--------------------|--|
| DB Warn %ED | Displayed when the DB resistor warning level is greater than the APP-37 (DB Warn %ED) set value. Operates when the APP-36 (DB Warn %ED Enable) code is set to 1 (Yes). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 26 (DB Warn %ED). |
| PreChargerRepWarn | Displayed when the number of pre-charger operations (DIAG- 42 PreCharger Used Lv) is greater than the pre-charger replacement level (DIAG-41 PreCharger Repl Lv). Operates when the DIAG-40 (PreCharger Warn Sel) code is set to 1 (Yes). |
| Main Cap Repl Warn | Displayed when the cumulative usage time of the main capacitor is greater than DIAG-12 (MainCap Repl Level). To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 40 (Main Cap Repl Warn). |
| Low Capacity Warn | Displayed when the capacitor capacity is low after performing main capacitor diagnostics. |
| MainCap Diag Alarm | It is a function that alerts with a warning so that periodic testing of the main capacitor can be performed. To receive a warning output signal, set the OUT-50, 52, 54 (DO1-DO3 Status) codes to 43 (Main Cap Diag Alarm). |
| Pos SW Limit High | Displayed when the current position (POS1-04 Cur Position) is greater than the set value of SW Hight Limit (POS1-33 Pos SW Limit High) in position control mode. Operates when POS1-30 (SW Limit Prot Mode) is set to 1 (Warning) and POS1-31 (SW Limit Hi Enable) is set to 1 (Yes) in position control mode. |
| Pos SW Limit Low | Displayed when the current position (POS1-4 Cur Position) is greater than the set value of SW Low Limit (POS1-34 Pos SW Limit Low) in position control mode. Operates when POS1-30 (SW Limit Prot Mode) is set to 1 (Warning) and POS1-32 (SW Limit Lo Enable) is set to 1 (Yes) in position control mode. |
| Pos HW Limit High | Occurs when there is an input signal at the multifunction terminal to which 59 (POS HW Lmt H) is set for the Define code of DI1-DI8 of the terminal input group (DIN). |
| Pos HW Limit Low | Occurs when there is an input signal at the multifunction terminal where 58 (POS HW Lmt L) is set for the Define item of DI1-DI8 of the terminal input group (DIN). |
| Motor Over Heat | Displayed when electronic thermal of the motor is detected by the temperature sensor attached to the motor. |
| AC Input Over Volt | Displayed when the input voltage of the inverter is greater than the allowable range during a stop. |
| AC Input Low Volt | Displayed when the input voltage of the inverter is less than the allowable range during a stop. |

14.1.2.2 Status display according to advanced tasks

Table 8. Status display warning according to advanced tasks

| LCD Display | Details |
|-------------------|--|
| Torque->Speed | Displayed when converting to speed control mode during a torque control mode operation in torque control mode. |
| Speed->Torque | Displayed when converting to torque control mode during a speed control mode operation in torque control mode. |
| Running Auto Tune | Displayed to indicate that autotuning is currently in progress. |
| Fire Mode | Displayed to indicate that a fire mode operation is currently in progress. |

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14.1.2.3 Miscellaneous

Table 9. Miscellaneous warnings

| LCD Display | Details |
|------------------|--|
| Power Off Please | Displayed if power off is required according to the sequence when performing the main capacitor diagnostic function. |

14.2 Troubleshooting Fault Trips

When a fault trip or warning occurs due to a protection function, refer to the following table for possible causes and remedies.

Table 10. Troubleshooting Fault Trips

| Items | Cause | Remedy |
|--------------|--|---|
| Over Load | The load is greater than the rated motor capacity. | Replace the motor and inverter with models that have a larger capacity. |
| | The set value for the overload trip level (PRT-39 OL Trip Level) is too low. | Increase the set value for the overload trip level. |
| Under Load | There is a motor-load connection problem. | Replace the motor and inverter with models that have smaller capacities. |
| | The set value for underload level is greater than the system's minimum load. | Lower the set value of the underload level (PRT-49 UL LF Level, PRT-50 UL BF Level). |
| Over Current | The acceleration/deceleration time is too short for the load inertia (GD2). | Set the acceleration/ deceleration time (DRV-05 Acc Time, DRV-06 Dec Time) to a longer value. |
| | The inverter load is greater than the rated capacity. | Replace the inverter with a model that has increased capacity. |
| | Inverter output was applied during a motor free run. | Operate the inverter after the motor has stopped or use the speed search function (APP-05 SpeedSearch Mode). |
| | The mechanical brake of the motor is operating too fast. | Check the mechanical brake. |

| Items | Cause | Remedy |
|--------------|---|--|
| Over Voltage | Deceleration time is too short for the load inertia (GD2). | Set the deceleration time (PRT-01 Trip Dec Time) to a longer value. |
| | A generative load occurs at the inverter output. | Use the braking unit. Refer to <u>16.6 Braking Unit</u> and Braking Resistor <u>Specifications</u> for more information on the types and specifications of brake units that can be used. |
| | The input voltage is too high. | Determine if the input voltage is above the specified value. |
| | The input voltage during operation is low. | Determine if the input voltage is below the specified value. |
| | A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.). | Increase the power capacity. |
| Low voltage | The magnetic contactor (MC) connected to the power source has a faulty connection. | Replace the magnetic contactor. |
| | An input open-phase has occurred when input voltage is low. | Check the input wiring. |
| Ground Trip | A ground fault has occurred in the inverter output wiring. | Check the output wiring. |
| Ground mp | The motor insulation is damaged. | Replace the motor. |
| E-Thermal | The motor is overheated. | Reduce the load or operation frequency. |
| | The inverter load is greater than the rated capacity. | Replace the inverter with a model that has increased capacity. |
| | The set value for electronic thermal protection (ETH) is too low. | Set the electronic thermal protection level (MOT1, MOT2- 77 ETH Cont Current, MOT1, MOT2-78 ETH 1min Current) appropriately. |
| | The inverter has been operated at low speed for an extended duration. | Replace the motor with a model that supplies extra power to the motor cooling fan. |

| Items | Cause | Remedy |
|----------------|--|---|
| Out Phase Open | The magnetic contactor (MC) on the output side has a connection fault. | Check the magnetic contactor on the output side. |
| | The output wiring is faulty. | Check the output wiring. |
| | The magnetic contactor (MC) on the input side has a connection fault. | Check the magnetic contactor on the input side. |
| In Phase Open | The input wiring is faulty. | Check the input wiring. |
| | The DC link capacitor needs to be replaced. | Replace the DC link capacitor. Contact the retailer or our customer service center. |
| Inverter OLT | The load is greater than the rated motor capacity. | Replace the motor and inverter with models that have a larger capacity. |
| | The torque boost level is too high. | Reduce the torque boost level. |
| | There is a problem with the cooling system. | Determine if a foreign object is obstructing the air inlet, outlet, or vent. |
| Over Heat | The inverter cooling fan has been operated for an extended period. | Replace the cooling fan. |
| | The ambient temperature is too high. | Keep the ambient temperature below 50℃. |
| | Output wiring is short-circuited. | Check the output wiring. |
| Arm Short | There is a fault with the electronic semiconductor (IGBT). | Do not operate the inverter. Contact the retailer or our customer service center. |
| NTC Open | The ambient temperature is too low. | Keep the ambient temperature above -10℃. |
| | There is a fault with the internal temperature sensor. | Contact the retailer or our customer service center. |
| Main Fan Fault | A foreign object is obstructing the fan's air vent. | Remove the foreign object from the air inlet or outlet. |
| | The cooling fan needs to be replaced. | Replace the cooling fan. |

14.3 Actions on Other Faults

When a fault other than those identified as fault trips or warnings occurs, refer to the following table for possible causes and remedies.

Table 11. Actions on Other Faults

| Items | Cause | Remedy |
|------------------------------|--|--|
| Parameters cannot be set. | The inverter is in operation (driving mode). | Stop the inverter to change to program mode and set the parameter. Refer to <u>13 Table of</u> <u>Functions</u> for a list of parameters that cannot be changed during operation. |
| | The parameter access is incorrect. | Check the correct parameter access level and set the parameter. |
| | The password is incorrect. | Check the password, disable the parameter lock and set the parameter. |
| | Low voltage is detected. | Check the power input to resolve the low voltage and set the parameter. |
| The motor does not rotate. | The frequency command source is set incorrectly. | Check the frequency command source setting. Refer to <u>5.1</u> <u>Frequency Settings</u> for details. |
| | The operation command source is set incorrectly. | Check the operation command source setting. Refer to <u>5.2</u> <u>Operation Command Settings</u> for details. |
| | Power is not supplied to the terminal R/S/T. | Check the terminal connections R/S/T and U/V/W. Refer to <u>2.2.3</u> <u>Step 3 Power Terminal Wiring</u> for information about terminal wiring. |
| | The charge indicator is off. | Turn on the inverter. |
| | The operation command is off. | Turn on the operation command as directed in DRV-10 (1st Command Source). |
| | The motor is locked. | Unlock the motor or lower the load level. |

| Items | Cause | Remedy |
|---|---|---|
| The motor does not rotate. | The load is too high. | Operate the motor independently. |
| | An emergency stop signal is input. | Reset the emergency stop signal. |
| | The wiring for the control circuit terminal is incorrect. | Check the wiring for the control circuit terminal. |
| | The input voltage or current for the frequency command is incorrect. | Check the input voltage or current for the frequency command. Refer to <u>5.1.1.3 Setting Frequency via</u> <u>Terminal Analog Voltage Input</u> (<u>AI1-AI3</u>) for details. |
| | The PNP/NPN mode is selected incorrectly. | Check the PNP/NPN mode setting. Refer to <u>2.2.5 Step 5</u> <u>PNP/ NPN Mode Selection</u> for details. |
| | The frequency command value is too low. | Check the frequency command and input a value above the minimum frequency. Refer to <u>5.1.1.2 Setting Operating</u> <u>Frequency in the Smart</u> <u>Operator-Direct Input</u> for details. |
| | The motor torque is too low. | Manually increase the amount of torque boost to operate. Refer to 7.6.1 Manual Torque Boost for details. If the fault remains, replace the inverter with a model with increased capacity. |
| The motor rotates in the opposite direction to the command. | The wiring for the motor output cable is incorrect. | Make sure that the output wiring is properly connected to the motor's phase (U/V/W). Refer to <u>2.2.3</u> <u>Step 3 Power Terminal Wiring</u> for information about terminal wiring. |
| | The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect. | Check the forward/reverse rotation wiring. |

| ltems | Cause | Remedy |
|--|---|---|
| The motor only rotates in one direction. | Reverse rotation prevention is selected. | Remove the reverse rotation prevention. |
| | The reverse rotation signal is not provided, even when a 3-wire sequence is selected. | Check the input signal associated with the 3-wire operation and adjust as necessary. Refer to <u>7.3</u> <u>3-Wire Operation</u> for details. |
| | The load is too high. | Reduce the load. Set the acceleration/deceleration time (DRV-05 Acc Time, DRV-06 Dec Time) to a longer value. |
| | | Check the motor-related parameters (MOT1, MOT2) and set the correct values. |
| | | Replace the motor and the inverter with models with appropriate capacities for the load. |
| | The ambient temperature of the motor is too high. | Lower the ambient temperature of the motor. |
| The motor is overheating. | The motor's phase-to-phase voltage is insufficient. | Use a motor that can withstand phase-to-phase voltage surges greater than the maximum surge voltage. |
| | | Only use motors suitable for applications with inverters. |
| | | Connect the AC reactor to the output side. Refer to <u>16.4.2</u> <u>AC Input Fuse and Reactor</u> <u>Specifications</u> for more information on the types and specifications of AC reactors that can be used |
| | The motor fan has stopped or the fan is obstructed with debris. | Check the motor fan and remove any foreign objects. |

| Items | Cause | Remedy |
|---|--|---|
| The motor stops when accelerating. | The load is too high. | Reduce the load. |
| | | Manually increase the amount of torque boost to operate. Refer to 7.6.1 Manual Torque Boost for details. |
| | | Replace the motor and the inverter with models with appropriate capacities for the load. |
| | The current is too high. | Manually reduce the amount of torque boost to operate if the load is light but the current is high. Refer to <u>7.6.1 Manual Torque</u> <u>Boost</u> for details. |
| | | Reduce the load. |
| The motor stops when the load is connected. | The load is too high. | Replace the motor and the inverter with models with appropriate capacities for the load. |
| | The frequency command value is low. | Check the frequency command and enter the value in the DRV-01 (Command Frequency) code or DRV-02 (Command Speed) code. |
| | The load is too high. | Reduce the load or increase the acceleration time (DRV-05 Acc Time). Or check the mechanical brake status. |
| The motor does not | The acceleration time is too long. | Check the acceleration time (DRV-05 Acc Time) and change it. |
| accelerate. / The acceleration time of the motor is long. | The combined values of the motor properties and the inverter parameter are incorrect. | Check the motor-related parameter group (MOT1, MOT2) and change the code value. |
| | The stall prevention level during acceleration is low. | Check the stall prevention level (VF1, VF2-81, 84, 87, 90 Stall Level-1 to Stall level-4) and change it. |
| | The stall prevention level during operation is low. | Check the stall prevention level (VF1, VF2-81, 84, 87, 90 Stall Level-1 to Stall level-4) and change it. |

| Items | Cause | Remedy |
|--|---|---|
| Motor revolutions per minute varies during | There is a high variance in load. | Replace the motor and inverter with models that have a larger capacity. |
| | The input voltage varies. | Stabilize the power supply voltage. |
| oporation. | Motor speed variations occur at a specific frequency. | Adjust the output frequency (DRV- 01 Command Frequency) to avoid a resonance area. |
| The motor rotation is different from the setting. | The V/F pattern is set incorrectly. | Set the V/F pattern (VF1, VF2- 01) in accordance with the motor specifications. |
| | The deceleration time is set too long. | Check the deceleration time (DRV-06 Dec Time) and change the setting. |
| The motor deceleration time is too long even with Dynamic Braking (DB) | Motor torque is insufficient. | Replace it with a motor of larger capacity if the motor-related parameters (MOT1, MOT2) are normal. |
| | There is a load applied to the inverter that exceeds its current limit. | Replace the inverter with a model that has increased capacity. |
| While the inverter is in operation, a control unit malfunctions or noise occurs. | Noise occurs due to switching inside the inverter. | Change the carrier frequency (DRV-27 Carrier Frequency) to the minimum value. |
| | | Install a micro surge filter in the inverter output. |
| | An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation. | Connect the inverter to a ground terminal. |
| When the inverter is operating, the earth leakage breaker is activated. | | Check that the ground resistance is less than 100 Ω for 200 V inverters and less than 10 Ω for 400 V inverters. |
| | | Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter. |
| | | Set the carrier frequency (DRV-27 Carrier Frequency) to a low value. |
| | | Make the cable length between the inverter and the motor as short as possible. |

| Items | Cause | Remedy |
|---|---|---|
| The motor vibrates severely and does not rotate normally. | The voltage between phases is badly balanced. | Check the input voltage and balance the voltage. |
| | | Check and test the motor's insulation. |
| | Resonance occurs between the motor's natural frequency and the carrier frequency. | Increase or decrease the carrier frequency (DRV-27 Carrier Frequency) slightly. |
| The motors makes humming, or loud noises | Resonance occurs between the motor's natural frequency and the inverter's output frequency. | Increase or decrease the operation frequency (DRV-01 Command Frequency) slightly. |
| 101565. | | Use the frequency jump function to avoid the frequency band where resonance occurs. Refer to <u>Frequency Jump</u> for details. |
| The motor vibrates/ hunts. | The frequency input command is an external, analog command. | In situations of noise inflow on the analog input side that results in frequency command interference, change the set value of the input filter time constant (AIN-04, 19, 34 AI1, 2, 3 LPF Gain). |
| | The wiring length between the inverter and the motor is too long. | The total wiring length for the inverter and motor should not exceed 100m. |
| | There is a deviation in the rotor time constant value when operating in induction motor vector control mode using the position/speed sensor. | Increase the current controller bandwidth (MOT1, MOT2-51 ACR Bandwidth) or adjust the torque compensation value (VEC1, VEC2-34 IMSD Trq Comp). |
| The motor will not come to a complete stop when the inverter output stops. | It is difficult to decelerate sufficiently, because DC braking is not operating normally. | Adjust the DC braking parameter. Refer to <u>5.2.5.2 Stop after DC</u> <u>Braking</u> for details. |
| | | Adjust the set value of DC braking current (BAS-07 DC Brake Level) to a larger value. |
| | | Adjust the set value of DC braking time (BAS-06 DC Brake Timer) to a larger value. |

| Items | Cause | Remedy | |
|---|--|--|--|
| - | The frequency reference is within the jump frequency range. | Set the frequency reference higher than the jump frequency range. | |
| The output frequency does not increase to the frequency | The frequency reference is exceeding the upper limit of the frequency command. | Set the upper limit of the frequency command higher than the frequency reference. | |
| | Because the load is too heavy, the stall prevention function is working. | Replace the inverter with a model that has increased capacity. | |
| The cooling fan does not rotate.The control parameter for the cooling fan is set incorrectly. | | Check the set value of the cooling fan control parameter (DRV-50 Fan Control). | |

15 Maintenance

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15.1 Regular Inspection Lists

15.1.1 Daily Inspections

Table 1. Regular Inspection List

| Inspection Area | Inspection Item | Inspection Details | Inspection Method | Judgment Standard | Inspection Equipment |
|-----------------------------|--------------------------|--|--|--|---|
| All | Environmental Factors | Is the ambient temperature and humidity within the design range, and is there any dust or foreign objects present? | Refer to <u>2.1</u> <u>Mounting on</u> <u>the Wall or</u> <u>within the</u> <u>Panel</u> . | There must be no danger of freezing with ambient temperature of -10~50°C and must be no condensation with ambient humidity of less than 90%. | Thermometer, hygrometer, recorder |
| | Inverter | Is there any abnormal vibration or noise? | Visual inspection | No abnormality | - |
| | Power voltage | Are the input and output voltages normal? | Measure voltages between R/S/ T-phases in. the inverter terminal block. | Refer to <u>16.1 Input</u> <u>and Output</u> Specifications. | Digital multimeter/ tester |
| Input/ Output circuit | Smoothing capacitor | Is there any leakage from the inside? | Visual inspection | No abnormality | |
| | | Is the capacitor swollen? | | | |

Maintenance

| Inspection Area | Inspection Item | Inspection Details | Inspection Method | Judgment Standard | Inspection Equipment |
|--------------------|---------------------|--|--|---|-----------------------------|
| Cooling system | Cooling Fan | ls there any abnormal vibration or noise? | Turn off the system and check operation by rotating the fan manually. | Fan rotates smoothly | - |
| Display | Measuring device | Is the display value normal? | Check the reading of displayed device on the panel. | Check and manage specified values. | Voltmeter, ammeter, etc. |
| Motor | All | ls there any abnormal vibration or noise? | Visual inspection | No abnormality | _ |
| | | ls there any abnormal smell? | Check for overheating or damage. | | |

15.1.2 annual Inspections

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Table 2. Regular (Yearly) Inspection List

| Inspection Area | Inspection Item | Inspection Details | Inspection Method | Judgment Standard | Inspection Equipment |
|-----------------------------|-----------------------------------|---|---|----------------------------|---|
| Input/ Output circuit | All | Megger test (between input/output terminals and earth terminal) | Remove wiring from the inverter and short R/S/T/U/V/W terminals, and then measure from each terminal to the earth terminal using a megger (insulation- resistance tester). | Must be above 5 MΩ | DC 500 V class megger (insulation- resistance tester) |
| | | Is there anything loose in the device? | Tighten up all screws. | | |
| | | Is there any evidence of parts overheating? | Visual inspection | No abnormality | |
| | Connecting conductor / wire | Are there any corroded cables? | Visual inspection | No abnormality | |
| | | ls there any damage to cable insulation? | | | - |
| | Terminal block | Is there any damage? | Visual inspection | No abnormality | - |
| | Smoothing capacitor | Measure electrostatic capacity. | Measure with capacity meter. | Rated capacity over 85% | Capacity meter |

| Inspection Area | Inspection Item | Inspection Details | Inspection Method | Judgment Standard | Inspection Equipment |
|---|---------------------|---|---|--|--|
| | Relay | Is there any chattering noise during operation? | Visual inspection | No abnormality | - |
| Input/ Output | | Is there any damage to the contacts? | Visual inspection | | |
| circuit | Braking resistor | Is there any damage from resistance? | Visual inspection | No abnormality | Digital multimeter / analog tester |
| | | Check for disconnection. | Disconnect one side and measure with a tester. | Must be within ±10% of the rated value of the resistor. | |
| Control Circuit and Safety Circuit | Operation check | Check for output voltage imbalance while the inverter is in operation. | Measure voltage among the inverter output terminals, U/V/W. | Balance the voltage between phases: Within 4 V for 200 V class and within 8 V for 400 V class. | Digital multimeter or DC voltmeter |
| | | Is there an error in the display circuit after the sequence protection test? | Test the inverter output protection in both short and open circuit conditions. | The circuit must work according to the sequence. | |
| Cooling system | Cooling Fan | Are any of the fan parts loose? | Check the connecting part of the connector and tighten up the screws. | No abnormality | - |
| Display | Display device | Is the display value normal? | Check the command value on the display device. | Specified and managed values must match. | Voltmeter, ammeter, etc. |

15.1.3 bi-annual Inspections

Table 3. Regular (Biennial) Inspection List

| Inspection | Inspection | Inspection | Inspection | Judgment | Inspection |
|------------|--------------------------|---|---|-----------------------|---|
| Area | Item | Details | Method | Standard | Equipment |
| Motor | Insulation resistance | Megger test (between the output and earth terminals). | Remove the wires from terminals U/V/W before testing the wiring. | Must be above 5 MΩ | DC 500 V class megger (insulation- resistance tester) |

① Caution

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Do not run a megger (insulation-resistance test) test on the control circuit. This may cause damage to the inverter.

15.2 Storage and Disposal

15.2.1 Proper Product Storage

If you are not using the product for an extended period, store it in the following way:

- Store the product in the environmental suitable for operation (refer to <u>1.3</u> <u>Installation Considerations</u>).
- When storing the product for a period longer than 3 months, store it between -10 °C and 30 °C, to prevent depletion of the electrolytic capacitor.
- Do not expose the inverter to snow, rain, fog, or dust.
- Package the inverter in a way that prevents contact with moisture. Keep the relative humidity below 70% in the package by including a desiccant, such as a silica gel packet.
- Do not leave the inverter in a humid or dusty environment (e.g. Used as a device or control panel at a construction site). Disassemble the product and store in a place that is suitable for operation.

15.2.2 Correct Disposal

When disposing of the product, categorize it as general industrial waste. The product contains materials that can be recycled. Please consider the environment, energy, and resources and recycle unused products. The packing materials and all metal parts can be recycled. Although plastic can also be recycled, it can be incinerated under controlled conditions in some regions.

① Caution

If the product is left in a prolonged state without a flow of current, the condenser will deteriorate due to its characteristics. To prevent the deterioration of the electrolytic condenser, turn on the power of the inverter at least once a year for the current to flow for 30–60 minutes. Run the device under no-load conditions.
16 Technical Specifications

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16.1 Input and Output Specifications

16.1.1 200 V Class 0.4-18.5 kW (LSLV0004 - 0185S300-2)

| Model: L | .SLVS | 300-2 | 0004 | 8000 | 0015 | 0022 | 0040 | 0055 | 0075 | 0110 | 0150 | 0185 | |
|--------------------|-------------------------------|-------------|------|---|------|--------|-------|--------------------|-------|------|------|------|--|
| | Heavy Duty | [HP] | 0.5 | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | |
| Applied | (HD) | [kW] | 0.4 | 0.75 | 1.5 | 2.2 | 4 | 5.5 | 7.5 | 11 | 15 | 18.5 | |
| Motor ¹ | Normal | [HP] | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | 30 | |
| | Duty (ND) | [kW] | 0.75 | 1.5 | 2.2 | 4 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | |
| | Rated capacity | HD [kVA] | 1.2 | 1.9 | 3.0 | 4.2 | 6.7 | 9.5 | 12.6 | 17.9 | 22.9 | 28.6 | |
| | | ND [kVA] | 1.9 | 3.0 | 4.6 | 6.1 | 8.4 | 11.4 | 16.0 | 21.3 | 26.7 | 31.2 | |
| | Rated current ² | HD [A] | 3.2 | 5 | 8 | 11 | 17.5 | 25 | 33 | 47 | 60 | 75 | |
| Output Rating | | ND [A] | 5 | 8 | 12 | 16 | 22 | 30 | 42 | 56 | 70 | 82 | |
| | | | | | Ŋ | V/F, V | /F-SC | ³ : 0.0 | 1~590 |) | | | |
| | frequency | [Hz] | | | | V/ | F-PG | ⁴ : 0~4 | 00 | | | | |
| | irequency | | SL | SLVC-IM ⁵ , SLVC-PM ⁶ , SVC-IM ⁷ , SVC-PM ⁸ : 0~400 | | | | | | | | | |
| | Output voltage | [V] | | | | 3-p | bhase | 200-2 | 40 | | | | |

Table 1. Input/Output Specifications (200 V Class 0.4-18.5 kW)

- ¹ The motor capacity is based on a standard 4-pole motor.
- ² The rated output current is limited based on the carrier frequency (DRV-27 Carrier Frequency) settings.
- ³ V/F slip compensation control mode
- ⁴ V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ⁵ Sensorless vector-induction motor control
- ⁶ Sensorless vector-permanent magnet motor control
- ⁷ Sensored vector-induction motor control
- ⁸ Sensored vector-permanent magnet motor control

| Model: L | .SLV 🗆 🗆 🗆 S | 300-2 | 0004 | 0008 | 0015 | 0022 | 0040 | 0055 | 0075 | 0110 | 0150 | 0185 | |
|-------------------|--------------------|-----------|------|-----------|------|--------|-------|--------|--------|------|------|------|--|
| | Input Voltage | [V] | | | 3-ph | nase 2 | 00-24 | 0, -15 | % - +′ | 10% | | | |
| Input 1 Rating | Input frequency | [Hz] | | 50/60 ±5% | | | | | | | | | |
| | Rated Current | HD [A] | 2.5 | 4.0 | 6.8 | 9.6 | 15.5 | 22.1 | 29.6 | 42.6 | 54.8 | 68.4 | |
| | | ND [A] | 4.0 | 6.8 | 10.5 | 14.1 | 19.5 | 26.9 | 38.1 | 51.1 | 63.9 | 75.8 | |
| W | 3.2 | 3.3 | 3.5 | 3.7 | 3.8 | 5.5 | 5.6 | 7.2 | 12.9 | 13.2 | | | |

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16.1.2 200 V Class 22-75 kW (LSLV0220 - 0750S300-2)

| Model: L | .SLV 🗆 🗆 🗆 S | 300-2 | 0220 | 0300 | 0370 | 0450 | 0550 | 0750 |
|--------------------|-----------------------|-------------|------|------|------|------|-------|-------|
| | Heavy Duty | [HP] | 30 | 40 | 50 | 60 | 75 | 100 |
| Applied | (HD) | [kW] | 22 | 30 | 37 | 45 | 55 | 75 |
| Motor ⁹ | Normal | [HP] | 40 | 50 | 60 | 75 | 100 | 125 |
| | Duty (ND) | [kW] | 30 | 37 | 45 | 55 | 75 | 90 |
| | Rated capacity | HD [kVA] | 33.5 | 43.8 | 55.3 | 68.6 | 83.8 | 109.7 |
| Output | | ND [kVA] | 41.9 | 52.6 | 64.4 | 80.4 | 109.7 | 131.5 |
| Rating | Rated | HD [A] | 88 | 115 | 145 | 180 | 220 | 288 |
| | current ¹⁰ | ND [A] | 110 | 138 | 169 | 211 | 288 | 345 |

Table 2. Input/Output Specifications (200 V Class 22-75 kW)

⁹ The motor capacity is based on a standard 4-pole motor.

¹⁰ The rated output current is limited based on the carrier frequency (DRV-27 Carrier Frequency) settings.

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| Model: L | .SLV0000S | 300-2 | 0220 | 0300 | 0370 | 0450 | 0550 | 0750 | | | |
|------------------|--------------------|--|-------------------|--|-----------------|-------|----------|-------|--|--|--|
| | | | V/ | F, V/F-SC | 11 | | 0.01~590 | | | | |
| | Output | [H7] | | V/F-PG ¹² | | 0~400 | | | | | |
| Output Rating | frequency | [1 12] | SLVC-IN SVC-II | SLVC-IM ¹³ , SLVC-PM ¹⁴ , SVC-IM ¹⁵ , SVC-PM ¹⁶ 0~400 3-phase 200-240 3-phase 200-240, -15% - +10% | | | | | | | |
| | Output voltage | [V] | | | 3-phase 200-240 | | | | | | |
| | Input Voltage | [V] | | 3-phase 200-240, -15% - +10% | | | | | | | |
| Input | Input frequency | [Hz] | | 50/60 ±5% | | | | | | | |
| Rating | Rated | HD [A] | 81.3 | 106.9 | 135.6 | 168.4 | 212.0 | 277.5 | | | |
| | Current | ND [A] 102.3 129.1 158.1 198.5 27 | | | | | 277.5 | 332.5 | | | |
| W | /eight (lb /kg) | | 19.1 | 26.7 | 38.8 | 39.1 | 54 | 73 | | | |

16.1.3 400 V Class 0.4-22 kW (LSLV0004 - 0220S300-4)

| Table 3. | Input/Output | Specifications | (400 V Class | 0.4-22 kW) |
|----------|--------------|-----------------------|--------------|------------|
|----------|--------------|-----------------------|--------------|------------|

| Model: LSLV | | | 0004 | 0008 | 0015 | 0022 | 0040 | 0055 | 0075 | 0110 | 0150 | 0185 | 0220 |
|--|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Applied Motor ¹⁷ Heavy Duty (HD) Normal Duty (ND) | [HP] | 0.5 | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | 30 | |
| | (HD) | [kW] | 0.4 | 0.75 | 1.5 | 2.2 | 4 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 |
| | Normal Duty (ND) | [HP] | 1 | 2 | 3 | 5 | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 |
| | | [kW] | 0.75 | 1.5 | 2.2 | 4 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |

¹¹ V/F slip compensation control mode

- ¹² V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ¹³ Sensorless vector-induction motor control
- ¹⁴ Sensorless vector-permanent magnet motor control
- ¹⁵ Sensored vector-induction motor control
- ¹⁶ Sensored vector-permanent magnet motor control
- ¹⁷ The motor capacity is based on a standard 4-pole motor.

| Model: L | .SLV 🗆 🗆 🗆 S | 300-4 | 0004 | 8000 | 0015 | 0022 | 0040 | 0055 | 0075 | 0110 | 0150 | 0185 | 0220 |
|------------------|---------------------|-------------|--|-----------------|--------|-------------------|--------|-------|------|-------|-------|------|------|
| | Rated | HD [kVA] | 1.4 | 2.6 | 3.7 | 4.2 | 7.0 | 11.3 | 12.6 | 18.3 | 23.6 | 29.7 | 34.3 |
| | capacity | ND [kVA] | 1.9 | 3.1 | 4.6 | 6.1 | 9.2 | 13.3 | 18.3 | 23.6 | 29.0 | 34.3 | 46.5 |
| | Rated | HD [A] | 1.8 | 3.4 | 4.8 | 5.5 | 9.2 | 14.8 | 16.5 | 24 | 31 | 39 | 45 |
| | (380 - 460 V) | ND [A] | 2.5 | 4.1 | 6 | 8 | 12.1 | 17.5 | 24 | 31 | 38 | 45 | 61 |
| Output Rating | Rated | HD [A] | 1.7 | 3.1 | 4.4 | 5 | 8.3 | 13.4 | 14.9 | 21.6 | 27.9 | 35.1 | 40.5 |
| | (460-480 V) | ND [A] | 2.3 | 3.7 | 5.4 | 7.6 | 11 | 15.8 | 21.6 | 27.9 | 34.2 | 40.5 | 54.9 |
| | Output frequency | | | V/F | , V/F- | -SC ¹⁹ | 9 | | | 0.0 | 1~590 |) | |
| | | [H7] | V/F-PG ²⁰ | | | | | | | 01 | ~400 | | |
| | | [] | SLVC-IM ²¹ , SLVC-PM ²² , SVC-IM ²³ , SVC-PM ²⁴ 0~400 | | | | | | | | | | |
| | Output voltage | [V] | | 3-phase 380-480 | | | | | | | | | |
| | Input Voltage | [V] | | | 3- | ohase | e 380- | -480, | -15% | - +1(|)% | | |
| Input | Input frequency | [Hz] | | | | | 50 | /60 ± | 5% | | | | |
| Rating | Rated | HD [A] | 1.4 | 2.7 | 4.1 | 4.8 | 8.1 | 13.1 | 14.8 | 21.8 | 28.3 | 35.6 | 41.6 |
| | current | ND [A] | 2.0 | 3.5 | 5.2 | 7.1 | 10.7 | 15.7 | 21.8 | 28.3 | 34.7 | 41.6 | 56.7 |
| W | /eight (lb /kg) | | 3.3 | 3.5 | 3.5 | 3.6 | 3.7 | 5.3 | 5.6 | 7.6 | 7.7 | 13.6 | 14 |

- ¹⁸ The rated output current is limited based on the carrier frequency (DRV-27 Carrier Frequency) settings.
- ¹⁹ V/F slip compensation control mode
- ²⁰ V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ²¹ Sensorless vector-induction motor control
- ²² Sensorless vector-permanent magnet motor control
- ²³ Sensored vector-induction motor control
- ²⁴ Sensored vector-permanent magnet motor control

16.1.4 400 V Class 30-75 kW (LSLV0300 - 0750S300-4)

| Model: L | .SLV 🗆 🗆 🗆 S | 300-4 | 0300 | 0370 | 0450 | 0 | 0550 | 0750 | |
|---------------------|---|-------------|-------------------|---|-------------------------|---------|---------|-------|--|
| | Heavy Duty | [HP] | 40 | 50 | 60 | | 75 | 100 | |
| Applied | (HD) | [kW] | 30 | 37 | 45 | | 55 | 75 | |
| Motor ²⁵ | Normal | [HP] | 50 | 60 | 75 | | 100 | 125 | |
| | Duty (ND) | [kW] | 37 | 45 | 55 | | 75 | 90 | |
| | Rated | HD [kVA] | 46.5 | 57.2 | 69.4 | 1 | 83.8 | 115.8 | |
| | capacity | ND [kVA] | 57.2 | 69.4 | 81.5 | | 108.2 | 128.8 | |
| - | Rated Current ²⁶ (380 - 460 V) | HD [A] | 61 | 75 | 91 | | 110 | 152 | |
| | | ND [A] | 75 | 91 | 107 | , | 142 | 169 | |
| Output Rating | Rated | HD [A] | 54.9 | 67.5 | 81.9 |) | 99 | 136.8 | |
| | (460-480 V) | ND [A] | 67.5 | 81.9 | 96.3 | 3 | 127.8 | 156 | |
| | | | V/F, | V/F-SC 27 | | | 0.01~59 | 90 | |
| | Output | [H7] | V/ | F-PG ²⁸ | | | 0~400 |) | |
| 1 | frequency | ני יבן | SLVC-IM SVC-IM | ²⁹ , SLVC-PN ³¹ , SVC-PM | 1 ³⁰ , 32 | 0~400 | | | |
| | Output voltage | [V] | | 3-p | bhase 3 | 380-480 | | | |

- ²⁵ The motor capacity is based on a standard 4-pole motor.
- ²⁶ The rated output current is limited based on the carrier frequency set at DRV-27 (Carrier Frequency).
- ²⁷ V/F slip compensation control mode
- ²⁸ V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ²⁹ Sensorless vector-induction motor control
- ³⁰ Sensorless vector-permanent magnet motor control
- ³¹ Sensored vector-induction motor control
- ³² Sensored vector-permanent magnet motor control

| Model: L | .SLV0000S | 300-4 | 0300 | 0370 | 0450 | 0550 | 0750 | | | | | |
|-----------------|--------------------|-----------|------|-----------|-------------|----------|-------|--|--|--|--|--|
| | Input Voltage | [V] | | 3-phase 3 | 80-480, -15 | % - +10% | | | | | | |
| Input | Input frequency | [Hz] | | 50/60 ±5% | | | | | | | | |
| Rating | Rated current | HD [A] | 56.7 | 70.1 | 85.1 | 103.5 | 146.5 | | | | | |
| | | ND [A] | 70.1 | 85.1 | 100.7 | 136.8 | 162.9 | | | | | |
| Weight (lb /kg) | | | 18.6 | 18.7 | 28.3 | 41.2 | 41.9 | | | | | |

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16.1.5 400 V Class 90-220 kW (LSLV0900 - 2200S300-4)

| Model: L | .SLV0000S | 300-4 | 0900 | 1100 | 1320 | 1600 | 1850 | 2200 |
|--------------------------------|----------------------------|-------|------|------|------|------|------|------|
| | Applied Heavy Duty (HD) | [HP] | 125 | 150 | 200 | 250 | 300 | 350 |
| Applied Motor ³³ | | [kW] | 90 | 110 | 132 | 160 | 185 | 220 |
| | Normal Duty (ND) | [HP] | 150 | 200 | 250 | 300 | 350 | 400 |
| | | [kW] | 110 | 132 | 160 | 185 | 220 | 250 |

³³ The motor capacity is based on a standard 4-pole motor.

| Model: L | SLVDDDDS | 300-4 | 0900 | 1100 | 1320 | 160 | 0 | 1850 | 2200 | | |
|------------------|---|--|-----------------|--|--|---|-----|--------|--|--|--|
| | Rated | HD [kVA] | 139 | 170 | 201 | 248 | 3 | 282 | 324 | | |
| | capacity | ND [kVA] | 170 | 201 | 248 | 282 | 2 | 329 | 367 | | |
| | Rated | $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | 370 | 425 | | | | | | | |
| | (380 - 460 V) | ND [A] | 223 | 264 | 325 | 3201600183020124828224828232926432537032537043237.6292.533392.5333388.8 35 0.01~59 $^{-PM}$ 38 , PM 0~400-PM 40 0~400phase 380-480380-480, -15% - +10%50/60 $\pm 5\%$ 58.9318.758.9318.7367.018.7362.8428.57778120.5 | 481 | | | | |
| Output Rating | Rated | HD [A] | 164.7 | 200.7 | 237.6 | 292 | .5 | 333 | 382.5 | | |
| fraing C (4t | (460-480 V) | ND [A] | 200.7 | 237.6 | 292.5 | 333 | 3 | 388.8 | 432.9 | | |
| | | | | V/F, V/F-S | SC ³⁵ | | | 0.01~5 | 90 | | |
| | Output | [H7] | | V/F-PG | 36 | | | 0~400 | 382.5 3 432.9 ~590 400 | | |
| | frequency | ני יבן | SLVC SVC | :-IM ³⁷ , SL)-IM ³⁹ , S\ | , | 0~400 | | | | | |
| | $\begin{array}{c} \begin{array}{c} Rated\\ Current ^{34}\\ (380 - 460 \ V) \end{array} & \begin{array}{c} HD\\ [A]\\ ND\\ [A]$ | [V] | 3-phase 380-480 | | | | | | | | |
| | Input Voltage | [V] | | 3-pha | se 380-48 | 0, -15 | % - | +10% | | | |
| Input | Input frequency | [Hz] | | | 201 248 282 248 282 329 248 282 329 264 325 370 325 370 432 7 237.6 292.5 333 6 292.5 333 388.8 $(F-SC)^{35}$ $0.01 \sim 59$ PG 36 $0 \sim 400$ SLVC-PM 38 , SVC-PM 40 $0 \sim 400$ 3 -phase $380-480$, $-15\% - +10\%$ $50/60 \pm 5\%$ 4 258.9 318.7 367.0 4 318.7 362.8 428.5 77 78 120.5 | | | | | | |
| Rating | Rated | HD [A] | 178.4 | 217.4 | 258.9 | 318 | .7 | 367.0 | 428.8 | | |
| | Input Input <th< td=""><td>362</td><td>.8</td><td>428.5</td><td>485.3</td></th<> | 362 | .8 | 428.5 | 485.3 | | | | | | |
| W | /eight (lb /kg) | | 58 | 58 | 77 | 78 | | 120.5 | 121.5 | | |

- ³⁴ The rated output current is limited based on the carrier frequency set at DRV-27 (Carrier Frequency).
- ³⁵ V/F slip compensation control mode

- ³⁶ V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ³⁷ Sensorless vector-induction motor control
- ³⁸ Sensorless vector-permanent magnet motor control
- ³⁹ Sensored vector-induction motor control
- ⁴⁰ Sensored vector-permanent magnet motor control

16.2 Product Specification Details

16.2.1 Product Specification Details

Table 6. Product Specifications

| | Item | s | Descr | iption | | | | |
|---|--|------------------------|---|---|--|--|--|--|
| | Cont | trol method | V/F control, slip comp sensorless vector | pensation, V/F PG ⁴¹ , , sensored vector | | | | |
| | Freque | ency settings | Digital command | 0.01Hz | | | | |
| | powe | er resolution | Analog command | 0.06 Hz(60 Hz standard) | | | | |
| | Freque | ency accuracy | 1% of maximum | output frequency | | | | |
| Control | V/ | F pattern | Linear, square re | duction, user V/F | | | | |
| Control V/F p Overload Torque Operat | | | Normal duty (ND): base | d on VT rated current ⁴² | | | | |
| | Overle | oad capacity | Heavy duty (HD): 150%/minute compared to CT rated current | | | | | |
| | que Boost | Manual torque boost, a | automatic torque boost | | | | | |
| | Control Freque Over To To Run Oper | ration type | Select among Smart Operator, terminal block, and communication operation | | | | | |
| | Freque | ency Settings | Analog type: -10-10 Digital type: Smart Ope | Analog type: -10-10 V, 0-10 V, 0-20 mA Digital type: Smart Operator, pulse train input | | | | |
| Run | Operation function | | PID Control, Up-down operation, 3-Wire Operation, DC braking, Frequency (speed) limit, Frequency Jump, Second function, Slip compensation, Anti-forward and reverse direction rotation, Automatic restart, Commercial transition, Kinetic energy buffering operation, Speed search, Flux Braking, Power braking, Energy Saving Operation, Leakage reduction operation | | | | | |
| | Input Multifunction Terminal (8ea) DI1-DI8 | | Select between PNP (Source) and NPN (Sink) modes Functions can be set according to parameter settings a DIN-01, 03, 05, 07, 09, 11, 13, and 15 as follows: | | | | | |

- ⁴¹ V/F sensored (encoder) control (Only available when the induction motor type is selected.)
- ⁴² 200V: 45 kW or less 120%, 1 minute / 55 kW or more 110%, 1 minute 400V: 75 kW or less 120%, 1 minute / 90 kW or more 110%, 1 minute

| Forward operation, reverse operation | n | | | | | | |
|---|--|--|--|--|--|--|--|
| | | | | | | | |
| Reset | Reset | | | | | | |
| Emergency stop | | | | | | | |
| External trip 1, 2, 3, 4 | | | | | | | |
| Jog operation | | | | | | | |
| Multi-stage frequency: L/M/H/X | | | | | | | |
| Multi-stage acceleration and deceleration: high low | h/medium/ | | | | | | |
| Acceleration or deceleration stop | | | | | | | |
| Safe operation (Run Enable) | | | | | | | |
| 3-wire | | | | | | | |
| Second operation (2nd Source) | Second operation (2nd Source) | | | | | | |
| Multifunction Switching to commercial power (Exchan | nge) | | | | | | |
| Terminal (8ea) Increase/reduce/delete/save up-down oper frequency | eration | | | | | | |
| Run Input DI1-DI8 Fix command frequency | Fix command frequency | | | | | | |
| Second motor selection | Second motor selection | | | | | | |
| DC braking during stop | | | | | | | |
| Timer settings (Timer Input) | | | | | | | |
| Deactivate auxiliary speed | | | | | | | |
| FWD jog | | | | | | | |
| REV jog | se operation | | | | | | |
| PID Enable, Open Loop | ration /X /X top / top change) operation / 0~0.8V 3.5~12V | | | | | | |
| PID Ref, Gain Change | | | | | | | |
| PID I-Term Clear | | | | | | | |
| PID Output Hold | | | | | | | |
| PID Sleep On/Change | | | | | | | |
| PID Step Ref L/M/H | 0~0.9\/ | | | | | | |
| Pulse Train 0~32kHz | 3.5~12\/ | | | | | | |

| | Item | S | | Descr | iption | | |
|--|---|---|--|---|--|--|--|
| | | Multifunction Open Collector Terminal | Trip output | Less than DC 26V, 50mA | | | |
| | ItemsDescriptionRunMultifunction Open Collector TerminalTrip output and inverter operation status outputLess that I I | Less than AC 250 V, 2 A, less than DC 30 V, 3 A | | | | | |
| Items Multifunction Open Collector Terminal Run Output Trip Relay Terminal Trip and ope stand Multi function relay terminal Multi function relay terminal Output Analog Output 0 - 1 Over Terminal Protection Functions Trip More terminal Protection Functions Trip More terminal Alarm W | status output | N.C. | Less than AC 250 V, 1 A, less than DC 30 V, 1 A | | | | |
| | | Multifunction Open Collector TerminalTrip output and inverter operation status outputLess than DC 26V, 50mATrip Relay TerminalTrip output and inverter | | | | | |
| | | relay terminal | | Description Less than DC 26V, 50mA tput arter ion s at N.O. Less than AC 250 V, 2 A, less than DC 30 V, 3 A Sat N.C. Less than AC 250 V, 5 A Less than AC 250 V, 5 A Less than DC 30 V, 5A 'dc (0-20 mA): Frequency, output current, output ltage, DC voltage, and more are selectable Maximum of 32 kHz, 0-10 V urrent trip, Overvoltage trip, External signal trip, erature sensor trip, ARM short current fault trip, Inverter overheat trip, Over heat trip, Out phase open trip, In phase open trip, nverter overload trip, Ground trip, Fan trip, poverheat trip, Low voltage trip during operation, I/O board link trip, Low voltage trip, urameter writing trip, Analog input error trip, Emergency stop trip, Motor overload trip, ind loss trip, Smart Operator command loss trip, xternal memory error, Level detection trip, CPU watchdog trip, Motor normal duty trip ings for command loss, overload, normal duty, roverload, fan operation, braking rate of braking resistance, and LDT | | | |
| | Run Output Multifunction Open Collector Terminal Trip output and inverter operation status output Less than DC 26V, 50r Run Output Trip Relay Terminal Trip output and inverter operation status output N.O. Less than AC 2 less than DC 30 V, 50r Multi function relay terminal Multi function relay terminal N.O. Less than AC 250 V, 50r Analog 0 - 10 Vdc (0-20 mA): Frequency, output curre voltage, DC voltage, and more are select Less than DC 30 V, 50r Pulse Train Maximum of 32 kHz, 0-10 V Overcurrent trip, Overvoltage trip, External s Temperature sensor trip, ARM short current Inverter overload trip, Ground trip, Fan Motor overheat trip, Low voltage trip, Over heat trip Out phase open trip, In phase open trip Inverter overload trip, Ground trip, Fan Motor overheat trip, Low voltage trip during of I/O board link trip, Low voltage trip, Overheat trip Command loss trip, Smart Operator comman External memory error, Level detection CPU watchdog trip, Motor normal duty Alarm Warnings for command loss, overload, norr inverter overload, fan operation, braking rate resistance, and LDT | ency, output current, output nd more are selectable | | | | | |
| | | Pulse Train | tion or al Trip output and inverter operation status output tion inal 0 - 10 Vdc (0-20 mA): Frequency, output current voltage, DC voltage, and more are select ain Maximum of 32 kHz, 0-10 V Overcurrent trip, Overvoltage trip, External sig Temperature sensor trip, ARM short current for Inverter overheat trip, Over heat trip, Out phase open trip, In phase open trip Inverter overheat trip, Cover heat trip, Out phase open trip, In phase open trip Inverter overheat trip, Cover voltage trip, External sig Temperature sensor trip, ARM short current for Inverter overheat trip, Over heat trip, Out phase open trip, In phase open trip Inverter overheat trip, Cover overload trip Command loss trip, Smart Operator command External memory error, Level detection t CPU watchdog trip, Motor normal duty t Warnings for command loss, overload, norm inverter overload, fan operation, braking rate or resistance, and LDT | | | | |
| Protection Functions | | Trip | Overcurrent Temperature Inverte Out p Inverte Motor overh I/O Parame Emerg Command los Externa CPU w | trip, Overvolta e sensor trip, A erter overheat t hase open trip, r overload trip, eat trip, Low vo board link trip, ter writing trip, gency stop trip, ss trip, Smart C al memory erro vatchdog trip, N | ge trip, External signal trip, RM short current fault trip, rip, Over heat trip, , In phase open trip, Ground trip, Fan trip, oltage trip during operation, , Low voltage trip, Analog input error trip, Motor overload trip, Operator command loss trip, r, Level detection trip, Motor normal duty trip | | |
| | | Alarm | Warnings fo inverter overl | or command lo oad, fan opera resistance | ss, overload, normal duty, tion, braking rate of braking , and LDT | | |
| | Inst powe | antaneous r interruption | | Use KEB o | peration ⁴³ | | |

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⁴³ Operates when 1 (KEB Ride-Through) is selected in APP-15 (KEB Mode).

16.2.2 Structure and Usage Environment

Table 7. Product Structure/Usage Environment

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| It | tems | Description | | | |
|------------------------------------|---------------------------------------|--|--|--|--|
| | Cooling type | Forced fan cooling structure | | | |
| | Protection structure | IP 20 (default), UL Open & Enclosed Type 1 (optional) Installing Conduit option fulfills UL Enclosed Type 1 | | | |
| | | Where there is no ice or frost, | | | |
| Structure/ Usage Environment | | -10~50°C on heavy duty | | | |
| | Ambient | -10~40℃ on normal duty | | | |
| | temperature | The conduit option requires 1.5%/℃ current derating when it is over 30℃ on normal duty and when it is over 40℃ on heavy duty. | | | |
| | Ambient humidity | Relative humidity less than 95% RH (to avoid condensation forming) | | | |
| | Storage temperature | -20~65°C | | | |
| | Environmental Factors | No corrosive gas, inflammable gas, oil stains, dust, and other pollutants inside (Pollution Degree 2 Environment ⁴⁴) | | | |
| | Operation altitude/ oscillation | No higher than 3280 ft (1,000 m), less than 9.8 m²/sec (1.0 G). | | | |
| | Air Pressure | 70~106kPa | | | |

⁴⁴ Pollution level of temporary conductivity from dew, though nonconductive pollution occurs.

16.3 External Dimensions (IP20 Type)

16.3.1 External Dimensions





[Image 1. 200 V class 0.4-4 kW/400 V class 0.4-4 kW Exterior Diagram]

Table 8. External Dimensions (200 V Class 0.4-4 kW/400 V Class 0.4-4 kW)

| Model | W | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S3 |
|----------------|--------|---------|--------|--------|--------|---------|--------|--------|--------|--------|
| LSLV0004S300-4 | | | | | | | | | | |
| LSLV0008S300-4 | | | | | | | | | | |
| LSLV0015S300-4 | | | | | | | | | | |
| LSLV0022S300-4 | | | | | | | | | | |
| LSLV0040S300-4 | 150.0 | 276.0 | 192.0 | 110.0 | 20.0 | 258.0 | 10.0 | 6.0 | 12.0 | 6.0 |
| LSLV0004S300-2 | (5.91) | (10.87) | (7.56) | (4.33) | (0.79) | (10.16) | (0.39) | (0.24) | (0.47) | (0.24) |
| LSLV0008S300-2 | | | | | | | | | | |
| LSLV0015S300-2 | | | | | | | | | | |
| LSLV0022S300-2 | | | | | | | | | | |
| LSLV0040S300-2 | | | | | | | | | | |



200 V Class 5.5-7.5 kW / 400 V Class 5.5-7.5 kW

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[Image 2. 200 V class 5.5-7.5 kW/400 V class 5.5-7.5 kW Exterior Diagram]

| Table 9. External Dimensions (200 v Class 5.5-7.5 KW/400 v Class 5.5-7.5 KV | Table 9. | External Dimensions | 200 V Class 5.5-7.5 kW/400 | V Class 5.5-7.5 kW |
|---|----------|----------------------------|----------------------------|--------------------|
|---|----------|----------------------------|----------------------------|--------------------|

| Model LSLV□□□□ | W | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S 3 |
|--|-----------------|------------------|-----------------|-----------------|----------------|------------------|---------------|---------------|----------------|---------------|
| LSLV0055S300-4 LSLV0075S300-4 LSLV0055S300-2 LSLV0075S300-2 | 180.0 (7.09) | 310.0 (12.20) | 225.0 (8.86) | 158.0 (6.22) | 11.0 (0.43) | 294.0 (11.57) | 8.0 (0.31) | 6.0 (0.24) | 12.0 (0.47) | 6.0 (0.24) |



200 V Class 11 kW / 400 V Class 11-15 kW



| Table 10. | External Dimer | nsions (200 V | / Class 11 | kW/400 V | Class 11-1 | 5 kW) |
|-----------|-----------------------|---------------|------------|----------|------------|-------|
| | | | | | | , |

| Model | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S 3 |
|--|-----------------|------------------|-----------------|-----------------|----------------|------------------|---------------|---------------|----------------|---------------|
| LSLV0110S300-4 LSLV0150S300-4 LSLV0110S300-2 | 200.0 (7.87) | 355.0 (13.98) | 225.0 (8.86) | 178.0 (7.01) | 11.0 (0.43) | 339.0 (13.35) | 8.0 (0.31) | 6.0 (0.24) | 12.0 (0.47) | 6.0 (0.24) |

Units: mm(in)



200 V Class 15-18.5 kW / 400 V Class 18.5-22 kW

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| Table 11. External Dimensions (| 200 V Class 15-18.5 kW/400 V Class 18.5-22 kW) |
|---------------------------------|--|
|---------------------------------|--|

| Model | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S3 |
|--|-----------------|------------------|------------------|-----------------|----------------|------------------|----------------|---------------|----------------|---------------|
| LSLV0185S300-4 LSLV0220S300-4 LSLV0150S300-2 LSLV0185S300-2 | 240.0 (9.45) | 424.0 (16.69) | 265.0 (10.43) | 211.6 (8.33) | 14.2 (0.56) | 400.0 (15.75) | 14.0 (0.55) | 7.0 (0.28) | 13.2 (0.52) | 7.0 (0.28) |



200 V Class 22 kW / 400 V Class 30-37 kW

[Image 5. 200 V Class 22 kW/400 V Class 30-37 kW Exterior Diagram]

| Table 12. | External | Dimensions | (200 V | Class | 22 kW/400 |) V | Class | 30-37 | kW) |
|-----------|----------|------------|--------|-------|-----------|-----|-------|-------|-----|
|-----------|----------|------------|--------|-------|-----------|-----|-------|-------|-----|

| Model LSLV□□□□ | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S3 |
|--|------------------|------------------|------------------|-----------------|----------------|------------------|---------------|---------------|----------------|---------------|
| LSLV0300S300-4 LSLV0370S300-4 LSLV0220S300-2 | 260.0 (10.24) | 500.0 (19.69) | 271.0 (10.67) | 214.0 (8.43) | 23.0 (0.91) | 482.5 (19.00) | 7.5 (0.30) | 7.0 (0.28) | 14.0 (0.55) | 7.0 (0.28) |



200 V Class 30 kW / 400 V Class 45 kW

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[Image 6. 200 V Class 30 kW/400 V Class 45 kW Exterior Diagram]

| Model | W | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S 3 |
|----------------|---------|---------|---------|--------|--------|---------|--------|--------|--------|------------|
| LSLV0450S300-4 | 300.0 | 510.0 | 298.2 | 240.0 | 30.0 | 488.0 | 9.5 | 9.0 | 18.0 | 9.0 |
| LSLV0300S300-2 | (11.81) | (20.08) | (11.74) | (9.45) | (1.18) | (19.21) | (0.37) | (0.35) | (0.71) | (0.35) |



200 V Class 37-45 kW / 400 V Class 55-75 kW

[Image 7. 200 V class 37-45 kW/400 V class 55-75 kW Exterior Diagram]

| Model LSLV□□□□ | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S3 |
|--|------------------|------------------|------------------|------------------|----------------|------------------|---------------|---------------|----------------|---------------|
| LSLV0550S300-4 LSLV0750S300-4 LSLV0370S300-2 LSLV0450S300-2 | 350.0 (13.78) | 615.0 (24.21) | 318.3 (12.53) | 290.0 (11.42) | 30.0 (1.18) | 593.0 (23.35) | 9.5 (0.37) | 9.0 (0.35) | 18.0 (0.71) | 9.0 (0.35) |

Units: mm(in)

400 V Class 90-110 kW

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[Image 8. 400 V Class 90-110 kW Exterior diagram]

Table 15. External Dimensions (400 V Class 90-110 kW)

| Model | W | н | D | W1 | W2 | W3 | W4 | H1 | H2 | S1 | S2 | S3 |
|----------------|---------|---------|---------|--------|--------|--------|--------|---------|--------|--------|--------|--------|
| LSLV0900S300-4 | 306.4 | 725.0 | 391.0 | 200.0 | 53.2 | 240.0 | 33.2 | 688.5 | 27.0 | 9.0 | 19.0 | 9.0 |
| LSLV1100S300-4 | (12.06) | (28.54) | (15.39) | (7.87) | (2.09) | (9.45) | (1.31) | (27.11) | (1.06) | (0.35) | (0.75) | (0.35) |



200 V Class 55-75 kW / 400 V Class 132-160 kW

[Image 9. 200 V class 55-75 kW/400 V class 132-160 kW Exterior Diagram]

| Table 16. External Dimensions | (200 V Class 55-75 kW/400 V Class 132-160 kW) |
|--------------------------------------|---|
|--------------------------------------|---|

| Model LSLV□□□□ | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S3 |
|--|------------------|------------------|------------------|------------------|----------------|------------------|----------------|---------------|----------------|---------------|
| LSLV1320S300-4 LSLV1600S300-4 LSLV0550S300-2 LSLV0750S300-2 | 386.4 (15.21) | 724.0 (28.50) | 401.0 (15.79) | 300.0 (11.81) | 43.2 (1.70) | 685.5 (26.99) | 29.0 (1.14) | 9.0 (0.35) | 19.0 (0.75) | 9.0 (0.35) |

400 V Class 185-220 kW

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| Table 1 | 7. | External | Dimensions | (400 V | Class | 185-220 | kW) |
|---------|----|----------|------------|--------|-------|---------|------|
| | | | | (100 1 | 01000 | | •••• |

| Model | w | н | D | W1 | W2 | H1 | H2 | S1 | S2 | S 3 |
|----------------|---------|---------|---------|--------|--------|---------|--------|--------|--------|------------|
| LSLV1850S300-4 | 426.0 | 920.0 | 440.9 | 160.0 | 53.0 | 895.5 | 9.0 | 11.0 | 24.0 | 11.0 |
| LSLV2200S300-4 | (16.77) | (36.22) | (17.36) | (6.30) | (2.09) | (35.26) | (0.35) | (0.43) | (0.94) | (0.43) |

16.4 Peripheral Devices

16.4.1 Standards of Molded Case Circuit Breaker (MCCB), Earth Leakage Circuit Breaker (ELCB), and Magnetic Contactor (MC)

You may use molded case circuit breakers (MCCB), earth leakage circuit breakers (ELCB), and magnetic contactors (MC) in the following table:

| Model LSLV | Molded Case Circuit Brea (MCCB) | ker | Earth Leakage Circuit Breaker (ELCB) | Magnetic Contactor (MC) | | | |
|---------------|------------------------------------|---------------|--|----------------------------|---------|---------------|--|
| | Model | Rating [A] | Model | Rating [A] | Model | Rating [A] | |
| 0004S300-2 | UTE100·H·FTU·15·3P·UL | 15 | EBS33c | 10 | MC-6a | 9 | |
| 0008S300-2 | UTE100·H·FTU·15·3P·UL | 15 | EBS33c | 10 | MC-9a | 11 | |
| 0015S300-2 | UTE100·H·FTU·15·3P·UL | 15 | EBS33c | 15 | MC-12a | 13 | |
| 0022S300-2 | UTE100·H·FTU·20·3P·UL | 20 | EBS33c | 20 | MC-18a | 18 | |
| 0040S300-2 | UTE100·H·FTU·30·3P·UL | 30 | EBS33c | 30 | MC-32a | 32 | |
| 0055S300-2 | UTS150·H·FTU·40·3P·UL | 40 | EBS53c | 40 | MC-40a | 40 | |
| 0075S300-2 | UTS150·H·FTU·60·3P·UL | 60 | EBS63c | 60 | MC-55a | 55 | |
| 0110S300-2 | UTS150·H·FTU·80·3P·UL | 80 | EBS103c | 75 | MC-75a | 75 | |
| 0150S300-2 | UTS150·H·FTU·100·3P·UL | 100 | EBS103c | 100 | MC-100a | 100 | |
| 0185S300-2 | UTS150·H·FTU·125·3P·UL | 125 | EBS103c | 125 | MC-130a | 130 | |
| 0220S300-2 | UTS150·H·FTU·150·3P·UL | 150 | EBS203c | 150 | MC-150a | 150 | |
| 0300S300-2 | UTS250·H·FTU·200·3P·UL | 200 | EBS203c | 175 | MC-185a | 185 | |
| 0370S300-2 | UTS250·H·FTU·225·3P·UL | 225 | EBS403c | 225 | MC-225a | 225 | |
| 0450S300-2 | UTS400·H·FTU·300·3P·UL | 300 | EBS403c | 300 | MC-265a | 265 | |
| 0550S300-2 | UTS400·H·FTU·400·3P·UL | 400 | EBS403c | 400 | MC-400a | 400 | |
| 0750S300-2 | UTS600·H·FTU·500·3P·UL | 500 | EBS603c | 500 | MC-500a | 500 | |
| 0004S300-4 | UTS150·L·MCP·3.2·3P·UL | 3.2 | EBS33c | 5 | MC-6a | 7 | |
| 0008S300-4 | UTS150·L·MCP·6.3·3P·UL | 6.3 | EBS33c | 5 | MC-6a | 7 | |
| 0015S300-4 | UTS150·L·MCP·12·3P·UL | 12 | EBS33c | 10 | MC-9a | 9 | |

Table 18. Compatible Molded Case Circuit Breaker, Earth Leakage CircuitBreaker, and Magnetic Contactor Standards

| Model LSLV | Molded Case Circuit Brea (MCCB) | Earth Leakage Circuit Breaker (ELCB) | Magnetic Contactor (MC) | | ctor | |
|---------------|------------------------------------|--|----------------------------|---------------|---------|---------------|
| | Model | Rating [A] | Model | Rating [A] | Model | Rating [A] |
| 0022S300-4 | UTS150·L·MCP·12·3P·UL | 12 | EBS33c | 10 | MC-12a | 12 |
| 0040S300-4 | UTS150·L·MCP·20·3P·UL | 20 | EBS33c | 15 | MC-18a | 18 |
| 0055S300-4 | UTS150·L·MCP·32·3P·UL | 32 | EBS33c | 25 | MC-32a | 32 |
| 0075S300-4 | UTS150·L·MCP·32·3P·UL | 32 | EBS33c | 30 | MC-32a | 32 |
| 0110S300-4 | UTS150·L·FTU·40·3P·UL | 40 | EBS53c | 50 | MC-50a | 43 |
| 0150S300-4 | UTS150·L·FTU·50·3P·UL | 50 | EBS53c | 50 | MC-65a | 65 |
| 0185S300-4 | UTS150·L·FTU·60·3P·UL | 60 | EBS63c | 60 | MC-65a | 65 |
| 0220S300-4 | UTS150·L·FTU·80·3P·UL | 80 | EBS103c | 100 | MC-100a | 100 |
| 0300S300-4 | UTS150·L·FTU·100·3P·UL | 100 | EBS103c | 100 | MC-100a | 100 |
| 0370S300-4 | UTS150·L·FTU·125·3P·UL | 125 | EBS103c | 125 | MC-130a | 130 |
| 0450S300-4 | UTS150·L·FTU·150·3P·UL | 150 | EBS203c | 150 | MC-150a | 150 |
| 0550S300-4 | UTS250·L·FTU·175·3P·UL | 175 | EBS203c | 200 | MC-185a | 185 |
| 0750S300-4 | UTS250·L·FTU·225·3P·UL | 225 | EBS203c | 225 | MC-225a | 225 |
| 0900S300-4 | UTS400·LT·FTU·300·3P·UL | 300 | EBS403c | 300 | MC-330a | 330 |
| 1100S300-4 | UTS400·LT·FTU·400·3P·UL | 400 | EBS403c | 350 | MC-400a | 400 |
| 1320S300-4 | UTS600·LT·FTU·500·3P·UL | 500 | EBS603c | 500 | MC-500a | 500 |
| 1600S300-4 | UTS600·LT·FTU·600·3P·UL | 600 | EBS603c | 500 | MC-500a | 500 |
| 1850S300-4 | UTS600·LT·FTU·600·3P·UL | 600 | EBS603c | 600 | MC-630a | 630 |
| 2200S300-4 | UTS800·LT·NGO·800·3P·UL | 800 | EBS803c | 800 | MC-800a | 800 |

16.4.2 AC Input Fuse and Reactor Specifications

This product has a built-in DC reactor. To additionally install an AC reactor, contact our customer service center.

| Model | AC Inp | ut Fuse | AC Reactor* | | |
|------------|-------------|-------------|-----------------|-------------|--|
| | Voltage [V] | Current [A] | Inductance [mH] | Current [A] | |
| 0004S300-2 | 600 | 10 | 2.02 | 5 | |
| 0008S300-2 | 600 | 15 | 1.12 | 9 | |
| 0015S300-2 | 600 | 15 | 0.92 | 11 | |
| 0022S300-2 | 600 | 25 | 0.59 | 17 | |
| 0040S300-2 | 600 | 35 | 0.42 | 24 | |
| 0055S300-2 | 600 | 50 | 0.30 | 34 | |
| 0075S300-2 | 600 | 70 | 0.22 | 46 | |
| 0110S300-2 | 600 | 80 | 0.16 | 64 | |
| 0150S300-2 | 600 | 100 | 0.12 | 83 | |
| 0185S300-2 | 600 | 125 | 0.10 | 103 | |
| 0220S300-2 | 600 | 150 | 0.08 | 123 | |
| 0300S300-2 | 600 | 200 | 0.06 | 161 | |
| 0370S300-2 | 600 | 250 | 0.05 | 204 | |
| 0450S300-2 | 600 | 300 | 0.04 | 253 | |
| 0550S300-2 | 600 | 400 | 0.03 | 334 | |
| 0750S300-2 | 600 | 500 | 0.02 | 417 | |
| 0004S300-4 | 600 | 6 | 6.74 | 3 | |
| 0008S300-4 | 600 | 6 | 4.04 | 5 | |
| 0015S300-4 | 600 | 10 | 2.89 | 7 | |
| 0022S300-4 | 600 | 15 | 2.25 | 9 | |
| 0040S300-4 | 600 | 20 | 1.56 | 13 | |
| 0055S300-4 | 600 | 25 | 1.01 | 20 | |
| 0075S300-4 | 600 | 35 | 0.75 | 27 | |

Table 19. Input Fuse and Reactor Specifications

| Model | AC Inp | ut Fuse | AC Reactor* | |
|------------|-------------|-------------|-----------------|-------------|
| | Voltage [V] | Current [A] | Inductance [mH] | Current [A] |
| 0110S300-4 | 600 | 50 | 0.59 | 34 |
| 0150S300-4 | 600 | 60 | 0.47 | 43 |
| 0185S300-4 | 600 | 80 | 0.37 | 54 |
| 0220S300-4 | 600 | 100 | 0.29 | 69 |
| 0300S300-4 | 600 | 100 | 0.24 | 86 |
| 0370S300-4 | 600 | 125 | 0.19 | 106 |
| 0450S300-4 | 600 | 150 | 0.16 | 128 |
| 0550S300-4 | 600 | 200 | 0.12 | 165 |
| 0750S300-4 | 600 | 250 | 0.09 | 220 |
| 0900S300-4 | 600 | 400 | 0.08 | 261 |
| 1100S300-4 | 600 | 400 | 0.07 | 309 |
| 1320S300-4 | 600 | 500 | 0.05 | 383 |
| 1600S300-4 | 600 | 600 | 0.05 | 446 |
| 1850S300-4 | 600 | 600 | 0.04 | 515 |
| 2200S300-4 | 600 | 800 | 0.03 | 583 |

① Caution

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Use Class CC, G, J, L, R or T UL Listed Input Fuse and UL Listed Breaker Only. See the table above For the Voltage and Current rating of the fuse and the breaker.

① Attention

Utiliser UNIQUEMENT des fusibles d'entrée homologués de Classe CC, G, J, L, R ou T UL et des disjoncteurs UL. Se reporter au tableau ci-dessus pour la tension et le courant nominal des fusibless et des disjoncteurs.

16.5 Terminal Screw Specifications

16.5.1 Input/output Terminal Screw Specification

| Model LSLV□□□□ | Terminal Block Screw Size | Screw Torque [Kgf⋅cm (N⋅m)] |
|-------------------|---------------------------|-----------------------------|
| 0004S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0008S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0015S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0022S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0040S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0055S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0075S300-2 | M4 | 12.2~14.3(1.2~1.4) |
| 0110S300-2 | M5 | 20.4~24.5(2.0~2.4) |
| 0150S300-2 | M5 | 20.4~24.5(2.0~2.4) |
| 0185S300-2 | M5 | 20.4~24.5(2.0~2.4) |
| 0220S300-2 | M6 | 30.6~38.2(3~3.74) |
| 0300S300-2 | M8 | 61.2~91.8(6~9) |
| 0370S300-2 | M8 | 61.2~91.8(6~9) |
| 0450S300-2 | M8 | 61.2~91.8(6~9) |
| 0550S300-2 | M12 | 182.4~215.0(18~21.2) |
| 0750S300-2 | M12 | 182.4~215.0(18~21.2) |
| 0004S300-4 | M4 | 12.2~14.3(1.2~1.4) |
| 0008S300-4 | M4 | 12.2~14.3(1.2~1.4) |
| 0015S300-4 | M4 | 12.2~14.3(1.2~1.4) |
| 0022S300-4 | M4 12.2~14.3(1.2~1.4) | |
| 0040S300-4 | M4 | 12.2~14.3(1.2~1.4) |
| 0055S300-4 | M4 | 12.2~14.3(1.2~1.4) |
| 0075S300-4 | M4 | 12.2~14.3(1.2~1.4) |

Table 20. Input/output Terminal Screw Specification

| Model | Terminal Block Screw Size | Screw Torque [Kgf⋅cm (N⋅m)] |
|------------|---------------------------|--------------------------------------|
| 0110S300-4 | M5 | 12.2~14.3(1.2~1.4) |
| 0150S300-4 | M5 | 12.2~14.3(1.2~1.4) |
| 0185S300-4 | M5 | 20.4~24.5(2.0~2.4) |
| 0220S300-4 | M5 | 20.4~24.5(2.0~2.4) |
| 0300S300-4 | M5 / M6 | 24.5~31.8(2.4~3.1)/30.6~38.2(3~3.74) |
| 0370S300-4 | M5 / M6 | 24.5~31.8(2.4~3.1)/30.6~38.2(3~3.74) |
| 0450S300-4 | M8 | 61.2~91.8(6~9) |
| 0550S300-4 | M8 | 61.2~91.8(6~9) |
| 0750S300-4 | M8 | 61.2~91.8(6~9) |
| 0900S300-4 | M8 | 61.2~91.8(6~9) |
| 1100S300-4 | M8 | 61.2~91.8(6~9) |
| 1320S300-4 | M12 | 182.4~215.0(18~21.2) |
| 1600S300-4 | M12 | 182.4~215.0(18~21.2) |
| 1850S300-4 | M12 | 182.4~215.0(18~21.2) |
| 2200S300-4 | M12 | 182.4~215.0(18~21.2) |

16.5.2 Control Circuit Terminal Screw Specifications

| Table 21. | Control | Circuit | Terminal | Screw | Specifications |
|-----------|---------|---------|----------|-------|----------------|
|-----------|---------|---------|----------|-------|----------------|

| Terminals | Terminal Block Screw Size | Screw Torque [Kgf⋅cm (N⋅m)] |
|--|------------------------------|--------------------------------|
| VR+, VR-, AI1, AI2, AI3, TI, TO, AO1, AO2, EPI, S+, S-, 5G, DI1~DI8, CM, DP, DG, A1/B1/C1, A2/C2, Q3, EG | M2.5 | 24.0 (0.4) |

() Caution

Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfunctions. Use copper wires only with 600V, 90°C rating for the power terminal wiring, and 300V, 75°C rating for the control terminal wiring.

① Attention

Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements. Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 90 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 °C pour le câblage de la borne de commande.

16.6 Braking Unit and Braking Resistor Specifications

16.6.1 Type of Braking Units

Table 22. Type of Braking Units

| UL Type | Туре | Voltage | Product Capacity | Brake unit | Exterior and Terminal Arrangement |
|------------|--|----------------|---------------------|-----------------|---|
| | Туре А | | 22kW | SV220DBU-2U | |
| | (Refer to the table 16 6 5 | 200 V class | 37kW | SV370DBU-2U | |
| UL type | Braking Resistor | | 55kW | SV550DBU-2U | Refer to Group 1 |
| type | Specifications for resistance values of | 400 V | 55kW | SV550DBU-4U | |
| | the braking resistor.) | class | 75kW | SV750DBU-4U | |
| | Type B (Refer to the user manual of each braking unit for resistance values of the braking resistor.) | 400 V | 75kW | SV750DB-4 | Refer to <u>Group 2</u> |
| | | class | 220kW | SV2200DB-4 | Refer to <u>Group 3</u> |
| | Type C (Refer to the user manual of each braking unit for resistance values of the braking resistar.) | | 22kW | LSLV0220DBU-2LN | Refer to |
| | | 200 V class | | LSLV0370DBU-2LN | <u>Group 4</u> |
| Non- UL | | | 37kW | LSLV0370DBU-2HN | Refer to Group 5 |
| туре | | | 75kW | LSLV0750DBU-2LN | Refer to <u>Group 4</u> |
| | | | | LSLV0750DBU-2HN | Refer to <u>Group 5</u> |
| | | 400 V | | LSLV0750DBU-4LN | Refer to <u>Group 4</u> |
| | | class | 7 3KVV | LSLV0750DBU-4HN | Refer to Group 5 |

Note

- Make sure to check the changes in the user manual of the relevant braking unit before use.
- Refer to <u>**16.6.5 Braking Resistor Specifications**</u>, or check the user manual of each braking unit for the resistance values of Type A.
- Check the user manual of each braking unit for resistance values of Type B and C.

16.6.2 Terminal Arrangement in the Braking Unit

The following table describes the terminals in the braking unit.

| Terminal Name | Functionality | |
|---------------|--|--|
| Р | Terminal that connects to inverter terminal P | |
| P(+) | | |
| Ν | Terminal that expresses to inverter terminal N | |
| N(-) | | |
| G | Cround Terminal | |
| E | Ground Terminar | |
| B1 | Terminal that connects to B1 in the braking resistor | |
| B2 | Terminal that connects to B2 in the braking resistor | |
| N.C | Terminal not used | |
| P/B1 | Terminal that connects to inverter terminal P2 or P/ terminal that connects to B1 in the braking resistor | |

The terminal arrangement of the braking unit is as the following groups:

Group 1

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[Image 11. Terminal Arrangement in the Braking Unit - Group 1]

Group 2

| [| \otimes | $\overline{\otimes}$ | \otimes | $\overline{\otimes}$ | $ \otimes $ |
|---|-----------|----------------------|-----------|----------------------|-------------|
| ſ | Ρ | B1 | Ν | B2 | G |
| | \otimes | $ \otimes $ | \otimes | \otimes | |

[Image 12. Terminal Arrangement in the Braking Unit - Group 2]

Group 3



[Image 13. Terminal Arrangement in the Braking Unit - Group 3]

Group 4



[Image 14. Terminal Arrangement in the Braking Unit - Group 4]

Group 5



[Image 15. Terminal Arrangement in the Braking Unit - Group 5: A Frame (200 V Class 37 kW, 400 V Class 37 kW/75 kW)



[Image 16. Terminal Arrangement in the Braking Unit - Group 5: B/C Frame (200 V Class 75 kW)]

16.6.3 Braking unit and braking resistor wiring diagram by capacity

200 V class 0.4-22 kW / 400 V class 0.4-37 kW

When using the built-in braking unit

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Connect the braking resistor to B (1) and B (2) terminals when using the built-in braking unit.



[Image 17. Braking resistor wiring – built-in braking unit (200 V class 0.4-18.5 kW, 400 V class 0.4-37 kW)]

When using the separate braking unit

Connect the braking unit to P (+) and N (-) terminals when using the separate braking unit.



[Image 18. Braking resistor wiring – separate braking unit (200 V class 0.4-22 kW, 400 V class 0.4-37 kW)]

200 V class 30-45 kW / 400 V class 45-75kW

Connect the braking unit to P (+) and N (-) terminals when using the separate braking unit.



[Image 19. Braking resistor wiring – separate braking unit (200 V class 30-45 kW, 400 V class 45-75 kW)]

200 V class 55-75 kW / 400 V class 90-220 kW

Connect the braking unit to P (+) and N (-) terminals when using the separate braking unit.

Do not use a B terminal.



[Image 20. Braking resistor wiring – separate braking unit (200 V class 55-75 kW, 400 V class 90-220 kW)]

| Table 24. | Braking | Resistor | Terminal |
|-----------|---------|----------|----------|
|-----------|---------|----------|----------|

| Braking Resistor Terminal | Terminal Description |
|---------------------------|--|
| B1, B2 | Wire correctly referring to the wiring diagram. Wire braking (DB) resistor to B1 and B2 terminals in the braking unit. |
| В | Do not use it. |

16.6.4 Exterior Diagram of Braking Unit

It shows the exterior diagram of the braking unit and product size.

Group 1

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[Image 21. Exterior Diagram of Braking Unit - Group 1]



Technical Specifications

Group 2




Group 3





Technical Specifications

Group 4



[Image 24. Exterior Diagram of Braking Unit - Group 4]

Group 5



[Image 25. Exterior Diagram of Braking Unit - Group 5: A Frame]



[Image 26. Exterior Diagram of Braking Unit - Group 5: B Frame]



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[Image 27. Exterior Diagram of Braking Unit - Group 5: C Frame]

Techn ecific

| Frame | Voltage Used | Capacity (kW) | Duty Cycle | Product Size (mm) | | | | Installation Location (mm) | | Weight | Hole Size for Installation |
|----------------|-----------------|------------------|---------------|-------------------|-----|-----|-------|----------------------------------|-------|--------|----------------------------------|
| | (•) | | (%ED) | W | Н | H2 | D | W1 | H1 | (Kg) | (f) |
| | 220 | 37 | 50 | 200 | | | | | | 3.77 | |
| A Frame 440 | 440 | 37 | 50 | 200 | 219 | 190 | 165.2 | 160 | 208.5 | 3.84 | |
| | 440 | 75 | 50 | 3.98 | | | 105.2 | | | | |
| | 220 | 75 | 50 | 215 | 240 | 044 | | | 329.5 | 0.06 | |
| В | 220 | 90 | 50 | | | | 8.48 | 175 | | | M6 |
| Frame | 440 | 90 | 50 | | 340 | 511 | | 175 | | 0.20 | |
| | 440 | 132 | 50 | 8.40 | | | 8.30 | | | | |
| C Frame | 440 | 160 | 50 | 240 | 200 | 251 | | 200 | 260 5 | 0.40 | |
| | 440 | 220 | 50 | 240 | 360 | 331 | 9.70 | 200 | 309.5 | 9.40 | |

Table 25. Exterior Dimensions of Braking Unit (Group 5)

16.6.5 Braking Resistor Specifications

 Table 26. Braking Resistor Specifications

| | | Braking resistance | | | | | | | |
|------------|---------------------------|--------------------|---------------|--------|-------------|--------|----------|--|--|
| Model | Reference Braking Unit | 10 | 0% Torq | ue | 150% Torque | | | | |
| | | Resistance | Capacity (kW) | | Resistance | Capaci | ity (kW) | | |
| | | (Ω) | ED 5% | ED 10% | (Ω) | ED 5% | ED 10% | | |
| 0004S300-2 | - | 400 | 0.05 | 0.1 | 300 | 0.1 | 0.2 | | |
| 0008S300-2 | - | 200 | 0.1 | 0.2 | 150 | 0.15 | 0.3 | | |
| 0015S300-2 | - | 100 | 0.2 | 0.4 | 60 | 0.3 | 0.6 | | |
| 0022S300-2 | - | 60 | 0.3 | 0.6 | 50 | 0.4 | 0.8 | | |
| 0040S300-2 | - | 40 | 0.5 | 1 | 33 | 0.5 | 1 | | |
| 0055S300-2 | - | 30 | 0.6 | 1.2 | 20 | 0.8 | 1.6 | | |
| 0075S300-2 | - | 20 | 0.8 | 1.6 | 15 | 1.2 | 2.4 | | |
| 0110S300-2 | - | 15 | 1.2 | 2.4 | 10 | 2 | 4 | | |
| 0150S300-2 | - | 10 | 2 | 4 | 8 | 2 | 4 | | |

| | | Braking resistance | | | | | | | | |
|------------|-------------------|--------------------|---------|---------|------------|---------|---------|--|--|--|
| Model | Reference Braking | 10 | 0% Torq | ue | 15 | 0% Torq | ue | | | |
| | Unit | Resistance | Capaci | ty (kW) | Resistance | Capaci | ty (kW) | | | |
| | | (Ω) | ED 5% | ED 10% | (Ω) | ED 5% | ED 10% | | | |
| 0185S300-2 | - | 10 | 2 | 4 | 5 | 3.6 | 7.2 | | | |
| 0220S300-2 | LSLV0220DBU-2LN | 8.4 | 2 | 4 | 5.0 | 3.6 | 7.2 | | | |
| 0300S300-2 | LSLV0370DBU-2HN | 6.0 | 3 | 6 | 4.0 | 4 | 8 | | | |
| 0370S300-2 | LSLV0370DBU-2HN | 5.0 | 3.6 | 7.2 | 3.4 | 5 | 10 | | | |
| 0450S300-2 | LSLV0750DBU-2HN | 4.0 | 4 | 8 | 2.8 | 6 | 12 | | | |
| 0550S300-2 | LSLV0750DBU-2HN | 3.4 | 5 | 10 | 2.0 | 8 | 16 | | | |
| 0750S300-2 | LSLV0750DBU-2HN | 2.4 | 6.4 | 12.8 | 1.6 | 9.6 | 19.2 | | | |
| 0004S300-4 | - | 1800 | 0.05 | 0.1 | 1200 | 0.1 | 0.2 | | | |
| 0008S300-4 | - | 900 | 0.1 | 0.2 | 600 | 0.15 | 0.3 | | | |
| 0015S300-4 | - | 450 | 0.2 | 0.4 | 300 | 0.3 | 0.6 | | | |
| 0022S300-4 | - | 300 | 0.3 | 0.6 | 200 | 0.4 | 0.8 | | | |
| 0040S300-4 | - | 200 | 0.4 | 0.8 | 130 | 0.6 | 1.2 | | | |
| 0055S300-4 | - | 120 | 0.6 | 1.2 | 85 | 1 | 2 | | | |
| 0075S300-4 | - | 90 | 0.8 | 1.6 | 60 | 1.2 | 2.4 | | | |
| 0110S300-4 | - | 60 | 1.2 | 2.4 | 40 | 2 | 4 | | | |
| 0150S300-4 | - | 45 | 2 | 4 | 30 | 2.4 | 4.8 | | | |
| 0185S300-4 | - | 35 | 2 | 4 | 20 | 3.6 | 7.2 | | | |
| 0220S300-4 | - | 30 | 2.4 | 4.8 | 20 | 3.6 | 7.2 | | | |
| 0300S300-4 | - | 20 | 3.6 | 7.2 | 16 | 5 | 10 | | | |
| 0370S300-4 | - | 20 | 3.6 | 7.2 | 12 | 6.4 | 12.8 | | | |
| 0450S300-4 | LSLV0750DBU-4HN | 16 | 4 | 8 | 10 | 6.4 | 12.8 | | | |
| 0550S300-4 | LSLV0750DBU-4HN | 13.0 | 5 | 10 | 9.0 | 7.2 | 14.4 | | | |
| 0750S300-4 | LSLV0750DBU-4HN | 10.0 | 6 | 12 | 6.8 | 9.6 | 19.2 | | | |
| 0900S300-4 | LSLV0900DBU-4HN | 8.4 | 8 | 16 | 5.6 | 12 | 24 | | | |
| 1100S300-4 | LSLV1320DBU-4HN | 6.4 | 9.6 | 19.2 | 4.6 | 15 | 30 | | | |

| | | Braking resistance | | | | | | | |
|------------|---------------------------|--------------------|---------------|--------|--------------|---------------|--------|--|--|
| Model | Reference Braking Unit | 10 | 0% Torq | ue | 150% Torque | | | | |
| | | Resistance | Capacity (kW) | | Resistance | Capacity (kW) | | | |
| | | (Ω) | ED 5% | ED 10% | β (Ω) | ED 5% | ED 10% | | |
| 1320S300-4 | LSLV1320DBU-4HN | 5.5 | 12 | 24 | 3.8 | 18 | 36 | | |
| 1600S300-4 | LSLV1600DBU-4HN | 4.8 | 15 | 30 | 3.2 | 20 | 40 | | |
| 1850S300-4 | LSLV2200DBU-4HN | 4.1 | 15 | 30 | 2.7 | 26 | 52 | | |
| 2200S300-4 | LSLV2200DBU-4HN | 3.4 | 20 | 40 | 2.3 | 30 | 60 | | |

Note

- Products that are less than 18.5 kW-200 V or 37 kW-400 V have a built-in braking unit by default and do not require separate installation.
- Refer to the user manual of each braking unit for more details on the specifications of the braking resistor applicable for the use of braking unit. Make sure you use the braking resistance value, watt, braking torque, and duty cycle described in the user manual of the braking unit.
- If you double the duty cycle (%ED) from the standard, you also need to double the rated watts of the separately installed resistor.
- Braking resistor is an object that heats during braking. Make sure there is enough distance from the inverter when you install it.

16.7 Derating

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16.7.1 Continuous Rated Current Derating

The continuous rated current of the inverter is limited based on the carrier frequency. Refer to the following table:

 Table 27. Inverter Rated Current Based on the Carrier Frequency (200 V Class)

| | | | Rat | ed Current | (A) | | |
|------------------|------|------|-----------|------------|----------|-------|-------|
| Capacity (kW) | | | Heavy Dut | y, Low Lea | kage PWM | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz |
| 0.4 | 3.2 | 3.2 | 3.2 | 3.2 | 3.1 | 3 | 2.9 |
| 0.75 | 5 | 5 | 5 | 5 | 4.8 | 4.7 | 4.4 |
| 1.5 | 8 | 8 | 8 | 8 | 7.8 | 7.5 | 7.2 |
| 2.2 | 11 | 11 | 11 | 11 | 10.8 | 10.5 | 10.2 |
| 4 | 17.5 | 17.5 | 17.5 | 17.5 | 17.1 | 16.8 | 16.2 |
| 5.5 | 25 | 25 | 25 | 25 | 24.3 | 23.6 | 22.5 |
| 7.5 | 33 | 33 | 33 | 33 | 32.1 | 31.1 | 29.7 |
| 11 | 47 | 47 | 47 | 47 | 45.3 | 43.6 | 41 |
| 15 | 60 | 60 | 60 | 60 | 58.1 | 56.3 | 53.4 |
| 18.5 | 75 | 75 | 75 | 75 | 72.7 | 70.3 | 66.8 |
| 22 | 88 | 88 | 88 | 88 | 80.6 | 73.1 | 62 |
| 30 | 115 | 115 | 115 | 99.4 | 89 | - | - |
| 37 | 145 | 145 | 145 | 125.2 | 112 | - | - |
| 45 | 180 | 180 | 180 | 155.7 | 139.5 | - | - |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | 7kHz |
| 55 | 220 | 220 | 220 | 220 | 213.8 | 207.5 | 201.3 |
| 75 | 288 | 288 | 288 | 288 | 279.8 | 271.7 | 263.5 |

| | Rated Current (A) | | | | | | | | | |
|------------------|-------------------|------|----------------|-------|-------|--|--|--|--|--|
| Capacity (kW) | | Heav | y Duty, Normal | PWM | | | | | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | | | | | |
| 0.4 | 3.2 | 3.2 | 3.2 | 3.1 | 3 | | | | | |
| 0.75 | 5 | 5 | 5 | 4.8 | 4.6 | | | | | |
| 1.5 | 8 | 8 | 8 | 7.6 | 7.4 | | | | | |
| 2.2 | 11 | 11 | 11 | 10.4 | 9.9 | | | | | |
| 4 | 17.5 | 17.5 | 17.5 | 16.5 | 15.8 | | | | | |
| 5.5 | 25 | 25 | 25 | 23.7 | 22.8 | | | | | |
| 7.5 | 33 | 33 | 33 | 31.3 | 30.1 | | | | | |
| 11 | 47 | 47 | 47 | 43.6 | 42 | | | | | |
| 15 | 60 | 60 | 60 | 57.4 | 55.6 | | | | | |
| 18.5 | 75 | 75 | 75 | 71.7 | 69.5 | | | | | |
| 22 | 88 | 88 | 88 | 72.4 | 62 | | | | | |
| 30 | 115 | 115 | 100.4 | 78.6 | - | | | | | |
| 37 | 145 | 145 | 126.5 | 98.8 | - | | | | | |
| 45 | 180 | 180 | 157.3 | 123.3 | - | | | | | |
| | 1kHz | 4kHz | 5kHz | 6kHz | 7kHz | | | | | |
| 55 | 220 | 220 | 215.6 | 211.1 | 206.7 | | | | | |
| 75 | 288 | 288 | 282.2 | 276.4 | 270.6 | | | | | |

| | | | Rat | ed Current | (A) | | |
|------------------|------|------|-----------|-------------|----------|-------|-------|
| Capacity (kW) | | | Normal Du | ty, Low Lea | kage PWM | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz |
| 0.4 | 5 | 5 | 4.9 | 4.7 | 4.6 | 4.5 | 4.3 |
| 0.75 | 8 | 8 | 7.8 | 7.6 | 7.4 | 7.2 | 6.9 |
| 1.5 | 12 | 12 | 11.7 | 11.3 | 11.1 | 10.8 | 10.4 |
| 2.2 | 16 | 16 | 15.7 | 15.2 | 14.9 | 14.6 | 14.1 |
| 4 | 22 | 22 | 21.6 | 20.9 | 20.5 | 20.1 | 19.4 |
| 5.5 | 30 | 30 | 29.3 | 28.2 | 27.5 | 26.8 | 25.7 |
| 7.5 | 42 | 42 | 41 | 39.5 | 38.5 | 37.5 | 36 |
| 11 | 56 | 56 | 54.4 | 52 | 50.5 | 48.9 | 46.5 |
| 15 | 70 | 70 | 68.1 | 65.2 | 63.3 | 61.4 | 58.5 |
| 18.5 | 82 | 82 | 79.8 | 76.4 | 74.1 | 71.9 | 68.5 |
| 22 | 110 | 110 | 102.7 | 91.7 | 84.3 | 77 | 66 |
| 30 | 138 | 138 | 125.1 | 105.9 | 93 | - | - |
| 37 | 169 | 169 | 153.6 | 130.4 | 115 | - | - |
| 45 | 211 | 211 | 191.9 | 163.1 | 144 | - | - |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | 7kHz |
| 55 | 288 | 288 | 280.6 | 273.1 | 265.5 | 258 | 250.5 |
| 75 | 345 | 345 | 336.8 | 328.6 | 320.4 | 312.1 | 303.9 |

| | Rated Current (A) | | | | | | | | | |
|------------------|-------------------|-------|-----------------|-------|-------|--|--|--|--|--|
| Capacity (kW) | | Norma | al Duty, Normal | PWM | | | | | | |
| () | 1kHz | 2kHz | 5kHz | 8kHz | 10kHz | | | | | |
| 0.4 | 5 | 5 | 4.8 | 4.6 | 4.5 | | | | | |
| 0.75 | 8 | 8 | 7.7 | 7.4 | 7.2 | | | | | |
| 1.5 | 12 | 12 | 11.6 | 11.1 | 10.8 | | | | | |
| 2.2 | 16 | 16 | 15.3 | 14.6 | 14.2 | | | | | |
| 4 | 22 | 22 | 21.1 | 20.1 | 19.5 | | | | | |
| 5.5 | 30 | 30 | 28.7 | 27.3 | 26.4 | | | | | |
| 7.5 | 42 | 42 | 40.1 | 38.3 | 37 | | | | | |
| 11 | 56 | 56 | 52.7 | 49.5 | 47.3 | | | | | |
| 15 | 70 | 70 | 65.8 | 61.7 | 58.9 | | | | | |
| 18.5 | 82 | 82 | 77.1 | 72.3 | 69 | | | | | |
| 22 | 110 | 110 | 93.5 | 77 | 66 | | | | | |
| 30 | 138 | 138 | 109.1 | 80.1 | - | | | | | |
| 37 | 169 | 169 | 134.3 | 99.6 | - | | | | | |
| 45 | 211 | 211 | 168 | 124.9 | - | | | | | |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | | | | | |
| 55 | 288 | 288 | 281.1 | 274.3 | 267.4 | | | | | |
| 75 | 345 | 345 | 336.8 | 328.6 | 320.3 | | | | | |

| | Rated Current (A) | | | | | | | | | |
|------------------|-------------------|------|-----------|------------|----------|-------|-------|--|--|--|
| Capacity (kW) | | | Heavy Dut | y, Low Lea | kage PWM | | | | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz | | | |
| 0.4 | 1.8 | 1.8 | 1.8 | 1.8 | 1.7 | 1.5 | 1.4 | | | |
| 0.75 | 3.4 | 3.4 | 3.4 | 3.4 | 3.2 | 2.9 | 2.6 | | | |
| 1.5 | 4.8 | 4.8 | 4.8 | 4.8 | 4.5 | 4.1 | 3.6 | | | |
| 2.2 | 5.5 | 5.5 | 5.5 | 5.5 | 5.2 | 4.8 | 4.3 | | | |
| 4 | 9.2 | 9.2 | 9.2 | 9.2 | 8.6 | 8.1 | 7.2 | | | |
| 5.5 | 14.8 | 14.8 | 14.8 | 14.8 | 13.7 | 12.6 | 11 | | | |
| 7.5 | 16.5 | 16.5 | 16.5 | 16.5 | 15.3 | 14.1 | 12.3 | | | |
| 11 | 24 | 24 | 24 | 24 | 21.9 | 19.8 | 16.6 | | | |
| 15 | 31 | 31 | 31 | 31 | 28.3 | 25.6 | 21.5 | | | |
| 18.5 | 39 | 39 | 39 | 39 | 36.5 | 33.9 | 30.2 | | | |
| 22 | 45 | 45 | 45 | 45 | 42.1 | 39.2 | 34.8 | | | |
| 30 | 61 | 61 | 61 | 61 | 53.6 | 46.1 | 35 | | | |
| 37 | 75 | 75 | 75 | 60.5 | 50.8 | - | - | | | |
| 45 | 91 | 91 | 91 | 75.4 | 65 | - | - | | | |
| 55 | 110 | 110 | 110 | 88.4 | 74 | - | - | | | |
| 75 | 152 | 152 | 152 | 122 | 102 | - | - | | | |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | - | | | |
| 90 | 183 | 183 | 183 | 180 | 177 | 174 | - | | | |
| 110 | 223 | 223 | 223 | 219.3 | 215.7 | 212 | - | | | |
| 132 | 264 | 264 | 264 | 250.6 | 237.2 | - | - | | | |
| 160 | 325 | 325 | 325 | 308.5 | 292 | - | - | | | |
| 185 | 370 | 370 | 370 | 330.8 | - | - | - | | | |
| 220 | 425 | 425 | 425 | 380 | - | - | - | | | |

Table 28. Inverter Rated Current Based on Carrier Frequency (400 V-460 V Class)

| | Rated Current (A) | | | | | | | | | |
|------------------|-------------------|-------|----------------|-------|-------|--|--|--|--|--|
| Capacity (kW) | | Heav | y Duty, Normal | PWM | | | | | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | | | | | |
| 0.4 | 1.8 | 1.8 | 1.8 | 1.6 | 1.5 | | | | | |
| 0.75 | 3.4 | 3.4 | 3.4 | 3.1 | 2.8 | | | | | |
| 1.5 | 4.8 | 4.8 | 4.8 | 4.3 | 4 | | | | | |
| 2.2 | 5.5 | 5.5 | 5.5 | 4.9 | 4.6 | | | | | |
| 4 | 9.2 | 9.2 | 9.2 | 7.9 | 7.3 | | | | | |
| 5.5 | 14.8 | 14.8 | 14.8 | 13.5 | 12.6 | | | | | |
| 7.5 | 16.5 | 16.5 | 16.5 | 15 | 14 | | | | | |
| 11 | 24 | 24 | 24 | 21.2 | 19.4 | | | | | |
| 15 | 31 | 31 | 31 | 27.4 | 25 | | | | | |
| 18.5 | 39 | 39 | 39 | 35.7 | 33.5 | | | | | |
| 22 | 45 | 45 | 45 | 41.2 | 38.6 | | | | | |
| 30 | 61 | 61 | 61 | 45.4 | 35 | | | | | |
| 37 | 75 | 75 | 61.5 | 41.2 | - | | | | | |
| 45 | 91 | 91 | 76.4 | 54.6 | - | | | | | |
| 55 | 110 | 110 | 89.8 | 59.6 | - | | | | | |
| 75 | 152 | 152 | 124 | 82 | - | | | | | |
| | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | | | | | |
| 90 | 183 | 175.4 | 167.8 | 160.2 | 152.6 | | | | | |
| 110 | 223 | 213.8 | 204.5 | 195.3 | 186 | | | | | |
| 132 | 264 | 249.1 | 234.2 | 219.3 | - | | | | | |
| 160 | 325 | 306.7 | 288.3 | 270 | - | | | | | |
| 185 | 370 | 331.3 | 292.5 | - | - | | | | | |
| 220 | 425 | 380.5 | 336 | - | - | | | | | |

| | Rated Current (A) | | | | | | | | | | |
|------------------|-------------------|------|-----------|-------------|----------|-------|-------|--|--|--|--|
| Capacity (kW) | | | Normal Du | ty, Low Lea | kage PWM | | | | | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz | | | | |
| 0.4 | 2.5 | 2.5 | 2.3 | 2.1 | 1.9 | 1.8 | 1.5 | | | | |
| 0.75 | 4.1 | 4.1 | 3.8 | 3.4 | 3.1 | 2.9 | 2.5 | | | | |
| 1.5 | 6 | 6 | 5.6 | 5 | 4.6 | 4.2 | 3.6 | | | | |
| 2.2 | 8 | 8 | 7.5 | 6.7 | 6.2 | 5.7 | 5 | | | | |
| 4 | 12.1 | 12.1 | 11.3 | 10.2 | 9.4 | 8.7 | 7.5 | | | | |
| 5.5 | 17.5 | 17.5 | 16.8 | 15.6 | 14.9 | 14.2 | 13.1 | | | | |
| 7.5 | 24 | 24 | 23 | 21.5 | 20.4 | 19.4 | 17.9 | | | | |
| 11 | 31 | 31 | 29.1 | 26.3 | 24.5 | 22.6 | 19.8 | | | | |
| 15 | 38 | 38 | 35.7 | 32.3 | 30 | 27.7 | 24.3 | | | | |
| 18.5 | 45 | 45 | 42.4 | 38.4 | 35.7 | 33.1 | 29.1 | | | | |
| 22 | 61 | 61 | 57.4 | 52 | 48.5 | 44.9 | 39.5 | | | | |
| 30 | 75 | 75 | 68.5 | 58.8 | 52.3 | 45.8 | 36 | | | | |
| 37 | 91 | 91 | 80.9 | 65.8 | 55.8 | 45.7 | 30.6 | | | | |
| 45 | 107 | 107 | 96.2 | 80.1 | 69.3 | - | - | | | | |
| 55 | 142 | 142 | 122.9 | 94.1 | 75 | - | - | | | | |
| 75 | 169 | 169 | 150.5 | 122.8 | 104.4 | - | - | | | | |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | | | | | |
| 90 | 223 | 223 | 213.9 | 204.8 | 195.8 | 186.7 | - | | | | |
| 110 | 264 | 264 | 253.3 | 242.5 | 231.8 | 221 | - | | | | |
| 132 | 325 | 325 | 311.2 | 297.5 | 283.7 | - | - | | | | |
| 160 | 370 | 370 | 354.3 | 338.7 | 323 | - | - | | | | |
| 185 | 432 | 432 | 388 | 344 | - | - | - | | | | |
| 220 | 481 | 481 | 432 | 383 | - | - | - | | | | |

| | | R | ated Current (# | ۹) | |
|------------------|------|-------|-----------------|-------|-------|
| Capacity (kW) | | Norma | al Duty, Norma | PWM | |
| () | 2kHz | 4kHz | 6kHz | 8kHz | 10kHz |
| 0.4 | 2.5 | 2.3 | 2.1 | 1.9 | 1.8 |
| 0.75 | 4.1 | 3.8 | 3.5 | 3.2 | 2.9 |
| 1.5 | 6 | 5.6 | 5.1 | 4.7 | 4.2 |
| 2.2 | 8 | 7.3 | 6.7 | 6 | 5.4 |
| 4 | 12.1 | 11.1 | 10.1 | 9.1 | 8.1 |
| 5.5 | 17.5 | 16.4 | 15.3 | 14.2 | 13.1 |
| 7.5 | 24 | 22.5 | 21 | 19.4 | 17.9 |
| 11 | 31 | 28.7 | 26.3 | 24 | 21.6 |
| 15 | 38 | 35.1 | 32.3 | 29.4 | 26.5 |
| 18.5 | 45 | 42 | 39 | 35.9 | 32.9 |
| 22 | 61 | 56.9 | 52.8 | 48.7 | 44.6 |
| 30 | 75 | 65.3 | 55.5 | 45.8 | 36 |
| 37 | 91 | 75.9 | 60.8 | 45.7 | - |
| 45 | 107 | 90.8 | 74.7 | 58.5 | - |
| 55 | 142 | 113.3 | 84.6 | 55.9 | - |
| 75 | 169 | 140.4 | 111.9 | 83.3 | - |
| | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz |
| 90 | 223 | 212.9 | 202.7 | 192.6 | 182.5 |
| 110 | 264 | 252 | 240 | 228 | 216 |
| 132 | 325 | 308 | 291 | 274.1 | - |
| 160 | 370 | 350.7 | 331.3 | 312 | _ |
| 185 | 432 | 384 | 335.9 | - | _ |
| 220 | 481 | 427.5 | 374 | - | - |

| | | Rated Current (A) | | | | | | |
|------------------|-------|-------------------|-----------|------------|----------|-------|-------|--|
| Capacity (kW) | | | Heavy Dut | y, Low Lea | kage PWM | | | |
| (, | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz | |
| 0.4 | 1.7 | 1.7 | 1.7 | 1.7 | 1.6 | 1.5 | 1.3 | |
| 0.8 | 3.1 | 3.1 | 3.1 | 3.1 | 2.9 | 2.7 | 2.3 | |
| 1.5 | 4.4 | 4.4 | 4.4 | 4.4 | 4.1 | 3.8 | 3.3 | |
| 2.2 | 5.0 | 5.0 | 5.0 | 5.0 | 4.7 | 4.4 | 3.9 | |
| 4 | 8.3 | 8.3 | 8.3 | 8.3 | 7.8 | 7.3 | 6.5 | |
| 5.5 | 13.4 | 13.4 | 13.4 | 13.4 | 12.4 | 11.5 | 10.0 | |
| 7.5 | 14.9 | 14.9 | 14.9 | 14.9 | 13.8 | 12.7 | 11.1 | |
| 11 | 21.6 | 21.6 | 21.6 | 21.6 | 19.7 | 17.8 | 15.0 | |
| 15 | 27.9 | 27.9 | 27.9 | 27.9 | 25.5 | 23.0 | 19.4 | |
| 18.5 | 35.1 | 35.1 | 35.1 | 35.1 | 32.8 | 30.6 | 27.1 | |
| 22 | 40.5 | 40.5 | 40.5 | 40.5 | 37.9 | 35.3 | 31.3 | |
| 30 | 54.9 | 54.9 | 54.9 | 54.9 | 48.2 | 41.5 | 31.5 | |
| 37 | 67.5 | 67.5 | 67.5 | 54.5 | 45.8 | - | - | |
| 45 | 81.9 | 81.9 | 81.9 | 67.9 | 58.5 | - | - | |
| 55 | 99.0 | 99.0 | 99.0 | 79.6 | 66.6 | - | - | |
| 75 | 136.8 | 136.8 | 136.8 | 109.8 | 91.8 | - | - | |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | - | |
| 90 | 164.7 | 164.7 | 164.7 | 162.0 | 159.3 | 156.6 | - | |
| 110 | 200.7 | 200.7 | 200.7 | 197.4 | 194.1 | 190.8 | - | |
| 132 | 237.6 | 237.6 | 237.6 | 225.5 | 213.5 | - | - | |
| 160 | 292.5 | 292.5 | 292.5 | 277.7 | 262.8 | - | - | |
| 185 | 333.0 | 333.0 | 333.0 | 297.7 | - | - | - | |
| 220 | 382.5 | 382.5 | 382.5 | 342.0 | - | - | - | |

Table 29. Inverter Rated Current Based on the Carrier Frequency (Over 460 V Class)

| | | R | ated Current (A | A) | | | | | | |
|------------------|------------------------|-------|-----------------|-------|-------|--|--|--|--|--|
| Capacity (kW) | Heavy Duty, Normal PWM | | | | | | | | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | | | | | |
| 0.4 | 1.7 | 1.7 | 1.7 | 1.5 | 1.4 | | | | | |
| 0.8 | 3.1 | 3.1 | 3.1 | 2.8 | 2.6 | | | | | |
| 1.5 | 4.4 | 4.4 | 4.4 | 4.0 | 3.7 | | | | | |
| 2.2 | 5.0 | 5.0 | 5.0 | 4.5 | 4.1 | | | | | |
| 4 | 8.3 | 8.3 | 8.3 | 7.1 | 6.6 | | | | | |
| 5.5 | 13.4 | 13.4 | 13.4 | 12.2 | 11.4 | | | | | |
| 7.5 | 14.9 | 14.9 | 14.9 | 13.5 | 12.6 | | | | | |
| 11 | 21.6 | 21.6 | 21.6 | 19.1 | 17.4 | | | | | |
| 15 | 27.9 | 27.9 | 27.9 | 24.7 | 22.5 | | | | | |
| 18.5 | 35.1 | 35.1 | 35.1 | 32.1 | 30.1 | | | | | |
| 22 | 40.5 | 40.5 | 40.5 | 37.0 | 34.7 | | | | | |
| 30 | 54.9 | 54.9 | 54.9 | 40.9 | 31.5 | | | | | |
| 37 | 67.5 | 67.5 | 55.3 | 37.1 | - | | | | | |
| 45 | 81.9 | 81.9 | 68.8 | 49.1 | - | | | | | |
| 55 | 99.0 | 99.0 | 80.9 | 53.6 | - | | | | | |
| 75 | 136.8 | 136.8 | 111.6 | 73.8 | - | | | | | |
| | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | | | | | |
| 90 | 164.7 | 157.9 | 151.0 | 144.2 | 137.3 | | | | | |
| 110 | 200.7 | 192.4 | 184.1 | 175.7 | 167.4 | | | | | |
| 132 | 237.6 | 224.2 | 210.8 | 197.4 | - | | | | | |
| 160 | 292.5 | 276.0 | 259.5 | 243.0 | - | | | | | |
| 185 | 333.0 | 298.1 | 263.3 | - | - | | | | | |
| 220 | 382.5 | 342.5 | 302.4 | - | - | | | | | |

| | Rated Current (A) | | | | | | |
|------------------|-------------------|-------|-----------|-------------|-----------|-------|-------|
| Capacity (kW) | | | Normal Du | ty, Low Lea | ikage PWM | | |
| () | 1kHz | 3kHz | 5kHz | 8kHz | 10kHz | 12kHz | 15kHz |
| 0.4 | 2.3 | 2.3 | 2.1 | 1.9 | 1.8 | 1.6 | 1.4 |
| 0.8 | 3.7 | 3.7 | 3.5 | 3.1 | 2.8 | 2.6 | 2.2 |
| 1.5 | 5.4 | 5.4 | 5.0 | 4.5 | 4.1 | 3.8 | 3.2 |
| 2.2 | 7.6 | 7.6 | 7.1 | 6.4 | 5.9 | 5.4 | 4.7 |
| 4 | 11.0 | 11.0 | 10.3 | 9.3 | 8.6 | 7.9 | 6.8 |
| 5.5 | 15.8 | 15.8 | 15.1 | 14.1 | 13.5 | 12.8 | 11.8 |
| 7.5 | 21.6 | 21.6 | 20.7 | 19.3 | 18.4 | 17.5 | 16.1 |
| 11 | 27.9 | 27.9 | 26.2 | 23.7 | 22.0 | 20.4 | 17.8 |
| 15 | 34.2 | 34.2 | 32.1 | 29.1 | 27.0 | 25.0 | 21.9 |
| 18.5 | 40.5 | 40.5 | 38.1 | 34.6 | 32.2 | 29.8 | 26.2 |
| 22 | 54.9 | 54.9 | 51.7 | 46.8 | 43.6 | 40.4 | 35.6 |
| 30 | 67.5 | 67.5 | 61.7 | 52.9 | 47.0 | 41.2 | 32.4 |
| 37 | 81.9 | 81.9 | 72.8 | 59.3 | 50.2 | - | - |
| 45 | 96.3 | 96.3 | 86.6 | 72.1 | 62.4 | - | - |
| 55 | 127.8 | 127.8 | 110.6 | 84.7 | 67.5 | - | - |
| 75 | 156.0 | 156.0 | 139.0 | 113.4 | 96.3 | - | - |
| | 1kHz | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | - |
| 90 | 200.7 | 200.7 | 192.5 | 184.4 | 176.2 | 168.0 | - |
| 110 | 237.6 | 237.6 | 227.9 | 218.3 | 208.6 | 198.9 | - |
| 132 | 292.5 | 292.5 | 280.1 | 267.7 | 255.3 | - | - |
| 160 | 333.0 | 333.0 | 318.9 | 304.8 | 290.7 | - | - |
| 185 | 388.8 | 388.8 | 349.2 | 309.6 | - | - | - |
| 220 | 432.9 | 432.9 | 388.8 | 344.7 | - | - | - |

| | | R | ated Current (A | ۹) | | | | | | |
|------------------|-------------------------|-------|-----------------|-------|-------|--|--|--|--|--|
| Capacity (kW) | Normal Duty, Normal PWM | | | | | | | | | |
| () | 2kHz | 4kHz | 6kHz | 8kHz | 10kHz | | | | | |
| 0.4 | 2.3 | 2.1 | 2.0 | 1.8 | 1.6 | | | | | |
| 0.8 | 3.7 | 3.4 | 3.1 | 2.9 | 2.6 | | | | | |
| 1.5 | 5.4 | 5.0 | 4.6 | 4.2 | 3.8 | | | | | |
| 2.2 | 7.6 | 7.0 | 6.3 | 5.7 | 5.1 | | | | | |
| 4 | 11.0 | 10.1 | 9.2 | 8.3 | 7.4 | | | | | |
| 5.5 | 15.8 | 14.8 | 13.8 | 12.8 | 11.8 | | | | | |
| 7.5 | 21.6 | 20.2 | 18.9 | 17.5 | 16.1 | | | | | |
| 11 | 27.9 | 25.8 | 23.7 | 21.6 | 19.5 | | | | | |
| 15 | 34.2 | 31.6 | 29.0 | 26.4 | 23.9 | | | | | |
| 18.5 | 40.5 | 37.8 | 35.1 | 32.3 | 29.6 | | | | | |
| 22 | 54.9 | 51.2 | 47.5 | 43.8 | 40.1 | | | | | |
| 30 | 67.5 | 58.7 | 50.0 | 41.2 | 32.4 | | | | | |
| 37 | 81.9 | 68.3 | 54.7 | 41.1 | - | | | | | |
| 45 | 96.3 | 81.8 | 67.2 | 52.7 | - | | | | | |
| 55 | 127.8 | 102.0 | 76.1 | 50.3 | - | | | | | |
| 75 | 156.0 | 129.6 | 103.3 | 76.9 | - | | | | | |
| | 2kHz | 3kHz | 4kHz | 5kHz | 6kHz | | | | | |
| 90 | 200.7 | 191.6 | 182.5 | 173.3 | 164.2 | | | | | |
| 110 | 237.6 | 226.8 | 216.0 | 205.2 | 194.4 | | | | | |
| 132 | 292.5 | 277.2 | 261.9 | 246.7 | - | | | | | |
| 160 | 333.0 | 315.6 | 298.2 | 280.8 | - | | | | | |
| 185 | 388.8 | 345.6 | 302.3 | - | - | | | | | |
| 220 | 432.9 | 384.8 | 336.6 | - | - | | | | | |

16.7.1.1 The Continuous Rated Current Derating Based on Input Voltage

The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.



[Image 28. The Continuous Rated Current Derating Ratio Based on Input Voltage (200 V Class)]



[Image 29. The Continuous Rated Current Derating Ratio Based on Input Voltage (400 V Class)]

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16.7.1.2 The Continuous Rated Current Derating Based on Operating Frequency

The following table shows the maximum value of the carrier frequency that guarantees 100% of the rated current. The continuous rated current of the inverter is limited based on the operating frequency if it is operated with the carrier frequency that exceeds this value. Refer to the following graph.

Table 30. Maximum value of the carrier frequency (Guarantees 100% of the rated current)

| | Inverter Capacity (kW) | Normal Duty (kHz) Low Leakage / Normal | Heavy Duty (kHz) Low Leakage / Normal |
|------------|------------------------|---|--|
| | 0.4~22 | 3/2 | 8/5 |
| 200 V Type | 30~45 | 3/2 | 5/3 |
| | 55~75 | 2 | 4 |
| | 0.4~30 | 3/2 | 8/5 |
| 400 V Type | 37~75 | 3/2 | 5/3 |
| | 90~220 | 2 | 3/2 |





16.7.2 Carrier Frequency Derating

16.7.2.1 Carrier Frequency Derating Based on the Power Unit Temperature

The carrier frequency may change according to the power unit temperature. This is to prevent burning the inverter from the temperature increase in the power unit. It reduces the switching loss and suppresses temperature increase. The example of operation conditions is as follows:



[Image 31. Carrier Frequency Derating Ratio Based on the Power Unit Temperature]

When the power unit temperature in the inverter goes above the reference temperature curve of the start of carrier derating during inverter operation, the carrier frequency will be changed to 2 kHz regardless of inverter capacity or control mode. If the power unite temperature in the inverter goes below the reference temperature for the carrier derating return while keeping operating in the changed carrier frequency, the carrier frequency will increase or decrease according to the power unit temperature. The carrier frequency cannot be lower than 2 kHz, and the carrier frequency derating will end when it reaches the setting value at DRV-27 (Carrier Frequency). Afterwards, if the power unit temperature in the inverter goes above the reference temperature curve of the carrier derating again, the former process will be iterated.

16.7.2.2 Carrier Frequency Derating Based on Operating Frequency

The carrier frequency may change according to the operating frequency. When the operating frequency is under 5 Hz, the carrier frequency will be changed to 2 kHz (derating carrier frequency), and when the operating frequency is 5 Hz or higher, the carrier frequency will be changed to the setting value at DRV-27 (Carrier Frequency). However, when the setting value at DRV-27 (Carrier Frequency) is lower than 2 kHz, the carrier frequency will not be changed.



16.7.2.3 Carrier Frequency Derating Based on the Inverter Load

The carrier frequency may change according to the inverter load. When the inverter load is too high and causes a overload warning, the carrier frequency will be changed to 2 kHz (derating carrier frequency), and when the overload warning is lifted, the carrier frequency will be changed to the setting value at DRV-27 (Carrier Frequency). However, when the setting value at DRV-27 (Carrier Frequency) is lower than 2 kHz, the carrier frequency will not be changed.



[Image 34. Carrier Frequency Derating Based on the Load Volume]

16.8 Parameter Default Values Based on the Motor Capacity

16.8.1 200 V Class Motor

Table 31. Parameter Default Values Based on the Motor Capacity (200 V class)

| Motor Output (kW) | Efficiency (%) | Rated Current (A) | No-Load Current (A) | Rated Speed (rpm) | Rs (mΩ) | Lsigma (uH) | Ls (uH) | Tr (ms) | Acceleration Time (sec) | Deceleration Time (sec) | Torque Boost (%) |
|-------------------------|-------------------|-------------------------|---------------------------|-------------------------|------------|----------------|------------|------------|-------------------------------|-------------------------------|------------------------|
| 0.2 | 64 | 1.1 | 0.8 | 1700 | 14000.0 | 40400 | 385000 | 93 | 20 | 30 | 20 |
| 0.4 | 70 | 2.4 | 1.4 | 1700 | 6700.0 | 26900 | 206000 | 116 | 20 | 30 | 20 |
| 0.7 | 74 | 3.4 | 1.7 | 1710 | 2600.0 | 17940 | 174400 | 145 | 20 | 30 | 20 |
| 1.5 | 80 | 6.4 | 2.6 | 1720 | 1170.0 | 9290 | 115800 | 162 | 20 | 30 | 20 |
| 2.2 | 82 | 8.6 | 3.3 | 1730 | 840.0 | 6630 | 90700 | 183 | 20 | 30 | 20 |
| 3.7 | 84 | 13.8 | 5.0 | 1730 | 500.0 | 4480 | 59700 | 211 | 20 | 30 | 20 |
| 5.5 | 85 | 21.0 | 7.1 | 1755 | 314.0 | 3190 | 41500 | 250 | 20 | 30 | 20 |
| 7.5 | 87 | 28.2 | 9.3 | 1760 | 169.0 | 2844 | 31860 | 271 | 20 | 30 | 20 |
| 11 | 88 | 40.0 | 12.4 | 1770 | 120.0 | 1488 | 23910 | 310 | 20 | 30 | 20 |
| 15 | 89 | 53.6 | 15.5 | 1770 | 84.0 | 1118 | 19070 | 350 | 20 | 30 | 20 |
| 18.5 | 89 | 65.6 | 19.0 | 1770 | 67.6 | 819 | 15590 | 390 | 20 | 30 | 20 |
| 22 | 90 | 76.8 | 21.5 | 1770 | 56.0 | 948 | 13790 | 435 | 20 | 30 | 20 |
| 30 | 90 | 104.6 | 29.3 | 1770 | 42.2 | 711 | 10120 | 530 | 20 | 30 | 20 |
| 37 | 91 | 128.6 | 34.7 | 1770 | 33.8 | 568 | 8540 | 600 | 20 | 30 | 20 |
| 45 | 91 | 156.0 | 42.1 | 1770 | 28.1 | 474 | 7040 | 630 | 20 | 30 | 20 |
| 55 | 92 | 184.1 | 49.7 | 1770 | 23.1 | 389 | 5960 | 670 | 20 | 30 | 20 |
| 75 | 92 | 244.5 | 61.1 | 1770 | 16.9 | 284 | 4850 | 800 | 20 | 30 | 20 |
| 90 | 93 | 289.5 | 72.3 | 1770 | 14.0 | 250 | 4090 | 900 | 60 | 90 | 10 |
| 110 | 93 | 351.5 | 84.3 | 1770 | 13.8 | 232 | 3510 | 1000 | 60 | 90 | 10 |
| 132 | 93 | 418.5 | 100.4 | 1770 | 11.5 | 193 | 2950 | 1100 | 60 | 90 | 10 |
| 160 | 93 | 501.8 | 120.4 | 1770 | 9.5 | 159 | 2460 | 1200 | 60 | 90 | 10 |
| 185 | 93 | 578.0 | 132.9 | 1770 | 9.0 | 150 | 2230 | 1250 | 60 | 90 | 10 |
| 220 | 93 | 690.0 | 158.7 | 1770 | 6.9 | 116 | 1860 | 1350 | 60 | 90 | 10 |
| 280 | 93 | 878.4 | 193.2 | 1770 | 5.4 | 91 | 1530 | 1400 | 60 | 90 | 10 |
| 315 | 93 | 988.3 | 217.4 | 1770 | 4.8 | 81 | 1360 | 1430 | 60 | 90 | 10 |
| 375 | 93 | 1176.7 | 247.1 | 1770 | 4.0 | 68 | 1190 | 1470 | 60 | 90 | 10 |
| 450 | 93 | 1412.2 | 296.5 | 1770 | 3.3 | 57 | 990 | 1520 | 60 | 90 | 10 |
| 784 | | | | | | | | | | | |

16.8.2 400V Class Motor

 Table 32. Parameter Default Values Based on the Motor Capacity (400 V class)

| Motor Output (kW) | Efficiency (%) | Rated Current (A) | No-Load Current (A) | Rated Speed (rpm) | Rs (mΩ) | Lsigma (uH) | Ls (uH) | Tr (ms) | Acceleration Time (sec) | Deceleration Time (sec) | Torque Boost (%) |
|-------------------------|-------------------|-------------------------|---------------------------|-------------------------|------------|----------------|------------|------------|-------------------------------|-------------------------------|------------------------|
| 0.2 | 64 | 0.7 | 0.5 | 1700 | 28000.0 | 121200 | 1045000 | 93 | 20 | 30 | 20 |
| 0.4 | 70 | 1.4 | 0.8 | 1700 | 14000.0 | 80800 | 610000 | 116 | 20 | 30 | 20 |
| 0.75 | 74 | 2.0 | 1.0 | 1710 | 7810.0 | 53900 | 512000 | 145 | 20 | 30 | 20 |
| 1.5 | 80 | 3.7 | 1.5 | 1720 | 3520.0 | 27900 | 346000 | 162 | 20 | 30 | 20 |
| 2.2 | 82 | 5.0 | 1.9 | 1730 | 2520.0 | 19950 | 269500 | 183 | 20 | 30 | 20 |
| 3.7 | 84 | 8.0 | 2.9 | 1730 | 1500.0 | 13450 | 177800 | 211 | 20 | 30 | 20 |
| 5.5 | 85 | 12.1 | 4.1 | 1755 | 940.0 | 9620 | 124500 | 250 | 20 | 30 | 20 |
| 7.5 | 87 | 16.3 | 5.4 | 1760 | 520.0 | 8530 | 95200 | 271 | 20 | 30 | 20 |
| 11 | 88 | 23.2 | 7.2 | 1770 | 360.0 | 4480 | 71200 | 310 | 20 | 30 | 20 |
| 15 | 89 | 31.0 | 9.0 | 1770 | 250.0 | 3380 | 57000 | 350 | 20 | 30 | 20 |
| 18.5 | 89 | 38.0 | 11.0 | 1770 | 168.0 | 2457 | 46470 | 390 | 20 | 30 | 20 |
| 22 | 90 | 44.5 | 12.5 | 1770 | 168.0 | 2844 | 41100 | 435 | 20 | 30 | 20 |
| 30 | 90 | 60.5 | 16.9 | 1770 | 126.6 | 2133 | 30230 | 530 | 20 | 30 | 20 |
| 37 | 91 | 74.4 | 20.1 | 1770 | 101.4 | 1704 | 25490 | 600 | 20 | 30 | 20 |
| 45 | 91 | 90.3 | 24.4 | 1770 | 84.3 | 1422 | 21010 | 630 | 20 | 30 | 20 |
| 55 | 92 | 106.6 | 28.8 | 1770 | 69.3 | 1167 | 17790 | 670 | 20 | 30 | 20 |
| 75 | 92 | 141.6 | 35.4 | 1770 | 50.7 | 852 | 14460 | 800 | 20 | 30 | 20 |
| 90 | 93 | 167.6 | 41.9 | 1770 | 39.9 | 715 | 12220 | 900 | 60 | 90 | 10 |
| 110 | 93 | 203.5 | 48.8 | 1770 | 32.6 | 585 | 10480 | 1000 | 60 | 90 | 10 |
| 132 | 93 | 242.3 | 58.1 | 1770 | 27.2 | 488 | 8800 | 1100 | 60 | 90 | 10 |
| 160 | 93 | 290.5 | 69.7 | 1770 | 22.4 | 403 | 7340 | 1200 | 60 | 90 | 10 |
| 185 | 93 | 335.0 | 77.0 | 1770 | 21.0 | 380 | 6640 | 1250 | 60 | 90 | 10 |
| 220 | 93 | 405.0 | 93.1 | 1770 | 16.3 | 293 | 5497 | 1350 | 60 | 90 | 10 |
| 280 | 93 | 530.7 | 116.7 | 1770 | 12.8 | 230 | 4386 | 1400 | 60 | 90 | 10 |
| 315 | 93 | 604.0 | 132.8 | 1770 | 11.4 | 204 | 3854 | 1430 | 60 | 90 | 10 |
| 375 | 93 | 729.7 | 153.2 | 1770 | 9.6 | 171 | 3342 | 1470 | 60 | 90 | 10 |
| 450 | 93 | 886.8 | 177.2 | 1770 | 8.0 | 143 | 2749 | 1520 | 60 | 90 | 10 |

16.9 Safe Torque Off (STO) Function



S300 series inverter offers a safety torque off (STO) function. In case of emergency, the inverter output can be immediately cut off to protect the users and prevent potential hazards. This manual provides only a basic overview of the safety functions. For more information, refer to the safety manual on the website (https://www.ls-electric.com).

16.9.1 Safety Standards

The safety torque off function of the S300 series complies with the following European directives and standards.

- European Machinery Directive 2006/42/EC
- EN 61800-5-2:2017 SIL2
- EN ISO 13849-1:2023 Category 3, PL d
- EN 61508:2010 SIL2

① Caution

Use caution when utilizing safety functions, verify that the system's risk factors are identified and safety requirements are satisfied.

Note

- When wiring or performing maintenance on the inverter, ensure that the power to the inverter is turned off.
- Safety functions are not designed to electrically isolate the inverter.

16.9.2 Safety Functions Description

The STO function offered by the S300 inverter consists of two independent channels (SA, SB). If either channel is activated during operation, it interrupts the motor drive gate signals, cutting off power to the motor. When motor power is interrupted, torque output ceases, and the motor transitions to a free-run state. Depending on the active channel, the keypad will display either the **STO Feedback A** or **STO Feedback B** trip message.

The STO function can be activated by removing the safety connector from the SA, SB, and SP terminals on the control board. The inverter operates normally when SA and SB are connected to SP, and disconnecting the SA and SB from SP activates the STO function. To deactivate the safety function after activation, reconnect SA and SB to the SP using the safety connector and press the **STO**/RESET key.



16.9.3 Safety Operation Diagram

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[Image 35. Safety Operation Diagram (When using internal DC 24 V power)]



[Image 36. Safety Operation Diagram (When using external DC 24 V power)]

Product Warranty

Warranty Period

The warranty period for the purchased product is 24 months from the date of manufacture.

Warranty Coverage

- 1. The initial fault diagnosis should be conducted by the customer as a general principle. However, upon request, we or our service network can carry out this task for a fee. If the fault is found to be our responsibility, the service will be free of charge.
- 2. The warranty applies only when our products are used under normal conditions as specified in the handling instructions, user manual, catalog, and caution labels.
- 3. Even within the warranty period, the following cases will be subject to chargeable repairs:
 - 1) Replacement of consumables or lifespan parts (relays, fuses, electrolytic capacitors, batteries, fans, etc.)
 - 2) Failures or damage due to improper storage, handling, negligence, or accidents by the customer
 - 3) Failures due to the hardware or software design of the customer
 - Failures due to modifications of the product without our consent (repairs or modifications recognized as done by others will also be refused, even if paid)
 - 5) Failures that could have been avoided if the customer's device, which incorporates our product, had been equipped with safety devices required by legal regulations or common industry practices.
 - 6) Failures that could have been prevented through proper maintenance and regular replacement of consumable parts as per the handling instructions and user manual
 - 7) Failures and damage caused by the use of inappropriate consumables or connected equipment
 - 8) Failures due to external factors, such as fire, abnormal voltage, and natural disasters like earthquakes, lightning, salt damage, and typhoons
 - 9) Failures due to reasons that could not have been foreseen with the scientific and technological standards at the time of our product shipment
 - 10) Other cases where the responsibility for failure, damage, or defect is acknowledged to lie with the customer

EC DECLARATION OF CONFORMITY

We, the undersigned,

| Representative: Address: | LS ELECTRIC Co., Ltd. LS Tower, 127, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea |
|-----------------------------|--|
| Manufacturer: Address: | LS ELECTRIC Co., Ltd. 56, Samseong 4-gil, Mokcheon-eup, Dongnam-gu. Cheonan-si. |

Certify and declare under our sole responsibility that the following apparatus:

Chungcheongnam-do, Korea

| Type of Equipment: | Inverter (Power Conversion Equipment) |
|--------------------|---------------------------------------|
| Model Name: | LSLV-S300 series |
| Trade Mark: | LS ELECTRIC Co.,Ltd. |

This declaration of conformity is under the sole responsibility of the manufacturer.

Conforms to the essential requirements of the directives:

2014/30/EU Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to electromagnetic compatibility.

2014/35/EU Directive of the European Parliament and of the Council on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

2011/65/EU Directive on the restriction of the use certain of certain Hazardous Substances in electrical and electronic equipment –RoHs.-

Based on the following specifications applied:

FF

EN IEC 61800-3:2018 EN 61800-5-1:2007+A1:2017+A11:2021 EN IEC 63000:2018

and therefore, complies with the essential requirements and provisions of the 2014/30/EU, 2014/35/EU and 2011/65/EU Directives.

Place:

Cheonan, Chungnam, <u>Korea</u>

(Signaturez Dade)

Mr. PARK CHANGKEUN / Manager

자 근 2024.5.13

UL mark



The UL mark applies to products in the United States and Canada. This mark indicates that UL has tested and evaluated the products and determined that the products satisfy the UL standards for product safety. If a product received UL certification, this means that

all components inside the product had been certified for UL standards as well.

Suitable for Installation in a compartment Handing Conditioned Air

CE mark

The CE mark indicates that the products carrying this mark comply with European safety and environmental regulations. European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers and the EMC guidelines

for safe noise control.

Low Voltage Directive

We have confirmed that our products comply with the Low Voltage Directive (EN 61800-5-1).

EMC Directive

The Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3) covers requirements stated for drives.

EAC mark

The EAC (EurAsian Conformity) mark is applied to the products before they are placed on the market of the Eurasian Customs Union member states.

It indicates the compliance of the products with the following technical regulations and requirements of the Eurasian Customs Union:

Technical Regulations of the Customs Union 004/2011 "On safety of low voltage equipment"

Technical Regulations of the Customs Union 020/2011 "On electromagnetic compatibility of technical products"

Manual Revision History

Revision History

| No. | Date | Version | Changes |
|-----|------------|---------|--------------------------------------|
| 1 | 2023/7/7 | 1.0 | First Issue |
| 2 | 2024/1/26 | 1.1 | Contents Improved |
| 3 | 2024/5/8 | 1.2 | Macro Setting/Winder Operation added |
| 4 | 2024/12/11 | 1.3 | STO Function added |
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Safety Instructions

- For your safety, please read user's manual thoroughly before operating
- · Contact the nearest authorized service facility for examination, repair, or adjustment.
- · Please contact qualified service technician when you need maintenance. Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.



· According to The WEEE Directive, please do not discard the device with your household waste.



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