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Delta Heavy Duty Vector Control Drive **CH2000** Series User Manua



Delta Heavy Duty Vector Control Drive CH2000 Series User Manual





PLEASE READ PRIOR TO INSTALLATION FOR SAFETY.



- AC input power must be disconnected before any wiring to the AC motor drive is made.
- ☑ Even if the power has been turned off, a charge may still remain in the DC-link capacitors with hazardous voltages before the POWER LED is OFF. Please do not touch the internal circuit and components.
- ☑ There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity. Please do not touch these components or the circuit boards before taking anti-static measures. Never reassemble internal components or wiring.
- Ground the AC motor drive using the ground terminal. The grounding method must comply with the laws of the country where the AC motor drive is to be installed.
- ☑ DO NOT install the AC motor drive in a place subjected to high temperature, direct sunlight and inflammables.



- ☑ Never connect the AC motor drive output terminals U/T1, V/T2 and W/T3 directly to the AC mains circuit power supply.
- ☑ Only qualified persons are allowed to install, wire and maintain the AC motor drives.
- ☑ Even if the 3-phase AC motor is stop, a charge may still remain in the main circuit terminals of the AC motor drive with hazardous voltages.
- ☑ If the AC motor drive is stored in no charge condition for more than 3 months, the ambient temperature should not be higher than 30 °C. Storage longer than one year is not recommended, it could result in the degradation of the electrolytic capacitors.
- ☑ Pay attention to the following when transporting and installing this package (including wooden crate, wood stave and carton box)
 - 1. If you need to sterilize, deform the wooden crate or carton box, please do not use steamed smoking sterilization or you will damage the VFD.
 - 2. Please use other ways to sterilize or deform.
 - 3. You may use high temperature to sterilize or deform. Leave the packaging materials in an environment of over 56°C for 30 minutes.
 - 4. It is strictly forbidden to use steamed smoking sterilization. The warranty does not covered VFD damaged by steamed smoking sterilization.
- ☑ Type of electrical supply system (3WYE) to which the drive shall be connected.

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http://www.deltaww.com/services/DownloadCenter2.aspx?secID=8&pid=2&tid=0&CID=06&itemID=060101&typeID=1&downloadI D=&title=&dataType=&check=0&hl=en-US

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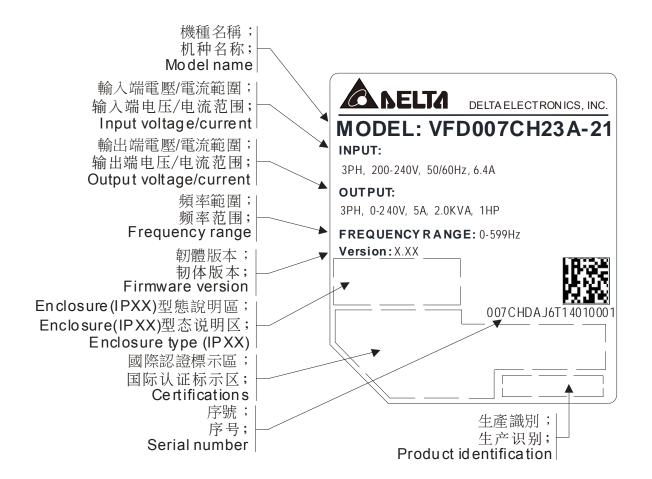
| on Control BD V1.20 |
|---------------------|
| Keypad V1.04 |

Chapter 1 Introduction

1-1 Receiving and Inspection

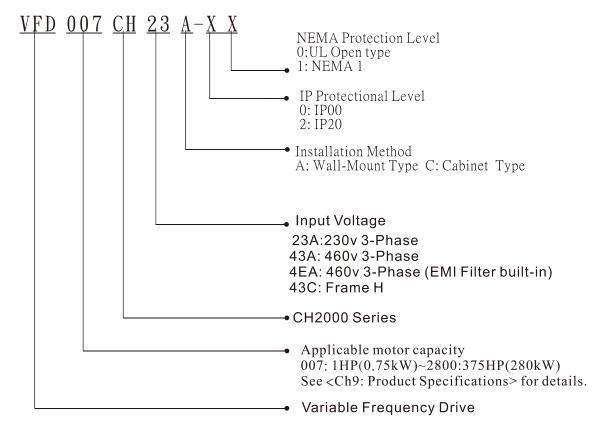
After receiving the AC motor drive, please check for the following:

- 1. Please inspect the unit after unpacking to assure it was not damaged during shipment. Make sure that the part number printed on the package corresponds with the part number indicated on the nameplate.
- 2. Make sure that the voltage for the wiring lie within the range as indicated on the nameplate. Please install the AC motor drive according to this manual.
- 3. Before applying the power, please make sure that all the devices, including power, motor, control board and digital keypad, are connected correctly.
- 4. When wiring the AC motor drive, please make sure that the wiring of input terminals "R/L1, S/L2, T/L3" and output terminals"U/T1, V/T2, W/T3" are correct to prevent drive damage.
- 5. When power is applied, select the language and set parameter groups via the digital keypad (KPC-CC01). When executes trial run, please begin with a low speed and then gradually increases the speed untill the desired speed is reached.

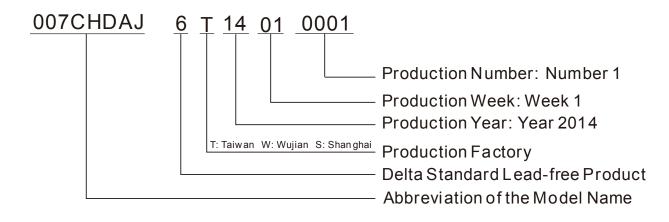


1-2 Nameplate Information

1-3 Model Name



1-4 Serial Number



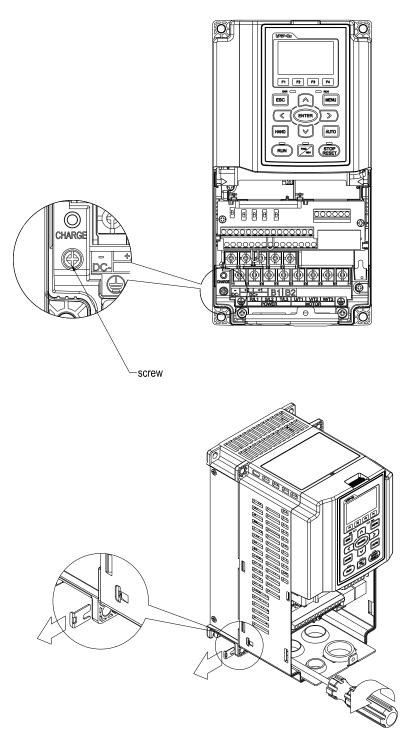
1-5 RFI Jumper

RFI Jumper: The AC motor drive may emit the electrical noise. The RFI jumper is used to suppress the interference (Radio Frequency Interference) on the power line.

Frame A~C

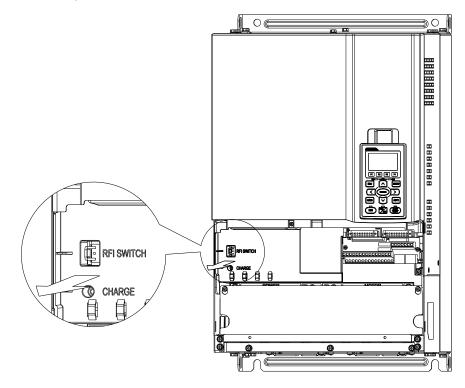
Screw Torque: 8~10kg-cm(6.9-8.7 lb -in.)

Loosen the screws and remove the MOV-PLATE. Fasten the screws back to the original position after MOV-PLATE is removed.



Frame D0~H

Remove the MOV-PLATE by hands, no screws need to be loosen.

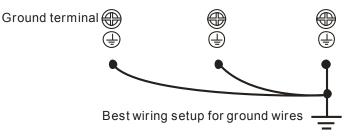


Isolating main power from ground:

When the power distribution system of the Power Regenerative Unit is a floating ground system (IT) or an asymmetric ground system (TN), the RFI short short-circuit cable must be cut off. Cutting off the short-circuit cable cuts off the internal RFI capacitor (filter capacitor) between the system's frame and the central circuits to avoid damaging the central circuits and (according to IEC 61800-3) reduce the ground leakage current.

Important points regarding ground connection

- ☑ To ensure the safety of personnel, proper operation, and to reduce electromagnetic radiation, the Power Regenerative Unit must be properly grounded during installation.
- ${\ensuremath{\boxtimes}}$ The diameter of the cables must meet the size specified by safety regulations.
- ☑ The shielded cable must be connected to the ground of the Power Regenerative Unit to meet safety regulations.
- ☑ The shielded cable can only be used as the ground for equipment when the aforementioned points are met.
- ☑ When installing multiple sets of Power Regenerative Units, do not connect the grounds of the Power Regenerative Units in series. As shown below



Pay particular attention to the following points:

- After turning on the main power, do not cut the RFI short-circuit cable while the power is on.
- \square Make sure the main power is turned off before cutting the RFI short-circuit cable.
- ☑ Cutting the RFI short-circuit cable will also cut off the conductivity of the capacitor. Gap discharge may occur once the transient voltage exceeds 1000V.

If the RFI short-circuit cable is cut, there will no longer be reliable electrical isolation. In other words, all controlled input and outputs can only be seen as low-voltage terminals with basic electrical isolation. Also, when the internal RFI capacitor is cut off, the Power Regenerative Unit will no longer be electromagnetic compatible.

- ☑ The RFI short-circuit cable may not be cut off if the main power is a grounded power system.
- ☑ The RFI short-circuit cable may not be cut off while conducting high voltage tests. When conducting a high voltage test to the entire facility, the main power and the motor must be disconnected if leakage current is too high.

Floating Ground System(IT Systems)

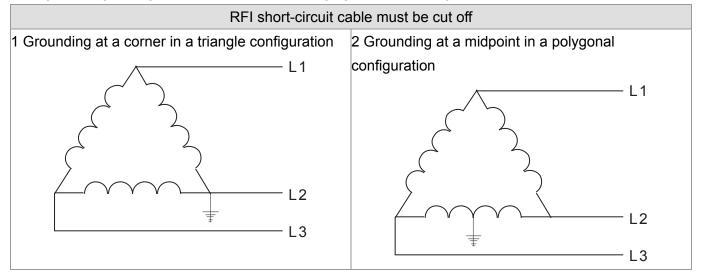
A floating ground system is also called IT system, ungrounded system, or high impedance/resistance (greater than 30Ω) grounding system.

- $\ensuremath{\boxtimes}$ Disconnect the ground cable from the internal EMC filter.
- ☑ In situations where EMC is required, check whether there is excess electromagnetic radiation affecting nearby low-voltage circuits. In some situations, the adapter and cable naturally provide enough suppression. If in doubt, install an extra electrostatic shielded cable on the power supply side between the main circuit and the control terminals to increase security.
- ☑ Do not install an external RFI/EMC filter, the EMC filter will pass through a filter capacitor, thus connecting power input to ground. This is very dangerous and can easily damage the Power Regenerative Unit.

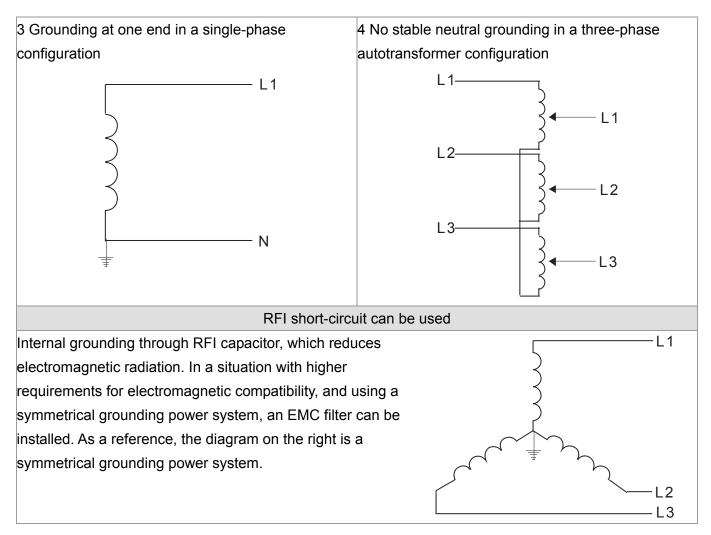
Asymmetric Ground System(Corner Grounded TN Systems)

Caution: Do not cut the RFI short-circuit cable while the input terminal of the Power Regenerative Unit carries power.

In the following four situations, the RFI short-circuit cable must be cut off. This is to prevent the system from grounding through the RFI capacitor, damaging the Power Regenerative Unit.



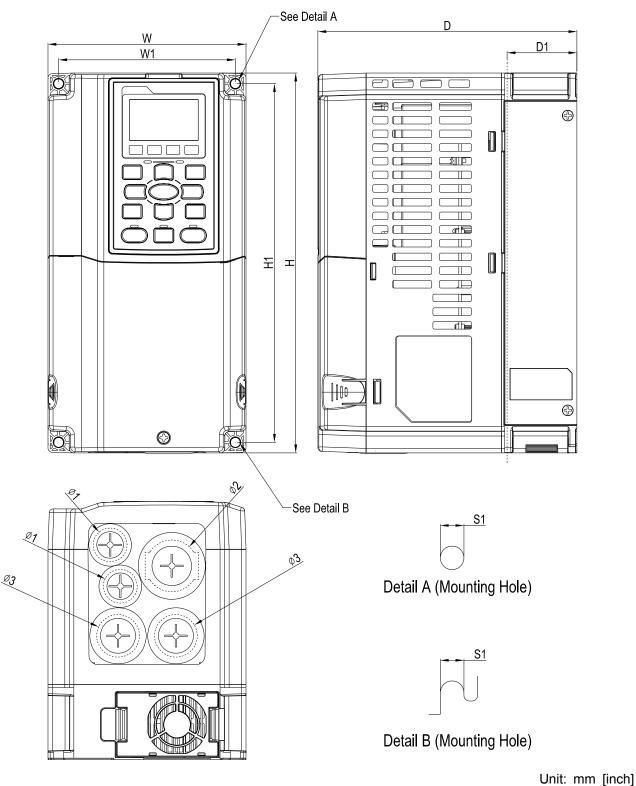
Chapter 1 Introduction



1-6 Dimensions

Frame A

VFD007CH23A-21, VFD015CH23A-21, VFD022CH23A-21, VFD037CH23A-21, VFD007CH43A-21, VFD015CH43A-21, VFD022CH43A-21, VFD037CH43A-21, VFD055CH43A-21, VFD007CH4EA-21, VFD015CH4EA-21, VFD022CH4EA-21, VFD037CH4EA-21, VFD055CH4EA-21



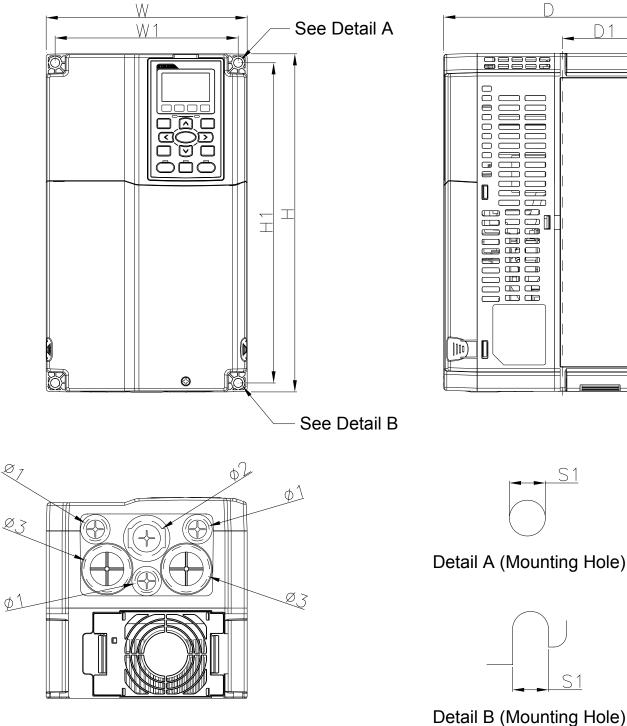
| 01* | S1 | Ф1 | Ф2 | Ф3 | |
|-----|----|------|------|------|--|
| 58 | 62 | 22.2 | 34.0 | 28.0 | |

| Frame | W | Н | D | W1 | H1 | D1* | S1 | Ф1 | Ф2 | Ф3 |
|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Δ 1 | 130.0 | 250.0 | 170.0 | 116.0 | 236.0 | 45.8 | 6.2 | 22.2 | 34.0 | 28.0 |
| A1 | [5.12] | [9.84] | [6.69] | [4.57] | [9.29] | [1.80] | [0.24] | [0.87] | [1.34] | [1.10] |
| | | | | | | | | | | |

Chapter 1 Introduction

Frame B

VFD055CH23A-21, VFD075CH23A-21, VFD110CH23A-21, VFD075CH43A-21, VFD110CH43A-21, VFD150CH43A-21, VFD075CH4EA-21, VFD110CH4EA-21, VFD150CH4EA-21



Unit: mm [inch]

| Frame | W | Н | D | W1 | H1 | D1* | S1 | Ф1 | Ф2 | Ф3 |
|-------|--------|---------|--------|--------|---------|--------|--------|--------|--------|--------|
| B1 | 190.0 | 320.0 | 190.0 | 173.0 | 303.0 | 77.9 | 8.5 | 22.2 | 34.0 | 43.8 |
| Ы | [7.48] | [12.60] | [7.48] | [6.81] | [11.93] | [3.07] | [0.33] | [0.87] | [1.34] | [1.72] |

D1*: Flange mounting

A

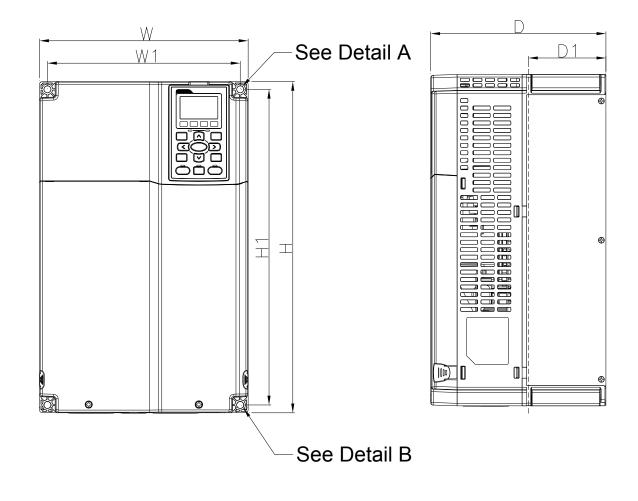
Φ

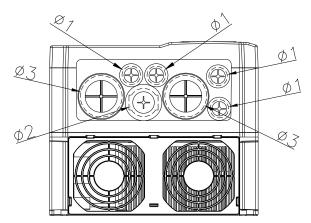
Frame C

VFD150CH23A-21, VFD185CH23A-21,

VFD185CH43A-21, VFD220CH43A-21, VFD300CH43A-21,

VFD185CH4EA-21, VFD220CH4EA-21, VFD300CH4EA-21







Detail A (Mounting Hole)



Detail B (Mounting Hole)

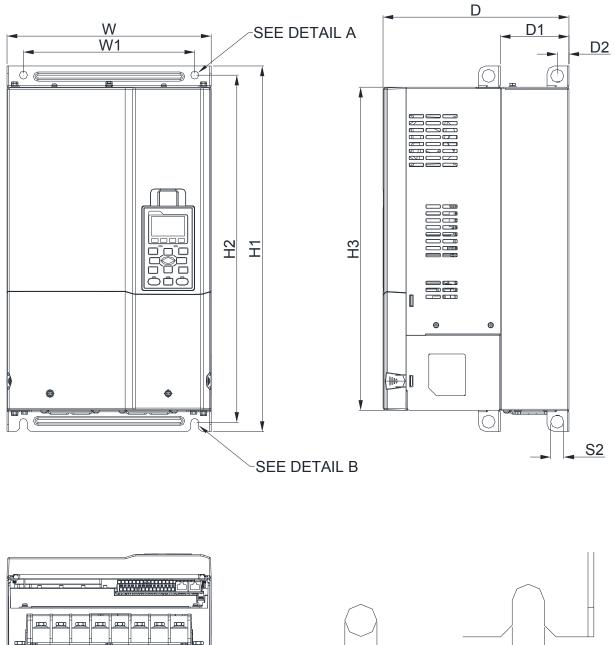
Unit: mm [inch]

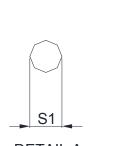
| Frame | W | Н | D | W1 | H1 | D1* | S1 | Φ1 | Ф2 | Ф3 |
|-------|--------|---------|--------|--------|---------|--------|--------|--------|--------|--------|
| C1 | 250.0 | 400.0 | 210.0 | 231.0 | 381.0 | 92.9 | 8.5 | 22.2 | 34.0 | 50.0 |
| C1 | [9.84] | [15.75] | [8.27] | [9.09] | [15.00] | [3.66] | [0.33] | [0.87] | [1.34] | [1.97] |

Chapter 1 Introduction

Frame D0 D0: VFD370CH43S-21

00







DETAIL A (MOUNTING HOLE)

(MOUNTING HOLE)

S1

DETAIL B

| | | | | | | | | | Uni | it: mm [inch] | |
|-------|----------------------|---------|---------|--------|---------|---------|--------|--------|--------|---------------|--|
| Frame | W | H1 | D | W1 | H2 | H3 | D1* | D2 | S1 | S2 | |
| | 280.0 | 500.0 | 255.0 | 235.0 | 475.0 | 442.0 | 94.2 | 16.0 | 11.0 | 18.0 | |
| D0-1 | [11.02] | [19.69] | [10.04] | [9.25] | [18.70] | [17.40] | [3.71] | [0.63] | [0.43] | [0.71] | |
| | D1*: Elange mounting | | | | | | | | | | |

00

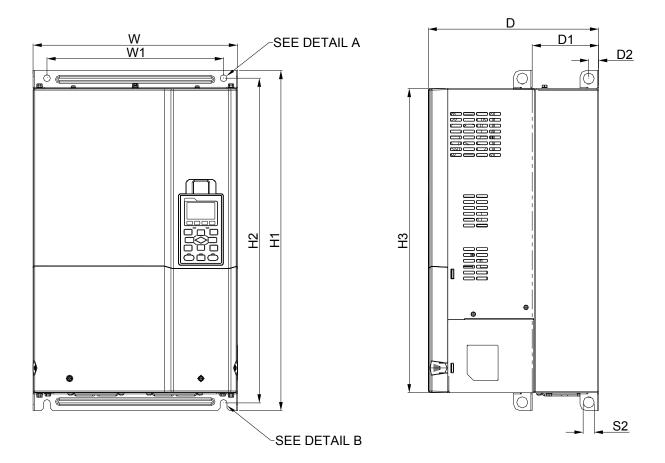
0

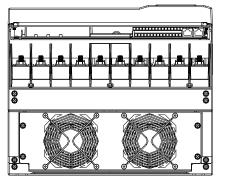
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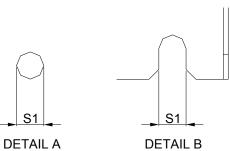
Frame D

D1: VFD220CH23A-00, VFD300CH23A-00, VFD370CH23A-00, VFD370CH43A-00, VFD450CH43A-00,

VFD550CH43A-00, VFD750CH43A-00







(MOUNTING HOLE)

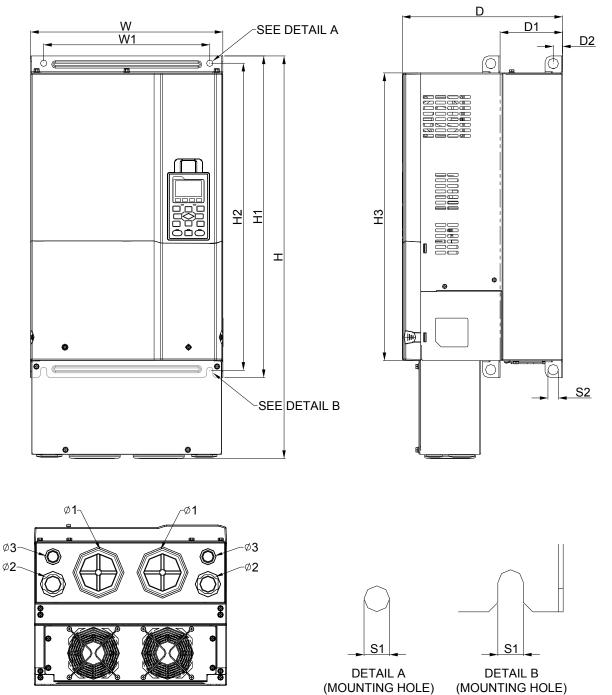
(MOUNTING HOLE)

Unit: mm [inch]

| Frame | W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1 | S2 | Φ1 | Φ2 | Ф3 |
|-------|---------|---|---------|---------|---------|---------|---------|--------|--------|--------|--------|----|----|----|
| D1 | 330.0 | - | 275.0 | 285.0 | 550.0 | 525.0 | 492.0 | 107.2 | 16.0 | 11.0 | 18.0 | | | |
| | [12.99] | | [10.83] | [11.22] | [21.65] | [20.67] | [19.37] | [4.22] | [0.63] | [0.43] | [0.71] | - | - | - |

Frame D

D2: VFD220CH23A-21, VFD300CH23A-21, VFD370CH23A-21, VFD370CH43A-21, VFD450CH43A-21, VFD550CH43A-21, VFD750CH43A-21



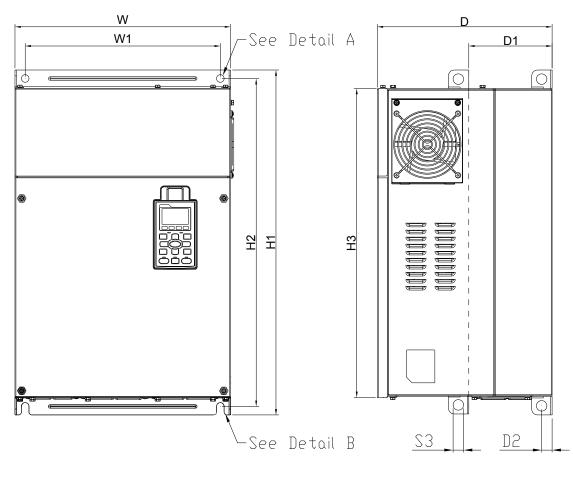
ONTING HOLL)

Unit: mm [inch]

| Fram | e W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1 | S2 | Φ1 | Ф2 | Φ3 |
|------|---------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| D2 | 330.0 | 688.3 | 275.0 | 285.0 | 550.0 | 525.0 | 492.0 | 107.2 | 16.0 | 11.0 | 18.0 | 76.2 | 34.0 | 22.0 |
| D2 | [12.99] | [27.10] | [10.83] | [11.22] | [21.65] | [20.67] | [19.37] | [4.22] | [0.63] | [0.43] | [0.71] | [3.00] | [1.34] | [0.87] |

Frame E

E1: VFD450CH23A-00, VFD550CH23A-00, VFD900CH43A-00, VFD1100CH43A-00

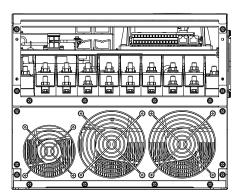




Detail B (Mounting Hole)





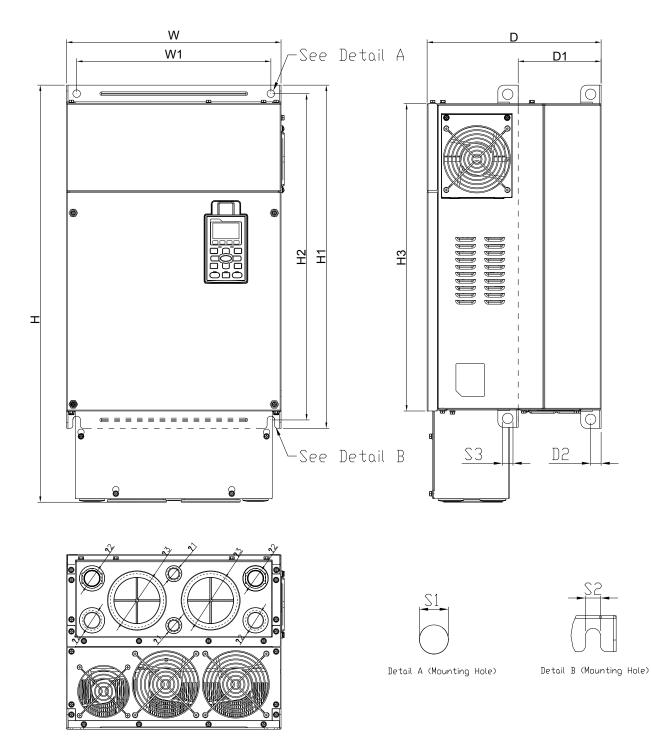


| Unit: | mm | [inch] |
|-------|----|--------|
| | | |

| F | rame | W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1, S2 | S3 | Φ1 | Ф2 | Ф3 |
|---|------|---------|---|---------|--------|---------|---------|---------|--------|--------|--------|--------|----|----|----|
| | E1 | 370.0 | | 300.0 | 335.0 | 589 | 560.0 | 528.0 | 143.0 | 18.0 | 13.0 | 18.0 | - | - | - |
| | | [14.57] | - | [11.81] | [13.19 | [23.19] | [22.05] | [20.80] | [5.63] | [0.71] | [0.51] | [0.71] | | | |

Frame E

E2: VFD450CH23A-21, VFD550CH23A-21, VFD900CH43A-21, VFD1100CH43A-21

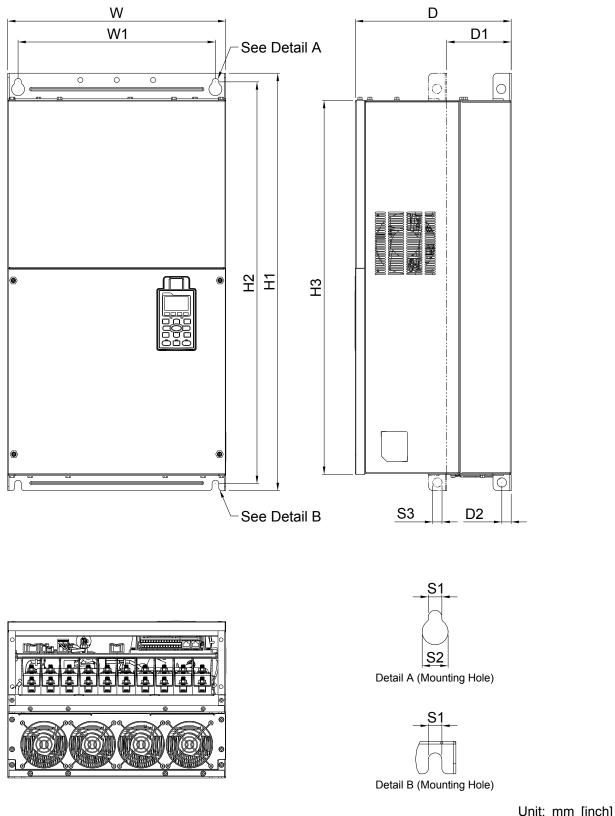


| Unit: | mm | [inch] |
|-------|----|--------|
| | | |

| | Frame | W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1, S2 | S3 | Φ1 | Φ2 | Ф3 |
|---|-------|---------|---------|---------|--------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|
| ſ | E2 | 370.0 | 715.8 | 300.0 | 335.0 | 589 | 560.0 | 528.0 | 143.0 | 18.0 | 13.0 | 18.0 | 22.0 | 34.0 | 92.0 |
| | ΕZ | [14.57] | [28.18] | [11.81] | [13.19 | [23.19] | [22.05] | [20.80] | [5.63] | [0.71] | [0.51] | [0.71] | [0.87] | [1.34] | [3.62] |

Frame F

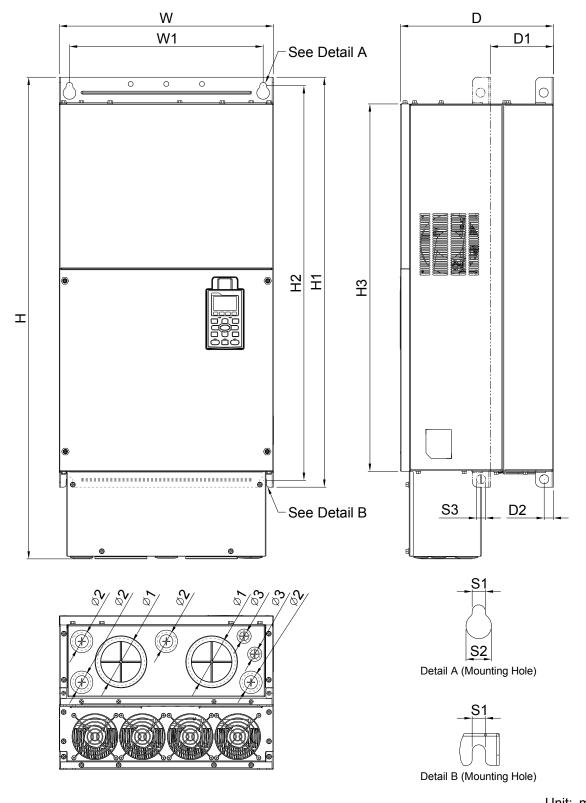
F1: VFD750CH23A-00, VFD1320CH43A-00



| | | | | | | | | | | | Onit. | |
|-------|------------------|---|------------------|------------------|------------------|------------------|------------------|-----------------|----------------|----------------|----------------|----------------|
| Frame | W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1 | S2 | S3 |
| F1 | 420.0 [16.54] | - | 300.0 [11.81] | 380.0 [14.96] | 800.0 [31.50] | 770.0 [30.32] | 717.0 [28.23] | 124.0 [4.88] | 18.0 [0.71] | 13.0 [0.51] | 25.0 [0.98] | 18.0 [0.71] |

Frame F

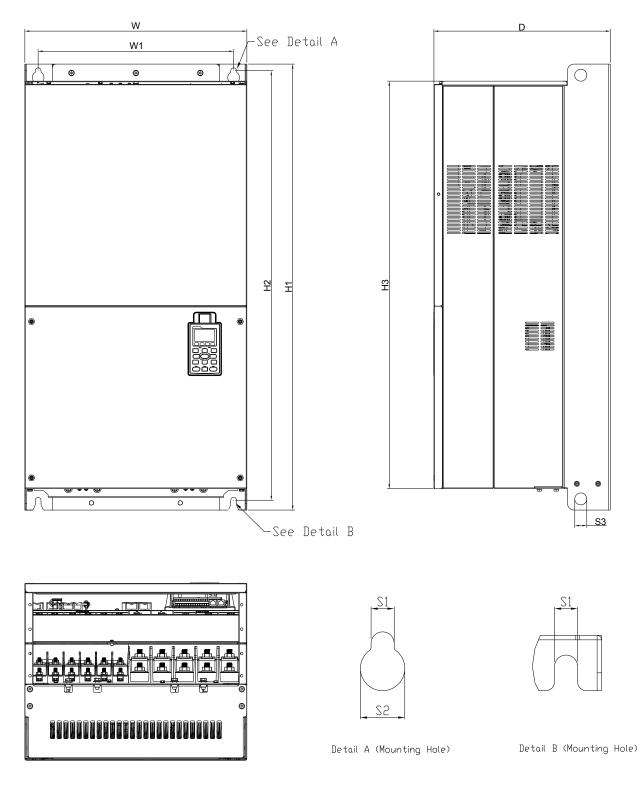
F2: VFD750CH23A-21, VFD1320CH43A-21



| | | | | | | | | | | - | Unit: | mm [inch] |
|-------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------------|----------------|----------------|----------------|----------------|
| Frame | W | Н | D | W1 | H1 | H2 | H3 | D1* | D2 | S1 | S2 | S3 |
| F2 | 420.0 [16.54] | 940.0 [37.00] | 300.0 [11.81] | 380.0 [14.96] | 800.0 [31.50] | 770.0 [30.32] | 717.0 [28.23] | 124.0 [4.88] | 18.0 [0.71] | 13.0 [0.51] | 25.0 [0.98] | 18.0 [0.71] |
| Frame | Φ1 | Φ2 | Ф3 | | | | | | | | | |
| F2 | 92.0 [3.62] | 35.0 [1.38] | 22.0 [0.87] | | | | | | | | | |

Frame G

G1: VFD1600CH43A-00, VFD1850CH43A-00, VFD2200CH43A-00

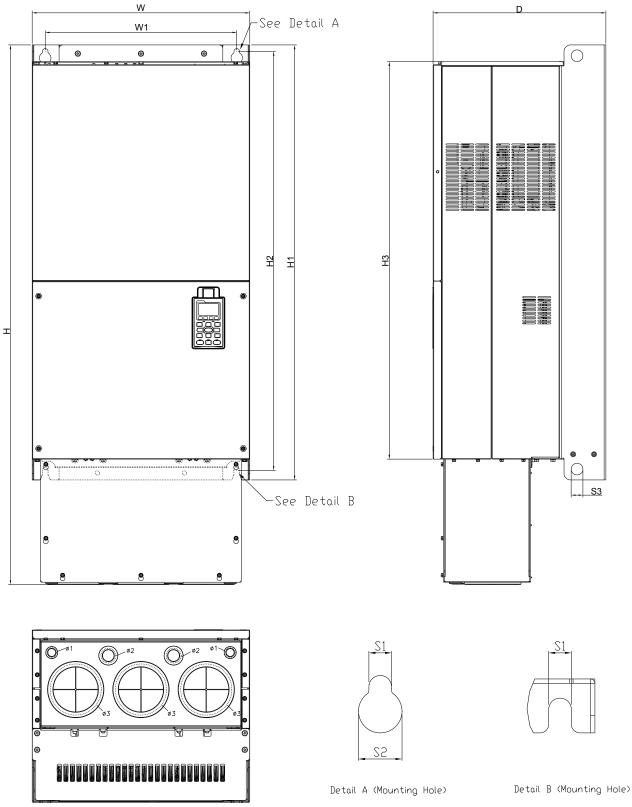


| Unit: | mm | [inch] |
|-------|----|--------|
| | | [] |

| F | rame | W | Н | D | W1 | H1 | H2 | H3 | S1 | S2 | S3 | Φ1 | Ф2 | Ф3 |
|---|------------|---------|---|---------|----------|---------|---------|---------|--------|--------|--------|----|----|----|
| | 0 4 | 500.0 | | 397.0 | 440.0 | 1000.0 | 963.0 | 913.6 | 13.0 | 26.5 | 27.0 | | | |
| | G1 | [19.69] | - | [15.63] | [217.32] | [39.37] | [37.91] | [35.97] | [0.51] | [1.04] | [1.06] | - | - | - |

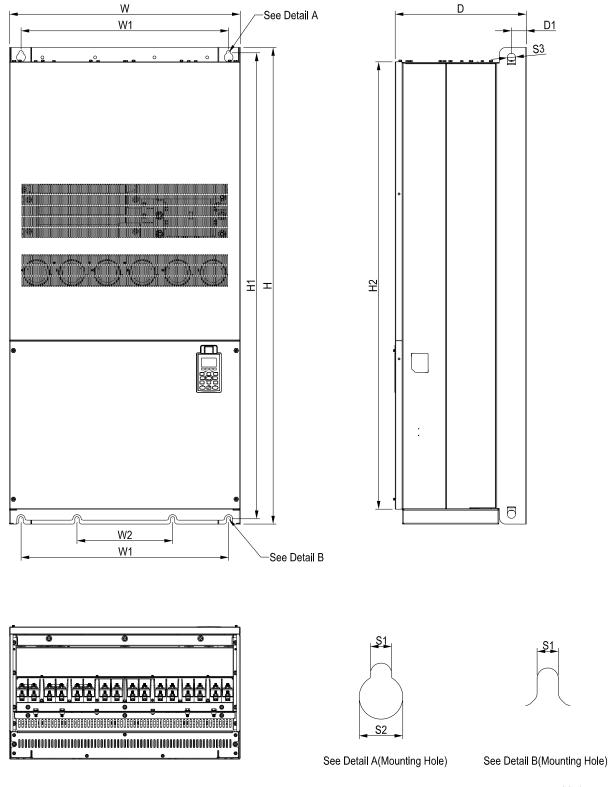
Frame G

G2: VFD1600CH43A-21, VFD1850CH43A-21, VFD2200CH43A-21



| | | | | | | | | | | | | Unit: n | nm [inch] |
|-------|---------|---------|---------|----------|---------|---------|---------|--------|--------|--------|--------|---------|-----------|
| Frame | W | Н | D | W1 | H1 | H2 | H3 | S1 | S2 | S3 | Φ1 | Ф2 | Ф3 |
| | 500.0 | 1240.2 | 397.0 | 440.0 | 1000.0 | 963.0 | 913.6 | 13.0 | 26.5 | 27.0 | 22.0 | 34.0 | 117.5 |
| G2 | [19.69] | [48.83] | [15.63] | [217.32] | [39.37] | [37.91] | [35.97] | [0.51] | [1.04] | [1.06] | [0.87] | [1.34] | [4.63] |

Frame H H1: VFD2800CH43A-00



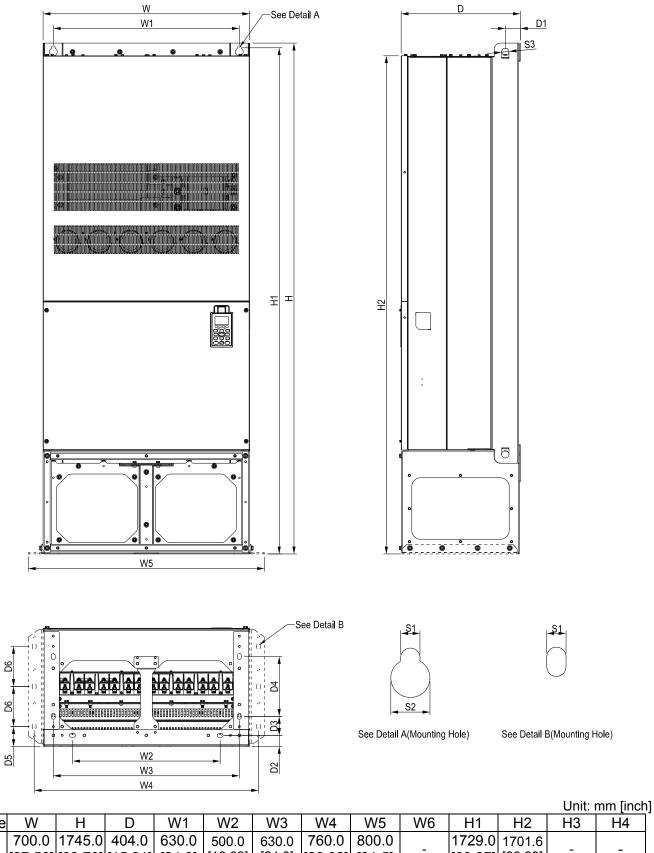
| Unit: | mm | [inch] |
|-------|----|--------|
| | | |

| Frame | W | Н | D | W1 | W2 | W3 | W4 | W5 | W6 | H1 | H2 | H3 | H4 |
|-------|------------------|------------------|------------------|-----------------|------------------|----|----|----------------|----------------|----------------|-------------------|----|----|
| H1 | 700.0 [27.56] | 1435.0 [56.5] | 398.0 [15.67] | 630.0 [24.8] | 290.0 [11.42] | - | - | - | - | | 1346.6 [53.02] | - | - |
| | | 1 | | | | | | | | | | | 1 |
| Frame | H5 | D1 | D2 | D3 | D4 | D5 | D6 | S1 | S2 | S3 | Φ1 | Ф2 | ФЗ |
| H1 | - | 45.0 [1.77] | - | - | - | - | - | 13.0 [0.51] | 26.5 [1.04] | 25.0 [0.98] | - | - | - |

Chapter 1 Introduction

Frame H

H2: VFD2800CH43C-00



| | | | | | | | | | | | | | IIIII LIIIOI |
|-------|---------|----------|---------|--------|---------|--------|---------|----------|--------|---------|---------|----|--------------|
| Frame | W | Н | D | W1 | W2 | W3 | W4 | W5 | W6 | H1 | H2 | H3 | H4 |
| H2 | | 1745.0 | | | 500.0 | 630.0 | 760.0 | 800.0 | | | 1701.6 | _ | _ |
| 112 | [27.56] | [68.70] | [15.91] | [24.8] | [19.69] | [24.8] | [29.92] | [31.5] | | [68.07] | [66.99] | | |
| _ | | . | | | | | | <u> </u> | ~ ~ ~ | | | | |
| Frame | H5 | D1 | D2 | D3 | D4 | D5 | D6 | S1 | S2 | S3 | Ф1 | Ф2 | ФЗ |
| Ц2 | - | 51.0 | 38.0 | 65.0 | 204.0 | 68.0 | 137.0 | 13.0 | 26.5 | 25.0 | | | |
| H2 | | [2.01] | [1.50] | [2.56] | [8.03] | [2.68] | [5.39] | [0.51] | [1.04] | [0.98] | - | - | - |

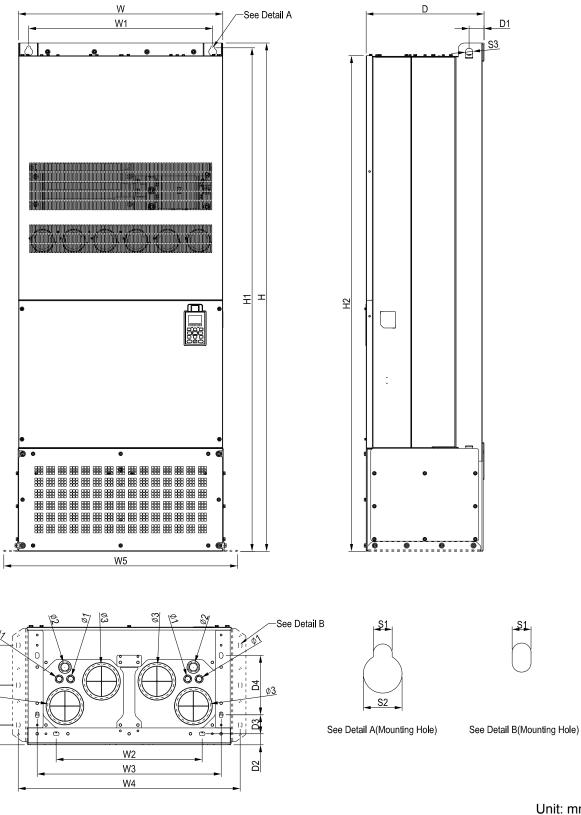
Frame H H3: VFD2800CH43C-21

80

90 0

D5

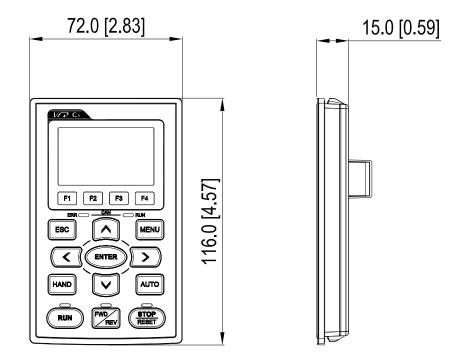
ø3



| | | | | | | | | | | | | Unit: ı | mm [inch] |
|-------|---------|---------|---------|--------|---------|--------|---------|--------|--------|---------|---------|---------|-----------|
| Frame | W | Н | D | W1 | W2 | W3 | W4 | W5 | W6 | H1 | H2 | H3 | H4 |
| H3 | 700.0 | 1745.0 | 404.0 | 630.0 | 500.0 | 630.0 | 760.0 | 800.0 | | 1729.0 | 1701.6 | | |
| 115 | [27.56] | [68.70] | [15.91] | [24.8] | [19.69] | [24.8] | [29.92] | [31.5] | - | [68.07] | [66.99] | - | - |
| Frame | H5 | D1 | D2 | D3 | D4 | D5 | D6 | S1 | S2 | S3 | Φ1 | Ф2 | ФЗ |
| 110 | - | 51.0 | 38.0 | 65.0 | 204.0 | 68.0 | 137.0 | 13.0 | 26.5 | 25.0 | 22.0 | 34.0 | 117.5 |
| H3 | | [2.01] | [1.50] | [2.56] | [8.03] | [2.68] | [5.39] | [0.51] | [1.04] | [0.98] | [0.87] | [1.34] | [4.63] |

Chapter 1 Introduction

Digital Keypad KPC-CC01

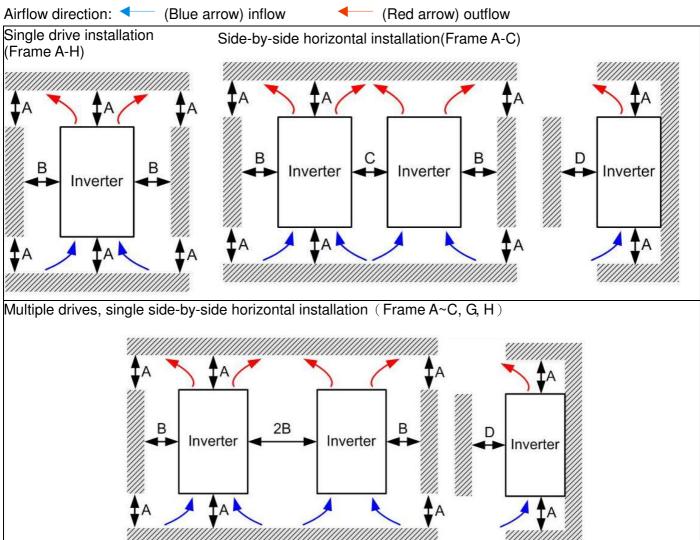


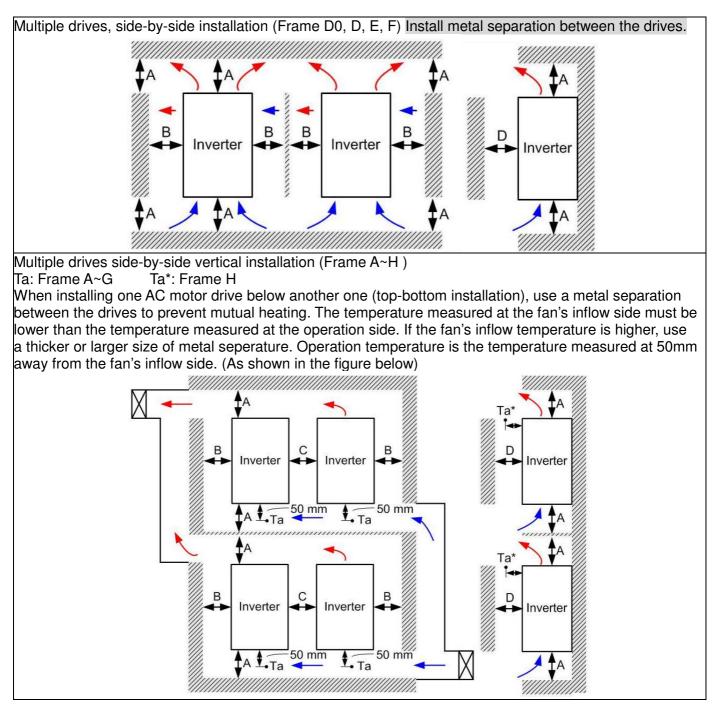
Chapter 2 Installation

2-1 Minimum Mounting Clearance and Installation

- ☑ Prevent fiber particles, scraps of paper, shredded wood saw dust, metal particles, etc. from adhereing to the heat sink
- Install the AC motor drive in a metal cabinet. When installing one drive below another one, use a metal separation between the AC motor drives to prevent mutual heating and to prevent the risk of fire accident.
- Install the AC motor drive in Pollution Degree 2 environments only: normallyl only nonconductive pollution occurs and temporary conductivity caused by condensation is expected.

The appearances shown in the following figures are for reference only.



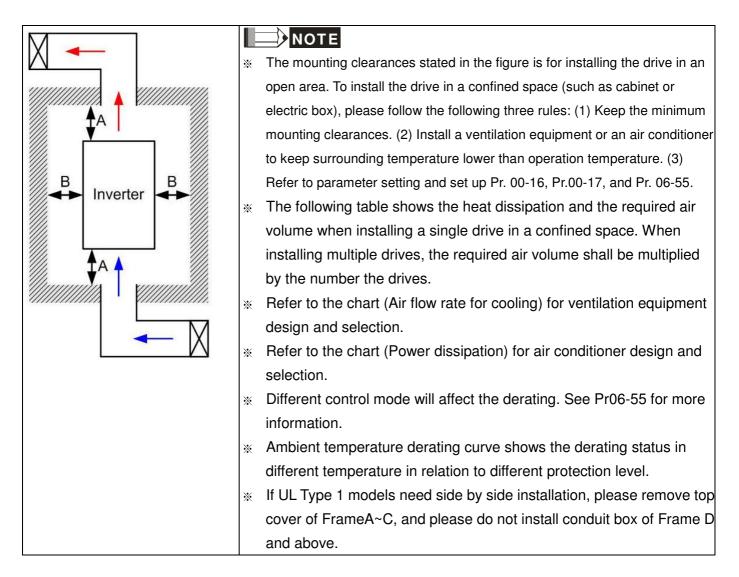


2-2 Minimum mounting clearance

| Frame | A (mm) | B (mm) | C (mm) | D (mm) | | | |
|---|--|--------|--------|-----------------------|--|--|--|
| A~C | 60 | 30 | 10 | 0 | | | |
| D0~F | 100 | 50 | - | 0 | | | |
| G | 200 | 100 | - | 0 | | | |
| Н | 350 | 0 | 0 | 200 (100, Ta=Ta*=40℃) | | | |
| VFD007CH23A-21, VFD015CH23A-21, VFD022CH23A-21, VFD037CH23A-21, Frame A VFD007CH43A/4EA-21, VFD015CH43A/4EA-21, VFD022CH43A/4EA-21, VFD037CH43A/4EA-21, VFD055CH43A/4EA-21 | | | | | | | |
| Frame B | VFD055CH23A-21,VFD075CH23A-21,VFD110CH23A-21, VFD075CH43A/4EA-21,VFD110CH43A/4EA-21, VFD150CH43A/4EA-21 | | | | | | |
| Frame C | VFD150CH23A-21,VFD185CH23A-21, VFD185CH43A/4EA-21, VFD220CH43A/4EA-21,VFD300CH43A/4EA-21 | | | | | | |
| Frame D0 | VFD370CH43S-21 | | | | | | |

| I romo II | VFD220CH23A-00/21, VFD300CH23A-00/21, VFD370CH23A-00/21, VFD370CH43A-00/21, VFD450CH43A-00/21, VFD550CH43A-00/21 |
|-----------|---|
| | VFD370CH43A-00/21, VFD430CH43A-00/21, VFD550CH43A-00/21, VFD750CH43A-00/21 VFD450CH23A-00/21, VFD550CH23A-00/21, VFD900CH43A-00/21, VFD1100CH43A-00/21 |
| Frame F | VFD750CH23A-00/21, VFD1320CH43A-00/21 |
| Frame G | VFD1600CH43A-00/21, VFD1850CH43A-00/21, VFD2200CH43A-00/21 |
| Frame H | VFD2800CH43A-00, VFD2800CH43C-00, VFD2800CH43C-21 |
| | |

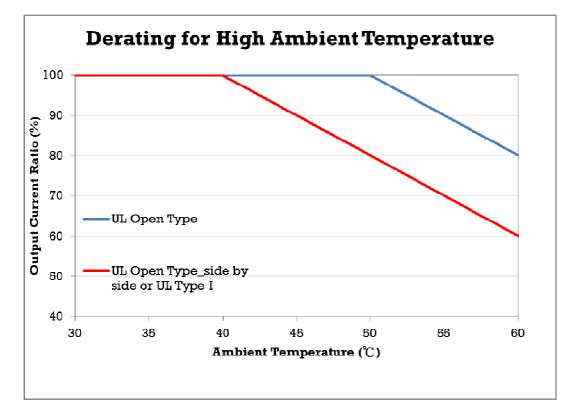
1. The minimum mounting clearances stated in the table above applies to AC motor drives frame A to D. A drive fails to follow the minimum mounting clearances may cause the fan to malfunction and heat dissipation problem.



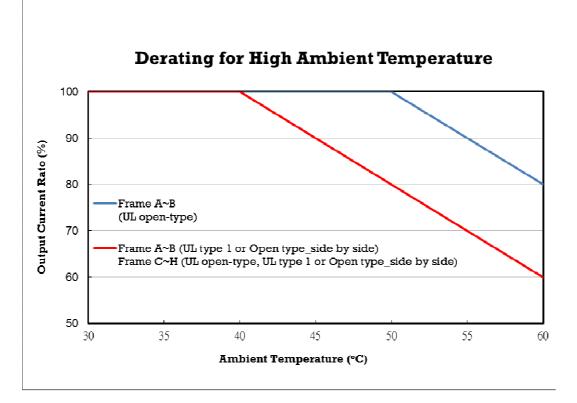
| Air flow rate for cooling | | | | | | Power Dissipation | | | |
|---------------------------|--|----------|-------|----------|----------|-------------------|------------------------------------|----------|----------|
| | Flow Rate (cfm) Flow Rate (m ³ /hr) | | | | | | Power Dissipation | | ı (watt) |
| Model No. | External | Internal | Total | External | Internal | Total | Loss External (Heat sink) | Internal | Total |
| VFD007CH23A-21 | - | - | - | - | - | - | 38 | 27 | 65 |
| VFD015CH23A-21 | 14 | - | 14 | 24 | - | 24 | 59 | 31 | 90 |
| VFD022CH23A-21 | 14 | - | 14 | 24 | - | 24 | 80 | 36 | 116 |
| VFD037CH23A-21 | 10 | - | 10 | 17 | - | 17 | 127 | 46 | 173 |
| VFD055CH23A-21 | 40 | 14 | 54 | 68 | 24 | 92 | 223 | 67 | 290 |
| VFD075CH23A-21 | 66 | 14 | 80 | 112 | 24 | 136 | 306 | 86 | 392 |
| VFD110CH23A-21 | 58 | 14 | 72 | 99 | 24 | 136 | 432 | 121 | 553 |
| VFD150CH23A-21 | 166 | 12 | 178 | 282 | 20 | 302 | 499 | 161 | 660 |
| VFD185CH23A-21 | 166 | 12 | 178 | 282 | 20 | 302 | 589 | 184 | 773 |
| VFD220CH23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 737 | 216 | 953 |
| VFD300CH23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1001 | 186 | 1187 |
| VFD370CH23A-00/23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1064 | 220 | 1284 |
| VFD450CH23A-00/23A-21 | 228 | 73 | 301 | 387 | 124 | 511 | 1238 | 267 | 1505 |
| VFD550CH23A-00/23A-21 | 246 | 73 | 319 | 418 | 124 | 542 | 1505 | 308 | 1813 |
| VFD750CH23A-00/23A-21 | 224 | 112 | 346 | 381 | 190 | 571 | 1758 | 369 | 2127 |
| VFD007CH43A/4EA-21 | - | - | - | - | - | - | 43 | 25 | 68 |
| VFD015CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 59 | 29 | 88 |
| VFD022CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 76 | 33 | 109 |
| VFD037CH43A/4EA-21 | 10 | - | 10 | 17 | - | 17 | 118 | 42 | 160 |
| VFD055CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 152 | 46 | 198 |
| VFD075CH43A/4EA-21 | 40 | 14 | 54 | 68 | 24 | 92 | 260 | 76 | 336 |
| VFD110CH43A/4EA-21 | 58 | 14 | 72 | 99 | 24 | 124 | 348 | 93 | 441 |
| VFD150CH43A/4EA-21 | 58 | 14 | 72 | 99 | 24 | 124 | 469 | 122 | 591 |
| VFD185CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 445 | 138 | 583 |
| VFD220CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 509 | 158 | 667 |
| VFD300CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 655 | 211 | 866 |
| VFD370CH43S-21 | 179 | 30 | 209 | 304 | 51 | 355 | 809 | 184 | 993 |
| VFD370CH43A/4EA-21 | 147 | 30 | 177 | 248 | 21 | 269 | 863 | 184 | 1047 |
| VFD450CH43A-00/43A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1162 | 218 | 1380 |
| VFD550CH43A-00/43A-21 | 186 | 30 | 216 | 316 | 51 | 367 | 1384 | 257 | 1641 |
| VFD750CH43A-00/43A-21 | 186 | 30 | 216 | 316 | 51 | 367 | 1878 | 334 | 2212 |
| VFD900CH43A-00/43A-21 | 257 | 73 | 330 | 437 | 124 | 561 | 1878 | 399 | 2277 |
| VFD1100CH43A-00/43A-21 | 223 | 73 | 296 | 379 | 124 | 503 | 2336 | 491 | 2827 |
| VFD1320CH43A-00/43A-21 | 224 | 112 | 336 | 381 | 190 | 571 | 2680 | 579 | 3259 |
| VFD1600CH43A-00/43A-21 | | | 454 | | | 771 | | | 4179 |
| VFD1850CH43A-00/43A-21 | | | 454 | | | 771 | | | 5011 |

| Air flow | | Power Dissipation | | | |
|--|-------------------------|-------------------|------|--|--|
| VFD2200CH43A-00/43A-21 | 454 | | 771 | | 6168 |
| VFD2800CH43A-00/43C-00/43C-21 | 769 | | 1307 | | 7059 |
| The required airflow shown in ch space. When installing the multiple drive required air volume for single dri | es, the required air vo | ume should be t | he | The heat dissipated for installisingle drive confined sp When install multiple drive volume of h dissipation sight the heat dissipated for drive X the form of the drives Heat dissipated for drive drive the heat dissipated for drive the drives Heat dissipated for drive the drives Heat dissipated for drive the drives Meat dissipated for drive the drives Heat dissipated for drives Heat dissipated for drives | e chart ng in a ace. ling the res, eat should or single number s. ation for is by rated rent and |

Normal control Ambient temperature derating curve



Advanced control Ambient temperature derating curve

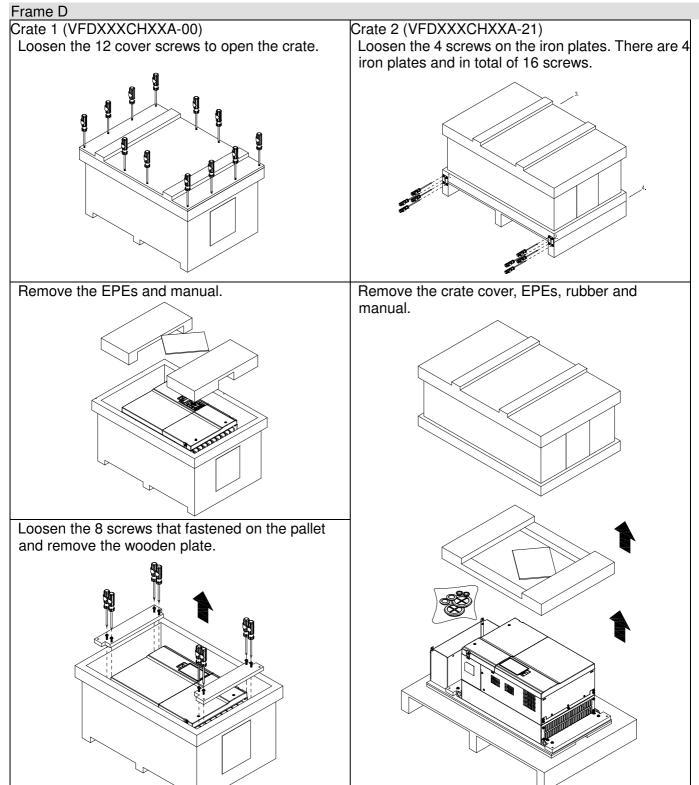


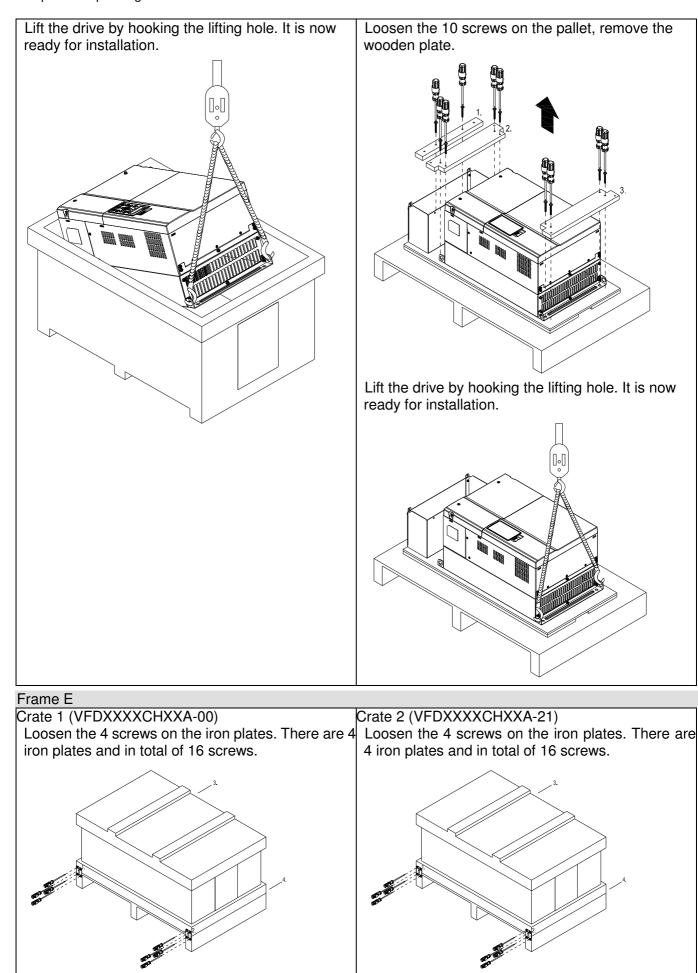
Chapter 3 Unpacking

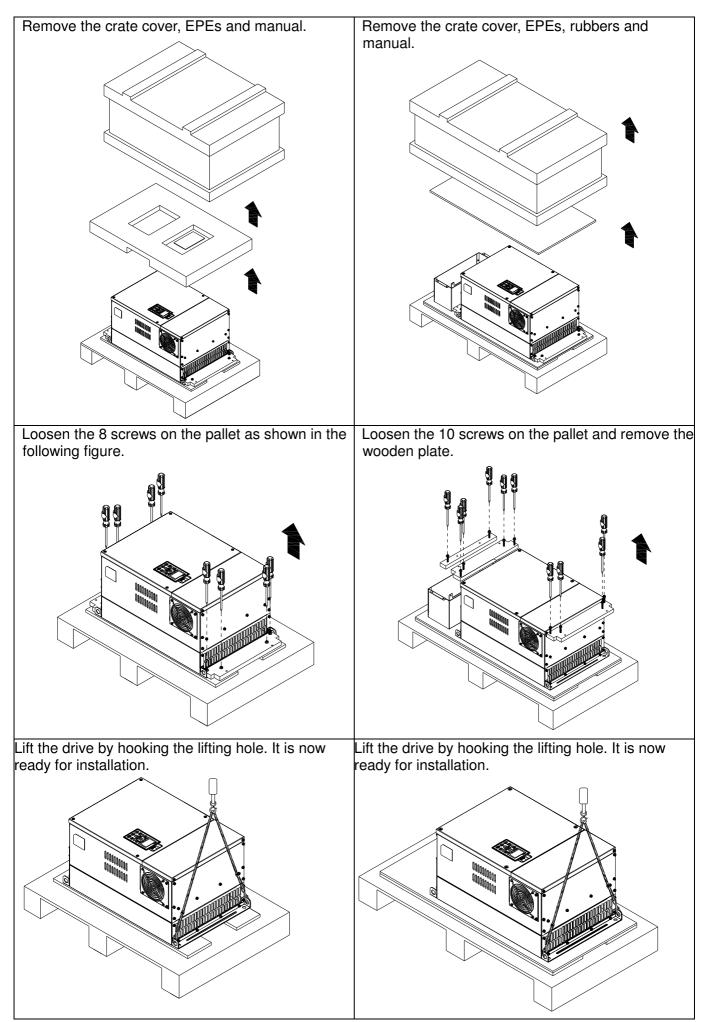
The AC motor drive should be kept in the shipping carton or crate before installation. In order to retain the warranty coverage, the AC motor drive should be stored properly when it is not to be used for an extended period of time.

3-1 Unpacking

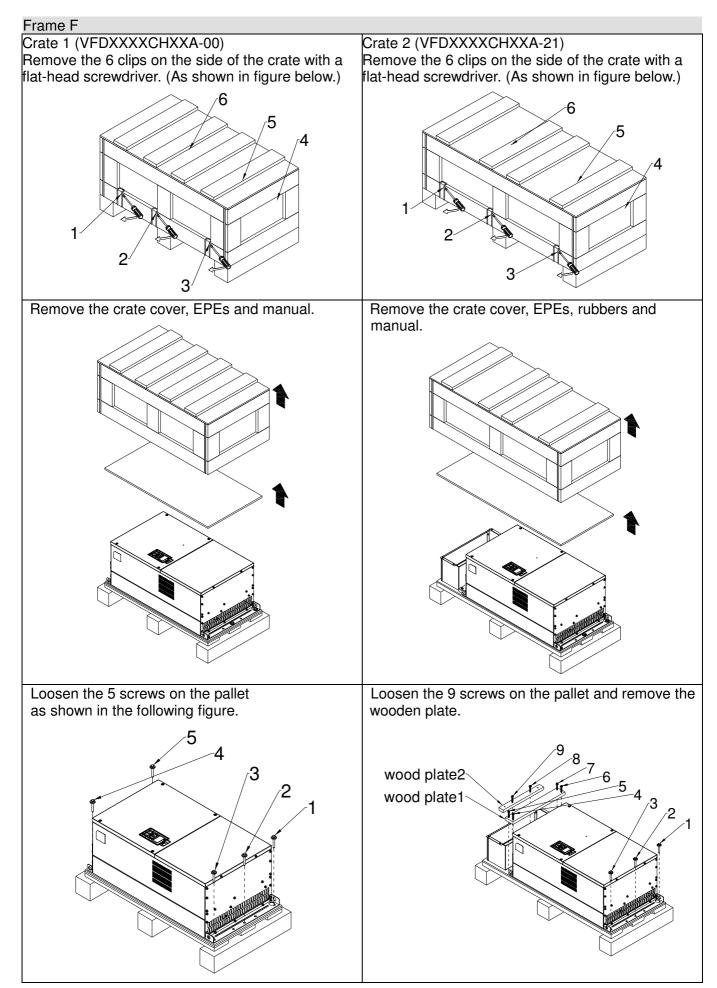
The AC motor drive is packed in the crate. Follows the following step for unpack:

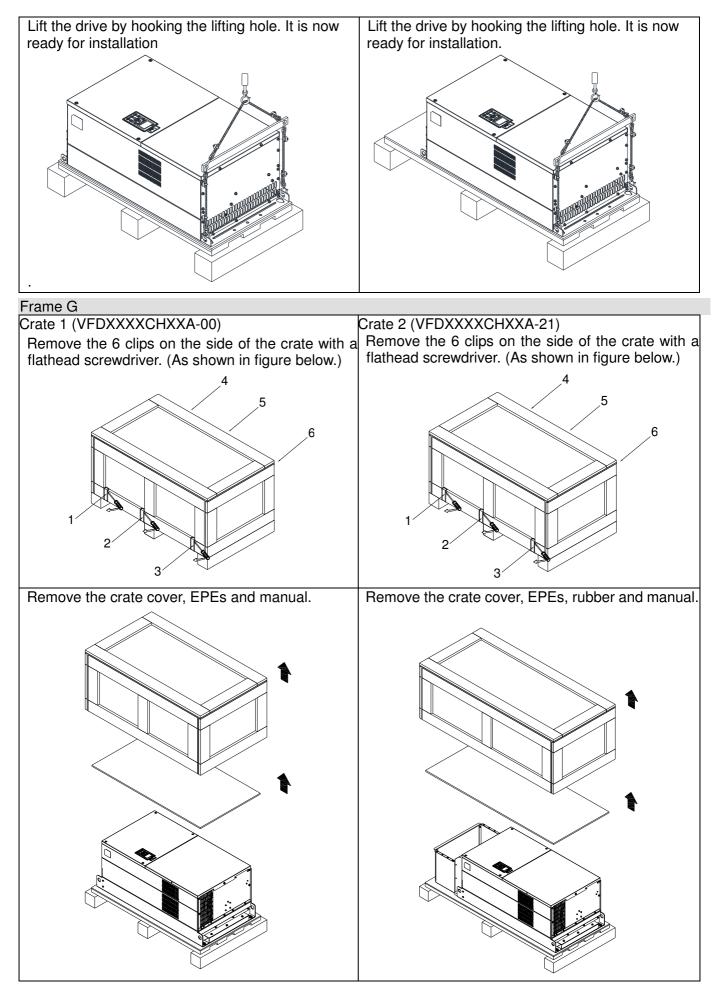




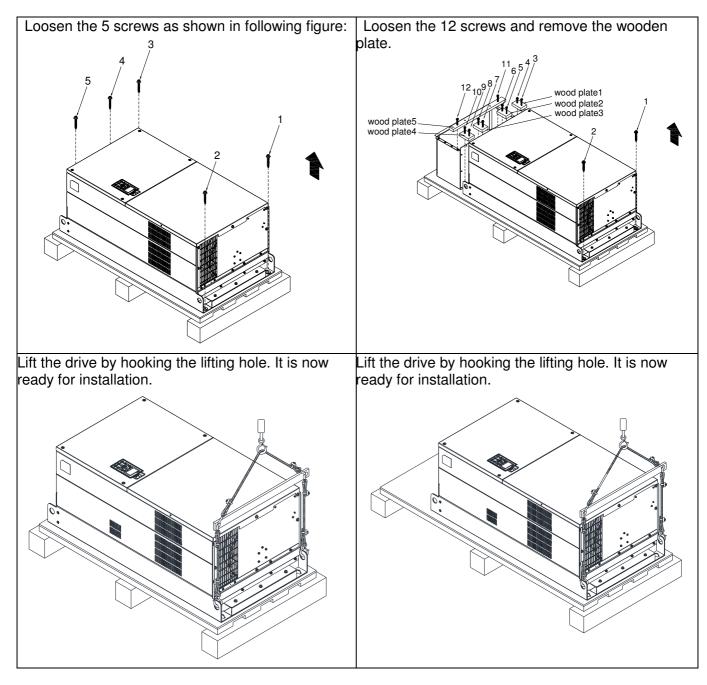


Chapter 3 Unpacking

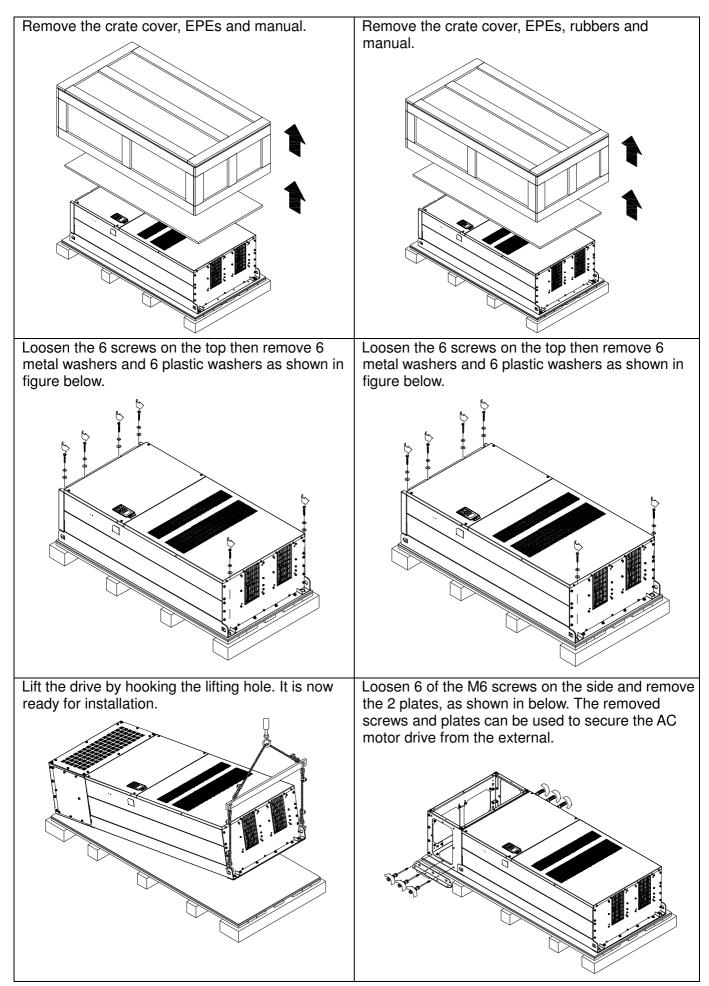




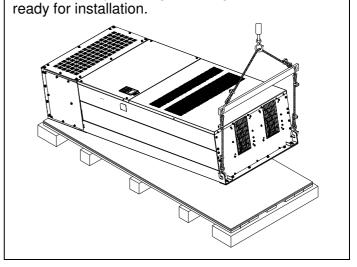
Chapter 3 Unpacking



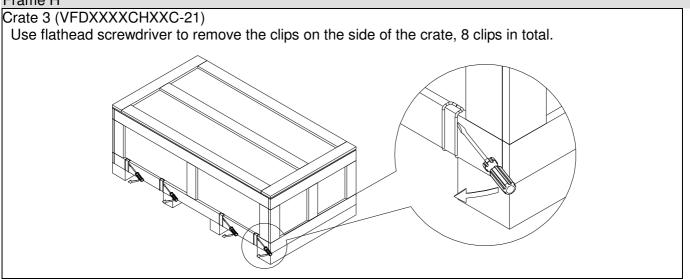
Frame H Crate 1 (VFDXXXXCHXXA-00) Remove the 8 clips on the side of the crate with a flathead screwdriver. (As shown in figure below.) Image: Crate 2 (VFDXXXCHXXC-00) Remove the 8 clips on the side of the crate with a flathead screwdriver. (As shown in figure below.) Image: Crate 2 (VFDXXXCHXXC-00) Remove the 8 clips on the side of the crate with a flathead screwdriver. (As shown in figure below.) Image: Crate 2 (VFDXXXCHXXC-00) Remove the 8 clips on the side of the crate with a flathead screwdriver. (As shown in figure below.) Image: Crate 2 (VFDXXXCHXC-00) Image: Crate 2 (VFDXXXCHXXC-00) Remove the 8 clips on the side of the crate with a flathead screwdriver. (As shown in figure below.) Image: Crate 2 (VFDXXXCHXXC-00) Image: Crate 2 (VFDXXXCHXXC-00)

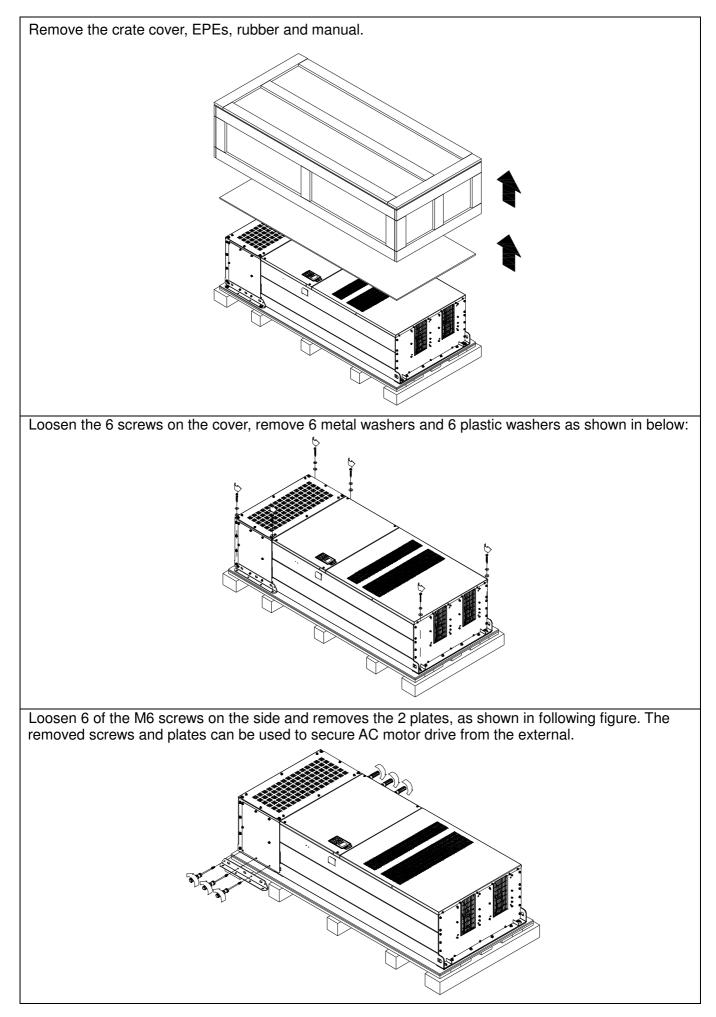


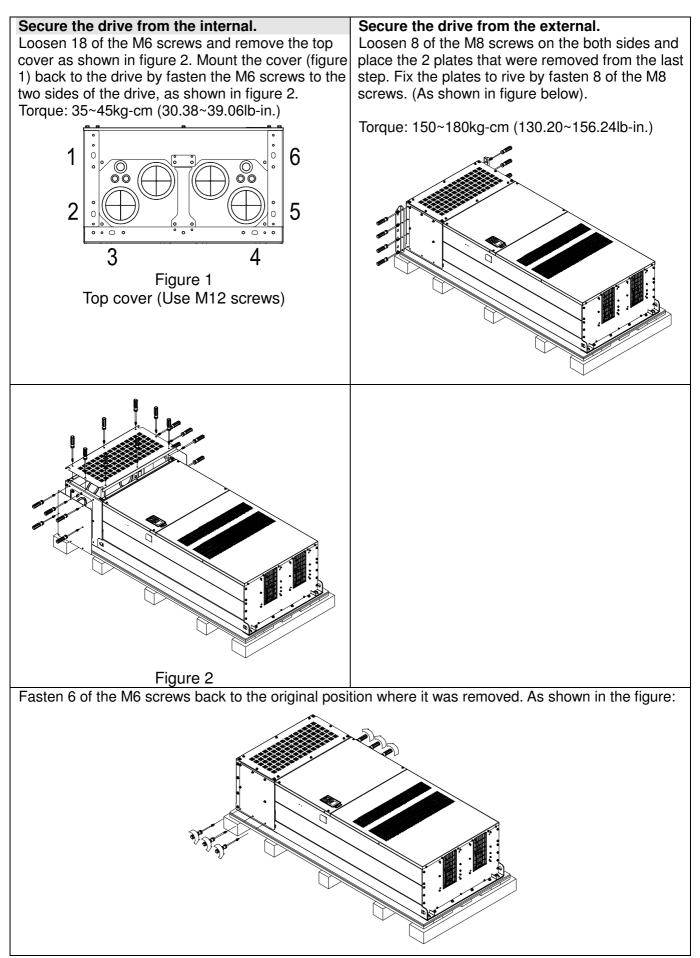
Secure the drive from the external. (Skip to the next step if this situation does not apply to you.) Loosen 8 of M8 screws on the both sides and place the 2 plates that were removed from the last step. Fix the plates to AC motor drive by fasten 8 of the M8 screws. (As shown in below) Torque: 150~180kg-cm (130.20~156.24lb-in.)

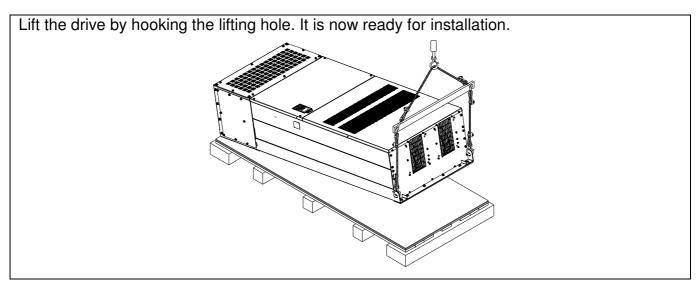










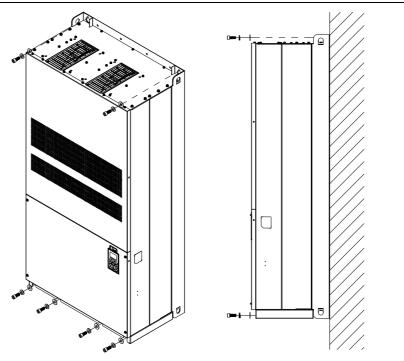


Frame H Secure the drive

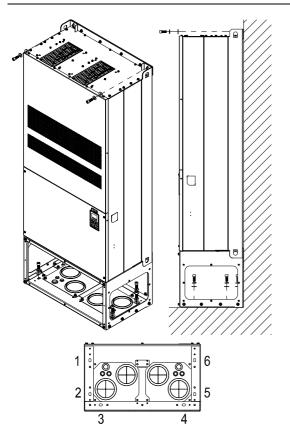
(VFDXXXXCHXXA-00)

Screw: M12*6

Torque: 340-420kg-cm [295.1-364.6lb-in.]



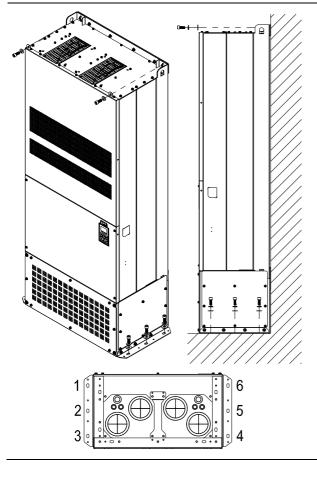
VFDXXXXCHXXC-00



Secure the drive from the internal.

Screw: M12*8 Torque: 340-420kg-cm [295.1-364.6lb-in.]

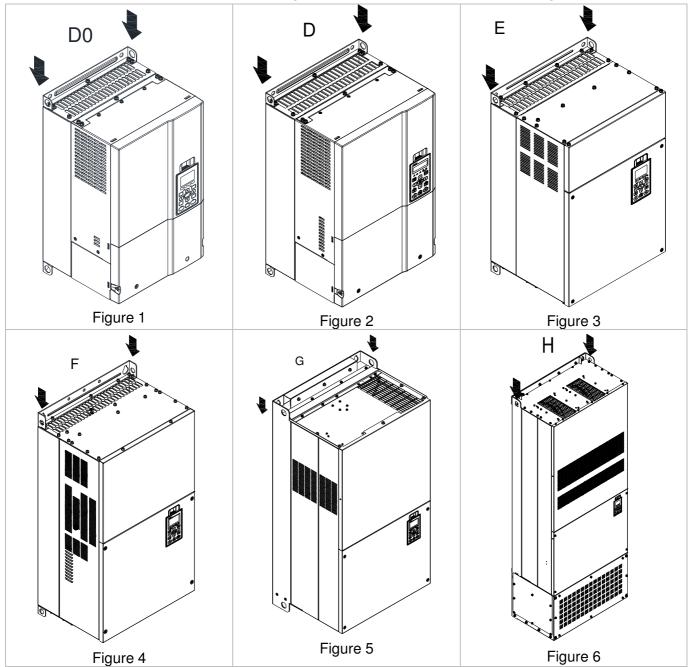
VFDXXXXCHXXC-21

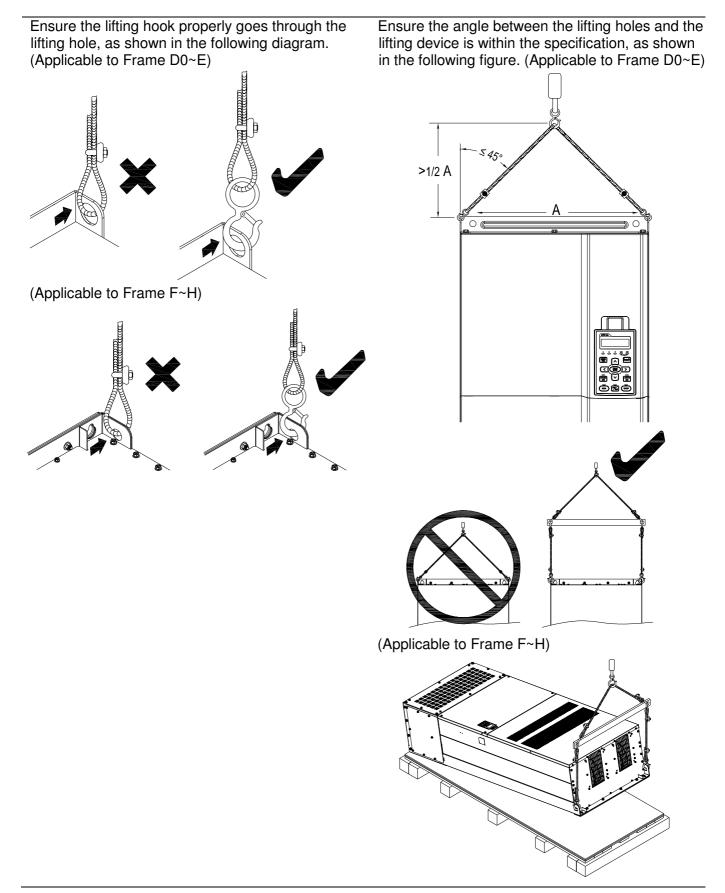


Secure the drive from the external. Screw: M12*8 Torque: 340-420kg-cm [295.1-364.6lb-in.]

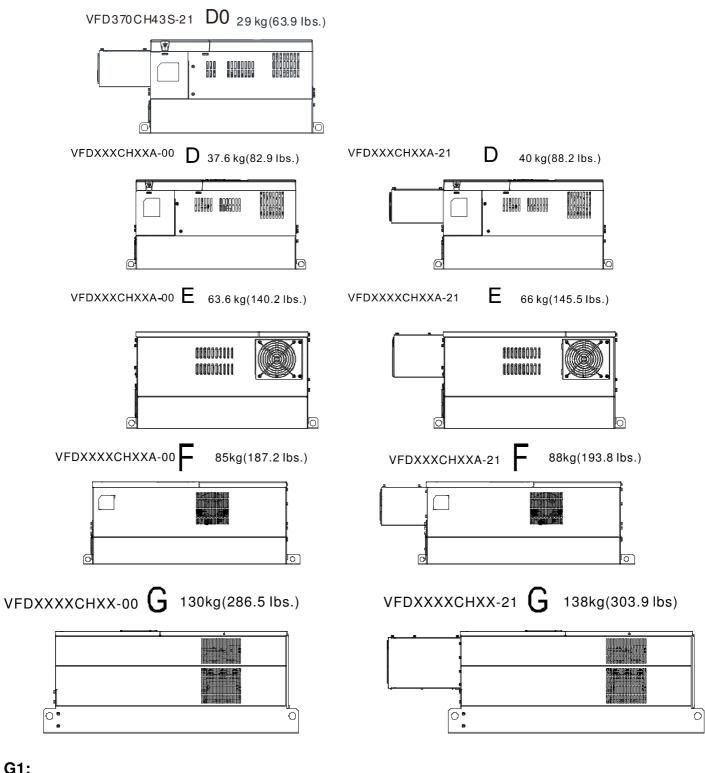
3-2 The Lifting Hook

The arrows indicate the location of the lifting holes of frame D0 to H, as shown in figure below:





Weight

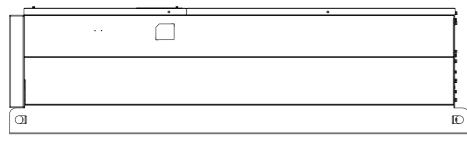


G1:

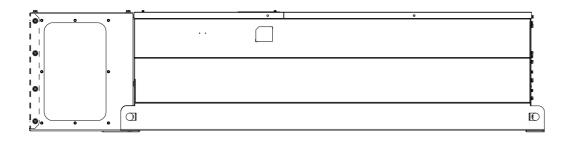
VFD1600CH43A-00 VFD1850CH43A-00 VFD2200CH43A-00 G2: VFD1600CH43A-21 VFD1850CH43A-21 VFD2200CH43A-21

Η

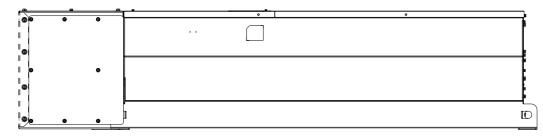
H1: VFD2800CH43A-00 235kg (518.1lbs)



H2: VFD2800CH43C-00 257kg (566.6lbs)



H3: VFD2800CH43C-21 263kg (579.8lbs)



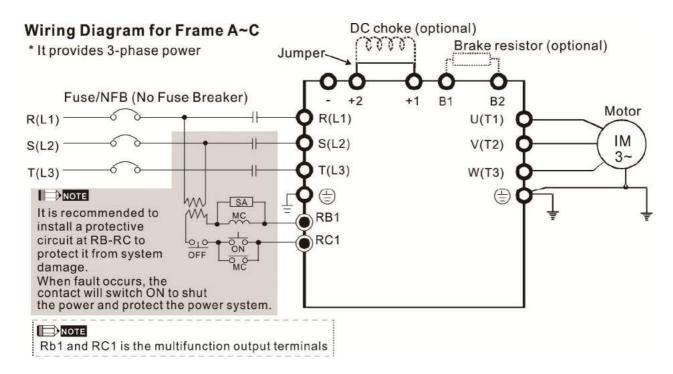
Chapter 4 Wiring

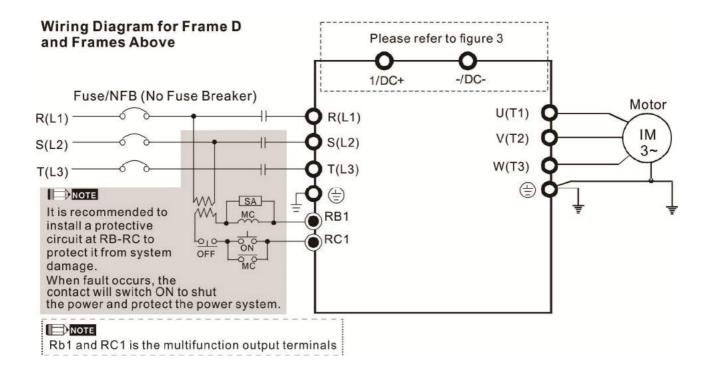
After removing the front cover, examine if the power and control terminals are clearly noted. Please read following precautions before wiring.

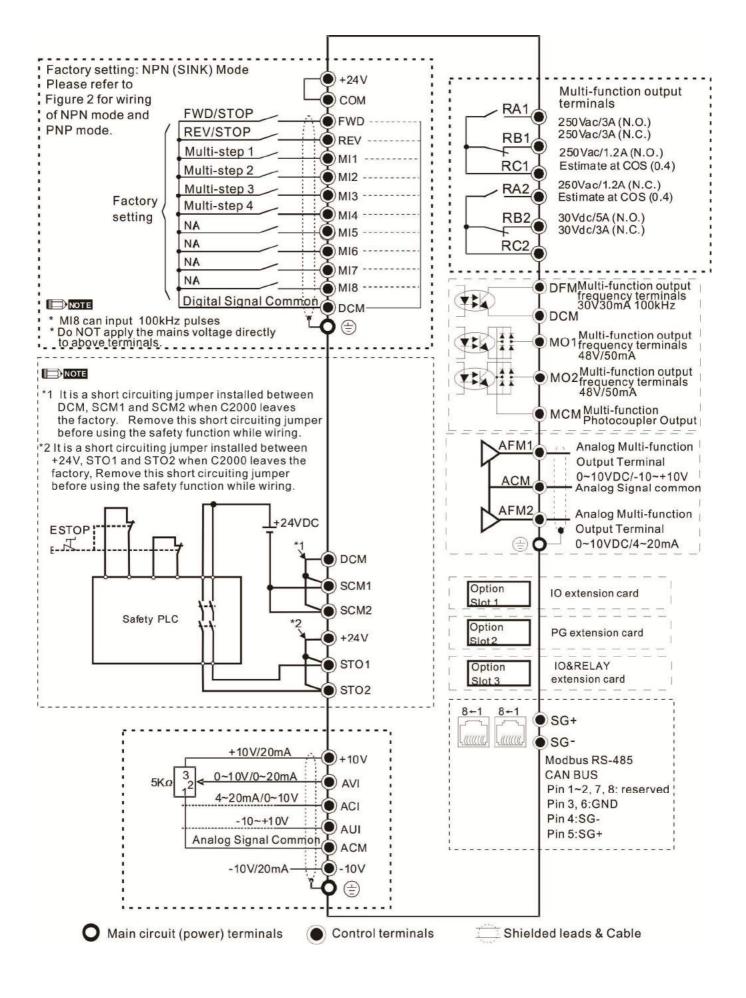
- ☑ Make sure that power is only applied to the R/L1, S/L2, T/L3 terminals. Failure to comply may result in damage to the equipments. The voltage and current should lie within the range as indicated on the nameplate (Chapter 1-1).
- ☑ All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock.
- ☑ Please make sure to fasten the screw of the main circuit terminals to prevent sparks which is made by the loose screws due to vibration

| DANGER | N | It is crucial to turn off the AC motor drive power before any wiring installation are made. A charge may still remain in the DC bus capacitors with hazardous voltages even if the power has been turned off therefore it is suggested for users to measure the remaining voltage before wiring. For your personnel saftery, please do not perform any wiring before the voltage drops to a safe level < 25 Vdc. Wiring installation with remaninig voltage condition may caus sparks and short circuit. Only qualified personnel familiar with AC motor drives is allowed to perform installation, wiring and commissioning. Make sure the power is turned off before wiring to prevent electric shock. |
|---------|----------|--|
| CAUTION | N | When wiring, please choose the wires with specification that complys with local regulation for your personnel safety. Check following items after finishing the wiring: Are all connections correct? Any loosen wires? Any short-circuits between the terminals or to ground? |

4-1 Wiring







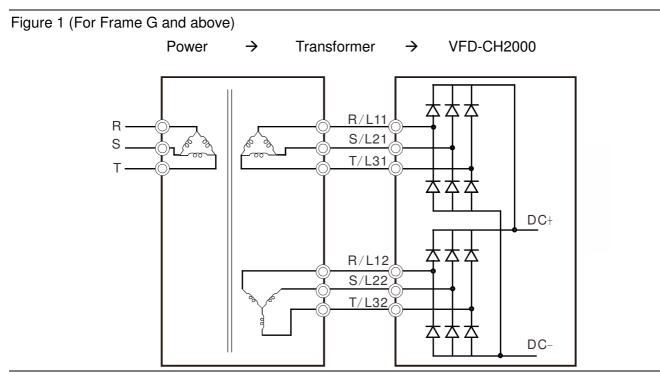


Figure 2



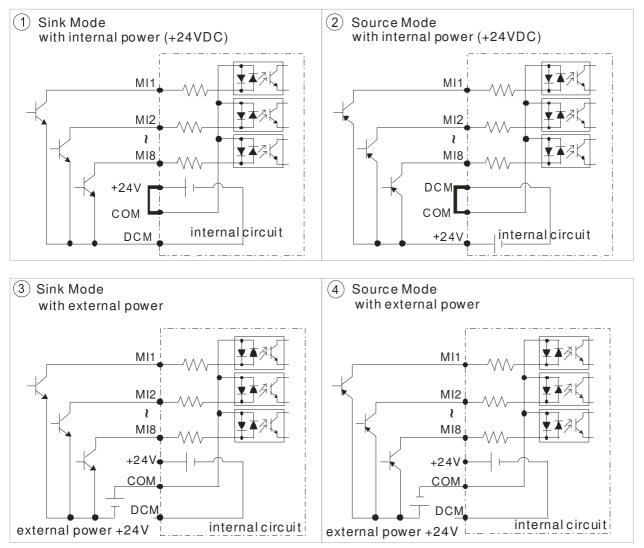


Figure 3

Function of DC Link

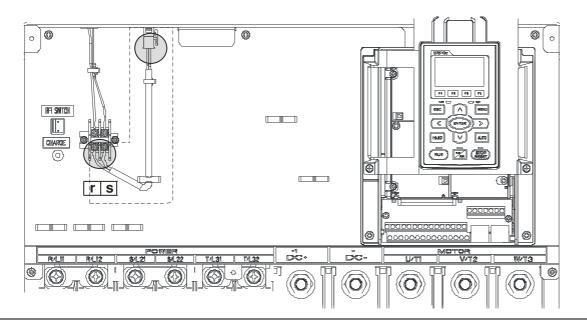
- ☑ Applicable to Frame E~H
- ☑ Operation Instruction
 - 1. When RST power is off, please disconnect terminal r and terminal s. (As circled in dotted line, uninstall the gray section and properly store cable r and cable s. Cable r and cable s are not available in optional accessories, do not dispose them.)

After terminal r and terminal s are cleared, user may now connect new power source to terminal r and terminal s. Please connect 220Vac for 220V model and 440 Vac for 440V model.

When the drive power is on, if terminal r and terminal s are not connected to new power source (220 Vac for 220V model and 440Vac for 440 V model), the digital keypad will display an error message "ryF".

2. When DC Link is used as a DC Bus connection (RST power is applied), it is not required to remove terminal r and terminal s.

Common DC Bus can only be applied to the drives with same power range. If in your case the drives are in different power range, please contact with us (Delta Industrial Automation Business Unit).



4-2 System Wiring Diagram

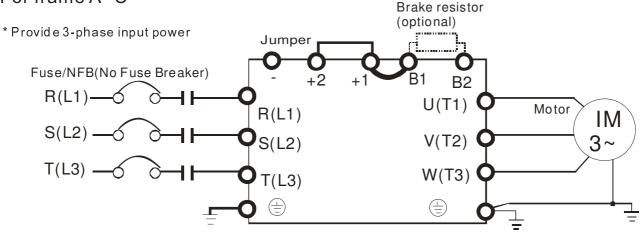
Power input terminal

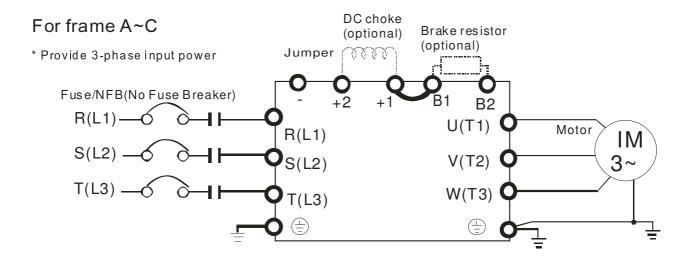
| Power input terminal | | 1 |
|---|-------------------------------------|---|
| | Power input terminal | Please supply power according to the rated power specifications indicated in the manual (refer to 9 Specifications Table). |
| NFB or fuse | NFB or fuse | There may be a large inrush current during power on. Refer to 7-2 NFB to select a suitable NFB or fuse. |
| | Electromagnetic contactor | Switching ON/OFF the primary side of the electromagnetic contactor can turn the integrate elevator device ON/OFF, but frequent switching a cause of machine failure. Do not switch ON/OF more than once an hour. Do not use the electromagnetic contactor as the power switch for the integrated elevator drive; doing so will shorten the life of the integrated elevator drive. |
| EMI filter EMI filter R/L1 S/L2 T/L3 E + B1 B2 | AC reactor (input terminal) Ლ | When the main power supply capacity is greater than 500kVA, or when it switches into the phase capacitor, the instantaneous peak voltage and current generated will destroy the internal circuit of the integrated elevator drive. It is recommended to install an input side AC reactor in the integrated elevator drive. This will also improve the power factor and reduce power harmonics. The wiring distance should be within 10m. Please refer to 7-4. |
| U/T1 V/T2 W/T3 \textcircled{E} E | Zero-phase reactor | Used to reduce radiated interference, especially in environments with audio devices, and reduce input and output side interference. The effective range is AM band to 10MHz. Please refer to Appendix 7-5. |
| AC reactor | EMI filter | Can be used to reduce electromagnetic interference. |
| (output terminal) | Brake resistor | Used to shorten deceleration time of the motor. Please refer to 7-1. |
| | AC reactor (output terminal) | The wiring length of the motor will affect the size of the reflected wave on the motor end. It is recommended to install an AC reactor when the motor wiring length is greater than 20 meters. Refer to 7-4. |

Chapter 5 Main Circuit Terminals

5-1 Main Circuit Diagram

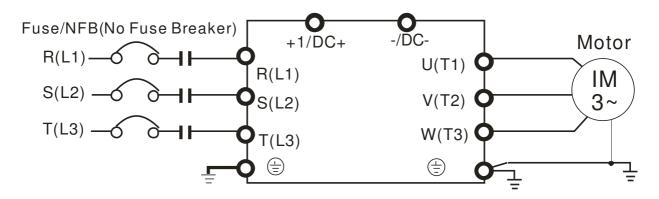
For frame A~C





For frame D0 and above D0

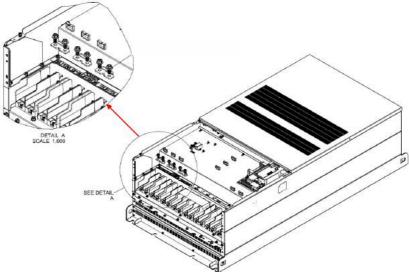
* Provide 3-phase input power



For Frame G and above Transformer **VFD-CH2000** Power \rightarrow \rightarrow 本本本 R/L11 R S/L21) S ġ 00 T/L31 Т DC+ Λ R/L12 S/L22 <u>T/L32</u> Д Д \sim DC-



Please remove short circuit plate of FRAME G and H if 12 pulse is implemented



Before implementing 12 pulse, consult Delta for more detail

| Terminals | Descriptions | | | |
|------------------|--|--|--|--|
| R/L1, S/L2, T/L3 | AC line input terminals 3-phase | | | |
| U/T1, V/T2, W/T3 | AC drive output terminals for connecting 3-phase induction motor | | | |
| | Applicable to frame A~C | | | |
| +1, +2 | Connections for DC reactor to improve the power factor. It needs to remove the | | | |
| | jumper for installation. | | | |
| | Connections for brake unit (VFDB series) | | | |
| | (for 230V models: \leq 22kW, built-in brake unit) | | | |
| +1/DC+, -/DC- | (for 460V models: \leq 30kW, built-in brake unit) | | | |
| | Common DC Bus | | | |
| B1, B2 | Connections for brake resistor (optional) | | | |
| | Earth connection, please comply with local regulations. | | | |

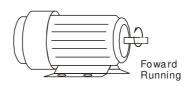


Main power terminals

- ☑ Do not connect 3-phase model to one-phase power. R/L1, S/L2 and T/L3 has no phase-sequence requirement, it can be used upon random selection.
- ☑ It is recommend to add a magnetic contactor (MC) to the power input wiring to cut off power quickly and reduce malfunction when activating the protection function of the AC motor drive. Both ends of the MC should have an R-C surge absorber.
- ☑ Fasten the screws in the main circuit terminal to prevent sparks condition made by the loose screws due to vibration.
- Please use voltage and current within the specification.
- When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of 200mA or above and not less than 0.1-second operation time to avoid nuisance tripping.
- ☑ Please use the shield wire or tube for the power wiring and ground the two ends of the shield wire or tube.
- ☑ Do NOT run/stop AC motor drives by turning the power ON/OFF. Run/stop AC motor drives by RUN/STOP command via control terminals or keypad. If you still need to run/stop AC motor drives by turning power ON/OFF, it is recommended to do so only ONCE per hour.

Output terminals for main circuit

- When it needs to install the filter at the output side of terminals U/T1, V/T2, W/T3 on the AC motor drive. Please use inductance filter. Do not use phase-compensation capacitors or L-C (Inductance-Capacitance) or R-C (Resistance-Capacitance), unless approved by Delta.
- DO NOT connect phase-compensation capacitors or surge absorbers at the output terminals of AC motor drives.
- $\ensuremath{\boxtimes}$ Use well-insulated motor, suitable for inverter operation.
- ☑ Note down the rated data and the torque force of the wiring when the output terminal is below 75°C. This information provides the right wiring method to wire terminals (It corresponds to the terminals of the motor wire and non-motor wire).
- ☑ When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U/T1, V/T2, and W/T3, respectively, the motor will rotate counterclockwise (as viewed on the shaft end of the motor) when a forward operation command is received. To permanently reverse the direction of motor rotation, switch over any of the two motor leads

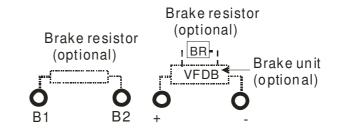


Terminals for connecting DC reactor, external brake resistor, external brake resistor and DC circuit

☑ This is the terminals used to connect the DC reactor to improve the power factor. For the factory setting, it connects the short-circuit object. Please remove this short-circuit object before connecting to the DC reactor.



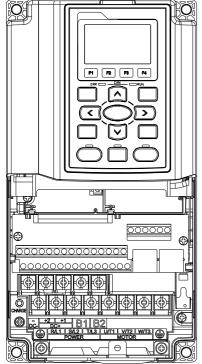
Connect a brake resistor or brake unit in applications with frequent deceleration ramps, short deceleration time, too low brake torque or requiring increased brake torque.



- ☑ The external brake resistor of Frame A, B and C should connect to the terminals (B1, B2) of AC motor drives.
- ☑ For those models without built-in brake resistor, please connect external brake unit and brake resistor (both of them are optional) to increase brake torque.
- ☑ When the terminals +1, +2 and are not used, please leave the terminals open.
- DO NOT connect [+1, -], [+2, -], [+1/DC+, -/DC-] or brake resistor directly to prevent drive damage.
- DC+ and DC- are connected by common DC bus, please refer to Chapter
 5-1(Main Circuit Terminal) for the wiring terminal specification and the wire gauge information.
- ☑ Please refer to the VFDB manual for more information on wire gauge when installing the brake unit.

5-2 Main Circuit Terminals

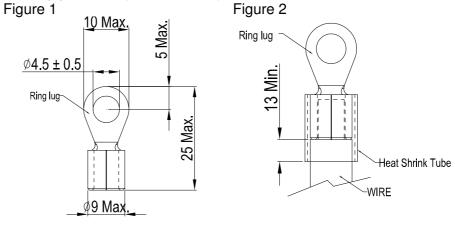
Frame A



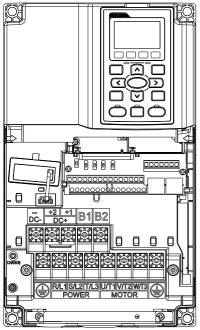
| Main circuit terminals: | | | | |
|-------------------------|-------------|--------|------------|------|
| R/L1, S/L2, T/L3, U/T1, | V/T2, W/T3, | ⊕, B1, | B2, +1, +2 | 2, - |

| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) |
|----------------------|--------------------------------|------------------------------|------------------|
| VFD007CH23A-21 | | 14 AWG (2.1mm ²) | |
| VFD015CH23A-21 | | 12 AWG (3.3mm ²) | |
| VFD022CH23A-21 | | 10 AWG (5.3mm ²) | |
| VFD037CH23A-21 | | 8 AWG (8.4mm ²) | |
| VFD007CH43A-21 | | 14 AWG (2.1mm ²) | |
| VFD007CH4EA-21 | | 14 AWG (2.1mm ²) | M4 |
| VFD015CH43A-21 | 8 AWG (8.4mm ²) | 14 AWG (2.1mm ²) | 20kg-cm |
| VFD015CH4EA-21 | | 14 AWG (2.1mm ²) | (17.4 lb-in.) |
| VFD022CH43A-21 | | 14 AWG (2.1mm ²) | (1.96Nm) |
| VFD022CH4EA-21 | | 14 AWG (2.1mm ²) | |
| VFD037CH43A-21 | | 10 AWG (5.3mm ²) | |
| VFD037CH4EA-21 | | 10 AWG (5.3mm ²) | |
| VFD055CH43A-21 | | 10 AWG (5.3mm ²) | |
| VFD055CH4EA-21 | | 10 AWG (5.3mm ²) | |
| UL installations mus | st use 600V, 7 | 75℃ or 90℃ wire. Us | e copper wire |
| only. | | | |

- 1. Figure 1 shows the terminal specification.
- 2. Figure 2 shows the specification of insulated heat shrink tubing that comply with UL (600V, YDPU2).



Frame B



| Main c | circuit | termi | nals: | | | | | |
|---------|---------|-------|-------|-------|-------|--------|--------|-------|
| R/L1, 3 | S/L2, | T/L3, | U/T1, | V/T2, | W/T3, | ⊕, B1, | B2, +1 | , +2, |

| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) | | | |
|--|---------------------------------|------------------------------|--------------------------|--|--|--|
| VFD055CH23A-21 | | 8 AWG (8.4mm ²) | | | | |
| VFD075CH23A-21 | | 6 AWG (13.3mm ²) | | | | |
| VFD110CH23A-21 | | 4 AWG (21.2mm ²) | NAC | | | |
| VFD075CH43A-21 | | 8 AWG (8.4mm ²) | M5 | | | |
| VFD075CH4EA-21 | 4 AWG (21.2mm ²) | 10 AWG (5.3mm ²) | 35kg-cm (30.4 lb-in.) | | | |
| VFD110CH43A-21 | | 8 AWG (8.4mm ²) | (3.434Nm) | | | |
| VFD110CH4EA-21 | | 8 AWG (8.4mm ²) | (3.4341111) | | | |
| VFD150CH43A-21 | | 6 AWG (13.3mm ²) | | | | |
| VFD150CH4EA-21 | | 8 AWG (8.4mm ²) | | | | |
| UL installations must use 600V, 75°C or 90°C wire. Use copper wire | | | | | | |
| only. | | | | | | |
| | | | | | | |

Terminal D+ [+2 & +1]: Torque: 45 kg-cm [39.0lb-in.] (4.415Nm) (±10%)

1. Figure 1 shows the terminal specification.

14 Max.

Max.

28 Max.

Ø13 Max.

2. Figure 2 shows the specification of insulated heat shrink tubing that comply with UL (600V, YDPU2).

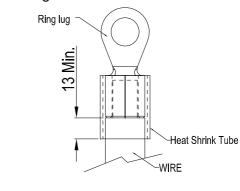
Figure 1

Ø5.2 Min.

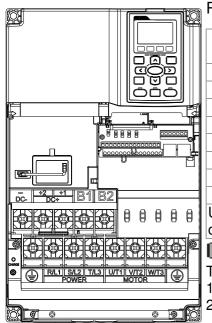
7.5 Min

Ring lug





Frame C

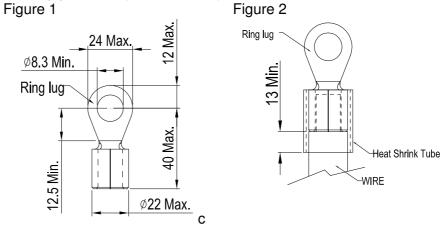


| Main ci | rcuit termi | nals: | | | |
|---------|-------------|----------|-----------|--------|---------------|
| R/L1, S | 3/L2, T/L3, | U/T1, V/ | T2, W/T3, | ⊕, B1, | B2, +1, +2, - |

| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) | | | |
|--|--------------------|--------------------------------|------------------|--|--|--|
| VFD150CH23A | | 1 AWG (42.4mm ²) | | | | |
| VFD185CH23A | | 1/0 AWG (53.5mm ²) | | | | |
| VFD185CH43A | | 4 AWG (21.2mm ²) | M8 | | | |
| VFD185CH43E | 1/0 AWG | 6 AWG (13.3mm ²) | 80kg-cm | | | |
| VFD220CH43A | (53.5mm²) | 4 AWG (21.2mm ²) | (69.4 lb-in.) | | | |
| VFD220CH43E | | 4 AWG (21.2mm ²) | (7.85Nm) | | | |
| VFD300CH43A | | 2 AWG (33.6mm ²) | | | | |
| VFD300CH43E | | 3 AWG (26.7mm ²) | | | | |
| UL installations must use 600V, 75°C or 90°C wire. Use copper wire | | | | | | |
| only. | | | | | | |
| | | | | | | |

Terminal D+ [+2 & +1]: Torque: 90 kg-cm [78.2lb-in.] (8.83Nm) (\pm 10%) 1. Figure 1 shows the terminal specification.

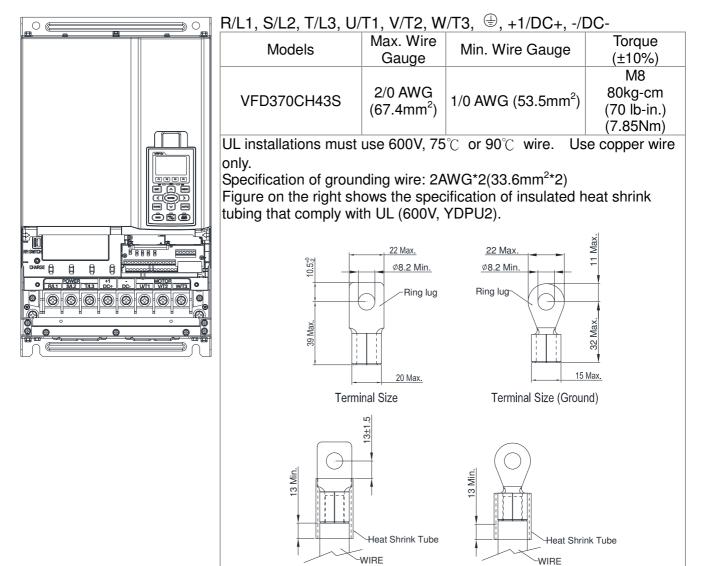
- 2. Figure 2 shows the specification of insulated heat shrink tubing that comply with UL (600V, YDPU2).



5-7

Frame D0

Main circuit terminals:



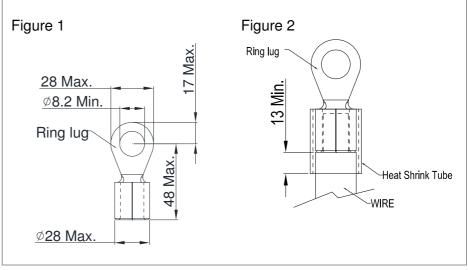
Frame D

Main circuit terminals:

| R/L1, S/L2, T/L3, U/T1, V/T2, | W/T3, ⊕, +1/DC+, -/DC- |
|-------------------------------|------------------------|
|-------------------------------|------------------------|

| $V_{L1}, S_{L2}, T_{L3}, S_{L1}, V_{L1}, V_{L1}, V_{L1}, V_{L1}, S_{L2}, T_{L3}, S_{L2}, T_{L3}, S_{L2}, T_{L3}, S_{L3}, S_{L$ | | | | | |
|--|------------------------------------|--------------------------------|--------------|--|--|
| Models | Max. Wire Gauge | | | | |
| VFD220CH23A-00 | | 1/0 AWG(53.5mm ²) | | | |
| VFD300CH23A-00 | | 4/0 AWG (107mm ²) | | | |
| VFD370CH23A-00 | 300MCM | 250MCM (127mm ²) | | | |
| VFD370CH43A-00 | (152 mm^2) | 1/0 AWG (53.5mm ²) | | | |
| VFD450CH43A-00 | (15211111) | 2/0 AWG (67.4mm ²) | | | |
| VFD550CH43A-00 | | 3/0 AWG (85mm ²) | M8 | | |
| VFD750CH43A-00 | | 300MCM (152mm ²) | 200kg-cm | | |
| VFD220CH23A-21 | | 1/0 AWG(53.5mm ²) | (173 lb-in.) | | |
| VFD300CH23A-21 | | 3/0 AWG (85mm ²) | (19.62Nm) | | |
| VFD370CH23A-21 | 4/0 AWG. | 4/0 AWG (107mm ²) | | | |
| VFD370CH43A-21 | 4/0 AvvG. (107mm ²) | 1/0 AWG (53.5mm ²) | | | |
| VFD450CH43A-21 | (10/1111) | 1/0 AWG (53.5mm ²) | | | |
| VFD550CH43A-21 | | 2/0 AWG (67.4mm ²) | | | |
| VFD750CH43A-21 | | 4/0 AWG (107mm ²) | | | |
| | | | | | |

- 1. UL installations must use 600V, 75°C or 90 °C wires. Use copper wire only.
- 2. Figure 1 shows the terminal specification.
- 3. Figure 2 shows the specification of insulated heat shrink tubing that comply with UL (600V, YDPU2).



Chapter 5 Main Circuit Terminals

Frame E 0

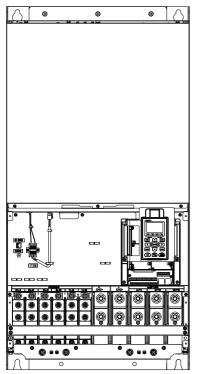
____Main circuit terminals: _____R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, ⊕, +1/DC+, -/DC-

| ja j | . , ,, | _ , , , | , , , , | |
|--|--|--------------------------------------|--|---------------------------|
| | Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) |
| | VFD220CH23A-00 VFD300CH23A-00 VFD370CH23A-00 | 300MCM*2 | 1/0 AWG(53.5mm ²) 4/0 AWG (107mm ²) 250MCM (127mm ²) | |
| | VFD370CH43A-00 VFD450CH43A-00 VFD550CH43A-00 VFD750CH43A-00 | (152mm ² *2) | 1/0 AWG (53.5mm ²) 2/0 AWG (67.4mm ²) 3/0 AWG (85mm ²) 300MCM (152mm ²) | M8 200kg-cm |
| | VFD220CH23A-21 VFD300CH23A-21 VFD370CH23A-21 VFD370CH43A-21 VFD450CH43A-21 VFD550CH43A-21 | 4/0 AWG*2 (107mm ² *2) | 1/0 AWG(53.5mm ²) 3/0 AWG (85mm ²) 4/0 AWG (107mm ²) 1/0 AWG (53.5mm ²) 1/0 AWG (53.5mm ²) 2/0 AWG (67.4mm ²) | (173 lb-in.) (19.62Nm) |
| | VFD750CH43A-21 | s must use 60 | 4/0 AWG (107mm ²) 00V, 75°C or 90 °C wires. | Use copper |
| | Torque: M8 18 Figure 2. 3. Figure 1 show | 0kg-cm (156 s the specific | vire ⁽⁾ : 300MCM [152 mr lb-in.) (17.64Nm) (±10%) ation for ring lug. ation of insulated heat sh | , as shown in |
| | comply with U Figure 1 | | PU2). Figure 2 | |
| | | 81MAX. | 17.0MAX | _28.0MAX. |
| | | <u>8.2MIN.</u> 26.5MAX. | 65.0MAX. | Ø8.2MIN. |
| | Figure 3 | | | |
| | | 13 Min. | Ring lug | |
| | | | Heat Shrink Tube | |



Main circuit terminals: 0 R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, +1/DC+, -/DC-Max. Wire Torque Models Min. Wire Gauge (±10%) Gauge VFD750CH23A-00 300MCM*2 (152mm²*2) 300MCM*2 M8 $(152 \text{mm}^{2} \times 2)$ 4/0 AWG*2 (107mm²*2) VFD1320CH43A-00 200kg-cm (173 lb-in.) 4/0 AWG*2 (107mm²*2) VFD750CH23A-21 4/0 AWG*2 (19.62Nm) $(107 \text{mm}^{2}*2)$ 3/0AWG*2 (85mm²*2) VFD1320CH43A-21 1. VFD750CH23A-00/21 installations must use 90°C wire. 2. For other model, UL installations must use 600V, 75°C or 90°C wire. Use copper wire only. Specification of grounding wire (=) : 300MCM*2 [152 mm²*2] 3. Torque: M8 200kg-cm (173 lb-in.) (19.62Nm) (±10%) 4. Figure 1 shows the specification for ring lug. 5. Figure 2 shows the specification of insulated heat shrink tubing that comply with UL (600C, YDPU2). Figure 1 Figure 2 Ring lug 6^{+}_{-4} 31MAX. Ø8.2MIN. 13 Min. 70MAX Heat Shrink Tube Ø26.5MAX. WIRE

Frame G



| Main circuit terminals: |
|--|
| R/L11, R/L12, S/L21, S/L22, T/L31, T/L32 |

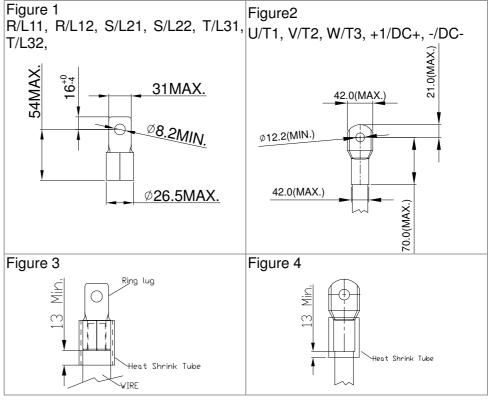
| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) |
|-----------------|-------------------------|-----------------------------------|------------------|
| VFD1600CH43A-00 | | 300MCM*2 (152mm ² *2) | |
| VFD1850CH43A-00 | | 2/0AWG*4 (67.4mm ² *4) | M8 |
| VFD2200CH43A-00 | | 3/0AWG*4 (85mm ² *4) | 200kg-cm |
| VFD1600CH43A-21 | (152mm ² *4) | 4/0 AWG*2 (107mm ² *2) | (173 lb-in.) |
| VFD1850CH43A-21 | | 1/0AWG*4 (53.5mm ² *4) | (19.62Nm) |
| VFD2200CH43A-21 | | 2/0AWG*4 (67.4mm ² *4) | |

Main circuit terminals:

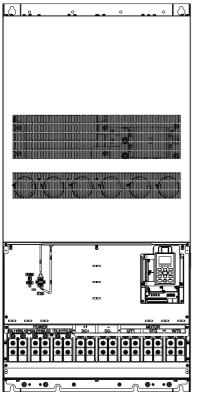
U/T1, V/T2, W/T3, +1/DC+, -/DC-

| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) |
|-----------------|-------------------------|-----------------------------------|------------------|
| VFD1600CH43A-00 | | 300MCM*2 (152mm ² *2) | |
| VFD1850CH43A-00 | | 400MCM*2 (203mm ² *2) | M12 |
| VFD2200CH43A-00 | | 500MCM*2 (253mm ² *2) | 408kg-cm |
| VFD1600CH43A-21 | (253mm ² *2) | 4/0 AWG*2 (107mm ² *2) | (354lb-in.) |
| VFD1850CH43A-21 | | 300MCM*2 (152mm ² *2) | (40Nm) |
| VFD2200CH43A-21 | | 400MCM*2 (203mm ² *2) | |

- UL installations must use 600V, 75℃ or 90℃ wire. Use copper wire only.
- Use 600V, 90°C wire for VFD2200C43A when the surrounding temperature is over 45°C.
- 3. Figure 1 and Figure 2 show the specification for using ring lug.
- Specification for grounding wire⁽≡): 300MCM*4 [152 mm²*2] Torque: M8 200kg-cm (173 lb-in.) (19.62Nm) (±10%), as shown in Figure 1
- 5. Figure 3 and Figure 4 shows the specification of insulated heat shrink tubing that comply with UL (600C, YDPU2).



Frame H

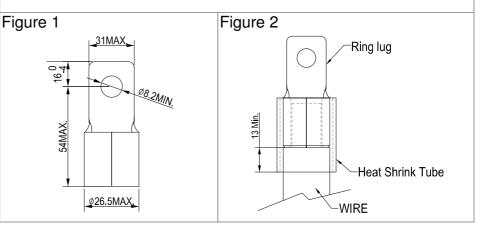


Main circuit terminals:

R/11,R12,S/21,S/22,T/31,T/32, U/T1,V/T2, W/T3, +1/DC+, -/DC-

| Models | Max. Wire Gauge | Min. Wire Gauge | Torque (±10%) |
|-----------------|-------------------------------------|-----------------------------------|--------------------------|
| VFD2800CH43A-00 | | 4/0 AWG*4 (107mm ² *4) | M8 |
| VFD2800CH43C-00 | 300MCM*4 (152mm ² *4) | 3/0 AWG*4 (85mm ² *4) | 200kg-cm (173 lb-in.) |
| VFD2800CH43C-21 | | 3/0 AWG*4 (85mm ² *4) | (19.62Nm) |

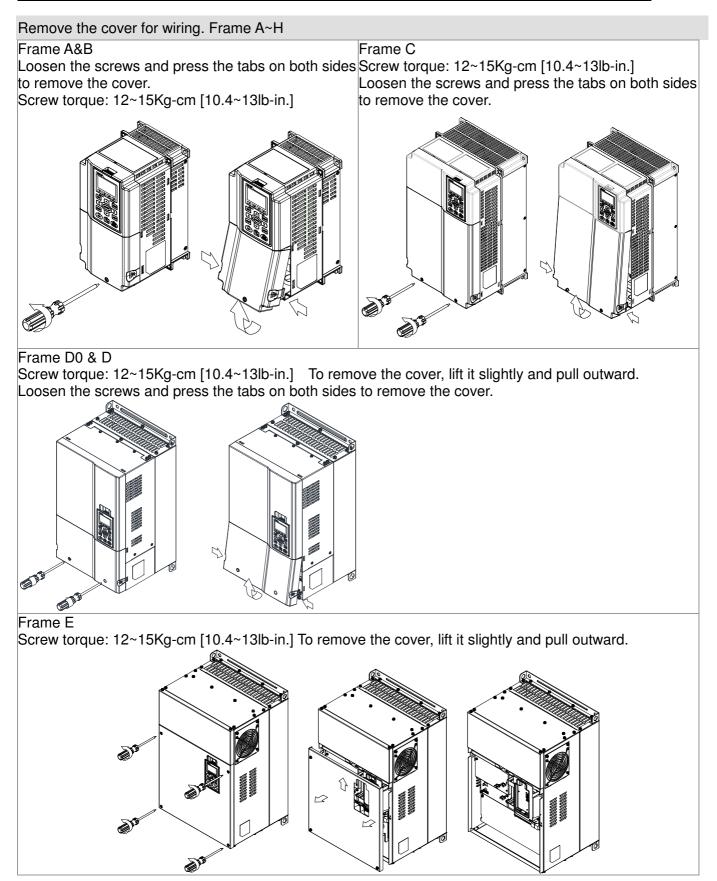
- 1. UL installations must use 600V, 75° C or 90° C wire. Use copper wire only.
- 2. Figure 1 shows the specification for using the ring lug.
- Specification of grounding wire ^(⊕) : 300MCM*4 [152 mm²*4], Torque: M8 200kg-cm (173 lb-in.) (19.62Nm) (±10%), as shown in figure 1.
- Figure 2 shows the specification of heat shrink tubing that comply with UL (600C, YDPU2).

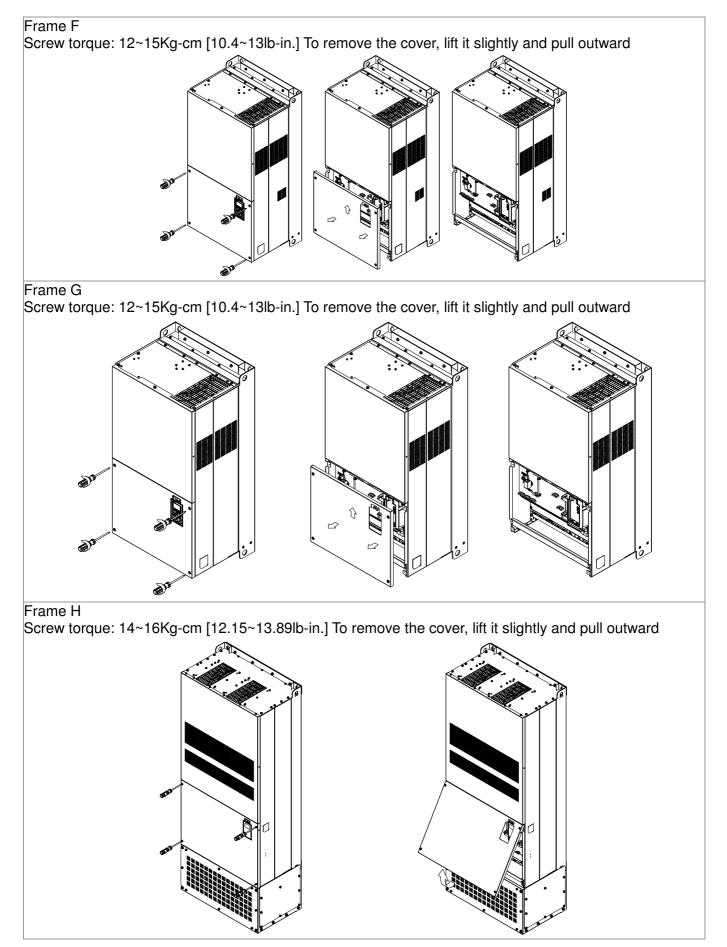


Chapter 6 Control Terminals

Please remove the top cover before wiring the multi-function input and output terminals,

The drive appearances shown in the figures are for reference only, a real drive may look different.





6-1 Specifications of Control Terminal

| AFM1 AFM2 -10-10V AFM2 AFM2 AVI AVI AVI AVI AVI AVI AVI AVI | RC2 RB2 RA2 RC1 RB1 RA1 |
|---|---|
| | B B B B B B B B B B B B B B B B B B B |

Removable Terminal Block

Wire Gauge: 26~16AWG $(\,0.1281\text{-}1.318\text{mm}^2\,)$,

Torque: (A) 5kg-cm [4.31lb-in.] (0.49Nm) (As shown in figure above)

(B) 8kg-cm [6.94lb-in.] (0.78Nm) (As shown in figure above)

Wiring precautions:

- Reserves 5mm and properly install the wire into the terminal; fasten the installation by a slotted screwdriver. If the wire is stripped, sort the wire before install into the terminal.
- Flathead screwdriver: blade width 3.5mm, tip thickness 0.6mm
- In the figure above, the factory setting for S1-SCM is short circuit. The factory setting for +24V-COM is short circuit and SINK mode (NPN); please refer to Chapter 4 Wiring for more detail.

| Terminals | Terminal Function | Factory Setting (NPN mode) |
|-----------------|---|--|
| +24V | Digital control signal common | +24V±5% 200mA |
| +240 | (Source) | |
| COM | Digital control signal common (Sink) | - |
| FWD | Forward-Stop command | FWD-DCM: ON→ forward running OFF→ deceleration to stop |
| REV | Reverse-Stop command | REV-DCM: ON→ reverse running OFF→ deceleration to stop |
| MI1 ~ MI8 | Multi-function input 1~8 | Refer to parameters 02-01~02-08 to program the multi-function inputs MI1~MI8. Source mode ON: the activation current is $3.3mA \ge 11Vdc$ OFF: cut-off voltage $\le 5Vdc$ Sink Mode ON: the activation current is $3.3mA \le 13Vdc$ OFF: cut-off voltage $\ge 19Vdc$ |
| DFM | Digital frequency meter DFM DCM | Regard the pulse voltage as the output monitor signal Duty-cycle: 50% Min. load impedance: 1kΩ/100pf Max. current: 30mA Max. voltage: 30Vdc |
| DCM | Digital frequency signal common | , i i i i i i i i i i i i i i i i i i i |
| MO1 | Multi-function Output 1 (photocoupler) | The AC motor drive releases various monitor signals, such as drive in operation, frequency attained and overload indication, via transistor (open collector). |

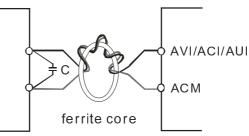
| Terminals | Terminal Function | Factory Setting (NPN mode) |
|-----------|---|--|
| MO2 | Multi-function Output 2 (photocoupler) | MO1 MO2 MCM |
| MCM | Multi-function Output Common | Max 48Vdc 50mA |
| RA1 | Multi-function relay output 1 (N.O.) a | Resistive Load: 3A(N.O.)/3A(N.C.) 250VAC |
| RB1 | Multi-function relay output 1 (N.C.) b | 5A(N.O.)/3A(N.C.) 30VDC Inductive Load (COS 0.4): |
| RC1 | Multi-function relay common | 1.2A(N.O.)/1.2A(N.C.) 250VAC 2.0A(N.O.)/1.2A(N.C.) 30VDC |
| RA2 | Multi-function relay output 2 (N.O.) a | |
| RB2 | Multi-function relay output 2 (N.C.) b | It is used to output each monitor signal, such as drive is in operation, frequency attained or overload indication. |
| RC2 | Multi-function relay common | |
| +10V | Potentiometer power supply | Analog frequency setting: +10Vdc 20mA |
| -10V | Potentiometer power supply | Analog frequency setting: -10Vdc 20mA |
| AVI | Analog voltage input | Impedance: 20kΩ Range: 0~20mA/4~20mA/0~10V =0~Max. Output Frequency (Pr.01-00) AVI switch, factory setting is 0~10V |
| ACI | Analog current input ACI ACI circuit ACI ACI circuit ACI ACI circuit | Impedance: 250Ω Range: 0~20mA/4~20mA/0~10V = 0 ~ Max. Output Frequency (Pr.01-00) ACI Switch, factory setting is 4~20mA |
| AUI | Auxiliary analog voltage input + 10V AUI (-10V~+ 10V) ACM | Impedance: 20kΩ Range: -10~+10VDC=0 ~ Max. Output Frequency(Pr.01-00) |

| Terminals | Terminal Function | Factory Setting (NPN mode) |
|-----------|--|---|
| AFM1 | | 0~10V Max. output current 2mA, Max. load 5kΩ -10~10V maximum output current 2mA, maximum load 5kΩ Output current: 2mA max Resolution: 0~10V corresponds to Max. operation frequency Range: 0~10V → -10~+10V AFM 1 Switch, factory setting is 0~10V |
| AFM2 | | 0~10V Max. output current 2mA, Max. load 5kΩ 0~20mA Max. load 500Ω Output current: 20mA max Resolution: 0~10V corresponds to Max. operation frequency Range: 0~10V \rightarrow 4~20mA AFM 2 Switch, factory setting is 0~10V |
| ACM | Analog Signal Common | Common for analog terminals |
| STO1 | | |
| SCM1 | Default setting is shorted | |
| STO2 | Power removal safety function for E | |
| SCM2 | witen 3101~30WH,3102~30W | 2 is activated, the activation current is $3.3mA \ge 11Vdc$ |
| SG+ | | |
| SG- | Modbus RS-485 | |
| SGND | | |
| RJ-45 | PIN 1,2,7,8 : Reserved PIN PIN 4: SG- PIN 5: S | 3, 6: SGND SG+ |

NOTE: Wire size of analog control signals: 18 AWG (0.75 mm²) with shielded wire

6-2 Analog input terminals (AVI, ACI, AUI, ACM)

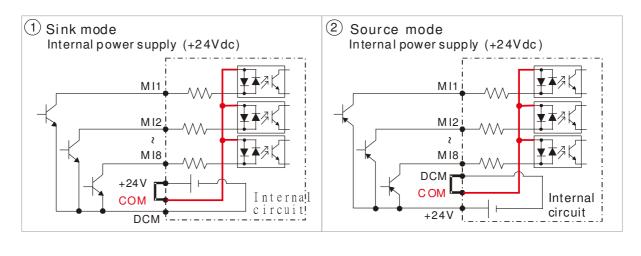
- Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (<20m) with proper grounding. If the noise is inductive, connecting the shield to terminal ACM can bring improvement.
- ☑ If the analog input signals are affected by noise from the AC motor drive, please connect a capacitor and ferrite core as indicated in the following diagram.

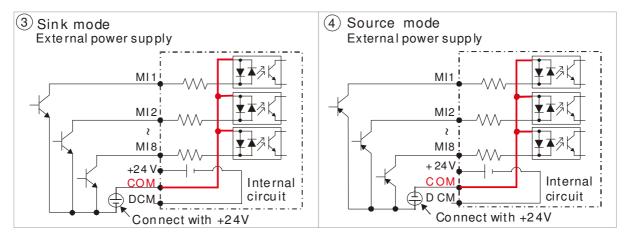


Wind each wires 3 times or more around the core

Digital inputs (FWD, REV, MI1~MI8, COM)

- ☑ When using contacts or switches to control the digital inputs, please use high quality components to avoid contact bounce.
- ☑ The "COM" terminal is the common side of the photo-coupler. Any of wiring method, the "common point" of all photo-coupler must be the "COM".





When the photo-coupler is using internal power supply, the switch connection for Sink and Source as below:

MI-DCM: Sink mode MI-+24V: Source mode

☑ When the photo-coupler is using external power supply, please remove the short circuit cable between the +24V and COM terminals. The connection mode is Sink mode or Source mode is according to the below:

The "+" of 24V connecting to "COM: Sink mode

The "-" of 24V connecting to COM: Source mode

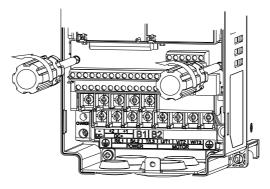
Transistor outputs (MO1, MO2, MCM)

- ☑ Make sure to connect the digital outputs to the right polarity.
- ☑ When connecting a relay to the digital outputs connect a surge absorber across the coil and check the polarity.

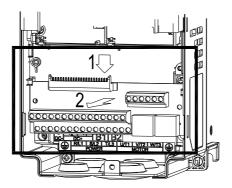
Chapter 6 Control Terminals

6-3 Remove the Terminal Block

1. Loosen the screws by screwdriver. (As shown in figure below).



2. Remove the control board by pulling it out for a distance 6~8 cm (as 1 in the figure) then lift the control board upward (as 2 in the figure).



Chapter 7 Optional Accessories

- 7-1 All Brake Resistors and Brake Units Used in AC Motor Drives
- 7-2 Non-fuse Circuit Breaker
- 7-3 Fuse Specification Chart
- 7-4 AC/DC Reactor
- 7-5 Zero Phase Reactor
- 7-6 EMI Filter
- 7-7 Digital Keypad
- 7-8 Panel Mounting
- 7-9 Conduit Box Kit
- 7-10 Fan Kit
- 7-11 Flange Mounting Kit
- 7-12 USB/RS-485 Communication Interface IF6530

The optional accessories listed in this chapter are available upon request. Installing additional accessories to your drive would substantially improve the drive's performance. Please select an applicable accessory according to your need or contact the local distributor for suggestion.

7-1 All Brake Resistors and Brake Units Used in AC Motor Drives

| Appli Mo | | * ¹ 125%Braking Torque 10%ED | | | | | | | * ² Max. Brake Torque | | |
|-------------|-----|---|--------------------------------------|---|----------|--|---------------------------------|-------------------------------|--------------------------------------|-----------------------|--|
| HP | kW | Braking Torque (kg-m) | Brake Unit * ⁴ VFDB | * ³ Braking Resistor series for each Brake Unit | | Resistor value spec. for each AC motor Drive | Total Braking Current (A) | Min. Resistor Value (Ω) | Max. Total Braking Current (A) | Peak Power (kW) | |
| 1 | 0.7 | 0.5 | - | BR080W20 | 00*1 | 80W200Ω | 1.9 | 63.3 | 6 | 2.3 | |
| 2 | 1.5 | 1.0 | - | BR200W09 | 91*1 | 200W91Ω | 4.2 | 47.5 | 8 | 3.0 | |
| 3 | 2.2 | 1.5 | - | BR300W070*1 | | 300W70Ω | 5.4 | 38.0 | 10 | 3.8 | |
| 5 | 3.7 | 2.5 | - | BR400W040*1 | | 400W40Ω | 9.5 | 19.0 | 20 | 7.6 | |
| 7.5 | 5.5 | 3.7 | - | BR1K0W020*1 | | 1000W20Ω | 19 | 14.6 | 26 | 9.9 | |
| 10 | 7.5 | 5.1 | - | BR1K0W020*1 | | 1000W20Ω | 19 | 14.6 | 26 | 9.9 | |
| 15 | 11 | 7.5 | - | BR1K5W013*1 | | 1500W13Ω | 29 | 13.6 | 28 | 10.6 | |
| 20 | 15 | 10.2 | - | BR1K0W4P3*2 | 2 series | 2000W8.6Ω | 44 | 8.3 | 46 | 17.5 | |
| 25 | 18 | 12.2 | - | BR1K0W4P3*2 | 2 series | 2000W8.6Ω | 44 | 8.3 | 46 | 17.5 | |
| 30 | 22 | 14.9 | - | BR1K5W3P3*2 | 2 series | 3000W6.6Ω | 58 | 5.8 | 66 | 25.1 | |
| 40 | 30 | 20.3 | 2015*2 | BR1K0W5P1*2 | 2 series | 4000W5.1Ω | 75 | 4.8 | 80 | 30.4 | |
| 50 | 37 | 25.1 | 2022*2 | BR1K2W3P9*2 | 2 series | 4800W3.9Ω | 97 | 3.2 | 120 | 45.6 | |
| 60 | 45 | 30.5 | 2022*2 | BR1K5W3P3*2 | 2 series | 6000W3.3Ω | 118 | 3.2 | 120 | 45.6 | |
| 75 | 55 | 37.2 | 2022*3 | BR1K2W3P9*2 | 2 series | 7200W2.6Ω | 145 | 2.1 | 180 | 68.4 | |
| 100 | 75 | 50.8 | 2022*4 | BR1K2W3P9*2 | 2 series | 9600W2Ω | 190 | 1.6 | 240 | 91.2 | |

460V

| | cable tor | * ¹ 125%Braking Torque 10%ED | | | | | | | ax. Brake Toro | que |
|------------|--------------|---|--------------------------------------|---|-------------------------|--|---------------------------------|-------------------------------|--------------------------------------|-----------------------|
| HP | kW | Braking Torque (kg-m) | Brake Unit * ⁴ VFDB | * ³ Braking Resistor series for each Brake Unit | | Resistor value spec. for each AC motor Drive | Total Braking Current (A) | Min. Resistor Value (Ω) | Max. Total Braking Current (A) | Peak Power (kW) |
| 1 | 0.7 | 0.5 | - | BR080W7 | '50*1 | 80W750Ω | 1 | 190.0 | 4 | 3.0 |
| 2 | 1.5 | 1.0 | - | BR200W3 | 860*1 | 200W360Ω | 2.1 | 126.7 | 6 | 4.6 |
| 3 | 2.2 | 1.5 | - | BR300W2 | 250*1 | 300W250Ω | 3 | 108.6 | 7 | 5.3 |
| 5 | 3.7 | 2.5 | - | BR400W1 | 50*1 | 400W150Ω | 5.1 | 84.4 | 9 | 6.8 |
| 5.5 7.5 | 4.0 5.5 | 2.7 3.7 | - | BR1K0W075*1 | | 1000W75Ω | 10.2 | 54.3 | 14 | 10.6 |
| 10 | 7.5 | 5.1 | - | BR1K0W075*1 | | 1000W75Ω | 10.2 | 47.5 | 16 | 12.2 |
| 15 | 11 | 7.5 | - | BR1K5W043*1 | | 1500W43Ω | 17.6 | 42.2 | 18 | 13.7 |
| 20 | 15 | 10.2 | - | BR1K0W016*2 | 2 series | 2000W32Ω | 24 | 26.2 | 29 | 22.0 |
| 25 | 18 | 12.2 | - | BR1K0W016*2 | 2 series | 2000W32Ω | 24 | 23.0 | 33 | 25.1 |
| 30 | 22 | 14.9 | - | BR1K5W013*2 | 2 series | 3000W26Ω | 29 | 23.0 | 33 | 25.1 |
| 40 | 30 | 20.3 | - | BR1K0W016*4 | 2 parallel, 2 series | 4000W16Ω | 47.5 | 14.1 | 54 | 41.0 |
| 50 | 37 | 25.1 | 4045*1 | BR1K2W015*4 | 2 parallel, 2 series | 4800W15Ω | 50 | 12.7 | 60 | 45.6 |
| 60 | 45 | 30.5 | 4045*1 | BR1K5W013*4 | 2 parallel, 2 series | 6000W13Ω | 59 | 12.7 | 60 | 45.6 |
| 75 | 55 | 37.2 | 4030*2 | BR1K0W5P1*4 | 4 parallel | 8000W10.2Ω | 76 | 9.5 | 80 | 60.8 |
| 100 | 75 | 50.8 | 4045*2 | BR1K2W015*4 | 2 parallel, 2 series | 9600W7.5Ω | 100 | 6.3 | 120 | 91.2 |
| 125 | 90 | 60.9 | 4045*2 | BR1K5W013*4 | 2 parallel, 2 series | 12000W6.5Ω | 117 | 6.3 | 120 | 91.2 |
| 150 | 110 | 74.5 | 4110*1 | BR1K2W015*10 | 5 parallel, 2 series | 12000W6Ω | 126 | 6.0 | 126 | 95.8 |

| 400 V | 4 | 6 | 0 | ٧ |
|-------|---|---|---|---|
|-------|---|---|---|---|

| | cable otor | * ¹ 125%Braking Torque 10%ED | | | | | | | * ² Max. Brake Torque | | |
|-----|---------------|---|---------------|---|-------------------------|--|---------------------------------|-------------------------------|--------------------------------------|-----------------------|--|
| ΗP | kW | Braking Torque (kg-m) | Brake Unit | * ³ Braking Resistor series for each Brake Unit | | Resistor value spec. for each AC motor Drive | Total Braking Current (A) | Min. Resistor Value (Ω) | Max. Total Braking Current (A) | Peak Power (kW) | |
| 175 | 132 | 89.4 | 4160*1 | BR1K5W012*12 | 6 parallel, 2 series | 18000W4Ω | 190 | 4.0 | 190 | 144.4 | |
| 215 | 160 | 108.3 | 4160*1 | BR1K5W012*12 | 6 parallel, 2 series | 18000W4Ω | 190 | 4.0 | 190 | 144.4 | |
| 250 | 185 | 125.3 | 4185*1 | BR1K5W012*14 | 7 parallel, 2 series | 21000W3.4Ω | 225 | 3.4 | 225 | 172.1 | |
| 300 | 220 | 148.9 | 4110*2 | BR1K2W015*10 | 5 parallel, 2 series | 24000W3Ω | 252 | 3.0 | 252 | 190.5 | |
| 375 | 280 | 189.6 | 4160*2 | BR1K5W012*12 | 6 parallel, 2 series | 36000W2Ω | 380 | 2.0 | 380 | 288.8 | |

Calculation for 125% brake toque: (kw)*125%*0.8; where 0.8 is motor efficiency.

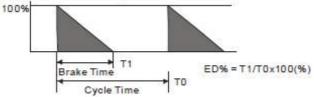
Because there is a resistor limit of power consumption, the longest operation time for 10%ED is 10sec (on: 10sec/ off: 90sec). *² Please refer to the Brake Performance Curve for "Operation Duration & ED" vs. "Braking Current".

*³ For heat dissipation, a resistor of 400W or lower should be fixed to the frame and maintain the surface temperature below 50°C; a resistor of 1000W and above should maintain the surface temperature below 350°C.

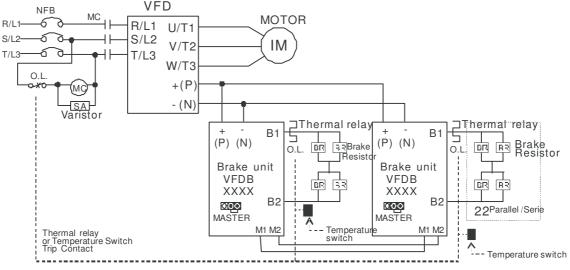
^{*4} Please refer to VFDB series Braking Module Instruction for more detail on braking resistor.

1. Definition for Brake Usage ED%

Explanation: The definition of the brake usage ED (%) is for assurance of enough time for the brake unit and brake resistor to dissipate away heat generated by braking. When the brake resistor heats up, the resistance would increase with temperature, and brake torque would decrease accordingly. Recommended cycle time is one minute.



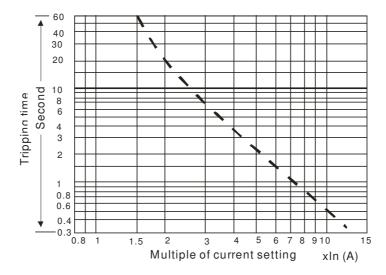
For safety concern, install an overload relay (O.L) between the brake unit and the brake resistor in conjunction with the magnetic contactor (MC) prior to the drive for abnormal protection. The purpose of installing the thermal overload relay is to protect the brake resistor from damage due to frequent brake, or due to brake unit keeping operating resulted from unusual high input voltage. Under such circumstance, just turn off the power to prevent damaging the brake resistor.



- When AC Drive is equipped with a DC reactor, please read user manual to know th wiring method of input circuit of brake unit +(P).
- Do Not connect input circuit -(N) to the neutral point of the power system.
- 2. If damage to the drive or other equipment is due to the fact that the brake resistors and brake modules in use are not provided by Delta, the warranty will be void.
- 3. Take into consideration the safety of the environment when installing the brake resistors. If the minimum resistance value is to be utilized, consult local dealers for the calculation of Watt figures.

- 4. When using more than 2 brake units, equivalent resistor value of parallel brake unit can't be less than the value in the column "Minimum Equivalent Resistor Value for Each AC Drive" (the right-most column in the table). Please read the wiring information in the user manual of brake unit thoroughly prior to operation
- 5. This chart is for normal usage; if the AC motor drive is applied for frequent braking, it is suggested to enlarge 2~3 times of the Watts.
- 6. Thermal Relay:

Thermal relay selection is basing on its overload capability. A standard braking capacity for C2000 is 10%ED (Tripping time=10s). The figure below is an example of 406V, 110kw AC motor drive. It requires the thermal relay to take 260% overload capacity in 10s (Host starting) and the braking current is 126A. In this case, user should select a rated 50A thermal relay. The property of each thermal relay may vary among different manufacturer, please carefully read specification.



7-2 Non-fuse Circuit Breaker

Comply with UL standard: Per UL 508, paragraph 45.8.4, part a. The rated current of the breaker shall be 2~4 times of the maximum rated input current of AC motor drive.

| 3-phase 230V | | | | | |
|-------------------|-------------------------------------|--|--|--|--|
| Model | Recommended non-fuse breaker (A) | | | | |
| VFD007CH23A-21 | 15 | | | | |
| VFD015CH23A-21 | 20 | | | | |
| VFD022CH23A-21 | 30 | | | | |
| VFD037CH23A-21 | 40 | | | | |
| VFD055CH23A-21 | 50 | | | | |
| VFD075CH23A-21 | 60 | | | | |
| VFD110CH23A-21 | 100 | | | | |
| VFD150CH23A-21 | 125 | | | | |
| VFD185CH23A-21 | 150 | | | | |
| VFD220CH23A-00/21 | 200 | | | | |
| VFD300CH23A-00/21 | 225 | | | | |
| VFD370CH23A-00/21 | 250 | | | | |
| VFD450CH23A-00/21 | 300 | | | | |
| VFD550CH23A-00/21 | 400 | | | | |
| VFD750CH23A-00/21 | 450 | | | | |

| 3-phase 460V | | | | | | |
|---------------------------------------|------------------------------------|--|--|--|--|--|
| Model | Recommended non-fuse breaker(A) | | | | | |
| VFD007CH43A/4EA-21 | 5 | | | | | |
| VFD015CH43A/4EA-21 | 10 | | | | | |
| VFD022CH43A/4EA-21 | 15 | | | | | |
| VFD037CH43A/4EA-21 | 20 | | | | | |
| VFD055CH43A/4EA-21 | 20 | | | | | |
| VFD075CH43A/4EA-21 | 30 | | | | | |
| VFD110CH43A/4EA-21 | 40 | | | | | |
| VFD150CH43A/4EA-21 | 50 | | | | | |
| VFD185CH43A/4EA-21 | 60 | | | | | |
| VFD220CH43A/4EA-21 | 75 | | | | | |
| VFD300CH43A/4EA-21 | 100 | | | | | |
| VFD370CH43A-00/21 | 125 | | | | | |
| VFD370CH43S-21 | 150 | | | | | |
| VFD450CH43A-00/21 | 175 | | | | | |
| VFD550CH43A-00/21 | 250 | | | | | |
| VFD750CH43A-00/21 | 300 | | | | | |
| VFD900CH43A-00/21 | 300 | | | | | |
| VFD1100CH43A-00/21 | 400 | | | | | |
| VFD1320CH43A-00/21 | 500 | | | | | |
| VFD1600CH43A-00/21 | 600 | | | | | |
| VFD1850CH43A-00/21 | 600 | | | | | |
| VFD2200CH43A-00/21 | 800 | | | | | |
| VFD2800CH43A-00 VFD2800CH43C-00/21 | 1000 | | | | | |

7-3 Fuse Specification Chart

- Use only the fuses comply with UL certificated.
- Use only the fuses comply with local regulations.

| 230V Model | Input Current I(A) | Lin | e Fuse |
|-------------------|--------------------|-------|--------------|
| | Super Heavy Duty | I (A) | Bussmann P/N |
| VFD007CH23A-21 | 6.4 | 15 | JJN-15 |
| VFD015CH23A-21 | 12 | 20 | JJN-20 |
| VFD022CH23A-21 | 16 | 30 | JJN-30 |
| VFD037CH23A-21 | 20 | 50 | JJN-50 |
| VFD055CH23A-21 | 28 | 50 | JJN-50 |
| VFD075CH23A-21 | 36 | 60 | JJN-60 |
| VFD110CH23A-21 | 52 | 110 | JJN-110 |
| VFD150CH23A-21 | 72 | 125 | JJN-125 |
| VFD185CH23A-21 | 83 | 150 | JJN-150 |
| VFD220CH23A-00/21 | 99 | 200 | JJN-200 |
| VFD300CH23A-00/21 | 124 | 225 | JJN-225 |
| VFD370CH23A-00/21 | 143 | 300 | JJN-300 |
| VFD450CH23A-00/21 | 171 | 300 | JJN-300 |
| VFD550CH23A-00/21 | 206 | 400 | JJN-400 |
| VFD750CH23A-00/21 | 245 | 500 | JJN-500 |

| 460VModel | Input Current I(A) | Line Fuse | | |
|---------------------------------------|--------------------|-----------|--------------|--|
| 400 11100001 | Super Heavy Duty | I (A) | Bussmann P/N | |
| VFD007CH43A/4EA-21 | 4.3 | 10 | JJS-10 | |
| VFD015CH43A/4EA-21 | 5.9 | 10 | JJS-10 | |
| VFD022CH43A/4EA-21 | 8.7 | 15 | JJS-15 | |
| VFD037CH43A/4EA-21 | 14 | 20 | JJS-20 | |
| VFD055CH43A/4EA-21 | 17 | 40 | JJS-40 | |
| VFD075CH43A/4EA-21 | 20 | 40 | JJS-40 | |
| VFD110CH43A/4EA-21 | 26 | 50 | JJS-50 | |
| VFD150CH43A/4EA-21 | 35 | 70 | JJS-70 | |
| VFD185CH43A/4EA-21 | 40 | 80 | JJS-80 | |
| VFD220CH43A/4EA-21 | 47 | 100 | JJS-100 | |
| VFD300CH43A/4EA-21 | 63 | 150 | JJS-150 | |
| VFD370CH43A-00/21 | 74 | 150 | JJS-150 | |
| VFD370CH43S-21 | 74 | 150 | JJS-150 | |
| VFD450CH43A-00/21 | 101 | 175 | JJS-175 | |
| VFD550CH43A-00/21 | 114 | 250 | JJS-250 | |
| VFD750CH43A-00/21 | 157 | 300 | JJS-300 | |
| VFD900CH43A-00/21 | 167 | 300 | JJS-300 | |
| VFD1100CH43A-00/21 | 207 | 400 | JJS-400 | |
| VFD1320CH43A-00/21 | 240 | 500 | JJS-500 | |
| VFD1600CH43A-00/21 | 300 | 600 | JJS-600 | |
| VFD1850CH43A-00/21 | 380 | 600 | JJS-600 | |
| VFD2200CH43A-00/21 | 400 | 800 | JJS-800 | |
| VFD2800CH43A-00 VFD2800CH43C-00/21 | 494 | 1000 | KTU-1000 | |

* Contact Delta Electronics or an authorized distributor for corresponding fuse of VFD4500C43A/E

7-4 AC/DC Reactor

When the AC Motor Drive is connected directly to a large-capacity power transformer (600kVA or above) or when a phase lead capacitor is switched, excess peak currents may occur in the power input circuit due to the load changes and the converter section may be damaged. To avoid this, it is recommend to use a serial connected AC input reactor (3%) at the AC Motor Drive mains input side to reduce the current and improve the input power efficiency.

AC Input/output Reactor

| 200V~230V/ | 50~60Hz |
|------------|----------|
| | 00 00112 |

| Туре | KW | HP | Rated Amps of AC Reactor (Arms) | Max. continuous Amps (Arms) | 3% impedance (mH) | 5% impedance (mH) | Built-in DC reactor | 3% Input AC reactor Delta part # |
|------|------|-----|---------------------------------------|--------------------------------|-------------------------|-------------------------|------------------------|--|
| 007 | 0.75 | 1 | 5 | 10 | 2.205 | 3.676 | Х | N/A |
| 015 | 1.5 | 2 | 8 | 16 | 1.378 | 2.297 | Х | N/A |
| 022 | 2.2 | 3 | 11 | 22 | 1.002 | 1.671 | Х | N/A |
| 037 | 3.7 | 5 | 17 | 34 | 0.649 | 1.081 | Х | N/A |
| 055 | 5.5 | 7.5 | 25 | 50 | 0.441 | 0.735 | Х | N/A |
| 075 | 7.5 | 10 | 33 | 66 | 0.320 | 0.534 | Х | DR033AP530 |
| 110 | 11 | 15 | 49 | 98 | 0.216 | 0.359 | Х | DR049AP360 |
| 150 | 15 | 20 | 65 | 130 | 0.163 | 0.271 | Х | DR065AP270 |
| 185 | 18.5 | 25 | 75 | 150 | 0.147 | 0.245 | Х | N/A |
| 220 | 22 | 30 | 90 | 180 | 0.123 | 0.204 | 0 | N/A |
| 300 | 30 | 40 | 120 | 240 | 0.092 | 0.153 | 0 | N/A |
| 370 | 37 | 50 | 146 | 292 | 0.076 | 0.126 | 0 | N/A |
| 450 | 45 | 60 | 180 | 360 | 0.061 | 0.102 | 0 | N/A |
| 550 | 55 | 75 | 215 | 430 | 0.051 | 0.085 | 0 | N/A |
| 750 | 75 | 100 | 255 | 510 | 0.043 | 0.072 | 0 | N/A |

380V~460V/ 50~60Hz

| Туре | KW | HP | Rated Amps of AC Reactor (Arms) | Max. continuous Amps (Arms) | 3% impedance (mH) | 5% impedance (mH) | Built-in DC reactor | 3% Input AC reactor Delta part # |
|------|------|-----|---------------------------------------|--------------------------------|-------------------------|-------------------------|------------------------|--|
| 007 | 0.75 | 1 | 3 | 6 | 7.045 | 11.741 | Х | N/A |
| 015 | 1.5 | 2 | 4 | 8 | 5.284 | 8.806 | Х | N/A |
| 022 | 2.2 | 3 | 6 | 12 | 3.522 | 5.871 | Х | N/A |
| 037 | 3.7 | 5 | 9 | 18 | 2.348 | 3.914 | Х | N/A |
| 055 | 5.5 | 7.5 | 12 | 24 | 1.761 | 2.935 | Х | N/A |
| 075 | 7.5 | 10 | 18 | 36 | 1.174 | 1.957 | Х | DR018A0117 |
| 110 | 11 | 15 | 24 | 48 | 0.881 | 1.468 | Х | DR024AP880 |
| 150 | 15 | 20 | 32 | 64 | 0.660 | 1.101 | Х | DR032AP660 |
| 185 | 18.5 | 25 | 38 | 76 | 0.556 | 0.927 | Х | N/A |
| 220 | 22 | 30 | 45 | 90 | 0.470 | 0.783 | Х | N/A |
| 300 | 30 | 40 | 60 | 120 | 0.352 | 0.587 | Х | N/A |
| 370 | 37 | 50 | 73 | 146 | 0.290 | 0.483 | 0 | N/A |
| 450 | 45 | 60 | 91 | 182 | 0.232 | 0.387 | 0 | N/A |
| 550 | 55 | 75 | 110 | 220 | 0.192 | 0.320 | 0 | N/A |
| 750 | 75 | 100 | 150 | 300 | 0.141 | 0.235 | 0 | N/A |
| 900 | 90 | 125 | 180 | 360 | 0.117 | 0.196 | 0 | N/A |
| 1100 | 110 | 150 | 220 | 440 | 0.096 | 0.160 | 0 | N/A |
| 1320 | 132 | 175 | 250 | 500 | 0.085 | 0.141 | 0 | N/A |
| 1600 | 160 | 215 | 310 | 620 | 0.068 | 0.114 | 0 | N/A |
| 1850 | 185 | 250 | 370 | 740 | 0.057 | 0.095 | 0 | N/A |
| 2200 | 220 | 300 | 450 | 900 | 0.047 | 0.078 | 0 | N/A |
| 2800 | 280 | 375 | 550 | 1100 | 0.038 | 0.064 | 0 | N/A |

DC Reactor

200V~230V/ 50~60Hz

| Туре | kW | HP | Rated Amps of AC Reactor | Max. continuous Amps | Inductance (mh) | Part NO. |
|------|------|-----|-----------------------------|----------------------------|-----------------|----------|
| 007 | 0.75 | 1 | 5 | 10 | 5.093 | N/A |
| 015 | 1.5 | 2 | 8 | 16 | 3.183 | N/A |
| 022 | 2.2 | 3 | 11 | 22 | 2.315 | N/A |
| 037 | 3.7 | 5 | 17 | 34 | 1.497 | N/A |
| 055 | 5.5 | 7.5 | 25 | 50 | 1.019 | N/A |
| 075 | 7.5 | 10 | 33 | 66 | 0.740 | N/A |
| 110 | 11 | 15 | 49 | 98 | 0.499 | N/A |
| 150 | 15 | 20 | 65 | 130 | 0.376 | N/A |
| 185 | 18.5 | 25 | 75 | 150 | 0.340 | N/A |

380V~460V/ 50~60Hz

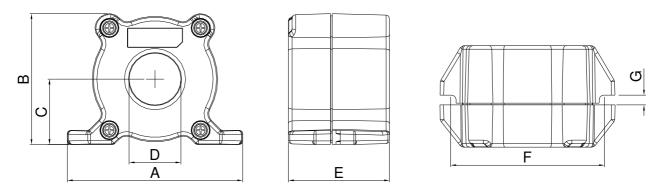
| Туре | kW | HP | Rated Amps of AC Reactor | Max. continuous Amps | Inductance (mh) | Part NO. |
|------|------|-----|-----------------------------|----------------------------|-----------------|----------|
| 007 | 0.75 | 1 | 3 | 6 | 16.269 | N/A |
| 015 | 1.5 | 2 | 4 | 8 | 12.201 | N/A |
| 022 | 2.2 | 3 | 6 | 12 | 8.135 | N/A |
| 037 | 3.7 | 5 | 9 | 18 | 5.423 | N/A |
| 055 | 5.5 | 7.5 | 12 | 24 | 4.067 | N/A |
| 075 | 7.5 | 10 | 18 | 36 | 2.712 | N/A |
| 110 | 11 | 15 | 24 | 48 | 2.033 | N/A |
| 150 | 15 | 20 | 32 | 64 | 1.525 | N/A |
| 185 | 18.5 | 25 | 38 | 76 | 1.284 | N/A |
| 220 | 22 | 30 | 45 | 90 | 1.084 | N/A |
| 300 | 30 | 40 | 60 | 120 | 0.813 | N/A |

THD

| Motor Drive Spec. | | Without Built- | in DC Reactor | | With Built in DC | | |
|-------------------|--|----------------|---------------|------------|------------------------|--|--|
| Motor Drive Opec. | | Without Dulit | | | Reactor | | |
| Reactor Spec. | 20/ Innut | | DC Reactor | DC Reactor | 20/ Input | | |
| | 3% Input | DC Reactor | + 3% Input | + 5% Input | 3% Input AC Reactor | | |
| | AC Reactor | | AC Reactor | AC Reactor | AC Reactor | | |
| THD | 44% | 46% | 34% | 30% | 34% | | |
| Neter | THD may have some differences due to different installation conditions and | | | | | | |
| Note: | environmen | t | | | | | |

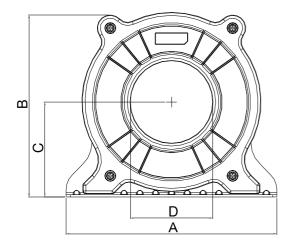
According to IEC61000-3-12, DC Reactor is designed with 4% system impedance, and AC Reactor is designed with 3% system impedance.

7-5 Zero Phase Reactors

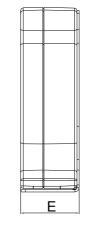


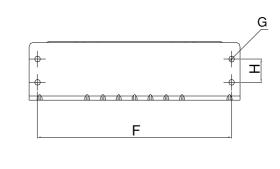
UNIT: mm(inch)

| model | Α | В | С | D | E | F | G(Ø) | Torque |
|-----------|----------------|-----------------|-----------------|---------------|-----------------|---------------|----------------|-------------------------|
| RF008X00A | 98 (3.858) | 73 (2.874) | 36.5 (1.437) | 29 (1.142) | 56.5 (2.224) | 86 (3.386) | 5.5 (0.217) | < 10kgf/cm ² |
| RF004X00A | 110 (4.331) | 87.5 (3.445) | 43.5 (1.713) | 36 (1.417) | 53 (2.087) | 96 (3.780) | 5.5 (0.217) | < 10kgf/cm ² |



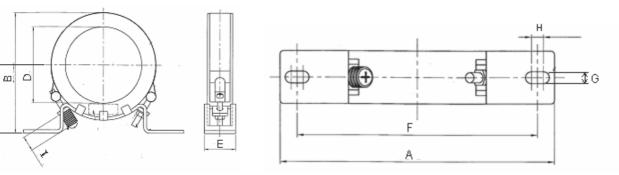
 \odot





UNIT: mm(inch)

| model | Α | В | С | D | E | F | G(Ø) | Н | Torque |
|-----------|----------------|------------------|---------------|---------------|-----------------|----------------|----------------|---------------|------------------------|
| RF002X00A | 200 (7.874) | 172.5 (6.791) | 90 (3.543) | 78 (3.071) | 55.5 (2.185) | 184 (7.244) | 5.5 (0.217) | 22 (0.866) | <45kgf/cm ² |



UNIT: mm(inch)

| model | Α | В | С | D | E | F | G(Ø) | H | Ι |
|-----------|------------|------------|------------|------------|-----------|------------|------------|------------|-----------|
| RF300X00A | 241(9.488) | 217(8.543) | 114(4.488) | 155(6.102) | 42(1.654) | 220(8.661) | 6.5(0.256) | 7.0(0.276) | 20(0.787) |

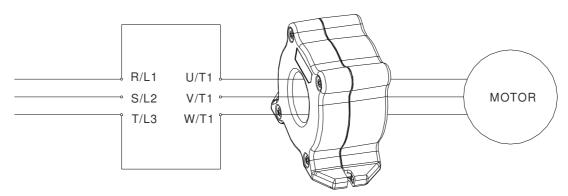
| Reactor model (Note) | Recommen | ded Wire Size | Wiring Method | Qty | Corresponding motor drives |
|-------------------------|--------------|------------------------------|------------------|-----|---|
| RF008X00A | ≦8 AWG | \leq 8.37 mm ² | Diagram A | 1 | VFD007CH23A, VFD015CH23A, VFD022CH23A, VFD037CH23A, VFD007CH43A, VFD015CH43A, VFD022CH43A, VFD037CH43A, VFD055CH43A |
| RF004X00A | \leq 4 AWG | \leq 21.15 mm ² | Diagram A | 1 | VFD055CH23A, VFD075CH23A, VFD110CH23A, VFD075CH43A, VFD110CH43A, VFD150CH43A |
| RF002X00A | ≦2 AWG | \leq 33.62 mm ² | Diagram A | 1 | VFD150CH23A, VFD185CH23A, VFD220CH23A, VFD300CH23A, VFD370CH23A, VFD185CH43A, VFD220CH43A, VFD300CH43A, VFD370CH43A, VFD450CH43A, VFD550CH43A, VFD750CH43A |
| RF300X00A | ≦300 MCM | \leq 152 mm ² | Diagram A | 1 | VFD450CH23A, VFD550CH23A, VFD750CH23A, VFD900CH43A, VFD1100CH43A, VFD1320CH43A, VFD1600CH43A, VFD1850CH43A, VFD2200CH43A, VFD2800CH43A |

Note: 600V insulated cable wire

Diagram A

Please put all wires through at least one core without winding.

Zero Phase Reactor



- Note 1: The table above gives approximate wire size for the zero phase reactors but the selection is ultimately governed by the type and diameter of cable fitted i.e. the cable must fit through the center hole of zero phase reactors.
- Note 2: Only the phase conductors should pass through, not the earth core or screen.
- **Note3:** When long motor output cables are used an output zero phase reactor may be required to reduce radiated emissions from the cable.

7-6 EMI Filter

| | | | | CE Cabl | e Length | Radiation Emission |
|-------------|------------------|--------------------------|-----------------------|-----------------|-----------------|------------------------------|
| Model | input Current | Applicable EMI Filter | Zero Phase Reactor | default carrie | er frequency | default carrier frequency |
| | ounon | | (locolo) | EN61800-3 C1 | EN61800-3 C2 | EN61800-3 C2 |
| VFD007CH23A | 6.4A | | | 50m | 100m | 100m |
| VFD015CH23A | 12A | EMF021A23A | RF008X00A | 50m | 100m | 100m |
| VFD022CH23A | 16A | EIVIFU2TA23A | RF006A00A | 50m | 100m | 100m |
| VFD037CH23A | 20A | | | 50m | 100m | 100m |
| VFD055CH23A | 28A | | | 50m | 100m | 100m |
| VFD075CH23A | 36A | EMF056A23A | RF004X00A | 50m | 100m | 100m |
| VFD110CH23A | 52A | | | 50m | 100m | 100m |
| VFD150CH23A | 76A | | | 50m | 100m | 100m |
| VFD185CH23A | 83A | KMF3100A | | 50m | 100m | 100m |
| VFD220CH23A | 99A | | RF002X00A | 50m | 100m | 100m |
| VFD300CH23A | 124A | B84143D0150R127 | | 50m | 100m | 100m |
| VFD370CH23A | 143A | D04143D0150R127 | | 50m | 100m | 100m |
| VFD450CH23A | 171A | | | 50m | 100m | 100m |
| VFD550CH23A | 206A | B84143B0250S020 | RF300X00A | 50m | 100m | 100m |
| VFD750CH23A | 245A | | | 50m | 100m | 100m |
| VFD007CH43A | 4.3A | | | 50m | 100m | 100m |
| VFD015CH43A | 5.9A | EMF014A43A | | 50m | 100m | 100m |
| VFD022CH43A | 8.7A | | RF008X00A | 50m | 100m | 100m |
| VFD037CH43A | 14A | | | 50m | 100m | 100m |
| VFD055CH43A | 17A | EMF018A43A | | 50m | 100m | 100m |
| VFD075CH43A | 20A | | | 50m | 100m | 100m |
| VFD110HC43A | 26A | EMF039A43A | RF004X00A | 50m | 100m | 100m |
| VFD150CH43A | 35A | | | 50m | 100m | 100m |
| VFD185CH43A | 40A | | | 50m | 100m | 100m |
| VFD220CH43A | 47A | KMF370A | | 50m | 100m | 100m |
| VFD300CH43A | 63A |] | | 50m | 100m | 100m |
| VFD370CH43A | 74A | | RF002X00A | 50m | 100m | 100m |
| VFD450CH43A | 101A | | | 50m | 100m | 100m |
| VFD550CH43A | 114A | B84143D0150R127 | | 50m | 100m | 100m |
| VFD750CH43A | 157A | | | 50m | 100m | 100m |

| | | Applicable EMI Filter | Zero Phase Reactor | CE Cabl | e Length | Radiation Emission |
|--------------|------------------|--------------------------|-----------------------|-----------------|-----------------|------------------------------|
| Model | input Current | | | default carrie | er frequency | default carrier frequency |
| | Guiloin | | i locoloi | EN61800-3 C1 | EN61800-3 C2 | EN61800-3 C2 |
| VFD900CH43A | 167A | | | 50m | 100m | 100m |
| VFD1100CH43A | 207A | B84143D0200R127 | | 50m | 100m | 100m |
| VFD1320CH43A | 240A | MIF3400B | | 50m | 100m | 100m |
| VFD1600CH43A | 300A | WIF3400B | RF300X00A | 50m | 100m | 100m |
| VFD1850CH43A | 380A | | | 50m | 100m | 100m |
| VFD2200CH43A | 400A | MIF3800 | | 50m | 100m | 100m |
| VFD2800CH43A | 494A | | | 50m | 100m | 100m |

EMI Filter Installation

All electrical equipment, including AC motor drives, will generate high-frequency/low-frequency noise and will interfere with peripheral equipment by radiation or conduction when in operation. By using an EMI filter with correct installation, much interference can be eliminated. It is recommended to use DELTA EMI filter to have the best interference elimination performance.

We assure that it can comply with following rules when AC motor drive and EMI filter are installed and wired according to user manual:

- EN61000-6-4
- EN61800-3: 1996

EN55011 (1991) Class A Group 1 (1st Environment, restricted distribution)

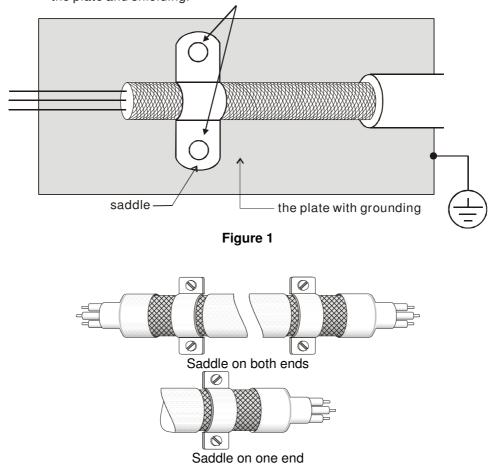
General precaution

- 1. EMI filter and AC motor drive should be installed on the same metal plate.
- 2. Please install AC motor drive on footprint EMI filter or install EMI filter as close as possible to the AC motor drive.
- 3. Please wire as short as possible.
- 4. Metal plate should be grounded.
- 5. The cover of EMI filter and AC motor drive or grounding should be fixed on the metal plate and the contact area should be as large as possible.

Choose suitable motor cable and precautions

Improper installation and choice of motor cable will affect the performance of EMI filter. Be sure to observe the following precautions when selecting motor cable.

- 1. Use the cable with shielding (double shielding is the best).
- 2. The shielding on both ends of the motor cable should be grounded with the minimum length and maximum contact area.
- 3. Remove any paint on metal saddle for good ground contact with the plate and shielding.



Remove any paint on metal saddle for good ground contact with the plate and shielding.

Figure 2

The length of motor cable

When motor is driven by an AC motor drive of PWM type, the motor terminals will experience surge voltages easily due to components conversion of AC motor drive and cable capacitance. When the motor cable is very long (especially for the 460V series), surge voltages may reduce insulation quality. To prevent this situation, please follow the rules below:

- Use a motor with enhanced insulation.
- Connect an output reactor (optional) to the output terminals of the AC motor drive

■ The length of the cable between AC motor drive and motor should be as short as possible (10 to 20 m or less)

For models 7.5hp and above:

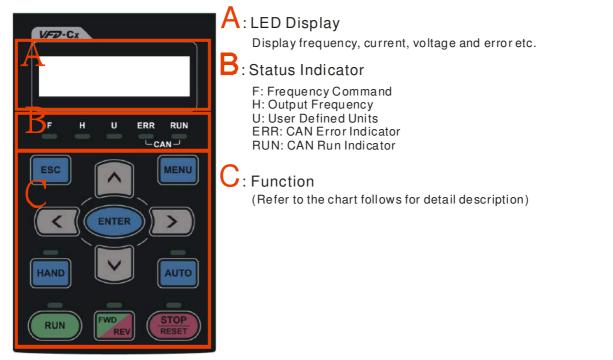
| Insulation level of motor | 1000V | 1300V | 1600V |
|---------------------------|----------------|----------------|----------------|
| 460VAC input voltage | 66 ft (20m) | 328 ft (100m) | 1312 ft (400m) |
| 230VAC input voltage | 1312 ft (400m) | 1312 ft (400m) | 1312 ft (400m) |

■ For models 5hp and less:

| Insulation level of motor | 1000V | 1300V | 1600V |
|---------------------------|---------------|---------------|---------------|
| 460VAC input voltage | 66 ft (20m) | 165 ft (50m) | 165 ft (50m) |
| 230VAC input voltage | 328 ft (100m) | 328 ft (100m) | 328 ft (100m) |

7-7 Digital Keypad

7-7-1 KPC-CE01

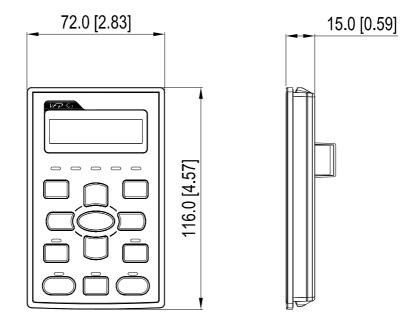


| Key | Description | | | | | |
|---------|--|--|--|--|--|--|
| ESC | ESC Key | | | | | |
| | Press ESC key to return to the previous page. It also functions as a return to last category key in the sub-menu. | | | | | |
| MENU | Menu Key | | | | | |
| | Press MENU key under any condition will return to the main MENU. | | | | | |
| | Menu content: | | | | | |
| | 1. Parameter Detail3. Keypad locked2. Copy Parameter4. PLC Function | | | | | |
| ENTER | ENTER Key | | | | | |
| | Press ENTER and go to the next level. If it is the last level then press ENTER to execute the command. | | | | | |
| HAND | HAND ON Key | | | | | |
| | 1. HAND key will operates according to the parameter settings when the source of HAND master frequency | | | | | |
| | command and the source of HAND operation command is properly set,. The factory setting of the source | | | | | |
| | command for frequency and operation are from the digital keypad. | | | | | |
| | 2. Press HAND key in stop status, the drive setting switches to the parameter setting of HAND. Press HAND | | | | | |
| | key in during operation, the drive will come to stop then switches to the parameter setting of HAND. | | | | | |
| | 3. When process complete: H/A LED ON. | | | | | |
| AUTO | Auto Operation Key | | | | | |
| | 1. AUTO function executes according to the parameter settings of the source of AUTO frequency and AUTO | | | | | |
| | operation. The factory setting is the external terminal (source of operation is 4-20mA). | | | | | |
| | 2. Press the ATUO key in stop status, the drivel switches to auto-setting. Press the auto key during operat | | | | | |
| | status, the drivel will come to stop and switch to auto-setting. 3. When process complete: H/A LED is OFF | | | | | |
| FWD/REV | Operation Direction Key | | | | | |
| | 1. FWD/REV key controls the operation direction but will NOT activate the drive. FWD: forward, REV: reverse. | | | | | |
| | 2. The drive operates in the direction as shown by the LED light. | | | | | |
| RUN | Start Key | | | | | |
| | 1. This button is functional only when the keypad is the source of the command. | | | | | |
| | 2. This button allows the motor drive to run by following its settings. See Description of LED functions for LED | | | | | |
| | status | | | | | |
| | 3. Press repeatedly the "RUN" button is allow while the motor drive is stopping. | | | | | |
| STOP | Stop Key. | | | | | |
| | 1. STOP key has the highest priority in command. | | | | | |
| | 2. Press STOP key, the drive will come to stop under any condition. | | | | | |
| | 3. The RESET key can be used to reset the drive when faults occur. If the RESET key is not responding, check MENU → Fault Records and check the most recent fault. | | | | | |
| | | | | | | |

Descriptions of LED Functions

| LED | Descriptions | | | | | |
|----------------|--|---|--|--|--|--|
| RUN | Steady ON: operation indicator of the AC motor drive, including DC brake, zero speed, standby, restart after fault and speed search. Blinking: drive is decelerating to stop or in the status of base block. Steady OFF: drive doesn't execute the operation command | | | | | |
| STOP | Steady ON: stop indicator of the AC motor drive. Blinking: drive is in the standby status. Steady OFF: drive doesn't execute "STOP" command. | | | | | |
| FWD | Operation Direction LED 『Green light= Forward』;『Red light= Reversely』 Steady ON: the drive is running forward. Blinking: the drive is changing direction. Steady Off: the drive is running reversely. | | | | | |
| | RUN (Gree LED status OFF | Condition/State CANopen at initial | | | | |
| CANopen ~"RUN" | Blinking | CANopen at pre-operation | | | | |
| | Single flash | CANopen at stopped | | | | |
| | ON CANopen at operation status No LED | | | | | |
| | ERR (Red | | | | | |
| | LED status | Condition/ State | | | | |
| | OFF Single | No Error | | | | |
| | flash | One message fail | | | | |
| CANopen ~"ERR" | Double flash | Guarding fail or heartbeat fail ON 200 200 200 100 ms ms ms ms ms | | | | |
| | Triple flash | ON 200 200 200 200 100 OFF ms ms ms ms ms | | | | |
| | ON | Bus off | | | | |
| | | | | | | |

7-7-2 Dimension



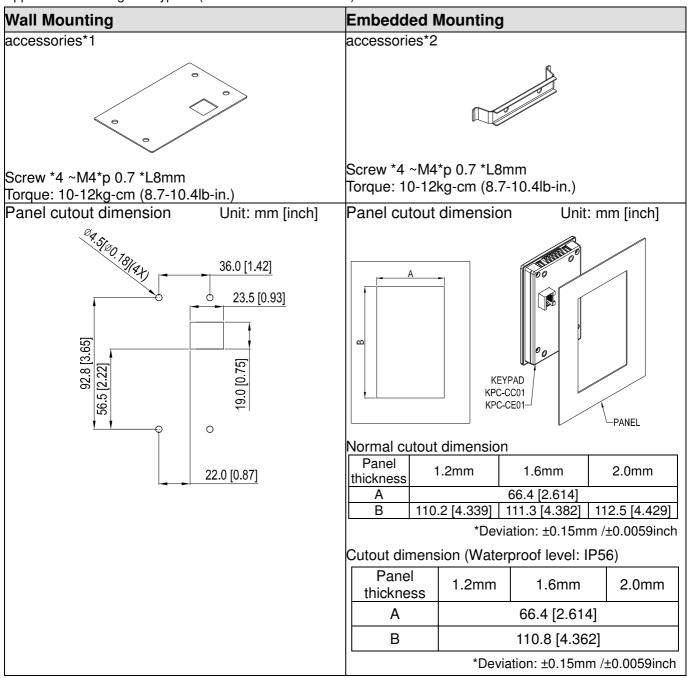
7-7-3 RJ45 Extension Lead for Digital Keypad

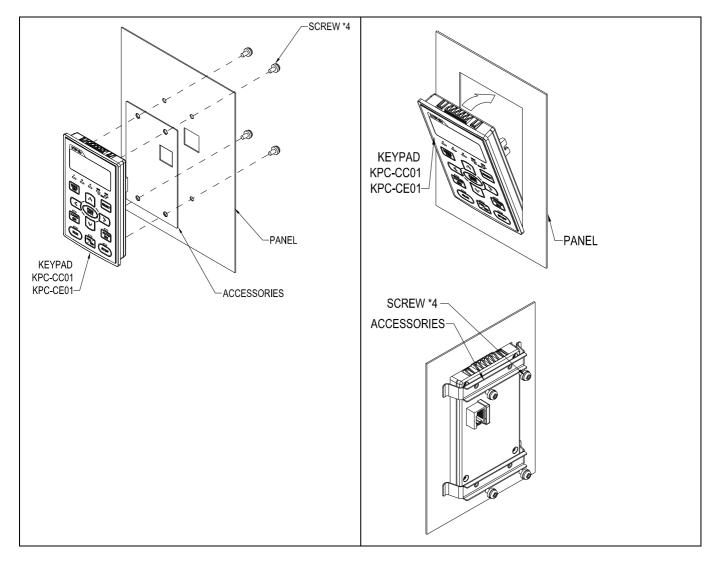
| Part # | Description | |
|-----------|---|--|
| CBC-K3FT | 3 feet RJ45 extension lead (approximately 0.9m) | |
| CBC-K5FT | 5 feet RJ45 extension lead (approximately 1.5 m) | |
| CBC-K7FT | 7 feet RJ45 extension lead (approximately 2.1 m) | |
| CBC-K10FT | 10 feet RJ45 extension lead (approximately 3 m) | |
| CBC-K16FT | 16 feet RJ45 extension lead (approximately 4.9 m) | |

7-8 Panel Mounting (MKC-KPPK)

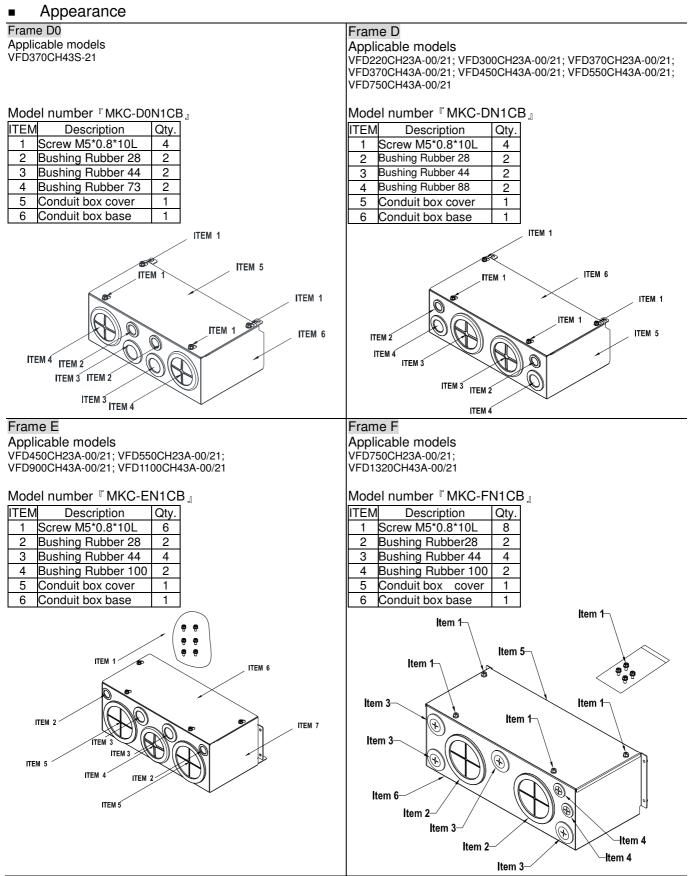
For MKC-KPPK model, user can choose wall mounting or embedded mounting, protection level is IP56.

Applicable to the digital keypads (KPC-CC01 & KPC-CE01).





7-9 Conduit Box Kit



Frame G Applicable models VFD1600CH43A-00/21;VFD1850CH43A-00/21; VFD2200CH43A-00/21

Model number [®] MKC-GN1CB _』 ITEM Description Qty. Screw M5* .8*10L 12 1 2 Bushing Rubber 28 2 2 3 3 Bushing Rubber 44 Bushing Rubber 130 Conduit box cover 4 1 5 Conduit box base 1 6 ITEM 1 ITEM 5 Q ITEM 2 ITEM 3

ITEM 4

ITEM

ITEM 4

ITEM

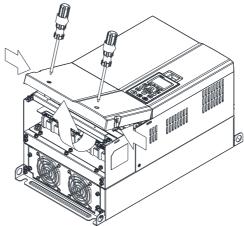
ITEM 4

ITEM 6

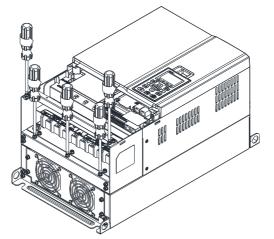
Conduit Box Installation

Frame D0

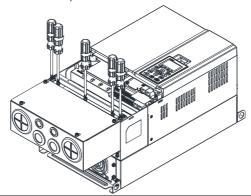
1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure. Screw torque: 12~15kg-cm (10.4~13 lb-in)



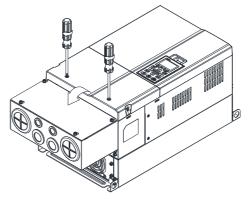
2. Remove the 5 screws shown in the following figure. Screw torque:24~26kg-cm (20.8~22.6lb-in)



3. Install the conduit box by fasten the 5 screws shown in the following figure. Screw torque:24~26kg-cm (20.8~22.6lb-in)

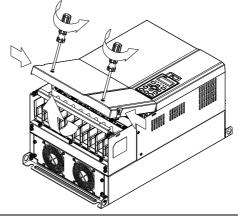


4. Fasten the 2 screws shown in the following figure. Screw torque: 12~15kg-cm (10.4~13 lb-in)

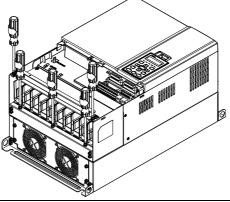


Frame D

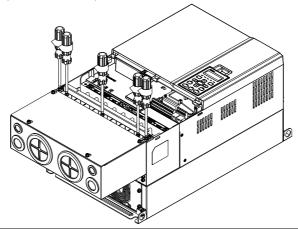
1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure. Screw torque: 12~15kg-cm (10.4~13 lb-in)



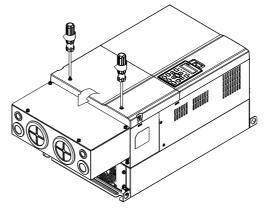
2. Remove the 5 screws shown in the following figure. Screw torque:24~26kg-cm (20.8~22.6lb-in)



3. Install the conduit box by fasten the 5 screws shown in the following figure. Screw torque:24~26kg-cm (20.8~22.6lb-in)

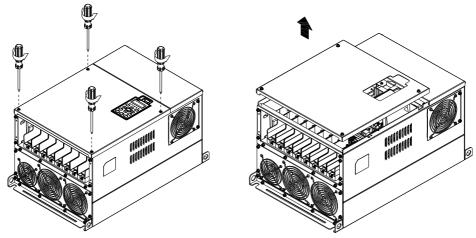


4. Fasten the 2 screws shown in the following figure. Screw torque: 12~15kg-cm (10.4~13 lb-in)

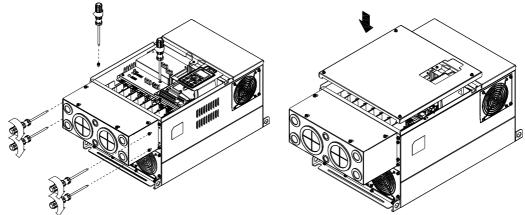


Frame E

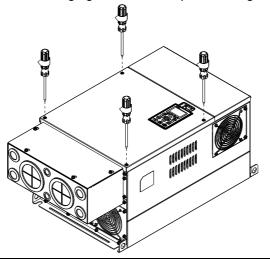
1. Loosen the 4 cover screws and lift the cover; Screw torque: 12~ 15 kg-cm (10.4~13lb-in).



2. Fasten the 6 screws shown in the following figure and place the cover back to the original position. Screw torque: 24~26kg-cm (20.8~22.6lb-in).

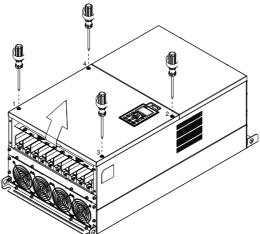


3. Fasten the 4 screws shown in the following figure. Screw torque:12~15kg-cm (10.4~13lb-in) _

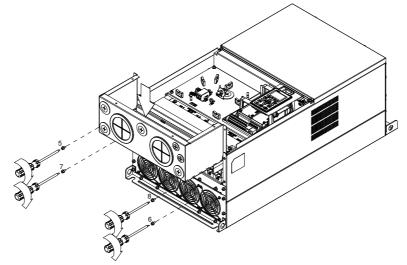


Frame F

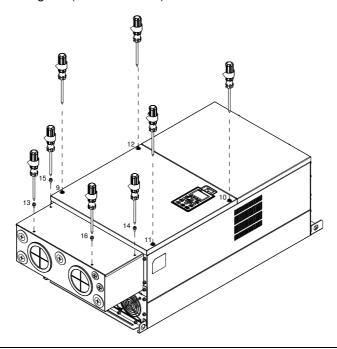
1. Loosen the cover screws and press the tabs on each side of the cover to remove the cover, as shown in the following figure. Screw torque: 12~15kg-cm (10.4~13 lb-in).



2. Install the conduit box by fastens the 4 screws, as shown in the following figure. Screw torque: 24~26kg-cm (20.8~22.6lb-in).

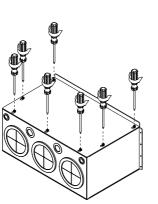


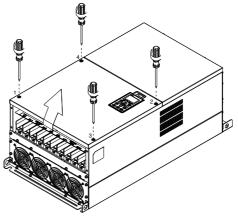
 Install the conduit box by fasten all the screws shown in the following figure Screw 9~12 torque: 12~15kg-cm (10.4~13.6lb-in) Screw 13~16 torque: 24~26kg-cm (20.8~22.6lb-in)



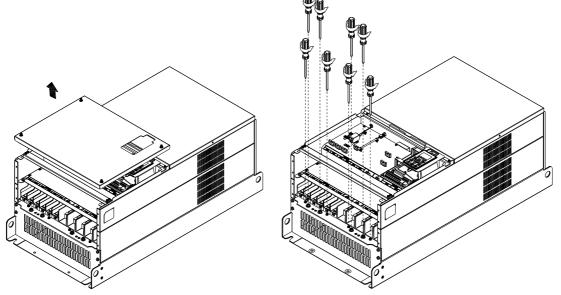
Frame G

On the conduit box, loosen 7 of the cover screws and remove the cover
 Screw torque: 24~26kg-cm
 (20.8~22.6lb-in)
 . On the drive, loosen 4 of the cover screws and press the tabs on each side of the cover to
 remove the cover, as shown in the following figure. Screw torque: 12~15kg-cm (10.4~13lb-in).

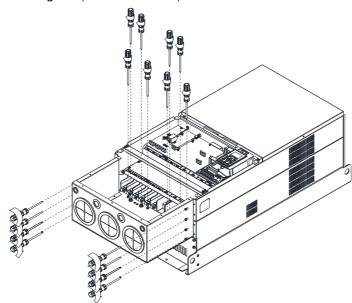




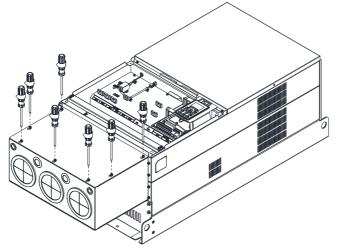
Remove the top cover and loosen the screws. M5 Screw torque: 24~26kg-cm (20.8~22.6lb-in) M8 Screw torque: 100~120kg-cm (86.7~104.1lb-in)



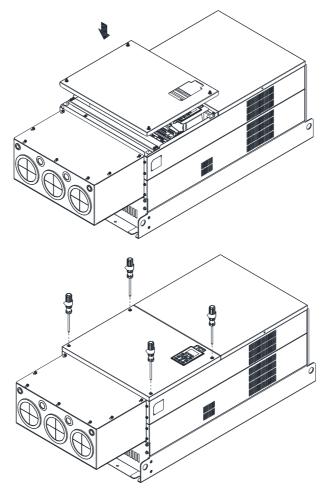
 Install the conduit box by fastening all the screws shown in the following figure. M5 Screw torque: 24~26kg-cm (20.8~22.6lb-in) M8 Screw torque: 100~120kg-cm (86.7~104.1lb-in)



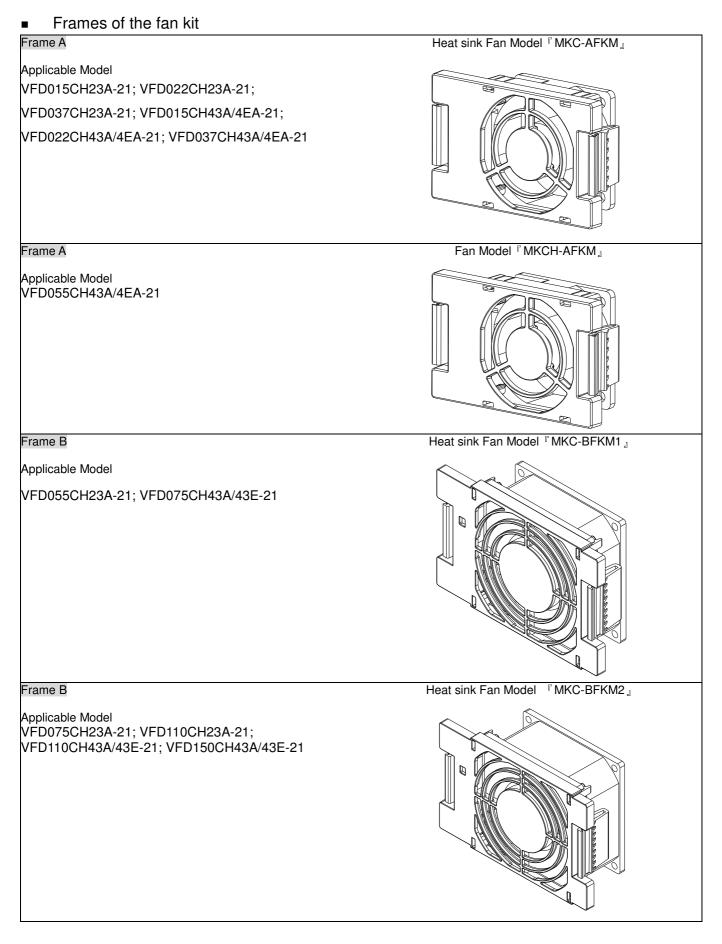
Fasten all the screws. Screw torque: 24~26kg-cm (20.8~22.6lb-in).

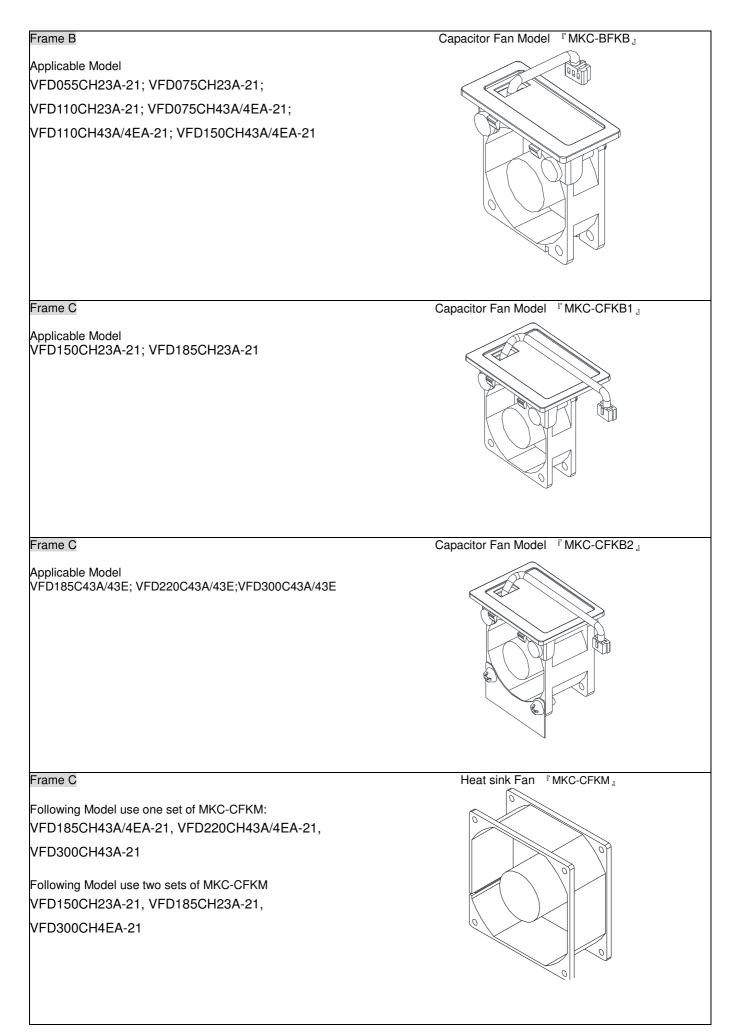


Place the cover back to the top and fasten the screws (as shown in the figure). Screw torque: $12 \sim 15$ kg-cm ($10.4 \sim 13$ lb-in).



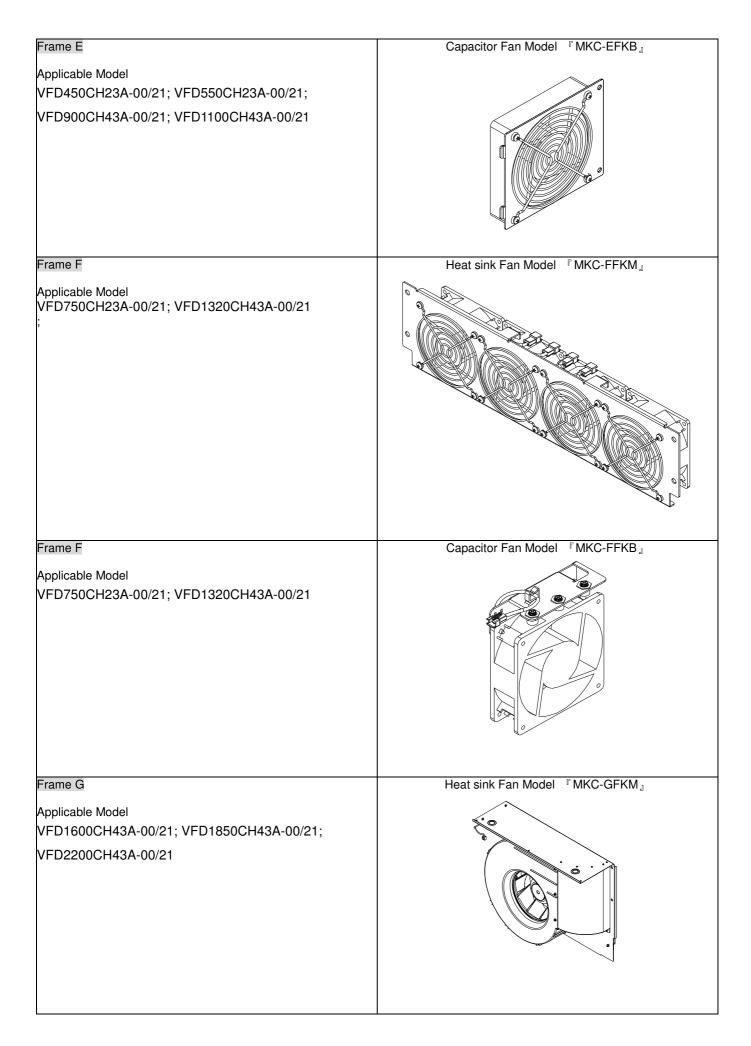
7-10 Fan Kit



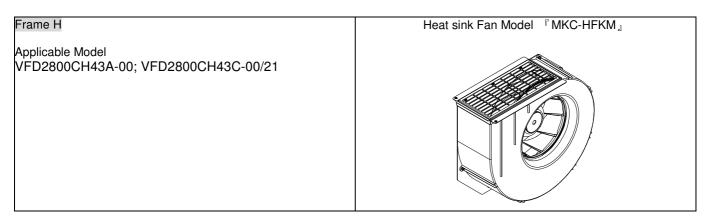


Chapter 7 Optional Accessories

| E | List sight Face Market | Orneriten Fen Medel |
|--|---------------------------------------|-----------------------------------|
| Frame D0 | Heat sink Fan Model 『MKC-D0FKM』 | Capacitor Fan Model 『MKC-DFKB』 |
| Applicable Model VFD370CH43S-00/21 | o o o o o o o o o o o o o o o o o o o | |
| Frame D | Heat sink Fan Model 『MKC-DFKM』 | Capacitor Fan Model 『MKC-DFKB』 |
| Applicable Model VFD220CH23A-00/21; VFD300CH23A-00/21; VFD370CH23A-00/21; VFD370CH43A-00/21; VFD450CH43A-00/21; VFD550CH43A-00/21; VFD750CH43A-00/21 | | |
| Frame E | Heat sink Fan Mode | I 『MKC-EFKM1』 |
| Applicable Model VFD450CH23A-00/21; VFD550CH23A-00/21 | | |
| Frame E | Heat sink Fan Mode | el 『MKC-EFKM2』 |
| Applicable Model VFD900CH43A-00/21; VFD1100CH43A-00/21 | | |



Chapter 7 Optional Accessories



Fan Removal

Frame A

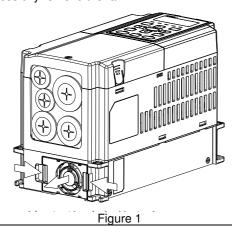
Model 『 MKC-AFKM 』: Heat Sink Fan

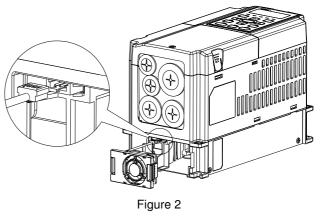
Applicable model

VFD015CH23A-21; VFD022CH23A-21; VFD037CH23A-21; VFD015CH43A/4EA-21; VFD022CH43A/4EA-21; VFD037CH43A/4EA-21 1. Refer to Figure 1, press the tabs on both side of the fan to 2. Disconnect the power terminal before removing the fan.

successfully remove the fan.

(As shown below.)





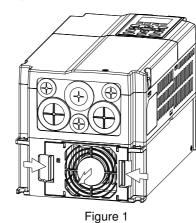
Frame B

Model 『 MKC-BFKM1 』 Heat Sink Fan

Applicable model

VFD055CH23A-21; VFD075CH43A/43E-21

- 1. Refer to Figure 1, press the tab on both side of the fan to 2. successfully remove the fan.
- Disconnect the power terminal before removing the fan. (As shown below.)



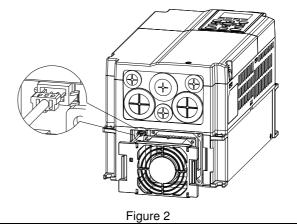


Figure 2

Frame B

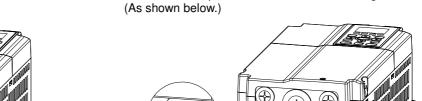
Model "MKC-BFKM2 J Heat Sink Fan

Applicable model

VFD075CH23A-21; VFD110CH23A-21; VFD110CH43A/43E-21; VFD150CH43A/43E-21 2. Disconnect the power terminal before removing the fan.

1. Refer to Figure 1, press the tab on both side of the fan to successfully remove the fan.

Figure 1





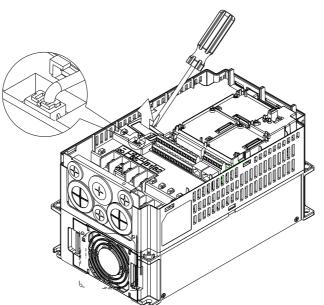
Frame B

Model 『 MKC-BFKB 』Capacitor Fan

Applicable model

VFD055CH23A-21; VFD075CH23A-21; VFD110CH23A-21; VFD075CH43A/4EA-21; VFD110CH43A/4EA-21; VFD150CH43A/4EA-21

Disconnect fan power and pull out the fan by using flathead screwdriver. (As shown in the larger picture)



Frame C

Model 『 MKC-CFKM 』Heat Sink Fan

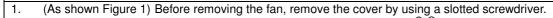
Applicable model

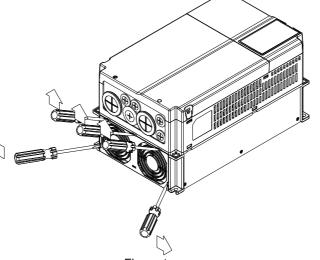
Single fan kit applicable models (only fan kit 1 is required to be installed):

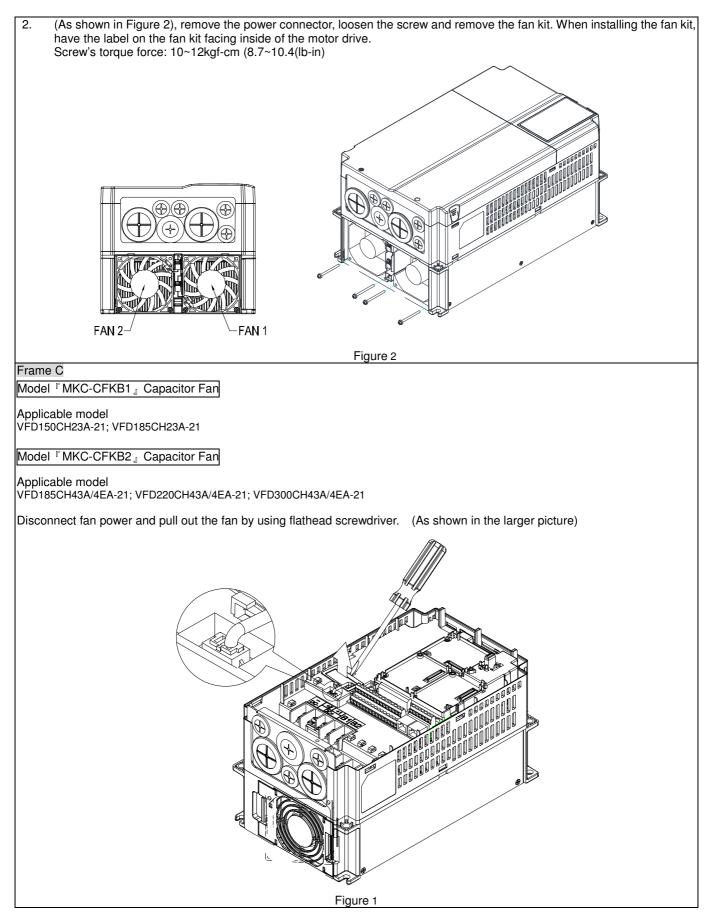
VFD185CH43A/4EA-21, VFD220CH43A/4EA-21, VFD300CH43A-21

Duo fan kit applicable models (both fan kit 1 and 2 are required to be installed):

VFD150CH23A-21, VFD185CH23A-21, VFD300CH4EA-21









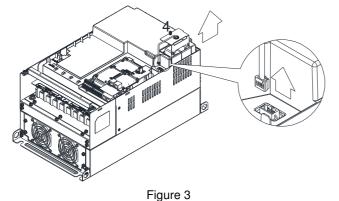
Model 『MKC-DFKB』Capacitor Fan

Applicable model

- VFD370CH43S-00/21
 Loosen screw 1 and screw 2, press the tab on the right and 2. left to remove the cover, follow the direction the arrows indicate. Press on top of digital keypad to properly remove it. Screw 1, 2 ^r Torque :12~15kgf-cm (8.6~10.4lb-in) ^a

Figure 1

 Loosen screw 4 (figure 3) and disconnect fan power and pull out the fan. (As shown in the enlarged picture 3) Screw 4 [『] Torque : 10~12kgf-cm (8.6~10.4lb-in) 』

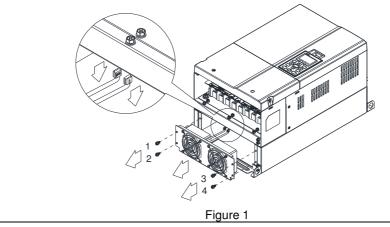


Frame D0

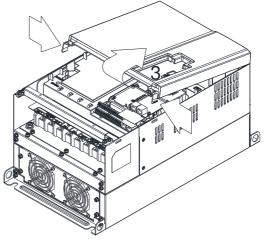
Model 『MKC-D0FKM』Heat Sink Fan

Applicable model

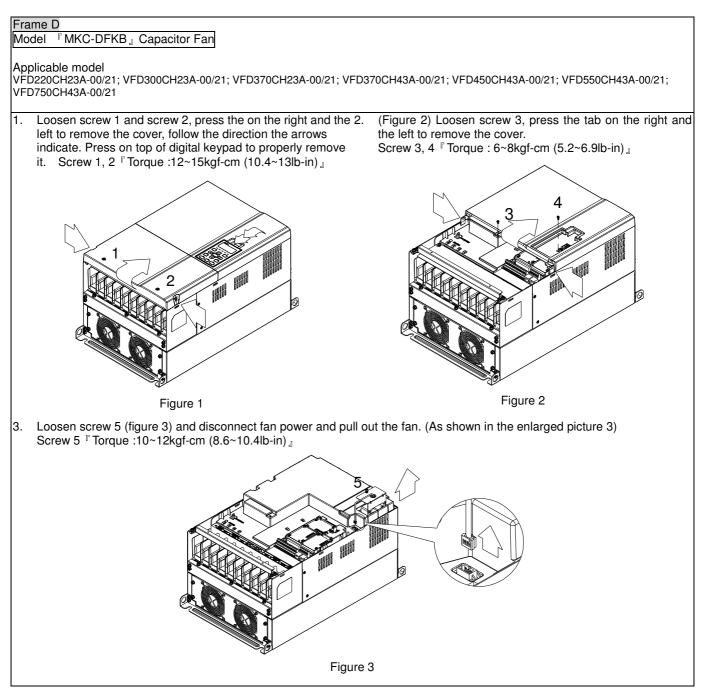
- VFD370CH43S-21
- 1. Loosen the screw and remove the fan kit. $\[\]$ Screw torque: 24~26kgf-cm (20.8~22.6lb-in) $\]$
- 2. (As shown Figure 1) Before removing the fan, remove the cover by using a slotted screwdriver.



(Figure 2) Loosen screw 3, press the tab on the right and the left to remove the cover. Screw 3 ^r Torque : 6~8kgf-cm (5.2~6.9lb-in) ^a







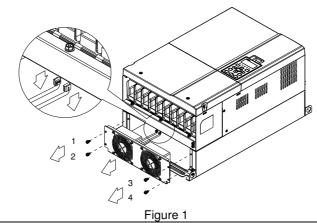
Frame D

Model 『MKC-DFKM』Heat Sink Fan

Applicable model

VFD220CH23A-00/21; VFD300CH23A-00/21; VFD370CH23A-00/21; VFD370CH43A-00/21; VFD450CH43A-00/21; VFD550CH43A-00/21; VFD750CH43A-00/21; VFD750CH43A-00/21

- 1. Loosen the screw and remove the fan kit. Screw torque: 24~26kgf-cm (20.8~22.6lb-in) _
- 2. (As shown Figure 1) Before removing the fan, remove the cover by using a slotted screwdriver.



Frame E

Applicable model

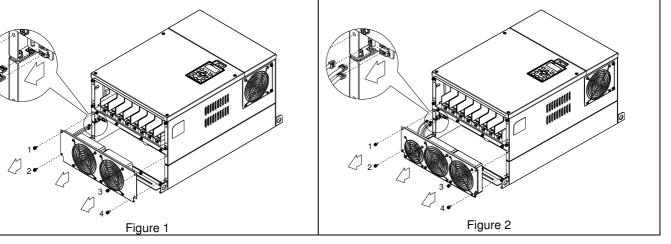
VFD450CH23A-00/21; VFD550CH23A-00/21; VFD900CH43A-00/21; VFD1100CH43A-00/21

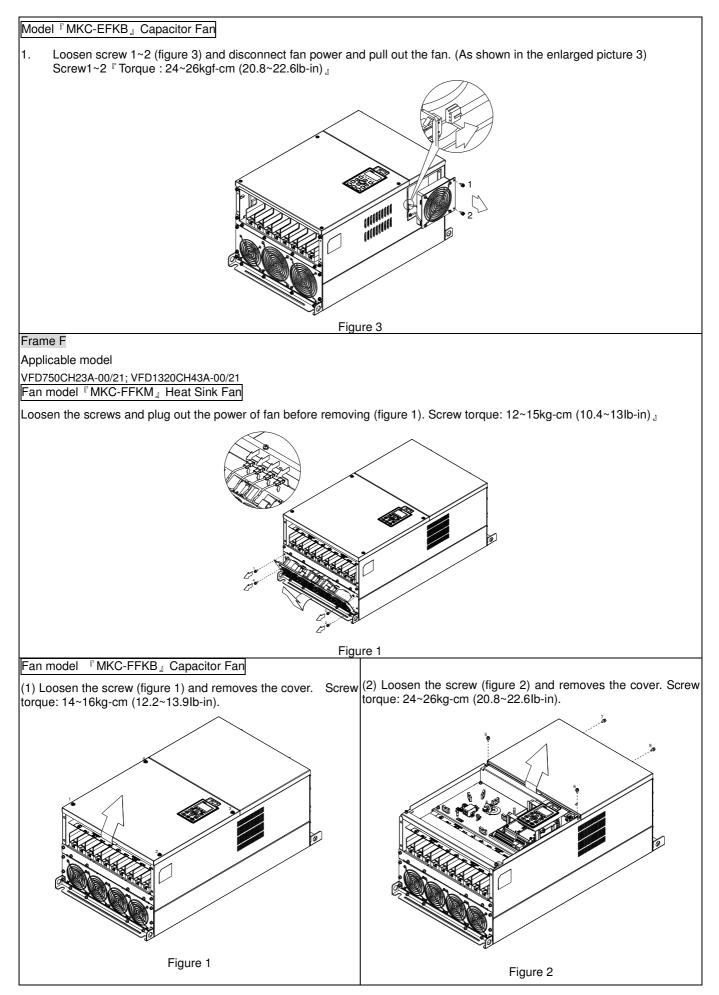
Model 『 MKC-EFKM1 』 Heat Sink Fan

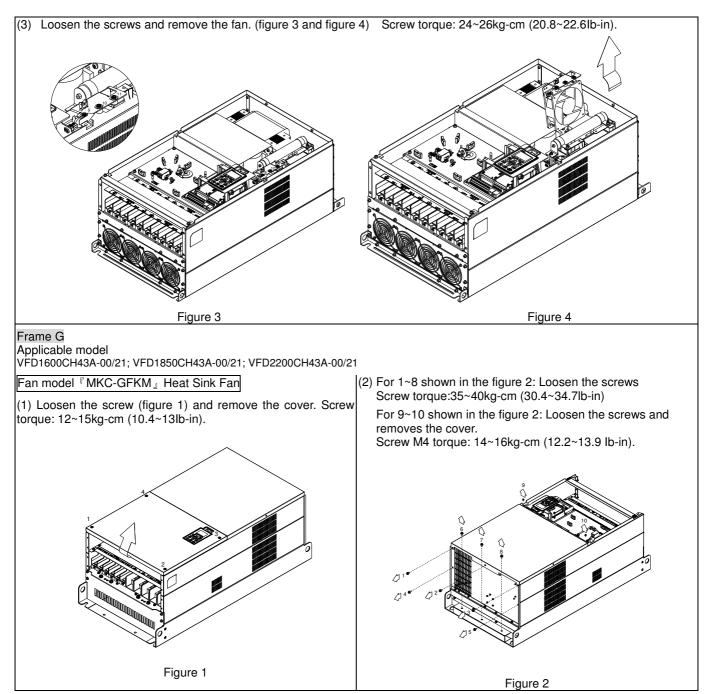
 Loosen screw 1~4 (figure 1) and disconnect fan power and pull out the fan. (As shown in the enlarged picture 3) Screw1~4 ^r Torque : 24~26kgf-cm (20.8~22.6lb-in) ^a

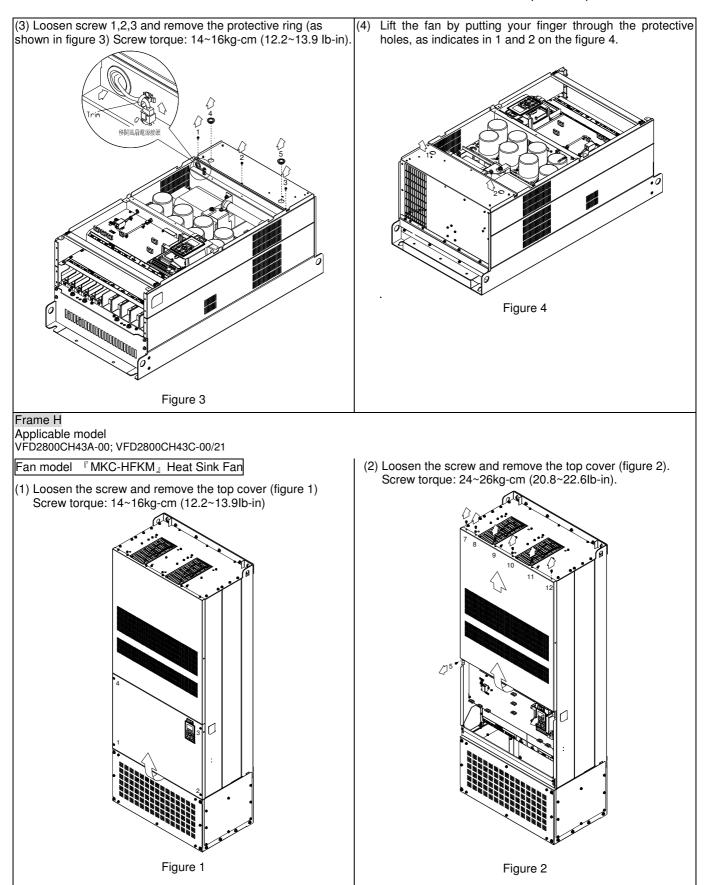
Model 『MKC-EFKM2』Heat Sink Fan

 Loosen screw 1~4 (figure 2) and disconnect fan power and pull out the fan. (As shown in the enlarged picture 3) Screw1~4 [[] Torque : 24~26kgf-cm (20.8~22.6lb-in)]

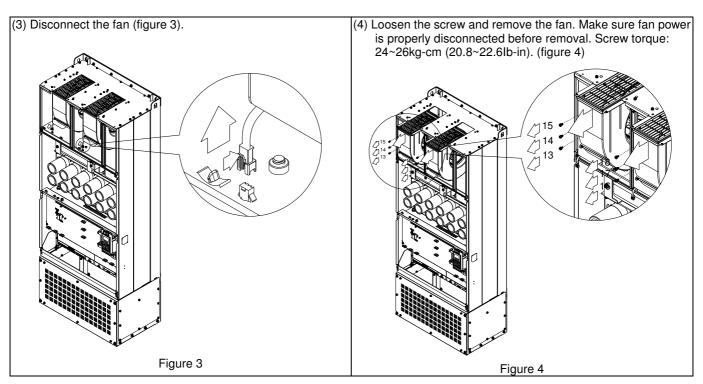








Chapter 7 Optional Accessories



7-11 Flange Mounting Kit

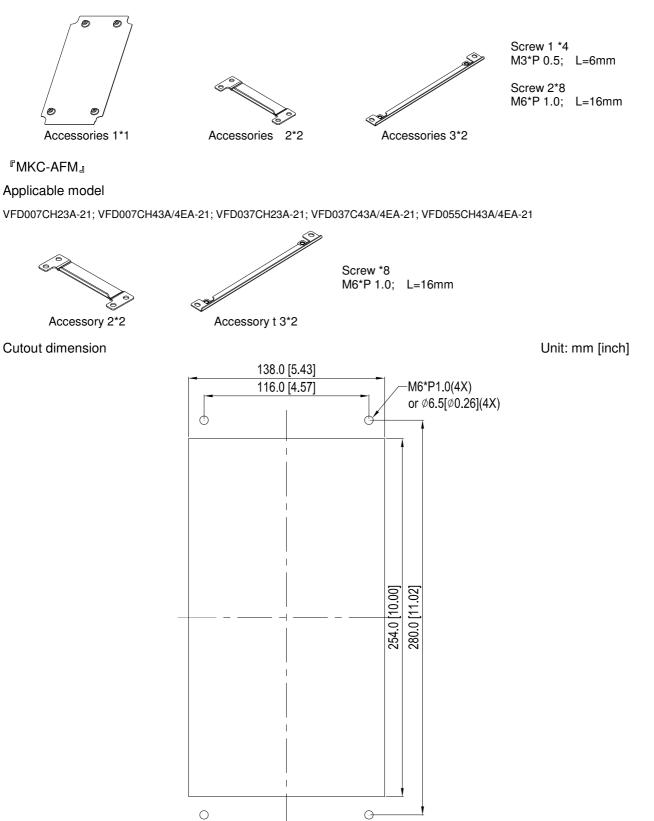
Applicable Models, Frame A~F

Frame A

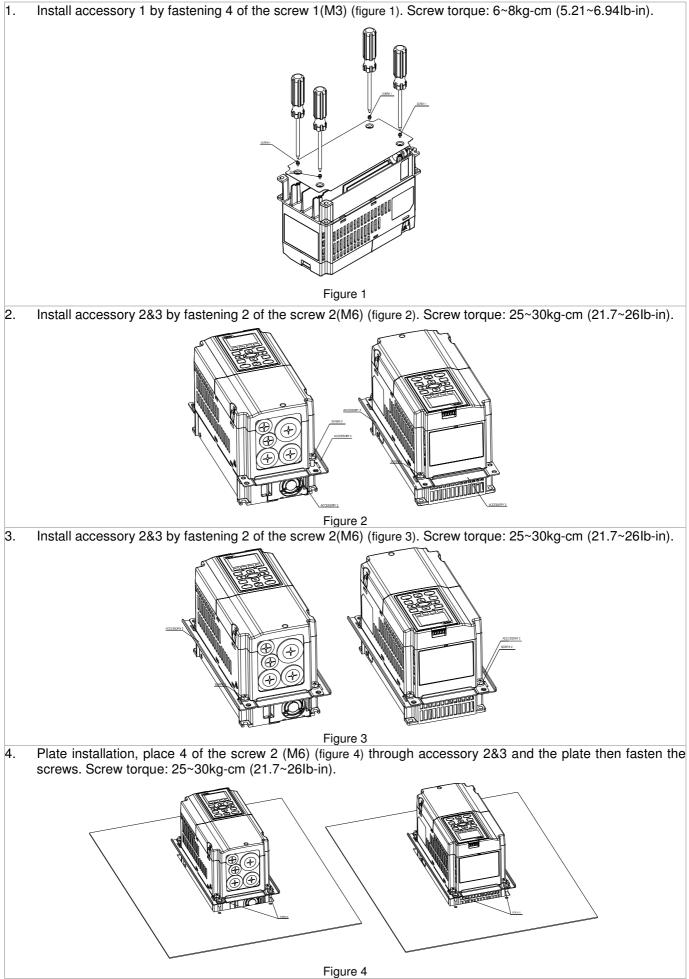
『MKC-AFM1』

Applicable model

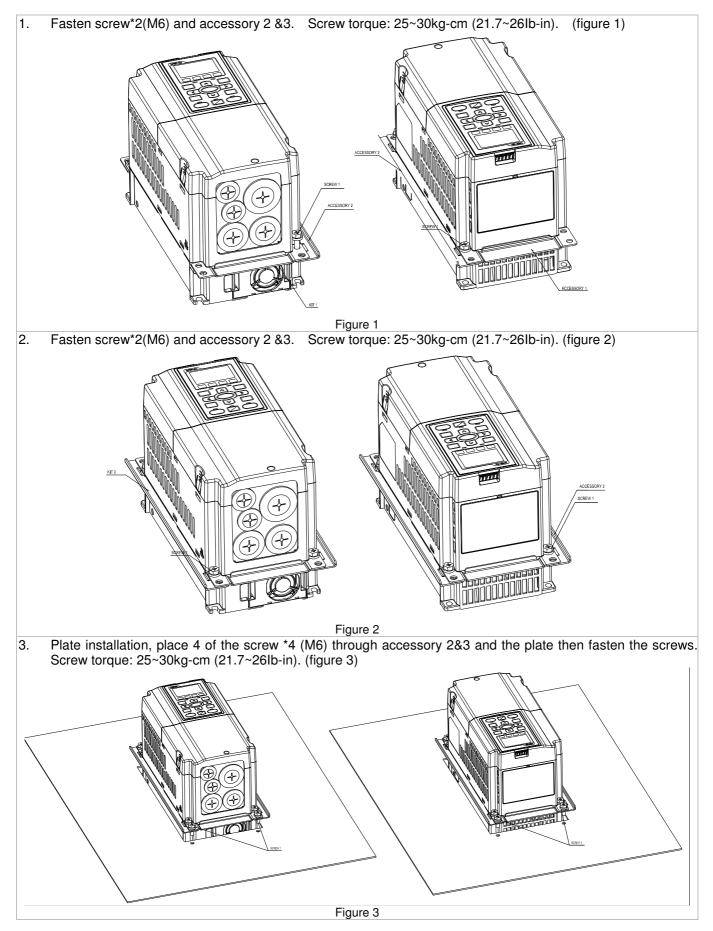
VFD015CH23A-21;VFD015CH43A/4EA-21; VFD022CH23A-21; VFD022CH43A/4EA-21



『MKC-AFM1』 Installation



[®]MKC-AFM₂ Installation



Frame B

MKC-BFM』

Applicable model

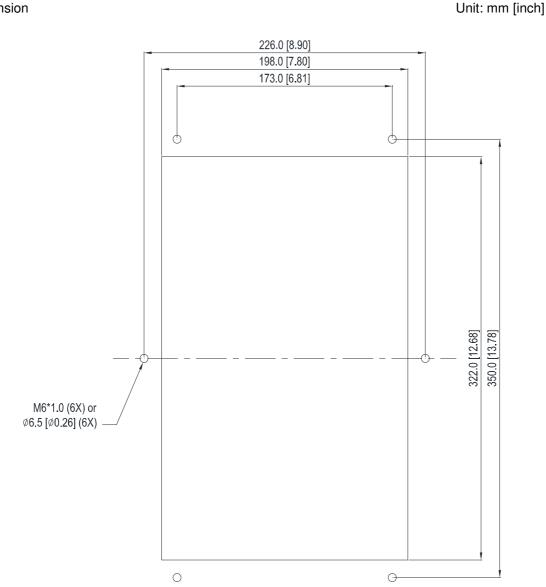
VFD055CH23A-21; VFD075CH23A-21; VFD110CH23A-21; VFD075CH43A/4EA-21; VFD110CH43A/4EA-21; VFD150CH43A/4EA-21



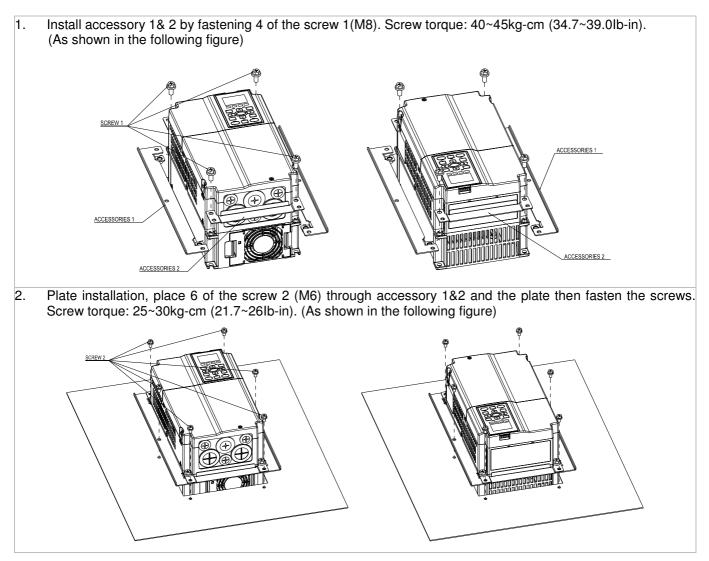
R 2*2

Screw 1 *4 ~ M8*P 1.25; Screw 2*6 ~ M6*P 1.0;

Cutout dimension



[®]MKC-BFM₂ Installation



Frame C

Applicable model

VFD150CH23A-21; VFD185CH23A-21; VFD185CH43A/4EA-21; VFD220CH43A/4EA-21; VFD300CH43A/4EA-21

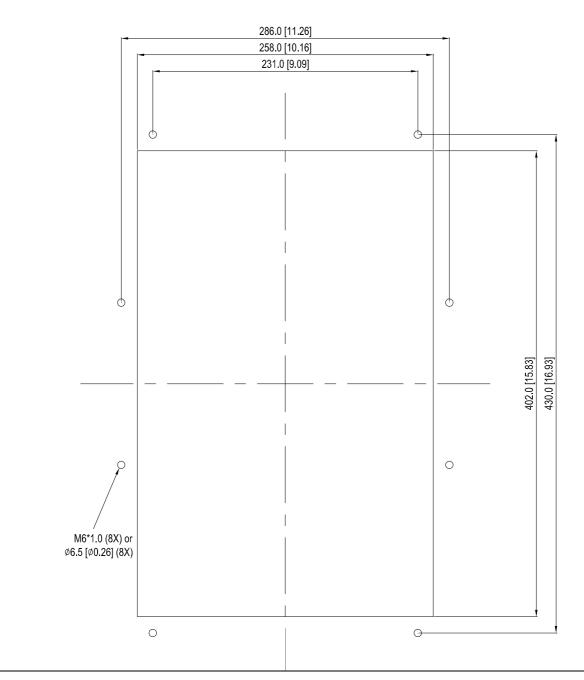




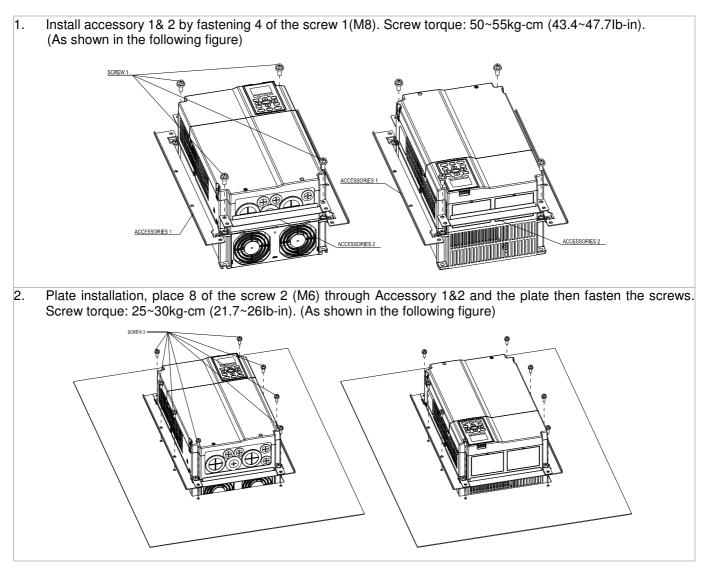
Screw 1*4 ~ M8*P 1.25; Screw 2*8 ~ M6*P 1.0;

Accessory 1*2

Cutout dimension



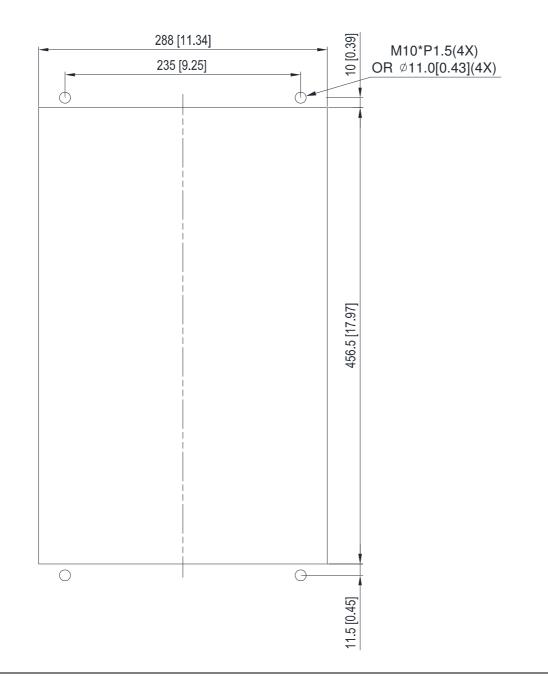
[®]MKC-CFM₂ Installation



Frame D0

Applicable model VFD370CH43S-00

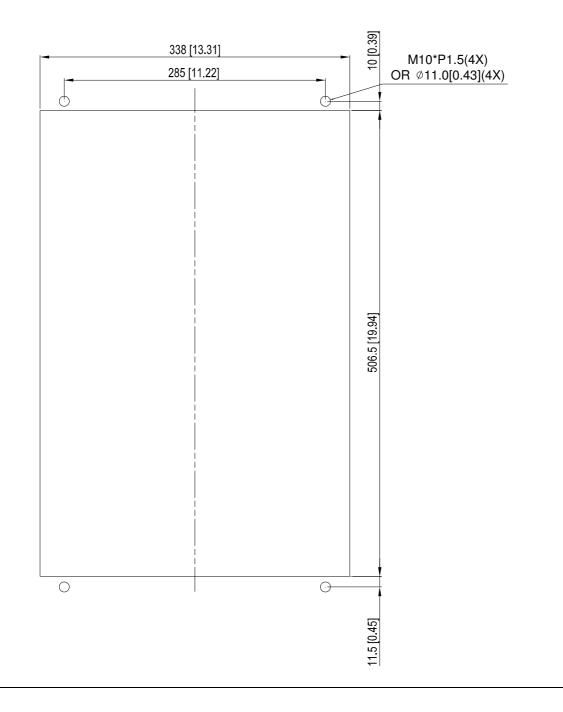
Cutout dimension



Applicable model

VFD220CH23A-00; VFD300CH23A-00; VFD370CH23A-00; VFD370CH43A-00; VFD450CH43A-00; VFD550CH43A-00; VFD750CH43A-00

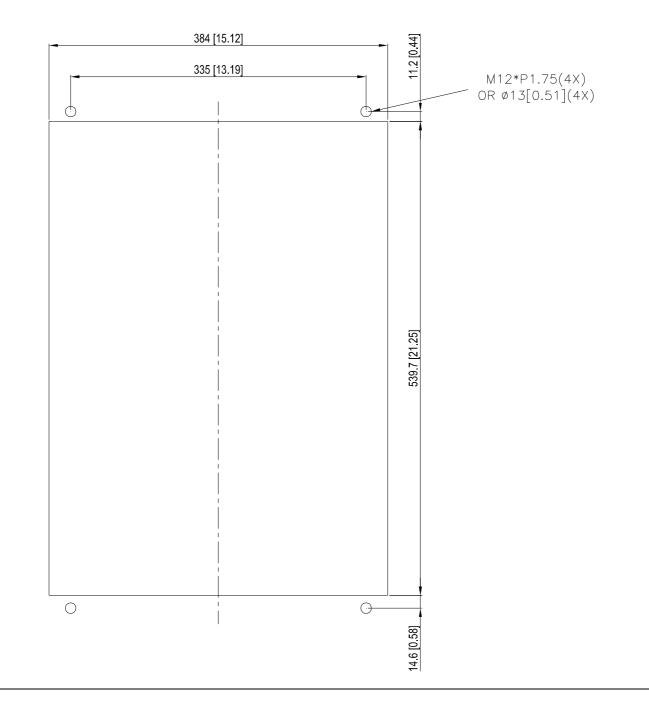
Cutout dimension



Frame E

Applicable model VFD450CH23A-00; VFD550CH23A-00; VFD900CH43A-00; VFD1100CH43A-21

Cutout dimension



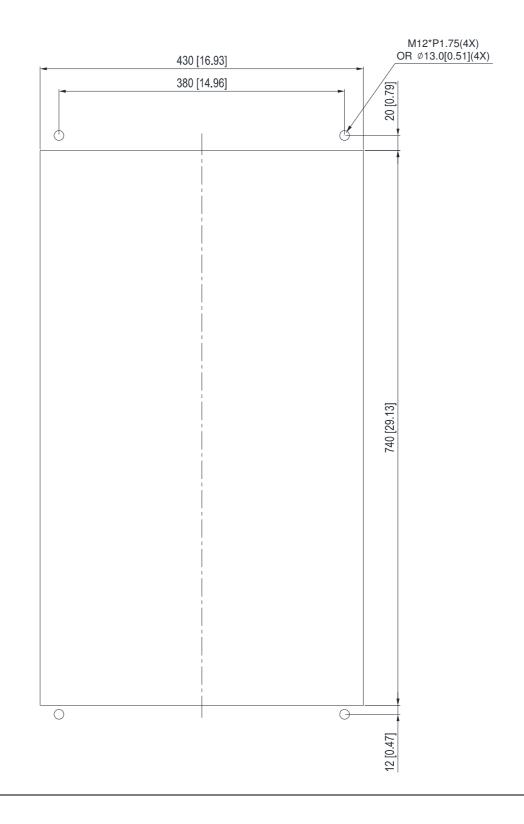
Frame D0&D&E

1. Loosen 8 screws and remove Fixture 2 (as shown in 2. Loosen 10 screws and remove Fixture 1 (as shown the following figure). in the following figure). 3. Fasten 4 screws (as shown in the following figure). Fasten 5 screws (as shown in the following figure). 4. Screw torque: 30~32kg-cm (26.0~27.8lb-in). Screw torque: 30~32kg-cm (26.0~27.8lb-in). Fasten 5 screws (as shown in the following figure). 5. Fasten 4 screws (as shown in the following figure). 6. Screw torque: 24~26kg-cm (20.8~22.6lb-in). Screw torque: 24~26kg-cm (20.8~22.6lb-in). 7. Place 4 screws (M10) through Fixture 1&2 and the plate then fasten the screws. (as shown in the following figure) Frame D0/D M10*4 Screw torque: 200~240kg-cm (173.6~208.3lb-in). Frame E M12*4 Screw torque: 300~400kg-cm (260~347lb-in). FIXTURE 1

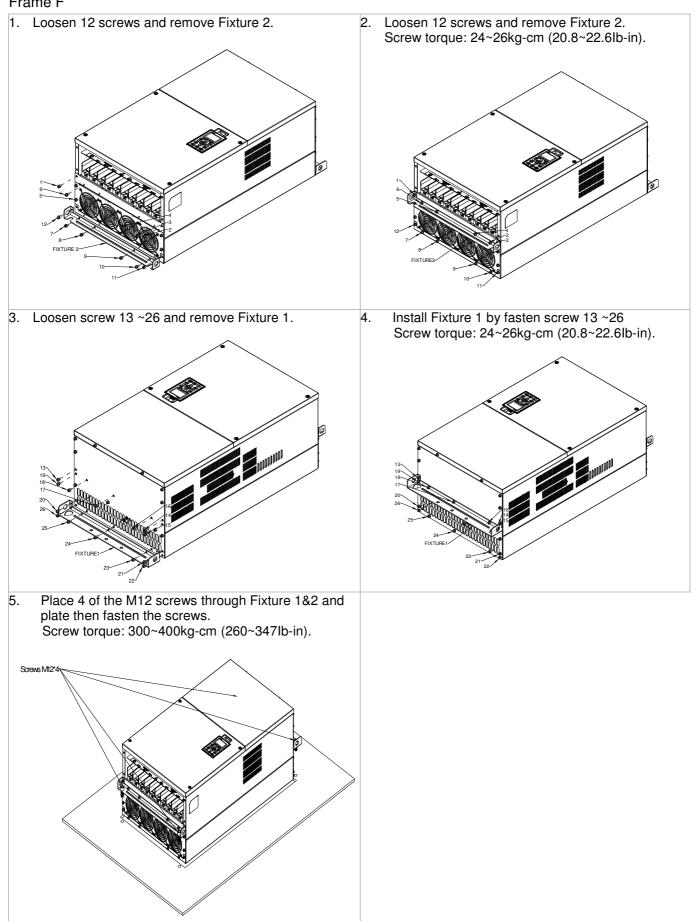
Frame F

Applicable model VFD750CH23A-00; VFD1320CH43A-00

Cutout dimension



Frame F



7-12 USB/RS-485 Communication Interface IFD6530

🕂 Warning

✓ Please thoroughly read this instruction sheet before installation and putting it into use.

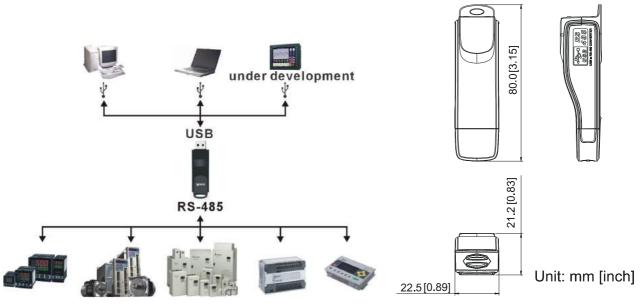
✓ The content of this instruction sheet and the driver file may be revised without prior notice. Please consult our distributors or download the most updated instruction/driver version at http://www.delta.com.tw/product/em/control/cm/control_cm_main.asp

1. Introduction

IFD6530 is a convenient RS-485-to-USB converter, which does not require external power-supply and complex setting process. It supports baud rate from 75 to 115.2kbps and auto switching direction of data transmission. In addition, it adopts RJ-45 in RS-485 connector for users to wire conveniently. And its tiny dimension, handy use of plug-and-play and hot-swap provide more conveniences for connecting all DELTA IABU products to your PC.

Applicable Models: All DELTA IABU products.

(Application & Dimension)



2. Specifications

| Power supply | No external power is needed | |
|---|--|--|
| Power consumption | 1.5W | |
| Isolated voltage | 2,500VDC | |
| Baud rate | 75, 150, 300, 600, 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 115,200 bps | |
| RS-485 connector | RJ-45 | |
| USB connector | A type (plug) | |
| Compatibility | Full compliance with USB V2.0 specification | |
| Max. cable length | RS-485 Communication Port: 100 m | |
| Support RS-485 half-duplex transmission | | |

RJ-45



| PIN | Description |
|-----|-------------|
| 1 | Reserved |
| 2 | Reserved |
| 3 | GND |
| 4 | SG- |

| PIN | Description |
|-----|-------------|
| 5 | SG+ |
| 6 | GND |
| 7 | Reserved |
| 8 | +9V |

3. Preparations before Driver Installation

Please extract the driver file (IFD6530_Drivers.exe) by following steps. You could find driver file (IFD6530_Drivers.exe) in the CD supplied with IFD6530.

Note: DO NOT connect IFD6530 to PC before extracting the driver file.

STEP 1 STEP 2 InstallShield Wizard InstallShield Wizard License Agreement Please read the following license agreement carefully 2 Welcome to the InstallShield Wizard for Silicon Laboratories CP210x Evaluation Kit Tools Press the PAGE DOWN key to see the rest of the agreement. The InstallShieldR Wizard will install Silicon Laboratories CP210x Evaluation Kit Tools Release 3.31 on your computer. To continue, click Next. 1 END-USER LICENSE AGREEMENT IMPORTANT: READ CAREFULLY BEFORE AGREEING TO TERMS THIS PRODUCT CONTAINS CERTAIN COMPUTER PROGRAMS AND OTHER THIRD PARTY PROPRIETARY MATERIAL ("LICENSED PRODUCT"), THE USE OF WHICH IS SUBJECT TO THIS END-USER LICENSE AGREEMENT, INDICATING YOUR AGREEMENT COMSTITUTES YOUR AND IF APPLICABLE) YOUR COMPANY'S ASSENT TO AND ACCEPTANCE OF THIS END-USER LICENSE AGREEMENT (THE Do you accept all the terms of the preceding License Agreement? If you choose No, the setup will close. To install Silicon Laboratories CP210x Evaluation Kit Tools Release 3.31 , you must accept this agreement. < Back Yes Next> No Cancel

STEP 3

| InstallShield Wizard | | |
|--|--------------------------------|--------------|
| Choose Destination Location Select folder where Setup will install files. | | No. |
| Setup will install Silicon Laboratories CP210x Ev. in the following folder. | aluation Kit Tools Release 3 | 131 |
| To install to this folder, click Next. To install to a another folder. | different folder, olick Browse | e and select |
| Destination Folder C:\SiLabs\MCU\CP210x | | Browse |
| | | |
| InstallShield | < Back Next> | Cancel |



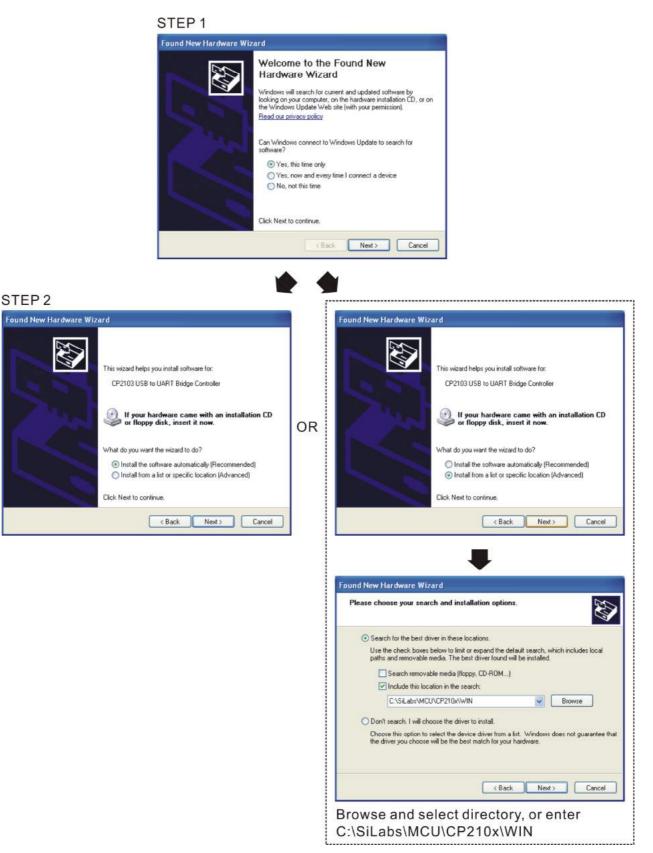
| InstallShield Wizard | |
|----------------------|--|
| | InstallShield Wizard Complete Setup has finished installing Silicon Laboratories CP210x Evaluation Kit Tools Release 3.31 on your computer. |
| | K∄ack Finish Cancel |

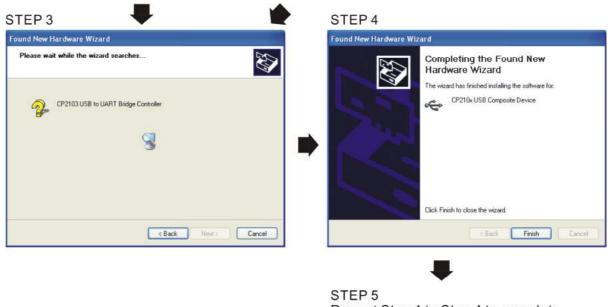
STEP 5

You should have a folder marked SiLabs under drive C. c:\ SiLabs

4. Driver Installation

After connecting IFD6530 to PC, please install driver by following steps.





Repeat Step 1 to Step 4 to complete COM PORT setting.

5. LED Display

- 1. Steady Green LED ON: power is ON.
- 2. Blinking orange LED: data is transmitting.

Chapter 8 Option Cards

| 8-1 | Removed Key Cover |
|-----|-------------------|
| | |

8-2 Srews Specification for Option Card Terminals

8-3 EMC-D42A

8-4 EMC-D611A

8-5 EMC-R6AA

8-6 EMC-BPS01

8-7 EMC-PG01/02L

8-8 EMC-PG01/02O

8-9 EMC-PG01/02U

8-10 EMC-PG01R

8-11 CMC-MOD01

8-12 CMC-PD01

8-13 CMC-DN01

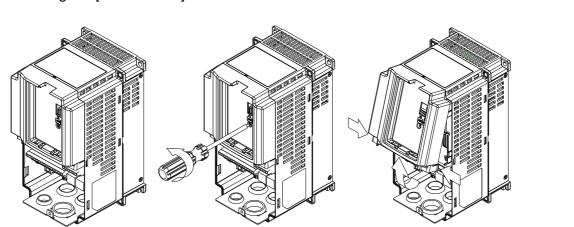
8-14 CMC-EIP01

8-15 EMC-COP01

Please select applicable option cards for your drive or contact local distributor for suggestion. To prevent drive damage during installation, please removes the digital keypad and the cover before wiring. Refer to the following instruction.

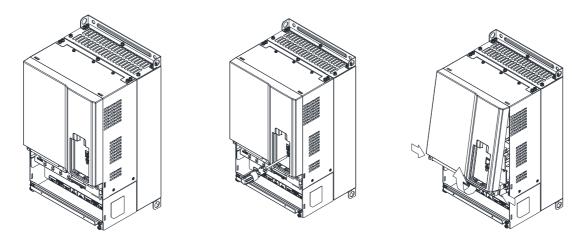
8-1 Removed key cover

Frame A & B & C Screw Torque: 8~10Kg-cm [6.9~8.7lb-in.]



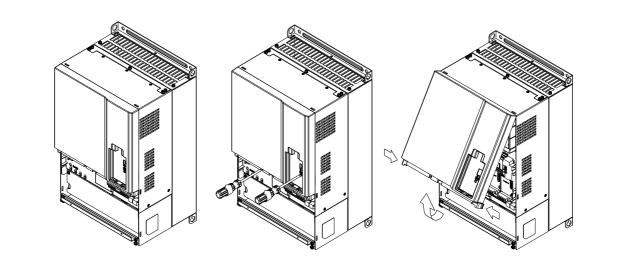
Frame D0

Screw Torque: 8~10Kg-cm [6.9~8.7lb-in.]

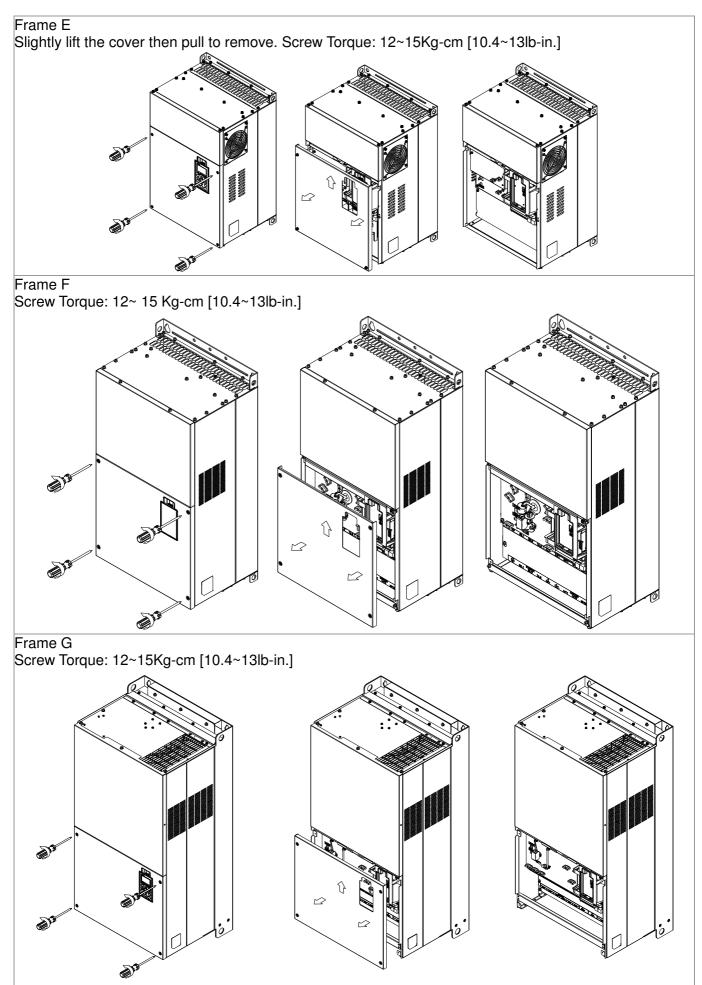


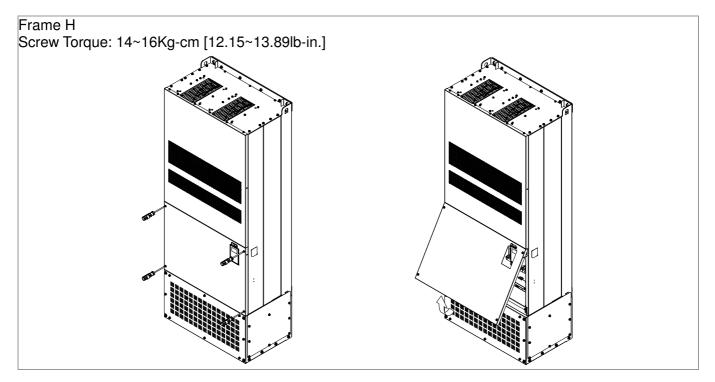
Frame D

Screw Torque: 8~10Kg-cm [6.9~8.7lb-in.]



Chapter 8 Optional Cards



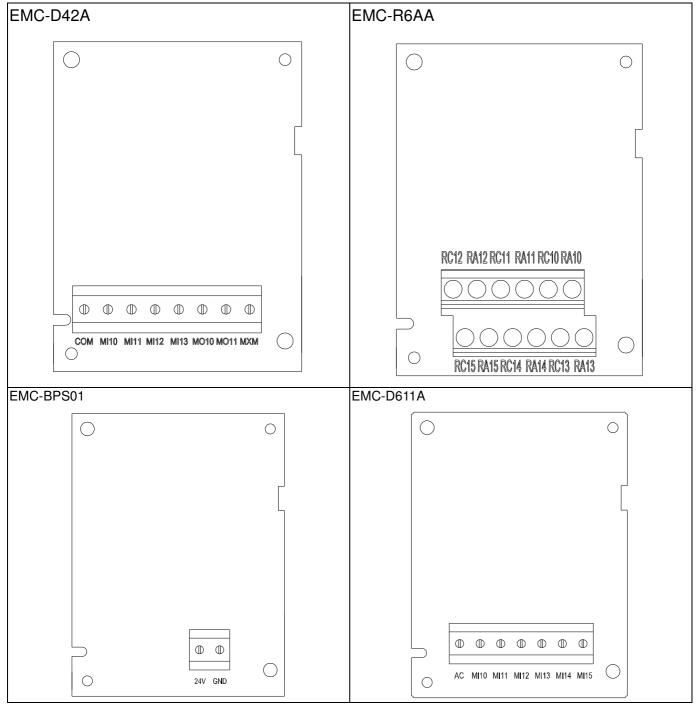


| | 1 | RJ45 (Socket) for digital keypad |
|-------------------|---|---|
| | | KPC-CC01; KPC-CE01 |
| | | Please refer to CH10 Digital Keypad for more details on |
| | | KPC-CE01. |
| | | Please refer to CH10 Digital Keypad for more details on |
| | | optional accessory RJ45 extension cable. |
| | 2 | Communication extension card (Slot 1) |
| (4) Slot 2 Slot 1 | | CMC-MOD01; CMC-PD01; |
| | | CMC-DN01; CMC-EIP01; |
| | | EMC-COP01; |
| | 3 | I/O & Relay extension card (Slot 3) |
| | | EMC-D42A; EMC-D611A; |
| | | EMC-R6AA; EMC-BPS01; |
| | 4 | PG Card (Slot 2) |
| | | EMC-PG01L; EMC-PG02L; |
| | | EMC-PG010; EMC-PG020; |
| | | EMC-PG01U; EMC-PG02U; |
| | | EMC-PG01R; |

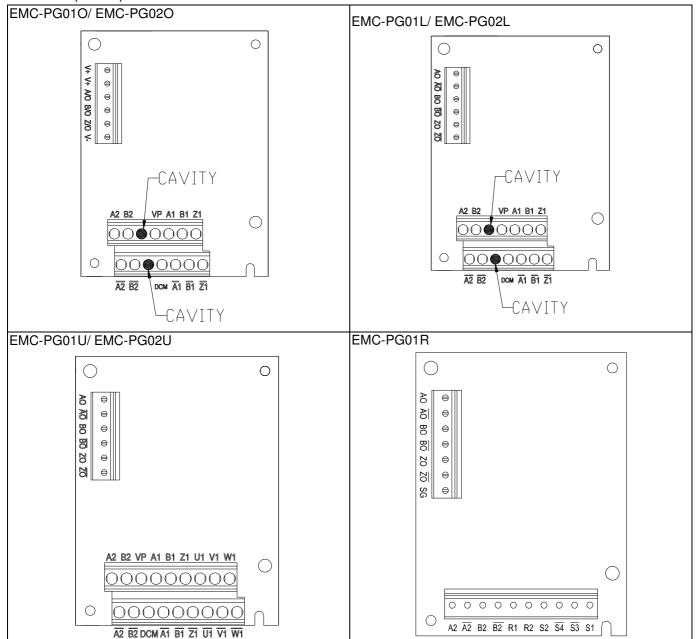
8-2 Screws Specification for option card terminals:

| | Wire gauge | 24~12AWG (0.205~3.31mm ²) |
|------------|------------|---------------------------------------|
| EMC-D611A | | |
| EMC-BPS01 | Torque | 5Kg-cm [4.34lb-in] |
| EMC-R6AA | Wire gauge | 26~16AWG (0.128~1.31mm ²) |
| EIVIC-ROAA | Torque | 8Kg-cm [6.94lb-in] |
| EMC-PG01L | | |
| EMC-PG01O | Wire gauge | 30~16AWG(0.0509~1.31mm ²) |
| EMC-PG01R | Torque | 2Kg-cm [1.74lb-in] |
| EMC-PG01U | | |

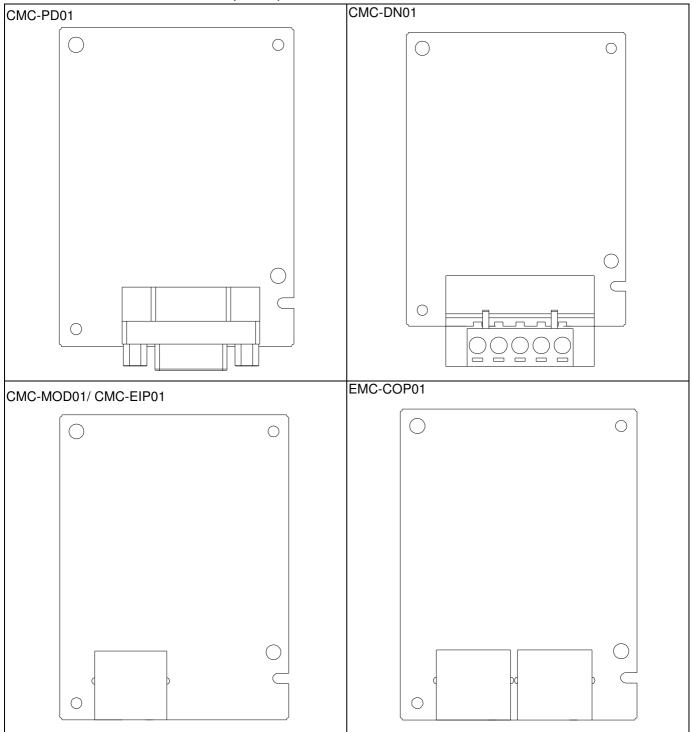
I/O & Relay extension card (Slot 3)



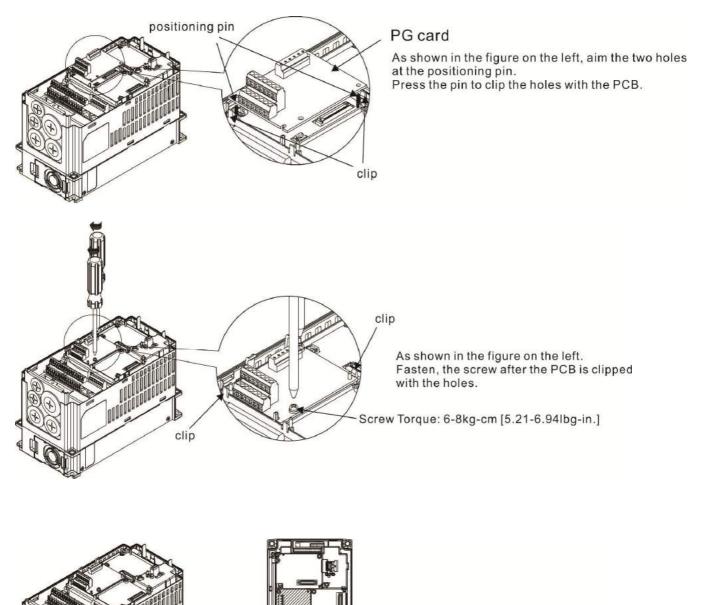
PG card (Slot 2)



Communication extension card (Slot 1)

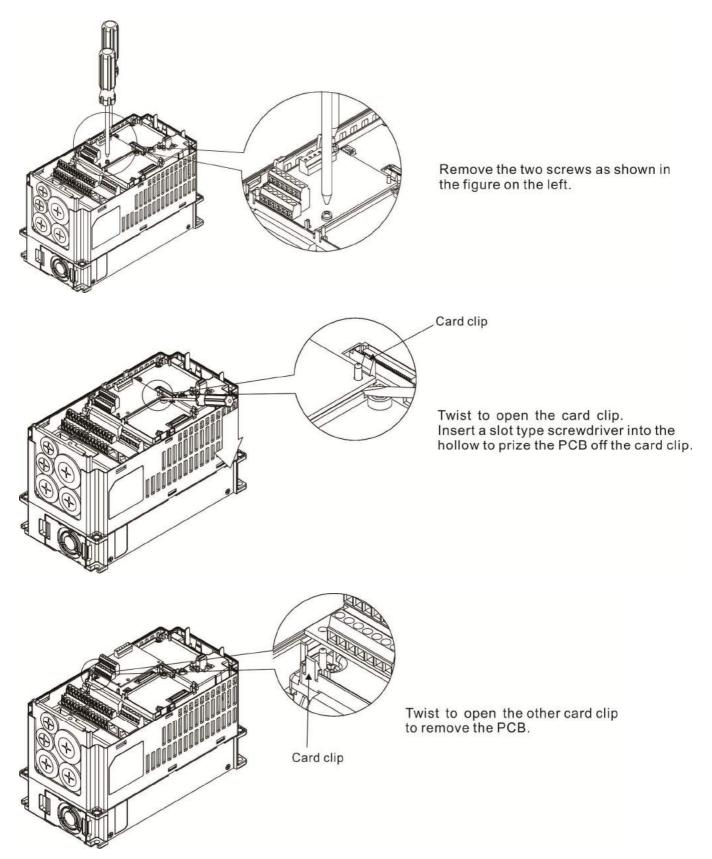


PG Card intallation



As shown in the figure on the left, installation is completed.

Disconneting the extension card



8-3 EMC-D42A

| | Terminals | Descriptions |
|-----------------------|------------|---|
| I/O Extension Card | СОМ | Common for Multi-function input terminals Select SINK(NPN)/SOURCE(PNP)in J1 jumper / external power supply |
| | MI10~ MI13 | Refer to parameters 02-26~02-29 to program the multi-function inputs MI10~MI13. Internal power is applied from terminal E24: +24Vdc±5% 200mA, 5W External power +24VDC: max. voltage 30VDC, min. voltage 19VDC, 30W ON: the activation current is 6.5mA OFF: leakage current tolerance is 10µA |
| | MO10~MO11 | Multi-function output terminals (photocoupler) The AC motor drive releases various monitor signals, such as drive in operation, frequency attained and overload indication, via transistor (open collector). |
| | МХМ | Common for multi-function output terminals MO10, MO11(photocoupler) Max 48VDC 50mA |

8-4 EMC-D611A

| | Terminals | Descriptions |
|-----------------------|------------|--|
| | AC | AC power Common for multi-function input terminal (Neutral) |
| I/O Extension Card | MI10~ MI15 | Refer to Pr. 02.26~ Pr. 02.31 for multi-function input selection Input voltage: 100~130VAC Input frequency: 47~63Hz Input impedance: 27Kohm Terminal response time: ON: 10ms OFF: 20ms |

8-5 EMC-R6AA

| | Terminals | Descriptions |
|-----------------|------------------------|--|
| | R10A~R15A R10C~R15C | Refer to Pr. 02.36~ Pr. 02.41 for multi-function input selection |
| | | Resistive load: |
| | | 5A(N.O.) 250VAC |
| Relay Extension | | 5A(N.O.) 30VDC |
| Card | | Inductive load (COS 0.4) |
| | | 2.0A(N.O.) 250VAC |
| | | 2.0A(N.O.) 30VDC |
| | | It is used to output each monitor signal, such as drive is in |
| | | operation, frequency attained or overload indication. |

8-6 EMC-BPS01

| | Terminals | Descriptions |
|----------------|------------|---|
| | | Input power: 24V±5% |
| | | Maximum input current:0.5A |
| External Power | | Note: |
| Supply | 24V GND | 1) Do not connect control terminal +24V (Digital control signal common: |
| | GILD | SOURCE) directly to the EMC-BPS01input terminal 24V. |
| | | 2) Do not connect control terminal GND directly to the EMC-BPS01 input |
| | | termina GND. |

Note: Refer to I/O & Rlay extension card installation/ disconnecting method for PG Card installation/ disconnecting.

8-7 EMC-PG01L/EMC-PG02L

Terminal description

Set by Pr.10-00~10-02, 10-16~10-18

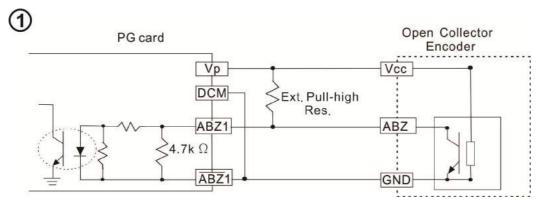
| Terminals | | Descriptions |
|-----------|---|--|
| | VP | Output voltage for power: +5V/+12V±5% (use FSW3 to switch +5V/+12V) Max. output current: 200mA |
| DOI | DCM | Common for power and signal |
| PG1 | A1, /A1, B1, /B1, Z1, /Z1 | Encoder input signal (Line Driver or Open Collector) Open Collector input voltage: +5~+24V (Note 1) It can be 1-phase or 2-phase input. EMC-PG01L: Max. input frequency: 300kHz EMC-PG02L: Max. input frequency: 30kHz(Note 2) |
| PG2 | A2, /A2, B2, /B2 | Pulse Input signal (Line Driver or Open Collector) Open Collector input voltage: +5~+24V (Note1) It can be 1-phase or 2-phase input. EMC-PG01L: Max. input frequency: 300kHz EMC-PG02L: Max. input frequency: 30kHz(Note 2) |
| PG OUT | AO, /AO, BO, /BO, ZO, /ZO, SG, | PG Card Output signals. It has division frequency function: 1~255 times Max. output voltage for Line driver: 5VDC Max. output current: 50mA EMC-PG01L Max. output frequency: 300kHz EMC-PG02L Max. output frequency: 30kHz SG is the GND of PG card. It is also the GND of position machine or PLC to make the ouput signal to be the common pivot point. |

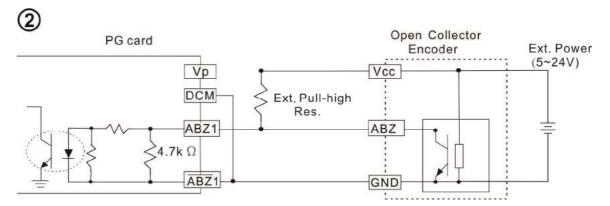
Note 1: Open Collector application, input current 5~15mA to each set then each set needs one pull-up resistor. If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Please refer diagram 2 of PG1.

| 5V | Recommended pull-up resistor: above100~220Ω, 1/2W |
|-----|--|
| 12V | Recommended pull-up resistor: above 510~1.35kΩ, 1/2W |
| 24V | Recommended pull-up resistor, above1.8k~3.3kΩ, 1/2W |

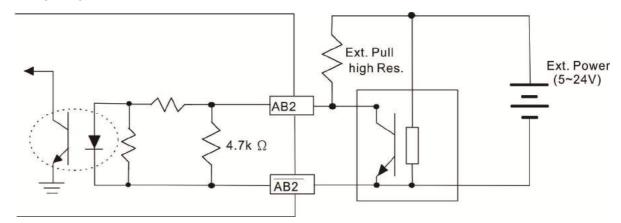
Note 2: If the required bandwidth is not over 30kHz at the application, it is recommended to use EMC-PG02O/L (bandwidth 30kHz) to avoid interference.

PG1 card wiring diagram (the image 1 and 2 below are wiring diagrams of Open Collector encoder)



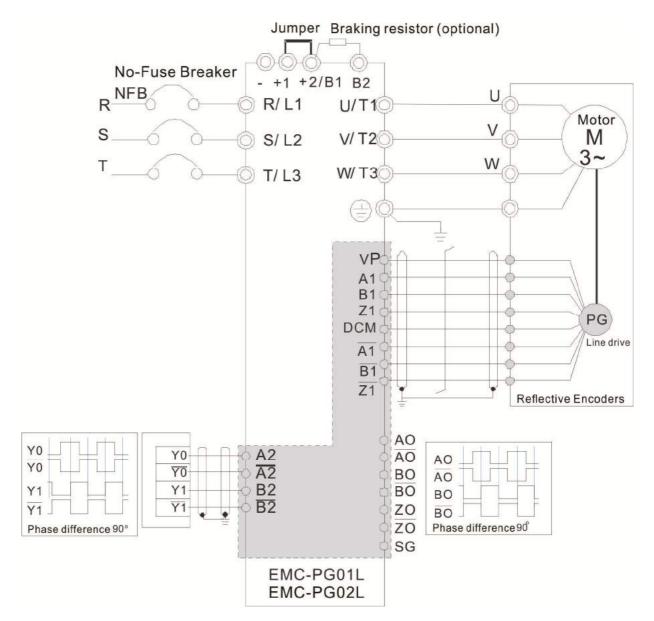


PG2 Wiring Diagram



EMC-PG01L/EMC-PG02L Wiring Diagram

- Please use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- ☑ Recommended wire size 0.21 to 0.81mm² (AWG24 to AWG18).
- ☑ Cable length: Less than 100m



8-8 EMC-PG010/EMC-PG020

Terminal descriptions

Set by Pr.10-00~10-02, 10-16~10-18

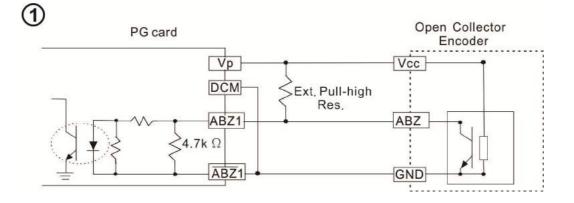
| Terminals | | Descriptions |
|-----------|------------------------------|---|
| | VP | Output voltage for power: +5V/+12V±5% (use FSW3 to switch +5V/+12V) Max. output current: 200mA |
| | DCM | Common for power and signal |
| PG1 | | Encoder Input signal (Line Driver or Open Collector) |
| | A1 /A1 D1 | Open Collector Input Voltage: +5V~+24V (Note 1) |
| | A1, /A1, B1, /B1, Z1, /Z1 | It can be 1-phase or 2-phase input. |
| | | EMC-PG01O Max. input frequency: 300kHz |
| | | EMC-PG02O Max. input frequency: 30kHz(Note 2) |
| | | Pulse Input Signal (Line Driver or Open Collector) |
| PG2 | A2, /A2, B2, /B2 | Open Collector Input Voltage: +5~+24V (Note 1) |
| FG2 | | EMC-PG01O Max. input frequency: 300kHz |
| | | EMC-PG02O Max. input frequency: 30kHz(Note 2) |
| | V+, V+ | Needs external power source for PG OUT circuit. |
| | VT, VT | Input voltage of power:+12V ~ +24V |
| | V- | Input voltage for the negative side |
| | | PG Card Output signals has division frequency function: 1~255 times. |
| PG OUT | | On the open collector's output signal, add a high-pull resistor on the external |
| 10001 | A/O, B/O, Z/O | power V+ \sim V- (e.g. power of PLC) to prevent the interference of the receiving |
| | | signal. Max. • [Three pull-up resistor are included in the package (1.8kW/1W)] |
| | | (Note 1) |
| | | EMC-PG01O Max. input frequency: 300kHz |
| | | EMC-PG02O Max. input frequency: 30kHz |

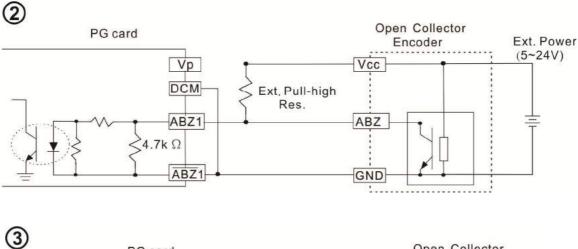
Note 1: Open Collector application, input current 5~15mÅ to each set then each set needs one pull-up resistor. If input voltage of open collector is 24V, the power of encoder needs to be connected externally. Please refer diagram 2 of PG1.

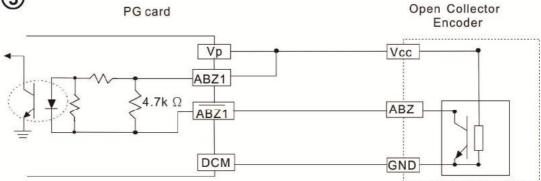
| | 5V | Recommended pull-up resistor: above100~220Ω, 1/2W |
|-----|-----------------------------|--|
| | 12V | Recommended pull-up resistor: above 510~1.35kΩ, 1/2W |
| | 24V | Recommended pull-up resistor, above1.8k~3.3kΩ, 1/2W |
| . ц | محرججا المحينات بمحيد محالة | huidh is wat such 00000 is at the second is stick. It is we seen a |

Note 2: If the required bandwidth is not over 30kHz at the application, it is recommended to use EMC-PG02O/L (bandwidth 30kHz) to avoid interference.

PG1 card wiring diagram (the image 1 and 2 below are wiring diagrams of Open Collector encoder)



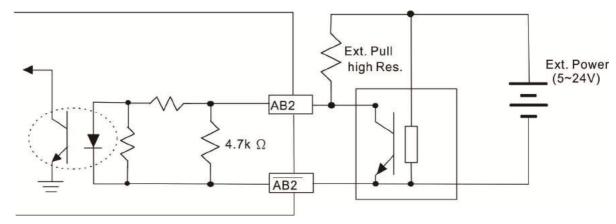




When wiring in this way, if there is a signal on EMC-PG010's A1, B1 and Z1, LED lights is OFF.

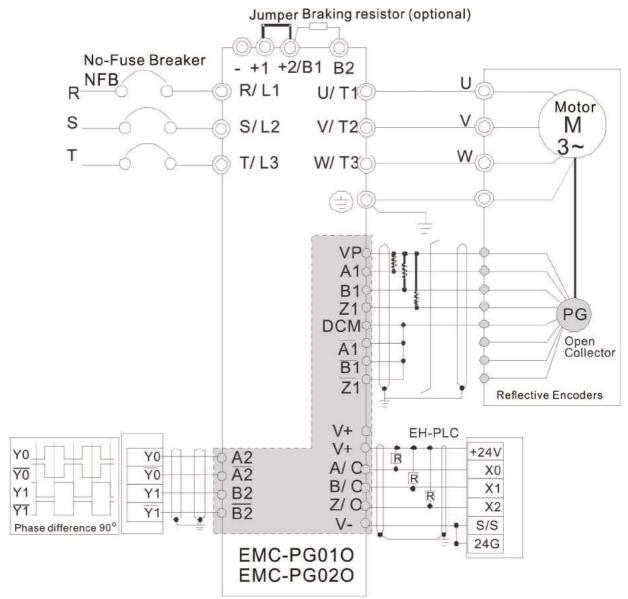
If A1, B1 and Z1 have no signals, LED lights is ON.

PG2 Wiring Diagram



■ EMC-PG010/EMC-PG020 Wiring Diagram

- Please use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- ☑ Recommended wire size 0.21 to 0.81mm² (AWG24 to AWG18).
- ☑ Cable length: Less than 30m



8-9 EMC-PG01U/ EMC-PG02U

- FSW1 S: Standard UVW Output Encoder; D: Delta Encoder
- When using the Delta Encoder, wait for at least 250ms after powering up to receive signals from UVW. If a running command is received before UVW signals finish, a PGF5 error message will be given. So wait for 250ms before sending a running command.
- EMC-PG02U has encoder disconnection detection function.
- Set by Pr.10-00~10-02, 10-16~10-18

| Terminals | Descriptions |
|----------------------------------|--|
| VP | Output voltage for power: +5V/+12V±5% (use FSW3 to switch +5V/+12V) Max. output current: 200mA |
| DCM | Common for power and signal |
| A1, /A1, B1, /B1, Z1, /Z1 | Encoder input signal (Line Driver) It can be 1-phase or 2-phase input. Max. output frequency: 300kP/sec |
| U1, /U1, V1, /V1, W1, /W1 | Encoder input signal |
| A2, /A2, B2, /B2 | Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5~+24V (Note1) It can be 1-phase or 2-phase input. Max. output frequency: 300kP/sec. |
| AO, /AO, BO, /BO, ZO, /ZO, SG | PG Card Output signals. It has division frequency function: 1~255 times Max. output voltage for Line driver: 5Vdc Max. output current: 50mA Max. output frequency: 300kP/sec SG is the GND of PG card. It is also the GND of position machine or PLC to make the ouput signal to be the common pivot point. |
| | VP DCM A1, /A1, B1, /B1, Z1, /Z1 U1, /U1, V1, /V1, W1, /W1 A2, /A2, B2, /B2 AO, /AO, BO, /BO, ZO, |

 Note 1: Open Collector application, input current 5~15mA to each set then each set needs one pull-up resistor.

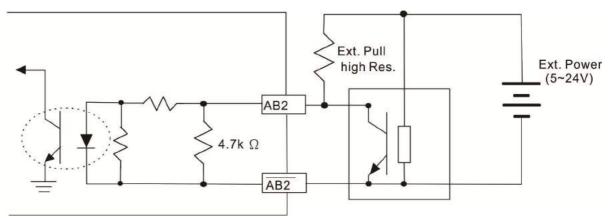
 5V
 Recommended pull-up resistor: above100~220Ω, 1/2W

 12V
 Recommended pull-up resistor: above 510~1.35kΩ, 1/2W

 04W
 Description

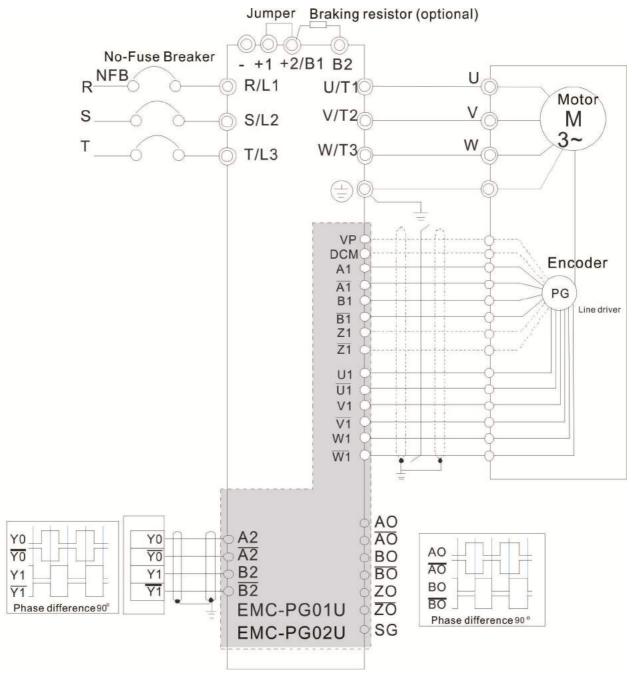
| 24V | Recommended pull-up resistor, above1.8k~3.3kΩ, 1/2W |
|-----|---|
| | |

PG2 Wiring Diagram



EMC-PG01U Wiring Diagram

- Please use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- \square Recommended wire size 0.21 to 0.81mm² (AWG24 to AWG18).
- ☑ Cable length: Less than 30m



8-10 EMC-PG01R

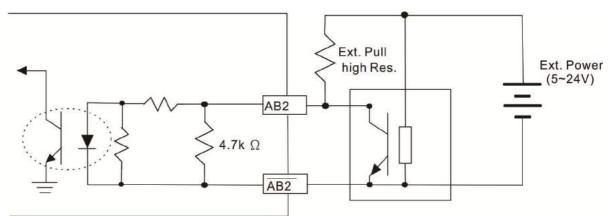
Terminal Descriptions

Set by Pr.10-00~10-02

| Т | erminals | Descriptions |
|---|---|---|
| | R1- R2 | Resolver Output Power 7Vrms, 10kHz |
| PG1 | S1, /S3, S2, /S4, | Resolver Input Signal (S2, /S4=Sin; S1, /S3=Cos) 3.5±0.175Vrms, 10kHz |
| PG2 | A2, /A2, B2, /B2 | Pulse Input signal (Line Driver or Open Collector) Open Collector Input Voltage: +5~+24V (Note1) It can be 1-phase or 2-phase input. Max. output frequency: 300kP/sec. |
| PG OUT | AO, /AO, BO, /BO, ZO, /ZO, SG, | PG Card Output signals. It has division frequency function: 1~255 times Max. output voltage for Line driver: 5VDC Max. output current: 50mA Max. output frequency: 300kP/sec SG is the GND of PG card. It is also the GND of position machine or PLC to make the ouput signal to be the common pivot point. |
| Note 1: Open Collector application, input current 5~15mA to each set then each set needs one pull-up resistor | | |
| | 5V Re | commended pull-up resistor: above100~220Ω, 1/2W |
| | 12V Re | commended pull-up resistor; above 510~1.35k Ω . 1/2W |

| 12V | Recommended pull-up resistor: above 510~1.35kΩ, 1/2W |
|-----|--|
| 24V | Recommended pull-up resistor, above1.8k~3.3kΩ, 1/2W |

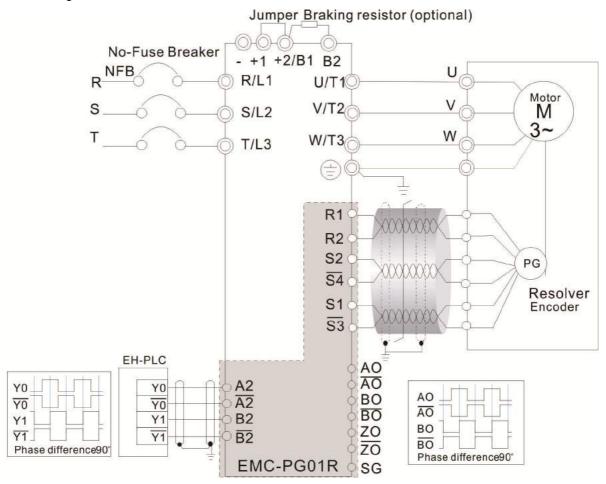
PG2 Wiring Diagram



- DOS(Degradation of Signal) : If the amplitude of the sine wave input of the S1-/S3/S2-/S4 is lower than or higher than the encoder IC's specification, a red light will be on. The possible reasons which cause this problem are the following.
 - 1. The turns ratio of the resolver encoder is not 1:0.5 which makes the sine wave input of the S1-/S3/S2-/S4 not equal to 3.5±0.175Vrms.
 - 2. While motor is running, motor creates common mode noise which makes accumulated voltage to be more than 3.5±0.175Vrms
- LOT(Loss of Tracking): Compare the angle of S1-/S3/S2-/S4 sine wave input to the R1-R2 cosine wave. If their difference is more than 5 degree, a red light will be on. Here are the possible reasons why that happens:
 - 1. The output frequency of the PG card is incorrect.
 - 2. The specification of Resolver's encoder is not 10KHz
 - 3. The motor creates common mode noise while it is running. That causes a big difference, while the motor is rotating, between main winding's cosine wave angle and the sine wave angle of second and third windings.

EMC-PG01R Wiring Diagram

- Please use a shielded cable to prevent interference. Do not run control wires parallel to any high voltage AC power line (200 V and above).
- ☑ Recommended wire size 0.21 to 0.81mm² (AWG24 to AWG18).
- ☑ Cable length: Less than 100m

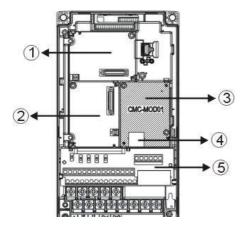


8-11 CMC-MOD01

Features

- 1. Supports Modbus TCP protocol
- 2. MDI/MDI-X auto-detect
- 3. Baud rate: 10/100Mbps auto-detect
- 4. E-mail alarm
- 5. AC motor drive keypad/Ethernet configuration
- 6. Virtual serial port.

Product File



| 1 | I/O CARD & Relay Card |
|---|---------------------------|
| 2 | PG Card |
| 3 | Comm. Card |
| 4 | RJ-45 connection port |
| 5 | Removable control circuit |

Specifications

Network Interface

| Interface | RJ-45 with Auto MDI/MDIX |
|---------------------|---|
| Number of ports | 1 Port |
| Transmission method | IEEE 802.3, IEEE 802.3u |
| Transmission cable | Category 5e shielding 100M |
| Transmission speed | 10/100 Mbps Auto-Detect |
| Notwork protocol | ICMP, IP, TCP, UDP, DHCP, HTTP, SMTP, MODBUS OVER TCP/IP, |
| Network protocol | Delta Configuration |

terminal

Electrical Specification

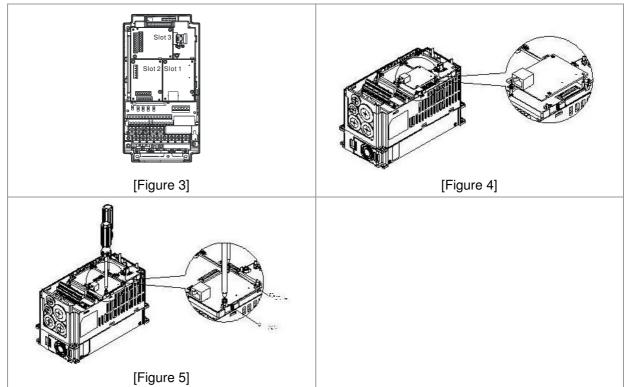
| Power supply voltage | 5VDC (supply by the AC motor drive) |
|----------------------|-------------------------------------|
| Insulation voltage | 2KV |
| Power consumption | 0.8W |
| Weight | 25g |

Environment

| Noise immunity | ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6) |
|--------------------------|---|
| Operation/storage | Operation: -10° ~ 50° (temperature), 90% (humidity) Storage: -25° ~ 70° (temperature), 95% (humidity) |
| Vibration/shock immunity | International standard: IEC 61800-5-1, IEC 60068-2-6/IEC 61800-5-1, IEC 60068-2-27 |

■ Install CMC-MOD01 to VFD-CH2000

- 1. Switch off the power supply of VFD-CH2000.
- 2. Open the front cover of VFD-CH2000.
- 3. Place the insulation spacer into the positioning pin at Slot 1 (shown in Figure 3), and aim the two holes on the PCB at the positioning pin. Press the pin to clip the holes with the PCB (shown in Figure 4).
- 4. Screw up at torque 6 ~ 8 kg-cm (5.21 ~ 6.94 in-lbs) after the PCB is clipped with the holes (shown in Figure 5).



Communication Parameters for VFD-CH2000 Connected to Ethernet

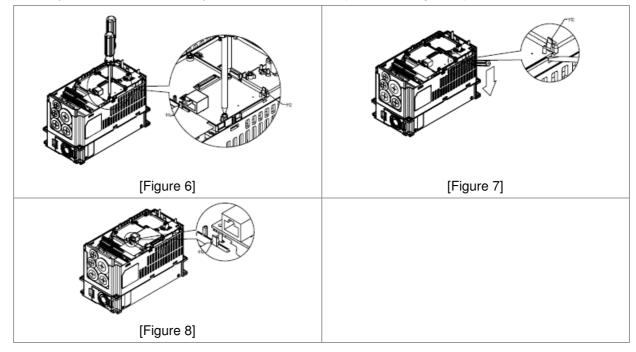
When VFD-CH2000 is link to Ethernet, please set up the communication parameters base on the table below. Ethernet master will be able to read/write the frequency word and control word of VFD-CH2000 after communication parameters setup.

| Parameter | Function | Set value (Dec) | Explanation |
|-----------|--|-----------------|--|
| P00-20 | Source of frequency command setting | 8 | The frequency command is controlled by communication card. |
| P00-21 | Source of operation command setting | 5 | The operation command is controlled by communication card. |

| P09-30 | Decoding method for communication | 0 | Decoding method for Delta AC motor drive |
|--------|-----------------------------------|-----|---|
| P09-75 | IP setting | 0 | Static IP(0) / Dynamic distribution IP(1) |
| P09-76 | IP address -1 | 192 | IP address 192.168.1.5 |
| P09-77 | IP address -2 | 168 | IP address 192.168.1.5 |
| P09-78 | IP address -3 | 1 | IP address 192.168.1.5 |
| P09-79 | IP address -4 | 5 | IP address 192.168.1.5 |
| P09-80 | Netmask -1 | 255 | Netmask 255.255.255.0 |
| P09-81 | Netmask -2 | 255 | Netmask 255.255.255.0 |
| P09-82 | Netmask -3 | 255 | Netmask 255.255.255.0 |
| P09-83 | Netmask -4 | 0 | Netmask 255.255.255.0 |
| P09-84 | Default gateway -1 | 192 | Default gateway 192.168.1.1 |
| P09-85 | Default gateway -2 | 168 | Default gateway 192.168.1.1 |
| P09-86 | Default gateway -3 | 1 | Default gateway 192.168.1.1 |
| P09-87 | Default gateway -4 | 1 | Default gateway 192.168.1.1 |

Disconnecting CMC- MOD01 from VFD-CH2000

- 1. Switch off the power supply of VFD-CH2000.
- 2. Remove the two screws (shown in Figure 6).
- 3. Twist opens the card clip and inserts the slot type screwdriver to the hollow to prize the PCB off the card clip (shown in Figure 7).
- 4. Twist opens the other card clip to remove the PCB (shown in Figure 8).



Basic Registers

| BR# | R/W | Content | Explanation |
|-----|-----|-----------------------------|--|
| #0 | R | Model name | Set up by the system; read only. The model code of CMC-MOD01=H'0203 |
| #1 | R | Firmware version | Displaying the current firmware version in hex, e.g. H'0100 indicates the firmware version V1.00. |
| #2 | R | Release date of the version | Displaying the data in decimal form. 10,000s digit and 1,000s digit are for "month"; 100s digit and 10s digit are for "day". For 1 digit: 0 = morning; 1 = afternoon. |
| #11 | R/W | Modbus Timeout | Pre-defined setting: 500 (ms) |
| #13 | R/W | Keep Alive Time | Pre-defined setting: 30 (s) |

■ LED Indicator & Troubleshooting

LED Indicators

| LED | S | tatus | Indication | How to correct it? |
|-------|-------|---------|-------------------------------------|---|
| POWER | On | | Power supply in normal status | |
| FOWER | Green | Off | No power supply | Check the power supply |
| | | On | Network connection in normal status | |
| LINK | Green | Flashes | Network in operation | |
| | | Off | Network not connected | Check if the network cable is connected |

Troubleshooting

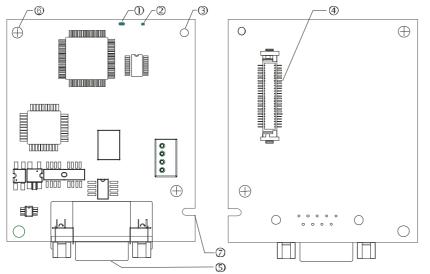
| Abnormality | Cause | How to correct it? |
|--|---|---|
| POWER LED off | AC motor drive not powered | Check if AC motor drive is powered, and if the power supply is normal. |
| | CMC-MOD01 not connected to AC motor drive | Make sure CMC-MOD01 is connected to AC motor drive. |
| | CMC-MOD01 not connected to network | Make sure the network cable is correctly connected to network. |
| LINK LED off | Poor contact to RJ-45 connector | Make sure RJ-45 connector is connected to Ethernet port. |
| | CMC-MOD01 not connected to network | Make sure CMC-MOD01 is connected to network. |
| No module found | PC and CMC-MOD01 in different networks and blocked by network firewall. | Search by IP or set up relevant settings by AC motor drive keypad. |
| | CMC-MOD01 not connected to network | Make sure CMC-MOD01 is connected to the network. |
| Fail to open CMC-MOD01 setup | Incorrect communication setting in DCISoft | Make sure the communication setting in DCISoft is set to Ethernet. |
| page | PC and CMC-MOD01 in different networks and blocked by network firewall. | Conduct the setup by AC motor drive keypad. |
| Able to open CMC-MOD01 setup page but fail to utilize webpage monitoring | Incorrect network setting in CMC-MOD01 | Check if the network setting for CMC-MOD01 is correct. For the Intranet setting in your company, please consult your IT staff. For the Internet setting in your home, please refer to the network setting instruction provided by your ISP. |
| Fail to send e-mail | Incorrect network setting in CMC-MOD01 | Check if the network setting for CMC-MOD01 is correct. |
| | Incorrect mail server setting | Please confirm the IP address for SMTP-Server. |

8-12 CMC-PD01

Features

- 1. Supports PZD control data exchange.
- 2. Supports PKW polling AC motor drive parameters.
- 3. Supports user diagnosis function.
- 4. Auto-detects baud rates; supports Max. 12Mbps.

Product Profile



| 1. NET indicator |
|------------------------------|
| 2. POWER indicator |
| 3. Positioning hole |
| 4. AC motor drive connection |
| port |
| 5. PROFIBUS DP connection |
| port |
| 6. Screw fixing hole |
| 7. Fool-proof groove |
| |

Specifications

PROFIBUS DP Connector

| Interface | DB9 connector |
|----------------------|-----------------------------|
| Transmission method | High-speed RS-485 |
| Transmission cable | Shielded twisted pair cable |
| Electrical isolation | 500VDC |

Communication

| Message type | Cyclic data exchange |
|--|--|
| Module name | CMC-PD01 |
| GSD document | DELA08DB.GSD |
| Company ID | 08DB (HEX) |
| Serial transmission speed supported (auto-detection) | 9.6kbps; 19.2kbps; 93.75kbps; 187.5kbps; 125kbps; 250kbps; 500kbps; 1.5Mbps; 3Mbps; 6Mbps; 12Mbps (bit per second) |

Electrical Specification

| Power supply | 5VDC (supplied by AC motor drive) | |
|--------------------|-----------------------------------|--|
| Insulation voltage | 500VDC | |
| Power consumption | 1W | |
| Weight | 28g | |

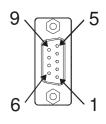
Environment

| | | ESD(IEC 61800-5-1,IEC 6100-4-2) | |
|----------------|------------------------------|---|--|
| | Nuclear transmission | EFT(IEC 61800-5-1,IEC 6100-4-4) | |
| Noise immunity | | Surge Teat(IEC 61800-5-1,IEC 6100-4-5) | |
| | | Conducted Susceptibility Test(IEC 61800-5-1,IEC 6100-4-6) | |
| | Onevetien /stevens | Operation: -10ºC ~ 50ºC (temperature), 90% (humidity) | |
| | Operation /storage | Storage: -25°C ~ 70°C (temperature), 95% (humidity) | |
| | Shock / vibration resistance | International standards: IEC61131-2, IEC68-2-6 (TEST Fc)/IEC61131-2 & IEC 68-2-27 (TEST Ea) | |

Installation

PROFIBUS DP Connector

| PIN | PIN name | Definition |
|-----|-----------|-----------------------------|
| 1 | - | Not defined |
| 2 | - | Not defined |
| 3 | Rxd/Txd-P | Sending/receiving data P(B) |
| 4 | - | Not defined |
| 5 | DGND | Data reference ground |
| 6 | VP | Power voltage – positive |
| 7 | - | Not defined |
| 8 | Rxd/Txd-N | Sending/receiving data N(A) |
| 9 | - | Not defined |



LED Indicator & Troubleshooting

There are 2 LED indicators on CMC-PD01. POWER LED displays the status of the working power. NET LED displays the connection status of the communication.

POWER LED

| LED status | Indication | How to correct it? |
|----------------|--------------------------------|--|
| Green light on | Power supply in normal status. | |
| Off | No power | Check if the connection between CMC-PD01 and AC motor drive is normal. |

NET LED

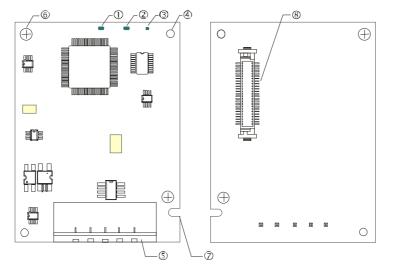
| LED status | Indication | How to correct it? |
|----------------------|--|--|
| Green light on | Normal status | |
| Red light on | CMC-PD01 is not connected to PROFIBUS DP bus. | Connect CMC-PD01 to PROFIBUS DP bus. |
| Red light flashes | Invalid PROFIBUS communication address | Set the PROFIBUS address of CMC-PD01 between 1 ~ 125 (decimal) |
| Orange light flashes | CMC-PD01 fails to communication with AC motor drive. | Switch off the power and check whether CMC-PD01 is correctly and normally connected to AC motor drive. |

8-13 CMC-DN01

Functions

- 1. Based on the high-speed communication interface of Delta HSSP protocol, able to conduct immediate control to AC motor drive.
- 2. Supports Group 2 only connection and polling I/O data exchange.
- 3. For I/O mapping, supports Max. 32 words of input and 32 words of output.
- 4. Supports EDS file configuration in DeviceNet configuration software.
- 5. Supports all baud rates on DeviceNet bus: 125kbps, 250kbps, 500kbps and extendable serial transmission speed mode.
- 6. Node address and serial transmission speed can be set up on AC motor drive.
- 7. Power supplied from AC motor drive.

Product Profile



 NS indicator
 MS indicator
 POWER indicator
 Positioning hole
 DeviceNet connection port
 Screw fixing hole
 Fool-proof groove
 AC motor drive connection port

Specifications

DeviceNet Connector

| Interface | 5-PIN open removable connector. Of 5.08mm PIN interval | | |
|--------------------|--|--|--|
| Transmission | CAN | | |
| Transmission cable | Shielded twisted pair cable (with 2 power cables) | | |
| Transmission speed | 125kbps, 250kbps, 500kbps and extendable serial transmission speed | | |
| Network protocol | DeviceNet protocol | | |

AC Motor Drive Connection Port

| Interface | 50 PIN communication terminal | |
|---------------------------------------|--|--|
| Transmission method SPI communication | | |
| Terminal function | Communicating with AC motor drive Transmitting power supply from AC motor drive | |
| Communication | Delta HSSP protocol | |

Electrical Specification

| Power supply voltage | 5VDC (supplied by AC motor drive) | |
|--------------------------------------|-----------------------------------|--|
| Insulation voltage | 500VDC | |
| Communication wire power consumption | 0.85W | |
| Power consumption | 1W | |
| Weight | 23g | |

Environment

| Noise immunity | ESD (IEC 61800-5-1,IEC 6100-4-2) EFT (IEC 61800-5-1,IEC 6100-4-4) Surge Teat(IEC 61800-5-1,IEC 6100-4-5) Conducted Susceptibility Test (IEC 61800-5-1,IEC 6100-4-6) |
|--|--|
| Operation /storage Operation: -10°C ~ 50°C (temperature), 90% (humidity) Storage: -25°C ~ 70°C (temperature), 95% (humidity) | |
| Shock / vibration resistanceInternational standards: IEC61131-2, IEC68-2-6 (TEST Fc)/IEC6113 IEC 68-2-27 (TEST Ea) | |

DeviceNet Connector

| PIN | Signal | Color | Definition |
|-----|--------|-------|------------|
| 1 | V+ | Red | DC24V |
| 2 | Н | White | Signal+ |
| 3 | S | - | Earth |
| 4 | L | Blue | Signal- |
| 5 | V- | Black | 0V |

| 1 |
|-------------|
| 2 |
| 2 3 4 |
| 4 |
| 5 |
| |
| |

LED Indicator & Troubleshooting

There are 3 LED indicators on CMC-DN01. POWER LED displays the status of power supply. MS LED and NS LED are dual-color LED, displaying the connection status of the communication and error messages.

POWER LED

| LED status | Indication | How to correct it? |
|------------|----------------------------------|-------------------------------------|
| On | Power supply in abnormal status. | Check the power supply of CMC-DN01. |
| Off | Power supply in normal status | |

NS LED

| LED status | atus Indication How to correct it? | |
|------------------------|---|---|
| Off | No power supply or CMC-DN01 has not completed MAC ID test yet. | Check the power of CMC-DN01 and see if the connection is normal. Make sure at least one or more nodes are on the bus. Check if the serial transmission speed of CMC-DN01 is the same as that of other nodes. |
| Green light flashes | CMC-DN01 is on-line but has not established connection to the master. | Configure CMC-DN01 to the scan list of the master. Re-download the configured data to the master. |
| Green light on | CMC-DN01 is on-line and is normally connected to the master | |
| Red light flashes | CMC-DN01 is on-line, but I/O connection is timed-out. | Check if the network connection is normal. Check if the master operates normally. |
| Red light on | The communication is down. MAC ID test failure. No network power supply. CMC-DN01 is off-line. | Make sure all the MAC IDs on the network are not repeated. Check if the network installation is normal. Check if the baud rate of CMC-DN01 is consistent with that of other nodes. Check if the node address of CMC-DN01 is illegal. Check if the network power supply is normal. |

MS LED

| LED status | Indication | How to correct it? | |
|-------------------------|--|---|--|
| Off | No power supply or being off-line | Check the power supply of CMC-DN01 and see of the connection is normal. | |
| Green light flashes | Waiting for I/O data | Switch the master PLC to RUN status | |
| Green light on | I/O data are normal | | |
| Red light flashes | Mapping error | Reconfigure CMC-DN01 Re-power AC motor drive | |
| Red light on | Hardware error | See the error code displayed on AC motor drive. Send back to the factory for repair if necessary. | |
| Orange light flashes | CMC-DN01 is establishing connection with AC motor drive. | If the flashing lasts for a long time, check if CMC-DN01 and AC motor drive are correctly installed and normally connected to each other. | |

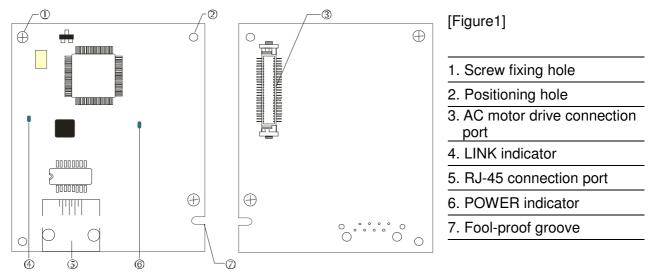
Chapter 8 Optional Cards

8-14 CMC-EIP01

Features

- 1. Supports Modbus TCP and Ethernet/IP protocol
- 2. MDI/MDI-X auto-detect
- 3. Baud rate: 10/100Mbps auto-detect
- 4. AC motor drive keypad/Ethernet configuration
- 5. Virtual serial port

Product Profile



Specifications

Network Interface

| Interface | RJ-45 with Auto MDI/MDIX | |
|---------------------|--|--|
| Number of ports | 1 Port | |
| Transmission method | IEEE 802.3, IEEE 802.3u | |
| Transmission cable | Category 5e shielding 100M | |
| Transmission speed | 10/100 Mbps Auto-Detect | |
| Network protocol | ICMP, IP, TCP, UDP, DHCP, HTTP, SMTP, MODBUS OVER TCP/IP, EtherNet/IP, Delta Configuration | |

Electrical Specification

| Weight | 25g |
|----------------------|--------|
| Insulation voltage | 500VDC |
| Power consumption | 0.8W |
| Power supply voltage | 5VDC |

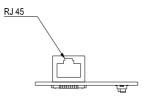
Environment

| Noise immunity | ESD (IEC 61800-5-1,IEC 61000-4-2) | | | | | |
|-----------------------------|--|--|--|--|--|--|
| | EFT (IEC 61800-5-1,IEC 61000-4-4) | | | | | |
| | Surge Test (IEC 61800-5-1,IEC 61000-4-5) | | | | | |
| | Conducted Susceptibility Test (IEC 61800-5-1,IEC 61000-4-6) | | | | | |
| On evention (stave as | Operation: -10 $^{\circ}$ C ~ 50 $^{\circ}$ C (temperature), 90% (humidity) | | | | | |
| Operation/storage | Storage: $-25 ^{\circ}\text{C} \sim 70 ^{\circ}\text{C}$ (temperature), 95% (humidity) | | | | | |
| Vibration/shock immunity | International standard: IEC 61800-5-1, IEC 60068-2-6/IEC 61800-5-1, IEC 60068-2-27 | | | | | |

Installation

Connecting CMC-EIP01 to Network

- 1. Turn off the power of AC motor drive.
- 2. Open the cover of AC motor drive.
- Connect CAT-5e network cable to RJ-45 port on CMC-EIP01 (See Figure 2).



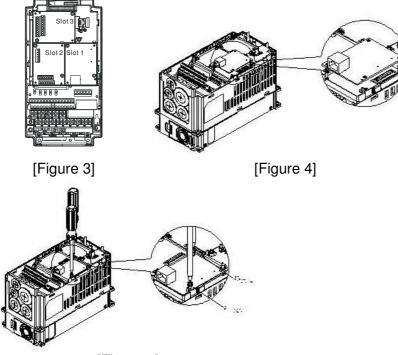


RJ-45 PIN Definition

| PIN | Signal | Definition | PIN | Signal | Definition | |
|-----|--------|-------------------------------------|-----|--------|-------------------------------------|----|
| 1 | Tx+ | Positive pole for data transmission | 5 | | N/C | |
| 2 | Tx- | Negative pole for data transmission | 6 | Rx- | Negative pole for data receiving | |
| 3 | Rx+ | Positive pole for data receiving | 7 | | N/C | 81 |
| 4 | | N/C | 8 | | N/C | |

Connecting CMC-EIP01 to VFD-CH2000

- 1. Switch off the power of AC motor drive.
- 2. Open the front cover of AC motor drive.
- 3. Place the insulation spacer into the positioning pin at Slot 1 (shown in Figure 3), and aim the two holes on the PCB at the positioning pin. Press the pin to clip the holes with the PCB (see Figure 4).
- 4. Screw up at torque 6 ~ 8 kg-cm (5.21 ~ 6.94 in-lbs) after the PCB is clipped with the holes (see Figure 5).



[Figure 5]

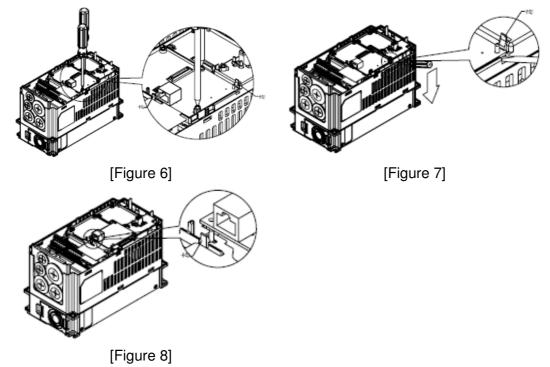
Communication Parameters for VFD-CH2000 Connected to Ethernet

When VFD-CH2000 is connected to Ethernet network, please set up the communication parameters for it according to the table below. The Ethernet master is only able to read/write the frequency word and control word of VFD-CH2000 after the communication parameters are set.

| Parameter (Dec) | Function | Set value (Dec) | Explanation |
|--------------------|--|-----------------|--|
| P00-20 | Source of frequency command setting | 8 | The frequency command is controlled by communication card. |
| P00-21 | Source of operation command setting | 5 | The operation command is controlled by communication card. |
| P09-30 | Decoding method for communication | 0 | The decoding method for Delta AC motor drive |
| P09-75 | IP setting | 0 | Static IP(0) / Dynamic distribution IP(1) |
| P09-76 | IP address -1 | 192 | IP address 192.168.1.5 |
| P09-77 | IP address -2 | 168 | IP address 192.168.1.5 |
| P09-78 | IP address -3 | 1 | IP address 192.168.1.5 |
| P09-79 | IP address -4 | 5 | IP address 192.168.1.5 |
| P09-80 | Netmask -1 | 255 | Netmask 255.255.255.0 |
| P09-81 | Netmask -2 | 255 | Netmask 255.255.255.0 |
| P09-82 | Netmask -3 | 255 | Netmask 255.255.255.0 |
| P09-83 | Netmask -4 | 0 | Netmask 255.255.255.0 |
| P09-84 | Default gateway -1 | 192 | Default gateway 192.168.1.1 |
| P09-85 | Default gateway -2 | 168 | Default gateway 192.168.1.1 |
| P09-86 | Default gateway -3 | 1 | Default gateway 192.168.1.1 |
| P09-87 | Default gateway -4 | 1 | Default gateway 192.168.1.1 |

Disconnecting CMC- EIP01 from VFD-CH2000

- 1. Switch off the power supply of VFD-CH2000.
- 2. Remove the two screws (see Figure 6).
- 3. Twist opens the card clip and inserts the slot type screwdriver to the hollow to prize the PCB off the card clip (see Figure 7).
- 4. Twist opens the other card clip to remove the PCB (see Figure 8).



LED Indicator & Troubleshooting

There are 2 LED indicators on CMC-EIP01. The POWER LED displays the status of power supply, and the LINK LED displays the connection status of the communication.

LED Indicators

| LED | Status | | Indication | How to correct it? | | |
|-------|--------|---------|-------------------------------------|-------------------------|--|--|
| POWER | Green | On | Power supply in normal status | | | |
| FOWER | Green | Off | No power supply | Check the power supply. | | |
| | Green | On | Network connection in normal status | | | |
| LINK | | Flashes | Network in operation | | | |
| | | Off | | Network not connected | Check if the network cable is connected. | |

Troubleshooting

| Abnormality | Cause | How to correct it? |
|---------------|--|--|
| POWER LED off | AC motor drive not powered | Check if AC motor drive is powered, and if the power supply is normal. |
| | CMC-EIP01 not connected to AC motor drive | Make sure CMC-EIP01 is connected to AC motor drive. |
| | CMC-EIP01 not connected to network | Make sure the network cable is correctly connected to network. |
| LINK LED off | Poor contact to RJ-45 connector | Make sure RJ-45 connector is connected to Ethernet port. |

| Abnormality | Cause | How to correct it? | | | | |
|--|---|---|--|--|--|--|
| | CMC-EIP01 not connected to network | Make sure CMC-EIP01 is connected to network. | | | | |
| No communication card found | PC and CMC-EIP01 in different networks and blocked by network firewall. | Search by IP or set up relevant settings by AC motor drive keypad. | | | | |
| | CMC-EIP01 not connected to network | Make sure CMC-EIP01 is connected to the network. | | | | |
| Fail to open CMC-EIP01 setup | Incorrect communication setting in DCISoft | Make sure the communication setting in DCISoft is set to Ethernet. | | | | |
| page | PC and CMC-EIP01 in different networks and blocked by network firewall. | Conduct the setup by AC motor drive keypad. | | | | |
| Able to open CMC-EIP01 setup page but fail to utilize webpage monitoring | Incorrect network setting in CMC-EIP01 | Check if the network setting for CMC-EIP01 is correct. For the Intranet setting in your company, please consult your IT staff. For the Internet setting in your home, please refer to the network setting instruction provided by your ISP. | | | | |
| | Incorrect network setting in CMC-EIP01 | Check if the network setting for CMC-EIP01 is correct. | | | | |
| Fail to send e-mail | Incorrect mail server setting | Please confirm the IP address for SMTP-Server. | | | | |

8-15 EMC-COP01

RJ-45 Pin definition



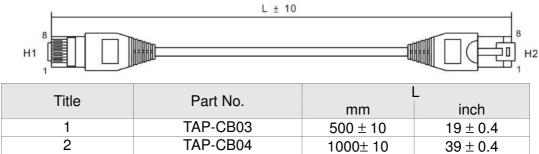
| Pin | Pin name | Definition | | | | | | | | |
|-----|----------|-------------------------------|--|--|--|--|--|--|--|--|
| 1 | CAN H | CAN_H bus line (dominant | | | | | | | | |
| | _ | high) | | | | | | | | |
| 2 | CAN_L | CAN_L bus line (dominant low) | | | | | | | | |
| 3 | CAN_GND | Ground/0V/V- | | | | | | | | |
| 7 | CAN_GND | Ground/0V/V- | | | | | | | | |

Specifications

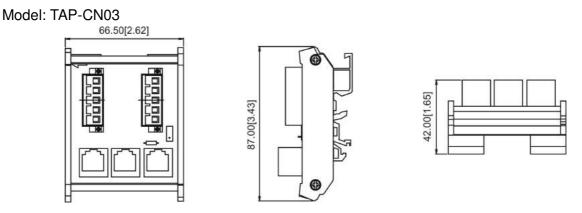
| Interface | RJ-45 |
|------------------------|----------------------------|
| Number of ports | 1 Port |
| Transmission method | CAN |
| Transmission cable | CAN standard cable |
| Transmission speed | 1M 500k 250k 125k 100k 50k |
| Communication protocol | CANopen |

CANopen Communication Cable

Model: TAP-CB03, TAP-CB04



CANopen Dimension



For more information on CANopen, please refer to Chapter 15 CANopen Overview or CANopen user manual can also be downloaded on Delta website: <u>http://www.delta.com.tw/industrialautomation/</u>.

9-1 230V Series

| | | Frame Size | | | A | | | | В | | С | | |
|---------------|------------|------------------------------------|---|----------|--------------------------|-----------|----------|---------|----------------------|-----------|------|-------|--|
| M | odel \ | /FDCH23A-21 | 007 | 015 | 022 | 03 | 57 | 055 | 075 | 110 | 150 | 185 | |
| Арр | licabl | e Motor Ourput (KW) | 0.75 | 1.5 | 2.2 | 3. | 7 | 5.5 | 7.5 | 11 | 15 | 18.5 | |
| Арр | olicabl | e Motor Ourput (HP) | 1 | 2 | 3 | 5 | 5 | 7.5 | 10 | 15 | 20 | 25 | |
| Output Rating | Juty | Rated Output Capacity (kVA) | 2.0 | 3.2 | 4.4 | 6. | 8 | 10 | 13 | 20 | 26 | 30 | |
| | Heavy Duty | Rated Output Current (A) | 5 | 8 | 11 | 1 | 7 | 25 | 33 | 49 | 65 | 75 | |
| | er He | Carrier Frequency (kHz) | | | | | 5~ | 15kHz | | | | | |
| Out | Super I | Overload Tolerance | | | | | | | 50% for 60 00% for 3 | | | | |
| ing | Inpu | ut Current (A) Super Heavy Duty | 6.4 | 12 | 16 | 2 | | 28 | 36 | 52 | 72 | 83 | |
| Input Rating | Rate | d Voltage/Frequency | | | 3-pha | se AC 20 |)0V~240 | V (-15% | % ~ +10%) | , 50/60Hz | | | |
| put | Oper | rating Voltage Range | | | | | 170~ | -265Va | с | | | | |
| Ч | Fre | equency Tolerance | | | | | 47 | ~63Hz | | | | | |
| | | Drive Weight | | 2.6 | ± 0.3Kg | | | | 5.4± 1Kg | | 9.8± | 1.5Kg | |
| | | poling Method | Natural cooling | | <u>J</u> | | 1 | Fan c | cooling | | | - 0 | |
| | Bra | aking Chopper | Frame A~C: Built-in; Frame D and above: Optional | | | | | | | | | | |
| | | DC reactor | Frame A~C: Optional; | | | | | | | | | | |
| | | EMI Filter | Frame D and above: Built-in Optional | | | | | | | | | | |
| | F | EMC-COP01 | | | | | | otional | | | | | |
| | - | | | | | | | Juonar | | | | | |
| | | Frame Size | D E F | | | | | | | | | | |
| Mod | VF | FDCH23A-00 FDCH23A-21 | 220 | 300 | 370 | 450 | 550 | 75 | 0 | | | | |
| | | e Motor Ourput (KW) | 22 | 30 | 37 | 45 | 55 | 75 | | | | | |
| Арр | | e Motor Ourput (HP) | 30 | 40 | 50 | 60 | 75 | 10 | 0 | | | | |
| bu | Duty | Rated Output Capacity (kVA) | 36 | 48 | 58 | 72 | 86 | 10 | 2 | | | | |
| Ratii | eavy l | Rated Output Current (A) | 90 | 120 | 146 | 180 | 215 | 25 | 5 | | | | |
| Output Rating | uper Heavy | Carrier Frequency (kHz) | | | 5~15 | | | | | | | | |
| 0 | Sup | Overload Tolerance | | | put curren put curren | | | | | | | | |
| ing | Inpu | It Current (A) Super Heavy Duty | 99 | 124 | 143 | 171 | 206 | 24 | 5 | | | | |
| Input Rating | Rate | d Voltage/Frequency | 3-phas | se AC 20 | 0V~240V (| (-15% ~ - | -10%), 5 | 0/60Hz | | | | | |
| Jput | Oper | ating Voltage Range | | | 170~26 | 65Vac | | | | | | | |
| - | Fre | equency Tolerance | | | 47~6 | 3Hz | | | | | | | |
| | | | | | | 1 | | 86 4 | | | | | |

| Frequency Tolerance | 47~6 | 47~63Hz | | | | | | |
|---------------------|--|--|---|--|--|--|--|--|
| AC Drive Weight | 38.5± 1.5Kg | 64.8± 1.5Kg | 86.5± 1.5Kg | | | | | |
| Cooling Method | Fan co | oling | | | | | | |
| Braking Chopper | Frame A~C: Built-in; Frame D and above: Optional | | | | | | | |
| DC reactor | | | | | | | | |
| EMI Filter | Optional | | | | | | | |
| EMC-COP01 | Optic | onal | | | | | | |
| | AC Drive Weight Cooling Method Braking Chopper DC reactor EMI Filter | Frequency Tolerance 47~6 AC Drive Weight 38.5± 1.5Kg Cooling Method Fan co Braking Chopper Frame D a DC reactor Frame D a EMI Filter Optic | Frequency Tolerance 47~63Hz AC Drive Weight 38.5± 1.5Kg 64.8± 1.5Kg Cooling Method Fan cooling Braking Chopper Frame A~C: Built-in; Frame D and above: Optional DC reactor Frame A~C: Optional; Frame D and above: Built-in EMI Filter Optional | | | | | |

9-2 460V Series

| Frame Size | | | | А | | | | | В | | С | | | |
|---------------|------------------------------|--|-----------------|--|----------|----------|----------|----------|------------------------|----------------|--------------------|---------|---------|-------|
| Mode | | ⁻ DCH43A-21 ⁻ DCH4EA-21 | 007 | 015 | 022 | 03 | 7 | 055 | 075 | 110 | 150 | 185 | 220 | 300 |
| Ар | plicab | ble Motor Ourput (KW) | 0.75 | 1.5 | 2.2 | 3.7 | 7 | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 |
| Ap | Applicable Motor Ourput (HP) | | | 2 | 3 | 5 | | 7.5 | 10 | 15 | 20 | 25 | 30 | 40 |
| | Duty | Rated Output Capacity (kVA) | 2.4 | 3.2 | 4.8 | 7.2 | 2 | 9.6 | 14 | 19 | 25 | 30 | 36 | 48 |
| Output Rating | Super Heavy Duty | Rated Output Current (A) | 3 | 4 | 6 | 9 | | 12 | 18 | 24 | 32 | 38 | 45 | 60 |
| put R | ber He | Carrier Frequency (kHz) | | 5~15kHz | | | | | | | | | | |
| Out | | Overload Tolerance | | | | | | | rent is 1 rent is 2 | | 60 sec.; 3 sec. | | | |
| Input Rating | Inp | out Current (A) Super Heavy Duty | 4.3 | 5.9 | 8.7 | 14 | ļ | 17 | 20 | 26 | 35 | 40 | 47 | 63 |
| Ra | Rate | ed Voltage/Frequency | | | 3-p | hase A | C 38 | 0V~48 | 0V (-15 | %~+109 | %), 50/60 |)Hz | | |
| out | Ope | erating Voltage Range | | | | | | 323 | ~528Va | с | | | | |
| lu | F | requency Tolerance | | | | | | 47 | 7~63Hz | | | | | |
| | | C Drive Weight | | | 2.6± 0.3 | Kg | | | | 5.4± 1K | a | | 9.8± 2K | q |
| | | Cooling Method | Natural cooling | | | <u> </u> | | | Fan co | | 5 | 1 | | 5 |
| | Braking Chopper | | | Frame A~C: Built-in; Frame D and above: Optional | | | | | | | | | | |
| | DC reactor | | | Frame A~C: Optional; Frame D and above: Built-in | | | | | | | | | | |
| | | EMI Filter | | Frame A ~ C, VFDCH4EA-21, EMI filter built-in; Frame A ~ C, VFDCH43A-21, EMI filtter without built-in | | | | | | | | | | |
| | | EMC-COP01 | | Optional | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| Mode | | Frame Size | | |) | | | E | | F | | G | | Н |
| woue | | 02800CH43C-00/-21 | 370 | 450 | 550 | 750 | 90 | 00 | 1100 | 1320 | 1600 | 1850 | 2200 | 2800 |
| | | le Motor Ourput (KW) | 37 | 45 | 55 | 75 | 9 | | 110 | 132 | 160 | 185 | 220 | 280 |
| Ap | plicab | ble Motor Ourput (HP) | 50 | 60 | 75 | 100 | 12 | 25 | 150 | 175 | 215 | 250 | 300 | 375 |
| bu | Duty | Rated Output Capacity (kVA) | 58 | 73 | 88 | 120 | 14 | 43 | 175 | 199 | 247 | 295 | 359 | 438 |
| Rating | Heavy Duty | Rated Output Current (A) | 73 | 91 | 110 | 150 | 18 | 80 | 220 | 250 | 310 | 370 | 450 | 550 |
| Output | er He | Carrier Frequency (kHz) | | 5~15 | ikHz | | | | | | ~10kHz | | | |
| 0 | Super | Overload Tolerance | | | | | | | ent is 18 rent is 2 | | 60 sec.; 3 sec. | | | |
| ing | Inp | out Current (A) Super Heavy Duty | 74 | 101 | 114 | 157 | 16 | 67 | 207 | 240 | 300 | 380 | 400 | 494 |
| Rat | Rate | ed Voltage/Frequency | | | 3-p | hase A | C 38 | 0V~~4 | 80V (-15 | 5% +109 | %), 50/60 |)Hz | | |
| Input Rating | Ope | erating Voltage Range | | | | | | 323 | ~528Va | с | | | | |
| Ч | F | requency Tolerance | | | | | | 47 | 7~63Hz | | | | | |
| | AC Drive Weight | | | 38.5± | 1.5Kg | | 64 | 4.8± 1.5 | | 86.5± 1.5Kg | 1 | 34± 4Kg | l | 228Kg |
| | C | cooling Method | | Fan cooling | | | | | | | | | | |
| | | raking Chopper | | | | F | - ram | | d above | | al | | | |
| | | DC reactor | | | | | Fram | ne D ar | nd above | e: Built-i | n | | | |
| | | EMI Filter | | | | F | Fram | | d above | : Option | al | | | |
| | | EMC-COP01 | | | | | | 0 | ptional | | | | | |

I.

- The value of the carrier frequency is a factory setting. To increase the carrier frequency, the current needs to be decreased. See derating curve diagram of Pr06-55 for more information.

- When a load is a shock or impact load, use a higher level model. For FRAME A, B and C, Model VFDXXXCHXXX-21 the enclosure type is IP20/-UL OPEN TYPE. For FRAME D and above, if the last character of the model is "-00" then the enclosure type is IP00/ IP20/ UL OPEN TYPE; if the last character of the model is "-21" then the enclosure type is IP20/ NEMA1/ UL TYPE1.

General Specifications

| | Control Method | 1: V/F, 2: SVC, 3: VF+PG, 4: FOC+PG, 5: TQC+PG, | | |
|----------------------------|---|---|--|--|
| | Starting Torque | Reach up to 200% or above at 0.5Hz. | | |
| | • | Under FOC+PG mode, starting torque can reach 200% at 0Hz. | | |
| | V/F Curve | 4 point adjustable V/F curve and square curve | | |
| | Speed Response Ability | 5Hz (vector control can reach up to 40Hz) | | |
| | Torque Limit | Max. 220% torque current | | |
| | Torque Accuracy | ±5% | | |
| | Max. Output Frequency (Hz) | Super Heavy Duty: 0.00~600.00Hz | | |
| ristics | Frequency Output Accuracy | Digital command:±0.01%, -10 $^\circ\!\mathrm{C}$ ~+40 $^\circ\!\mathrm{C}$, Analog command: ±0.1%, 25±10 $^\circ\!\mathrm{C}$ | | |
| | Output Frequency Resolution | Digital command: 0.01Hz, Analog command: 0.03 X max. output frequency/60 Hz (±11 bit) | | |
| cte | Overload Tolerance | Rated output current is 150 % for 60 seconds ; 200% for 3 seconds | | |
| hara | Frequency Setting Signal | +10V~-10, 0~+10V, 4~20mA, 0~20mA, Pulse input | | |
| | Accel./decel. Time | 0.00~600.00/0.0~6000.0 seconds | | |
| Control Characteristics | Main control function | Torque control, Droop control, Speed/torque control switching, Feed forward control, Zero-servo control, Momentary power loss ride thru, Speed search, Over-torque detection, Torque limit, 17-step speed (max), Accel/decel time switch, S-curve accel/decel, 3-wire sequence, Auto-Tuning (rotational, stationary), Dwell, Cooling fan on/off switch, Slip compensation, Torque compensation, JOG frequency, Frequency upper/lower limit settings, DC injection braking at start/stop, High slip braking, PID control (with sleep function),Energy saving control, MODOBUS communication (RS-485 RJ45, max. 115.2 kbps), Fault restart, Parameter copy | | |
| | Fan Control | 230V model VFD150CH23A-21(include) and series above: PMW control; VFD110CH23A-21(include) and series below: on/off switch control 460V model VFD185CH43A/4EA-21(include) and series above: PMW control; VFD150CH43A/4EA-21(include) and series below: on/off switch control | | |
| | Motor Protection | Electronic thermal relay protection | | |
| | | For drive model 230V and 440V | | |
| ĸ | Over-current | Over-current protection for 300% rated current | | |
| stic | Protection | current clamp [©] Super heavy duty: 220% [©] | | |
| eri | Over-voltage | 230: drive will stop when DC-BUS voltage exceeds 410V | | |
| act | Protection | 460: drive will stop when DC-BUS voltage exceeds 820V | | |
| Protection Characteristics | Over-temperature Protection | Built-in temperature sensor | | |
| | Stall Prevention | Stall prevention during acceleration, deceleration and running independently | | |
| | Restart After Instantaneous Power Failure | Parameter setting up to 20 seconds | | |
| | Grounding Leakage Current Protection | Leakage current is higher than 50% of rated current of the AC motor drive | | |
| Certifications | | | | |

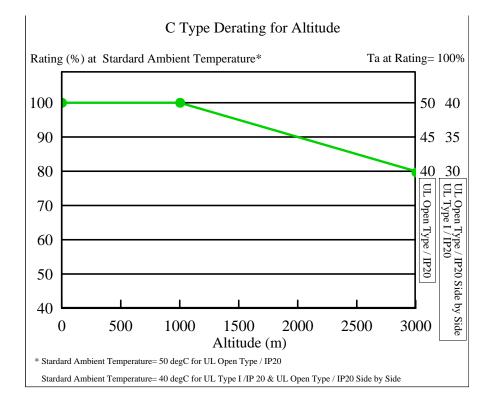
9-3 Environment for Operation, Storage and Transportation

DO NOT expose the AC motor drive in the bad environment, such as dust, direct sunlight, corrosive/inflammable gasses, humidity, liquid and vibration environment. The salt in the air must be less than 0.01mg/cm² every year.

| | Installation location | IEC60364-1/IEC606 | 664-1 Pollution degree 2, Indoor use only | | |
|-----------------------|---|-------------------------|---|--|--|
| | Currounding | Storage | -25 °C ~ +70 °C | | |
| | Surrounding | Transportation | -25 °C ~ +70 °C | | |
| | Temperature | Non-condensatior | n, non-frozen | | |
| | Rated Humidity | Operation | Max. 95% | | |
| | | Storage/ | Max. 95% | | |
| | Rated Humbling | Transportation | | | |
| | | No condense water | | | |
| | | Operation/ | 86 to 106 kPa | | |
| Environment | Air Pressure | Storage | | | |
| | | Transportation | 70 to 106 kPa | | |
| | | IEC721-3-3 | | | |
| | | Operation | Class 3C2; Class 3S2 | | |
| | Pollution Level | Storage | Class 2C2; Class 2S2 | | |
| | | Transportation | Class 1C2; Class 1S2 | | |
| | | No concentrate | | | |
| | Altitude | Operation | If AC motor drive is installed at altitude 0~1000m, follow normal operation restriction. If it is install at altitude 1000~2000m, decrease 2% of rated current or lower 0.5° C of temeperature for every 100m increase in altitude. Maximum altitude for Corner Grounded is 2000m. | | |
| Package Drop | Storage ISTA procedure 1A(according to weight) IEC60068-2-31 | | | | |
| Vibration | 1.0mm, peak to peak value range from 2Hz to 13.2 Hz; 0.7G~1.0G range from 13.2Hz to 55Hz; 1.0G range from 55Hz to | | | | |
| Vibration | 512 Hz. Com | mply with IEC 60068-2-6 | | | |
| Impact | IEC/EN 60068-2-27 | | | | |
| Operation Position | Max. allowed offset angle $\pm 10^{\circ}$ (under normal installation position) | | | | |

9-4 Specification for Operation Temperature and Protection Level

| Model | Frame | Top cover | Conduit Box | Protection Level | Operation Temperature |
|-----------------|---|-------------------------|------------------------------|---|--------------------------|
| | Frame A~C | Top cover Removed | Standard conduit plate | IP20/ UL Open Type | -10~50 ℃ |
| VFDxxxxCHxxx-21 | 230V: 0.75~18.5kW 460V: 0.75~30kW | Standard with top cover | | IP20/ UL Type1/ NEMA1 | -10~40 ℃ |
| | Frame D~H 230V: >22kW 460V: >30kW | N/A | Standard conduit box | IP20/ UL Type1/ NEMA1 | -10~50° ℃ |
| VFDxxxxCHxxx-00 | Frame D~H 230V: >22kW 460V: >30kW | N/A | Standard conduit box | IP00 IP20/UL Open Type Only the circled ar Other parts are IP2 | -10~50° ℃ |



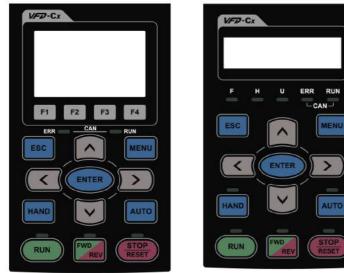
9-5 Derating of ambient temperature and altitude

| Protection Level | Operating Environment | |
|---------------------|---|--|
| UL Type I / IP20 | When the AC motor drive is operating at the rated current and the ambient temperature has to be between 10° C ~ +40°C. When the temperature is over 40° C, for every increase by 1° C, decrease 2% of the rated current. The maximum allowable temperature is 60° C. | |
| UL Open Type / IP20 | When the AC motor drive is operating at the rated current and the ambient temperature has to be between -10° C ~ $+50^{\circ}$ C. When the temperature is over 50° C, for every increase by 1° C, decrease 2% of the rated current. The maximum allowable temperature is 60° C. | |
| High Altitude | If AC motor drive is installed at altitude $0 \sim 1000$ m, follow normal operation restriction. If it is install at altitude $1000 \sim 2000$ m, decrease 2% of rated current or lower 0.5° C of temperature for every 100m increase in altitude. Maximum altitude for Corner Grounded is 2000m. Contact Delta for more information, if you need to use this motor drive at an altitude of 2000m or higher. | |

Chapter 10 Digital Keypad

- 10-1 Descriptions of Digital Keypad
- 10-2 Function of Digital Keypad KPC-CC01
- 10-3 TPEditor Installation Instruction
- 10-4 Fault Code Description of Digital Keypad KPC-CC01

10-1 Descriptions of Digital Keypad KPC-CC01 KPC-CE01(Option)



Installation Method

- 1. Embedded type and can be put flat on the surface of the control box. The front cover is water proof.
- 2. Buy a MKC-KPPK model to do wall mounting or embedded mounting. Its protection level is IP66.
- 3. The maximum RJ45 extension lead is 5 m (16ft)
- 4. This keypad can only be used on Delta's motor drive C2000, CH2000 and CP2000.

Descriptions of Keypad Functions

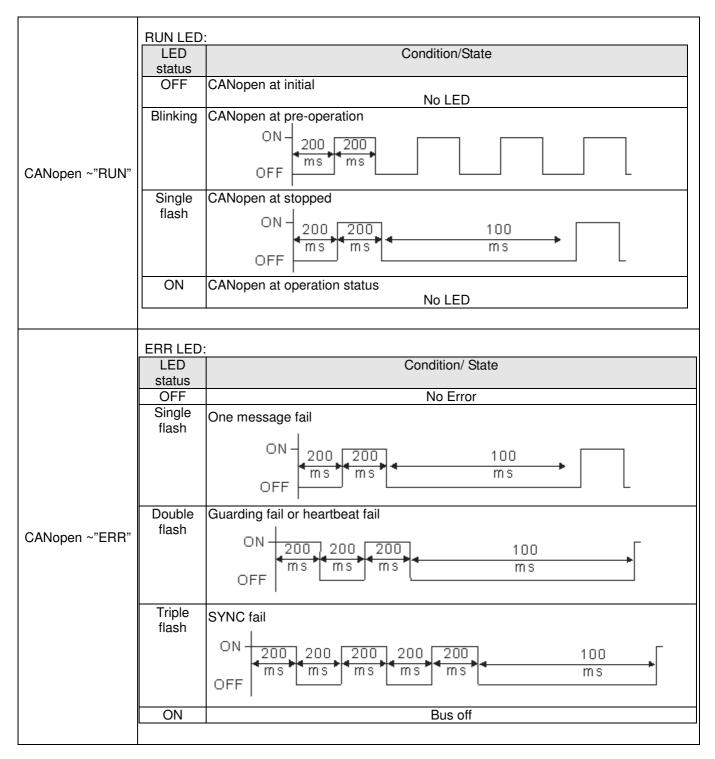
| Кеу | Descriptions | | |
|----------------------|---|--|--|
| RUN | Start Operation Key 1. It is only valid when the source of operation command is from the keypad. 2. It can operate the AC motor drive by the function setting and the RUN LED will be ON. 3. It can be pressed again and again at stop process. 4. When enabling "HAND" mode, it is only valid when the source of operation command is from the keypad. | | |
| STOP RESET | Stop Command Key. This key has the highest processing priority in any situation. When it receives STOP command, no matter the AC motor drive is in operation or stop status, the AC motor drive needs to execute "STOP" command. The RESET key can be used to reset the drive after the fault occurs. For those faults that can't be reset by the RESET key, see the fault records after pressing MENU key for details. | | |
| FWD REV | Operation Direction Key 1. This key is only control the operation direction NOT for activate the drive. FWD: forward, REV: reverse. 2. Refer to the LED descriptions for more details. | | |
| ENTER | ENTER Key Press ENTER and go to the next level. If it is the last level then press ENTER to execute the command. | | |
| ESC | ESC Key ESC key function is to leave current menu and return to the last menu. It is also functioned as a return key in the sub-menu. | | |
| MENU | Press menu to return to main menu. Menu content: KPC-CE01 does not support function 5 ~13. 1. Parameter setup 7. Quick start 13. PC Link 2. Copy Parameter 8. Display Setup 3. Keypad Locked 9. Time Setup 4. PLC Function 10. Language Setup 5. Copy PLC 11. Startup Menu 6. Fault Record 12. Main Page | | |
| | Direction: Left/Right/Up/Down 1. In the numeric value setting mode, it is used to move the cursor and change the numeric | | |

Chapter 10 Digital Keypad

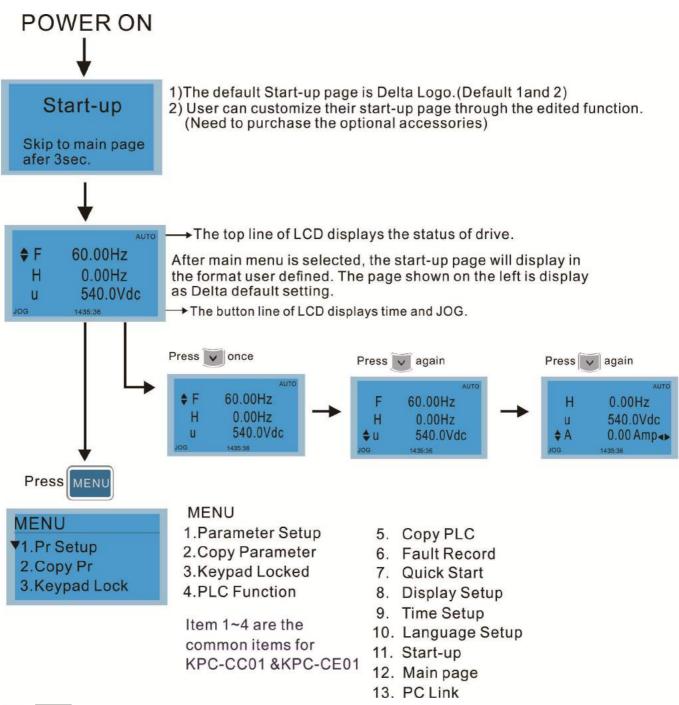
| | unction Key | |
|-------|---------------------------------------|--|
| | The functions keys have factory se | ttings and can be defined by users. The factory settings |
| | of F1 and F4 work with the function | n list below. For example, F1 is JOG function, F4 is a |
| F1 F2 | speed setting key for adding/deleting | ng user defined parameters. |
| | | / TPEditor first. TPEditor software V1.30.6 is available |
| F3 F4 | for download at: | |
| | http://www.delta.com.tw/ch/product | t/em/download/download_main.asp?act=3&pid=1&cid= |
| | 1&tpid=3 | · · · · · · · · · · · · · · · · · · · |
| | Installation Instruction for TPEditor | is on page 10-15 of this chapter. |
| | AND ON Key | |
| | , | eter settings of the source of Hand frequency and hand |
| | | oth source of Hand frequency and hand operation are |
| | the digital keypad. | our source of mand nequency and hand operation are |
| | e 1 | s, the setting will switch to hand frequency source and |
| HAND | | ID ON key at operation status, it stops the AC motor |
| | | and switch to hand frequency source and hand |
| | | and switch to hand hequency source and hand |
| | operation source. | |
| | • | C-CE01, "H/A" LED will be on; for KPC-CC01, it will |
| | display HAND mode/ AUTO mode | |
| | | eter settings of the source of AUTO frequency and |
| | | g is the external terminal (source of operation is |
| | 4-20mA). | |
| Αυτο | | setting will switch to hand frequency source and hand |
| | | at operation status, it stops the AC motor drive first |
| | | h to auto frequency source and auto operation source. |
| | • | C-CE01, "H/A" LED will be off; for KPC-CC01, it will |
| | display HAND mode/ AUTO mode | on the screen |
| | | |

Descriptions of LED Functions

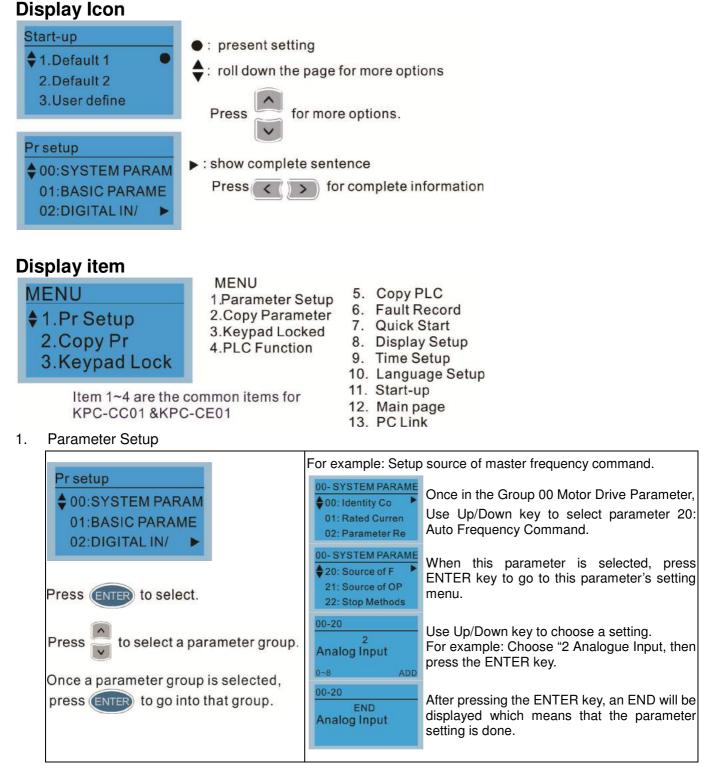
| LED | Descriptions |
|----------------------|---|
| | Steady ON: operation indicator of the AC motor drive, including DC brake, zero speed, |
| RUN | standby, restart after fault and speed search. Blinking: drive is decelerating to stop or in the status of base block. |
| | Steady OFF: drive doesn't execute the operation command |
| | Steady ON: stop indicator of the AC motor drive. |
| STOP RESET | Blinking: drive is in the standby status. |
| RESET | Steady OFF: drive doesn't execute "STOP" command. |
| | Operation Direction LED |
| | 1. Green light is on, the drive is running forward. |
| | 2. Red light is on, the drive is running backward. |
| | 3. Twinkling light: the drive is changing direction. |
| | (Only KPC-CE01 support this function) |
| HAND | Setting can be done during operation. |
| | HAND LED: When HAND LED is on (HAND mode); when HAND LED is off (AUTO mode). |
| | (Only KPC-CE01Support this function) |
| Αυτο | Setting can be done during operation. |
| | AUTO LED: when AUTO LED is on (AUTO mode); when AUTO LED is off (HAND mode). |



10-2 Function of Digital Keypad KPC-CC01

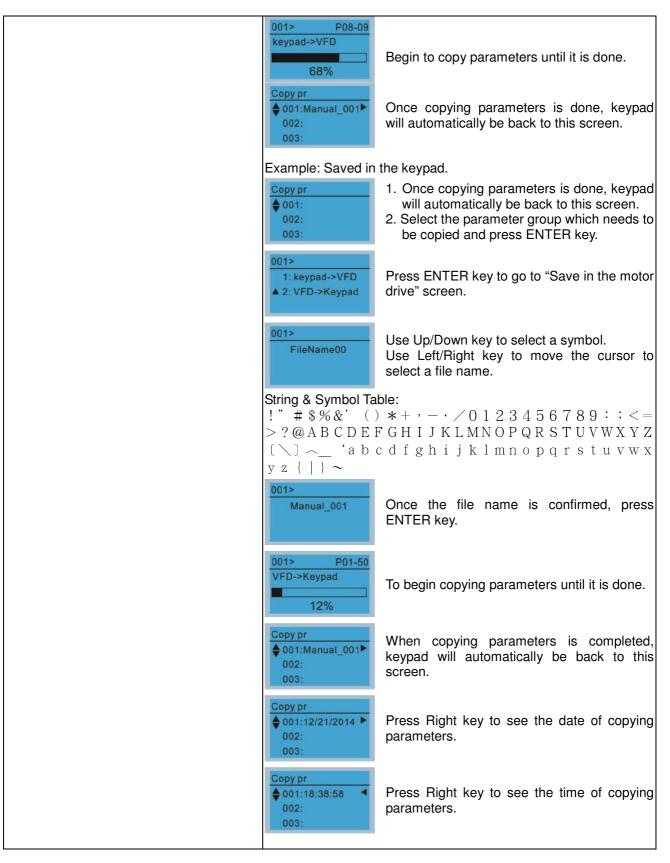


- 1. Startup page can only display pictures, no flash.
- 2. When Power ON, it will display startup page then the main page. The main page displays Delta's default setting F/H/A/U, the display order can be set by Pr.00.03 (Startup display). When the selected item is U page, use left key and right key to switch between the items, the display order of U page is set by Pr.00.04 (User display).

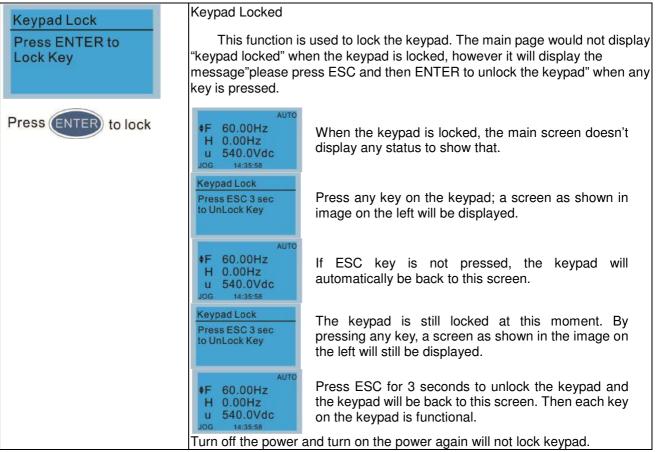


2. Copy Parameter

| Copy Pr | | 4 duplicates are pr | ovided |
|-----------------------------------|--|--|--|
| ♦ 001:Manual_001 ► | | The steps are show | wn in the example below. |
| 002:FileName01 | | Example: Saved in | the motor drive. |
| 003:FileName02 | | Copy pr | 1 Go to Copy Parameter |
| | | ♦ 001:Manual_001► | 2 Select the parameter group which needs to |
| Press ENTER key to go to 001~004: | | 002: 003: | be copied and press ENTER key. |
| content storage | | 001> ▼ 1: keypad->VFD 2: VFD->Keypad | Select 1: Save in the motor drive. Press ENTER key to go to "Save in the motor drive" screen. |



3. Keypad locked

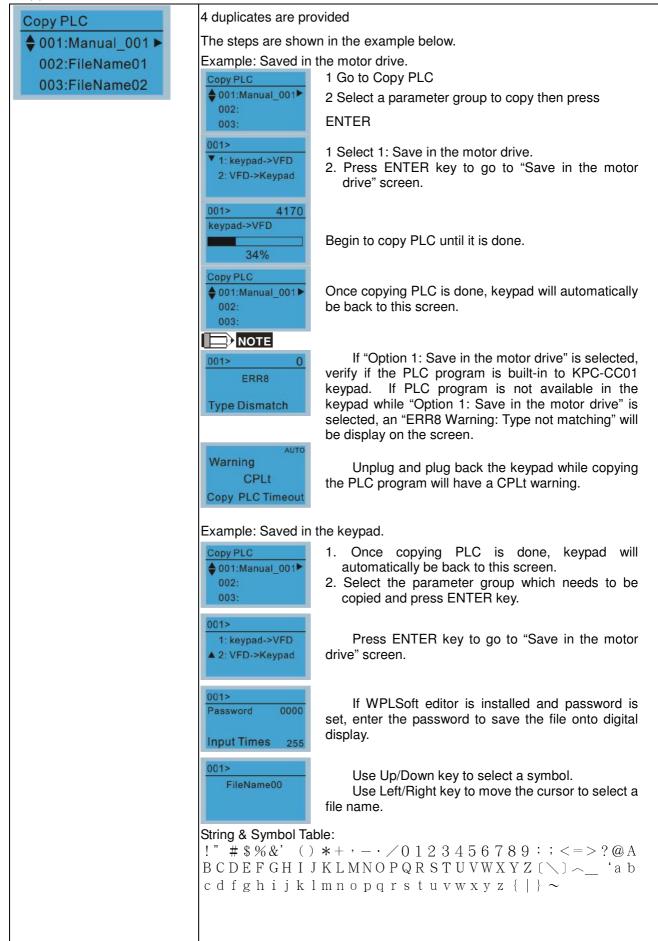


4. PLC Function

| PLC | | When activate and stop PLC function, the PLC status will be displayed on main page of Delta default setting. | |
|---|--|--|--|
| ▼1.Disable 2.PLC Run 3.PLC Stop | PLC 1.Disable \$2.PLC Run 3.PLC Stop | Optipn 2: Enable PLC function | |
| Press Up/Down key to select PLC's function. Then press ENTER. | a PLC/RUN AUTO F 60.00Hz H 0.00Hz u 540.0Vdc JOG 14:35:58 | Factory setting on the main screen displays PLC/RUN status bar. | |
| | PLC 1.Disable 2.PLC Run ▲3.PLC Stop • | Option 3: Disable PLC function | |
| | PLC/STOP AUTO F 60.00Hz H 0.00Hz u 540.0Vdc JOG 14:35:58 | Factory setting on the main screen displays PLC/STOP status bar | |
| | PLC/STOP AUTO Warning PLFF Function defect | If the PLC program is not available in the control board, PLFF warning will be displayed when choosing option 2 or 3. In this case, select option 1 : No Function to clear PLFF warning. | |
| | The PLC function of 1. PLC0 2. PLC1 3. PLC2 | of KPC-CE01 can only displays: | |

Chapter 10 Digital Keypad

5. Copy PLC



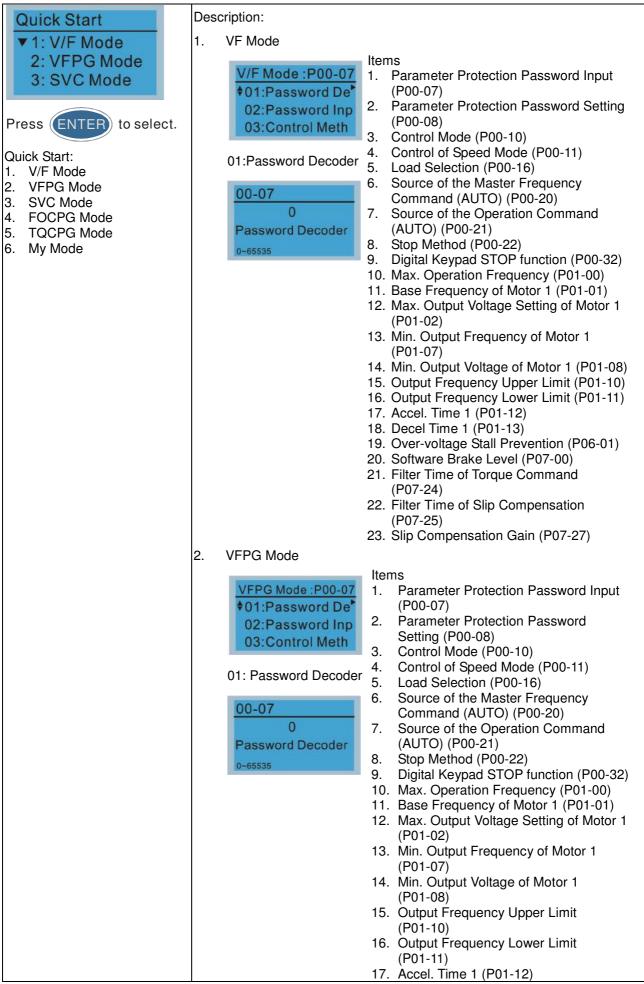
| 001> Manual_001 | Once the file name is confirmed, press ENTER key. |
|--|---|
| 001> 2010 VFD->Keypad 12% | To begin copying parameters until it is done. |
| Copy PLC ♦ 001:Manual_001 002: 003: | When copying parameters is completed, keypad will automatically be back to this screen. |
| Copy PLC ♦ 001:12/21/2014 ► 002: 003: | Press Right key to see the date of copying parameters. |
| Copy PLC ♦ 001:18:38:58 ◀ 002: 003: | Press Right key to see the time of copying parameters. |

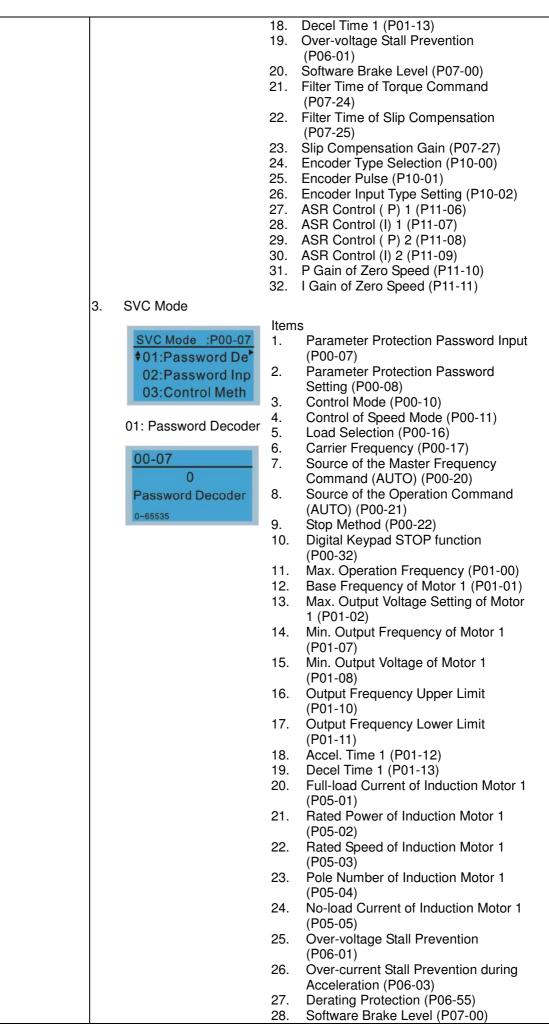
6. Fault record

| Fault record ▼1:oL 2:ovd 3:GFF | Able to store 6 error code (Keypad V1.02 and previous versions) Able to store 20 error code(Keypad V1.0e3 and previous version) The most recent error record is shown as the first record. Select an error record to see its detail such as date, tme, frequency, current, voltage, DCBUs voltage) | |
|---|--|---|
| Press ENTER to select. KPC-CE01 does not support | Fault record ▼1:oL 2:ovd 3:GFF | Press Up/Down key to select an error record. After selecting an error code, press ENTER to see that error record's detail |
| this function. | 1: oL ♦ Current: 79.57 Voltage: 189.2 BUS Voltage:409.5 1: oL ♦ Date: 01/20/2014 Time: 21:02:24 Outfreq: 32.61 | Press Up/Down key to see an error record's detail such as date, time, frequency, current, voltage, DCBus voltage. |
| | Fault record 1:oL ♦ 2:ovd 3:GFF | Press Up/Down key to select an error record. After selecting an error code, press ENTER to see that error record's detail |
| | 2: ovd ♦ Current: 79.57 Voltage: 189.2 BUS Voltage:409.5 2: ovd ♦ Date: 01/20/2014 Time: 21:02:24 Outfreq: 32.61 | Press Up/Down key to see an error record's detail such as date, time, frequency, current, voltage, DCBus voltage. |
| | KPC-CC01 is re fault records will | AC motor drive are record and save to KPC-CC01. When moved and apply to another AC motor drive, the previous not be deleted. The new fault records of the present AC accumulate to KPC-CC01. |

Chapter 10 Digital Keypad

7. Quick Start

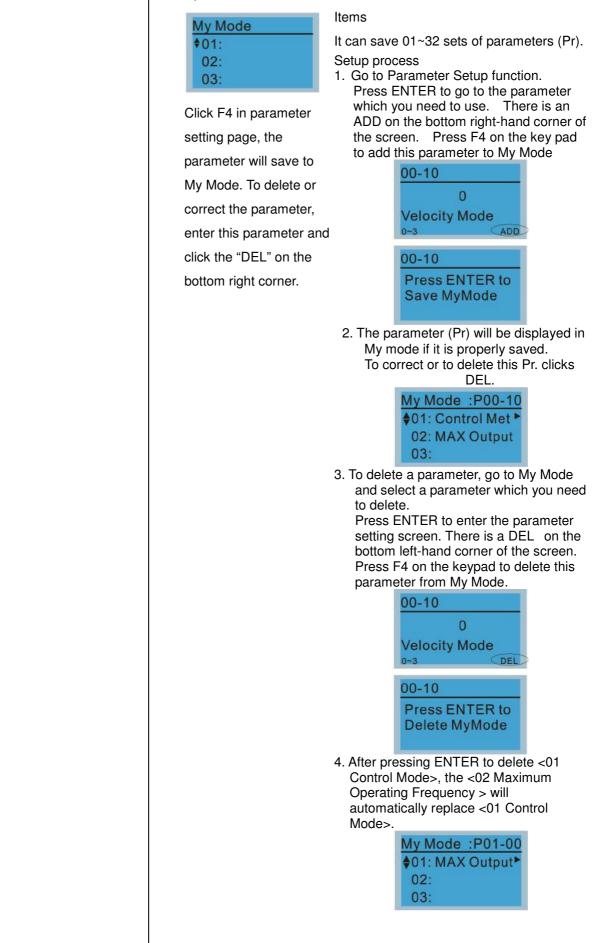




| | | 29. Emergency Stop (EF) & Force to Stop Selection (P07-20) |
|---|--|---|
| | | 30. Filter Time of Torque Command (P07-24) |
| | | 31. Filter Time of Slip Compensation (P07-25) |
| | | 32. Slip Compensation Gain (P07-27) |
| 4 | 4. FOCPG Mode | No. or a |
| | FOCPG Mode :P00-07 \$01:Password De | Items 1. Parameter Protection Password Input (P00-07) |
| | 02:Password Inp 03:Control Meth | Parameter Protection Password Setting (P00-08) Control Mode (P00-10) |
| | 01: Password Decoder | Control of Speed Mode (P00-11) Source of the Master Frequency |
| | 00-07 | Command (AUTO) (P00-20) 6. Source of the Operation Command (AUTO) (P00-21) |
| | Password Decoder | Stop Method (P00-22) Max. Operation Frequency (P01-00) |
| | | Base Frequency of Motor 1 (P01-01) Max. Output Voltage Setting of Motor 1 (P01-02) |
| | | Output Frequency Upper Limit (P01-10) Output Frequency Lower Limit (P01-11) |
| | | Accel. Time 1 (P01-12) Decel Time 1 (P01-13) Full load Current of Industion Mater 1 |
| | | Full-load Current of Induction Motor 1 (P05-01) Rated Power of Induction Motor 1 |
| | | (P05-02) 17. Rated Speed of Induction Motor 1 |
| | | (P05-03) 18. Pole Number of Induction Motor 1 |
| | | (P05-04) 19. No-load Current of Induction Motor 1 (P05-05) |
| | | Over-voltage Stall Prevention (P06-01) Over-current Stall Prevention during |
| | | Acceleration (P06-03) 22. Derating Protection (P06-55) 23. Software Brake Level (P07-00) |
| | | 24. Emergency Stop (EF) & Force to Stop Selection (P07-20) |
| | | Encoder Type Selection (P10-00) Encoder Pulse (P10-01) Encoder Input Type Setting (P10-00) |
| | | 27. Encoder Input Type Setting (P10-02) 28. System Control (P11-00) 29. Per Unit of System Inertia (P11-01) |
| | | 30. ASR1 Low-speed Bandwidth (P11-03) 31. ASR2 High-speed Bandwidth (P11-04) |
| | | 32. Zero-speed Bandwidth (P11-05) |
| | | |
| | | |
| | | |
| | | |

| 1 | | | |
|----|--|---|--|
| 5. | TQCPG Mode | | |
| 5. | TQCPG Mode :P00-07 * 01:Password De 02:Password Inp 03:Control Meth 01: Password Decoder 0-65535 | 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. | ns Password Input (Decode) (P00-07) Password Setting (P00-08) Control Mode (P00-10) Control of Speed Mode (P00-11) Source of the Master Frequency Command (P00-20) Source of the Operation Command (P00-21) Max. Operation Frequency (P01-00) Base Frequency of Motor 1 (P01-01) Max. Output Voltage Setting of Motor 1 (P01-02) Full-load Current of Induction Motor 1 (P05-01) Rated Power of Induction Motor 1 (P05-02) Rated Speed of Induction Motor 1 (P05-03) Pole Number of Induction Motor 1 (P05-04) No-load Current of Induction Motor 1 (P05-05) Over-voltage Stall Prevention (P06-01) Software Brake Level (P07-00) Encoder Type Selection (P10-02) System Control (P11-00) Per Unit of System Inertia (P11-01) ASR1 Low-speed Bandwidth (P11-03) ASR2 High-speed Bandwidth (P11-03) ASR2 High-speed Bandwidth (P11-03) Torque Command (P11-27) Source of Torque Offset (P11-28) Torque Offset Setting (P11-29) Source of Torque Command (P11-33) Torque Command (P11-34) Speed Limit Selection (P11-36) Forward Speed Limit (torque mode) (P11-37) Reverse Speed Limit (torque mode) (P11-38) |
| | | 16. 17. | Software Brake Level (P07-00) Encoder Type Selection (P10-00) |
| | | | |
| | | 20. | System Control (P11-00) |
| | | 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. | ASR1 Low-speed Bandwidth (P11-03) ASR2 High-speed Bandwidth (P11-04) Zero-speed Bandwidth (P11-05) Max. Torque Command (P11-27) Source of Torque Offset (P11-28) Torque Offset Setting (P11-29) Source of Torque Command (P11-33) Torque Command (P11-34) Speed Limit Selection (P11-36) Forward Speed Limit (torque mode) (P11-37) Reverse Speed Limit (torque mode) |
| | | | |
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| 6. | Мy | Mode |
|----|----|------|
|----|----|------|

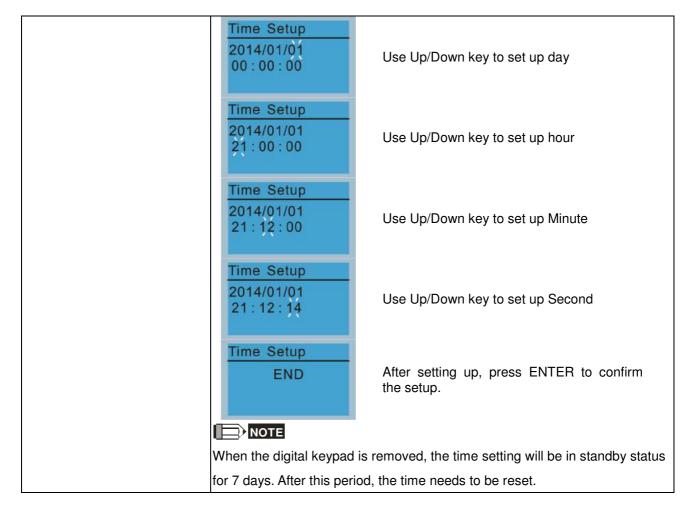


8. Display setup

| Display Setup | | |
|-----------------------------|-----------------------------|---|
| Displ Setup | 1. Contrast | |
| ▼1:Contrast | Contrast | |
| 2:Back-Light | +0 | Use Up/Down key to adjust the setting value. |
| 3:Text Color | -20 +20 | value. |
| 3. Text Color | | |
| | Contrast | After selecting a setting value. Press |
| Press ENTER to setting menu | +10 | ENTER to see screen's display after |
| | -20 +20 | contrast is adjusted to be +10. |
| | | |
| | Displ Setup ▼1:Contrast | When the patting value is 0 Min, the back |
| | 2:Back-Light | When the setting value is 0 Min, the back light will be steady on. |
| | 3:Text Color | ight win be bloady on. |
| | Contrast | |
| | -10 | |
| | -10 | Then press ENTER. |
| | -20 +20 | |
| | Displ Setup | |
| | ▼1:Contrast | After select a setting value Press ENTER to |
| | 2:Back-Light | see screen's display result after contrast is adjusted to be -10. |
| | 3.Text Color | |
| | 2. Back-light | |
| | Displ Setup | |
| | 1:Contrast | Press ENTER to go to Back Light Time |
| | | Setting screnn. |
| | 3:Text Color | |
| | Back-Light Min | |
| | 5 | Use Up/Down key to adjust the setting |
| | | value. |
| | 0 10 | |
| | Back-Light Min | |
| | 0 | When the setting value is 0 Min, the back |
| | 0 10 | light will be steady on. |
| | | |
| | Displ Setup | When the patting value is 10 Min the |
| | 1:Contrast ¢2:Back-Light | When the setting value is 10 Min, the backlight will be off in 10 minutes. |
| | 3:Text Color | Saskight will be on in 10 minutes. |
| L | | |

9. Time setting

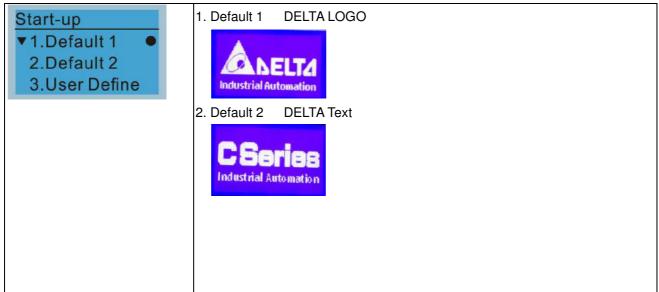
| Time setup 2009/01/01 :: | Time Setup 2014/01/01 00 : 00 : 00 | Use Up/Down key to set up Year |
|---|--|---------------------------------|
| Use Left/Right key to select Year, Month, Day, Hour, Minute or Second to set up | Time Setup 2014/01/01 00 : 00 : 00 | Use Up/Down key to set up Month |



10. Language setup

| Language ▼1:English ♥ | Language setting option Language setting option | is displayed in the language of the user's choice. s: |
|---------------------------|--|--|
| 2:繁體中文 | 1. English | 5. |
| 3:简体中文 | 2. 繁體中文 | 6. Espanol |
| Use Up/Down key to select | | 7. Portugues |
| language, than press ENTE | R. 4. Turkce | |

11. Startup-up



| 3 | 3. User Defined: optional accessory is require (TPEditor & USB/RS-485 |
|---|---|
| | Communication Interface-IFD6530) |
| | Install an editing accessory would allow users to design their own start-up |
| | page.If editor accessory is not installed, "user defined" option will dispay a |
| | blank page. |
| | DELTA VFD C2000 X-Y-Z 3-axis station X-axis |
| L | JSB/RS-485 Communication Interface-IFD6530 Please refer to Chapter 07 Optional Acessories for more detail. |
|] | <u>TPEditor</u> Go to Delta's website to download TPEditor V1.30.6 or later versions. <u>http://www.delta.com.tw/ch/product/em/download/download_main.asp?act</u> |
| | =3&pid=1&cid=1&tpid=3 |

12. Main page

| Main Page | 1. Default page |
|--|--|
| ▼ 1.Default 2.User Define | ▲UTO ♦ F 60.00Hz H 0.00Hz u 540.0Vdc JOG 14:25:56 |
| Default picture and editable picture are available upon selection. | F 600.00Hz >>> H >>> A >>> U (circulate) 2. User Defined: optional accessory is require (TPEditor & USB/RS-485 |
| Press ENTER to select. | Communication Interface-IFD6530) Install an editing accessory would allow users to design their own start-up page.If editor accessory is not installed, "user defined" option will dispay a blank page. |
| | Freq. 60.00 Hz PID target 50.00 % Current 123.45 A PID feedback 47.45 % DC BUS 543.21 Vdc Output freq. 53.21 Hz 2014/02/06 14: 25:56 |
| | USB/RS-485 Communication Interface-IFD6530 Please refer to Chapter 07 Optional Acessories for more detail. |
| | TPEditor Go to Delta's website to download TPEditor V1.30.6 or later versions. <u>http://www.delta.com.tw/ch/product/em/download/download_main.asp?act</u> =3&pid=1&cid=1&tpid=3 |

13. PC Link

| PC Link | | allows users to connect the keypad to a bad and edit user defined pages. |
|------------|--------------------------|--|
| 2. VFDSoft | PC Link Waiting 0% | Click ENTER to go to <waiting connect="" pc="" to=""></waiting> |

| | In TPEditor, choose <co< th=""><th>mmunication>, then choose "Write</th><th>to HMI"</th></co<> | mmunication>, then choose "Write | to HMI" |
|---|---|---|--|
| | Ref Constant Deter Treater Ref (5.612) と Werking Constant Consta | All De Det 1 | T |
| | X-axis Output cument ####.# PID tanget 0 | | Difference in the second secon |
| | XXX XI XXX XI XXX XI XXX XI XXX XI XXXXXX XXXXXX XXXXXX XXXXXXX XXXXXXX XXXX | Deno Type DBLTA VTG-C Inone Missiae Type VTG-C Roffel Deno Type DBLTA | Degery 0 3 1 1 2 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 |
| | Choose <yes> in the <c< th=""><th>Confirm to Write> dialogue box.</th><th></th></c<></yes> | Confirm to Write> dialogue box. | |
| | Clean XML Color TROLO TROL TROL Vanda Color (Color Color Col | a B fee - Posting - | |
| | X-axis Output cument ####. # FID tanget 0 | F4 | (6) The -0 -1 -DoPpe |
| | Korvy Without Decorption of the second s | Driss Type DE.7A VPD-C lawren Matgar Type VPD-C Karbal | Poperty 2 Poperty 2 0 80 % 2 2 90 % 2 2 90 % 2 |
| | PC Link Receiving 28% | Start downloading pages to ed | it KPC-CC01. |
| | PC Link Completed 100% | Download completed | |
| 2 | . VFDSoft: this function | allows user to link to the VFDSoft | Operating |
| | software then to uploa | id data | |
| | Copy parameter 1~4 i | n KPC-CC01 | |
| | Connect KPC-CCO1 t | o a computer | |
| | PC Link 1TPEditor ▲2. VFDSoft | Start downloading pages to KPC-CC01 | edit to |
| | PC Link \$001: C2000_Fan1► 002: C2000_Fan2 003: C2000_Pum1 | Use Up/Down key to select a group to upload to VFDSoft. Press ENTER | parameter |

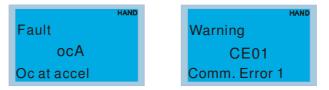
| PC Link 1: 0 Waiting Waiting to connect to PC 0% Omega |
|--|
| Open VFDSoft, choose <parameter function="" manager=""></parameter> |
| The Delay Discont Contons Help |
| Officier Digen State Dd State Dd State Regnant Tend |
| |
| Onine Venamin Külden |
| Balad Votage Balad Curnet |
| Hatter Message |
| - |
| |
| |
| In Parameter Manager, choose <load from="" kpc-cc01="" parameter="" table=""></load> |
| |
| 04-14e 2014/70214-10048 |
| Choose the right communication port and click OK |
| Della VIDSolt |
| 16 Dec Degrade Carlos Help |
| OPTion Date Date |
| |
| |
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| i de la construcción de la constru |

E.

| PC Link 1: 2170 Receiving 58% | Start to upload parameters to VFDSoft |
|--------------------------------------|---|
| PC Link 1: 3640 Completed 100% | Uploading parameter is completed |
| Before using the user de | fined starting screen and user defined main |
| screen, the starting scree | en setup and the main screen setup have to be |
| preset as user defined. | |
| If the user defined page | are not downloaded to KPC-CC01, the starting |
| screen and the main scre | een will be blank. |

Other display

When fault occur, the menu will display:



- 1. Press ENTER and start RESET. If still no response, please contact local distributor or return to the factory. To view the fault DC BUS voltage, output current and output voltage, press "MENU"→"Fault Record".
- 2. Press ENTER again, if the screen returns to main page, the fault is clear.
- 3. When fault or warning message appears, backlight LED will blinks until the fault or the warning is cleared.

Optional accessory: RJ45 Extension Lead for Digital Keypad

| | • • |
|-----------|--|
| Part No. | Description |
| CBC-K3FT | RJ45 extension lead, 3 feet (approximately 0.9m) |
| CBC-K5FT | RJ45 extension lead, 5 feet (approximately 1.5 m) |
| CBC-K7FT | RJ45 extension lead, 7 feet (approximately 2.1 m) |
| CBC-K10FT | RJ45 extension lead, 10 feet (approximately 3 m) |
| CBC-K16FT | RJ45 extension lead, 16 feet (approximately 4.9 m) |

Note: When you need to buy communication cables, buy non-shielded , 24 AWG, 4 twisted pair, 100 ohms communication cables.

10-3 TPEditor Installation Instruction

TPEditor can edit up to 256 HMI (Human-Machine Interface) pages with a total storage capacity of 256kb.

Each page can edit 50 normal objects and 10 communication objects.

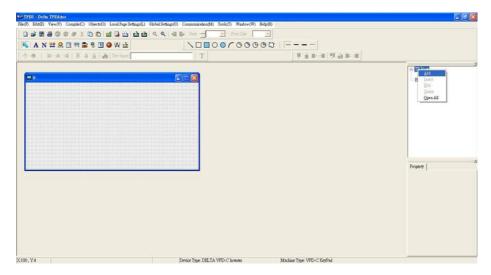
- 1) TPEditor: Setup & Basic Functions
 - 1. Run TPEditor version 1.30



2. Go to File(F)→Click on New. The Window below will pop up. At the device type, click on the drop down menu and choose DELTA VFD-C Inverter. At the TP type, click on the drop down menu and choose VFD-C KeyPad. As for File Name, enter TPE0. Now click on OK.

| New Project | |
|----------------------|----------|
| HMI <=> PLC | |
| Set Device Type | |
| DELTA VFD-C Inverter | <u>•</u> |
| ТР Туре | |
| VFD-C KeyPad | • |
| File Name | |
| TPEO | |
| OK | Cancel |

3. You are now at the designing page. Go to Edit (E)→Click on Add a New Page (A) or go to the TP page on the upper right side, right click once on TP page and choose Add to increase one more page for editing. The current firmware of Keypad is version1.00 and can support up to 4 pages.



4. Edit Startup Page

5. Static Text **A**. Open a blank page, click once on this button **A**, and then double click on that blank page. The following windows will pop up.

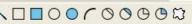
| Street - Join (Plaine) 76(7) [hit], View? (Lumple?) (Surre?) Londbay-Schood); | ALANA AN ALAN ALAN MUL MUL MU | 302 |
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| Dy | | is TP Pug 0 Box Page |
| | Rome Text Freitig Forme String Text Denkine Alignment Alignment Alignment Align Text | |
| | Featbrag OK Oand | Propriet [mittees labs [Left/Top/With/35 France Prices], Shape Test Directors, France Labs Page Nation Adaption Vers Algement Adapt Top Para Testage [Nation Price] Para Testage [Nation Price] [Nation Price] |
| X28 , Y.30 Steen Ten III, 20 (W=12, H=14) | Deter Type DBLTA IA Poster Madae Type TF040 | |

6. Static Bitmap \rightarrow Open a blank page, then click once on this button and then double click on that blank page. The following window will pop up.

| K AN 2200 × 1 1 6 0 1 1 4 1 8 8 8 5 0 1 A 1000 | | 1819 | | 7 0000 | າສ∣⊑ •• | | |
|---|--|--|--|---|--|--------------|--|
| 2 Bust Face 0 0 0 0 0 0 0 0 | RAD RAUMONA AR ADAN ADAN ADAN ADAN ADAN ADAN | larrov tarrov011 tarrov021 tarrov021 tarrov012 tarrov014 tarrov015 tarrov016 tarrov017 tarrov019 tarrov019 tarrov019 tarrov011 tarrov012 tarrov012 tarrov012 tarrov014 tarrov014 tarrov015 tarrov015 tarrov016 tarrov017 tarrov017 tarrov017 tarrov018 tarrov011 tarrov011 tarrov013 tarrov013 tarrov014 tarrov014 tarrov013 tarrov014 tarrov014 tarrov014 tarrov014 tarrov015 tarrov015 tarrov018 tar | domord 15 domord 16 domord 16 domord 18 domord 19 domord 20 domord 20 domord 23 domord | + + C Auron 029 Auron 020 Auron 021 Auron 021 Auron 021 Auron 023 Auron 023 Auron 023 Auron 024 Auron 024 | C C E E - 0 demoil 4 0 demoil 5 0 demoi | Petre (Nort) | Boot Page |
| | | 編名(2) 編末頻型(1) | Binops (* bag) | | u BRASS u Rom | | Popert Ottown Kon (Luft) (ng Wath Dirag New (Britan) |

Please note that Static Bitmap setting support only images in BMP format. Now choose a image that you need and click open, then that image will appear in the Static Bitmap window.

7. Geometric Bitmap



Geometric Bitmap Geometric bitmap to choose. Open a new blank page then click once on a geometric bitmap icon that you need. Then drag that icon and enlarge it to the size that you need on that blank page.

Chapter 10 Digital Keypad

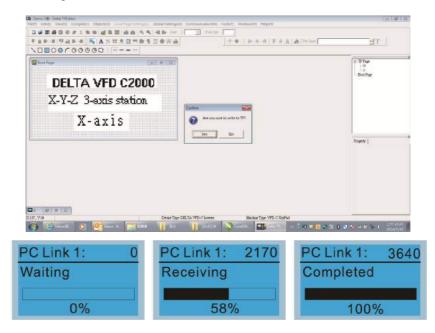
8. Finish editing the keypad starting screen and select **Communication>Input User Defined Keypad Starting Screen.**

| 200000×10000000000000000000000000000000 | |
|---|------------------------|
| ■···································· | A M Intiget |
| | |
| out Page | IP TP Page Box Page |
| oot Rege | |
| DELTA VFD C2000 | |
| DELLIA VID CZUUU | |
| X-Y-Z 3-axis station | |
| | |
| X-axis | |
| | Fingenty |
| | rideo (|
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| | |
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| | |
| | |

- 9. Downloading setting: Go to Tool > Communication. Set up communication port and speed of IFD6530.
- 10. Only three speed selections are available: 9600 bps, 19200 bps and 38400 bps.

| TP Station Address | 1 : |
|--------------------|--------|
| PC COM Port | COM3 - |
| Baud Rate | 9600 - |

11. When a dialogue box displayed on the screen asking to confirm writing or not, press buttons on the keypad to go to MENU, select PC LINK and then press ENTER and wait for few seconds. Then select YES on the screen to start downloading.



- 2) Edit Main Page & Example of Download
 - 1. Go to editing page, select EditàAdd one page or press the button ADD on the right hand side of the HMI page to increase number of pages to edit. This keypad currently support up to 256 pages.

| Tpe0-Detre T/Editor eth Editati Vew(M CompletC) Objects(0) Local | Page Settings(1) Oktobil Settings(3) Commu | water official toolets | | 20 |
|---|--|--|---------------|---|
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| Carl N Carl | Denix The DB TA VPD | Clanare Medias Type 1920 2014201 Constant | Classed | |

2. On the bottom right-hand corner of the HMI, click on a page number to edit or go to VIEW >HMI page to start editing main page. As shown in the image, the following objects are available. From left to right: Static Text, ASCII Display, Static Bitmap, Scale, Bar Graph, Button, Clock Display, Multi-state bit map, Units, Numeric Input and 11 geometric bitmaps and lines of different width. The application of Static Text, Static Bitmap, and geometric bitmap is the same as the editing startup page.



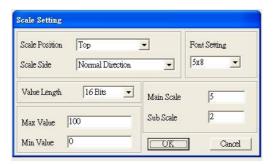
3. Numric/ASCII Display : To add a Numeric/ASCII Display object to a screen, double click on the object to set up Related Devices, Frame Setting, Fonts and Alignment.

| Refer Device | | | Frame Setting Font Setting | No Frame | • |
|----------------|----------|----------|-------------------------------|------------|---|
| Value Type | Unsigned | * | Alignment | Align Left | • |
| Value Length | 16 Bits | 7 | 🔽 Leading Zeros | | |
| Integer Number | 5 | Ŧ | | | |
| Decimal Number | 0 | - | OK | Cancel | 1 |

Related Device: Choose the VFD Communication Port that you need, if you want to read output frequency (H), set the VFD Communication Port to \$2202. For other values, please refer to ACMD ModBus Comm Address List.

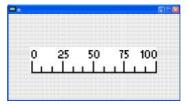
| C PLC | Refer Device Device Name S | |
|----------------|-------------------------------|-------------|
| ☞ VFD | Aksolute Addr. 2100 | |
| Set PLC ID 1 | 012345 6789AB | OK Ciear |
| TP Port COM1 - | CDEF./ | Close |

4. Scale Setting "" : On the Tool Bar, click on this "" for Scale Setting. You can also edit Scale Setting in the Property Window on the right hand side of your computer screen.



- a. Scale Position: Click on the drop down list to choose which position that you need to place a scale.
- b. Scale Side: Click on the drop down list to choose if you want to number your scale from smaller number to bigger number or from big to small. Click OK to accept this setting or click Cancel to abort.
- c. Font Setting: Click on the drop down list to choose the Font setting that you need then click OK to accept the setting or click Cancel to abort.
- d. Value Length: Click on the drop down to choose 16bits or 32 bits. Then click OK to accept the setting or click Cancel to abort.
- e. Main Scale & Sub Scale: In order to divide the whole scale into equal parts, key in the numbers of your choices for main scale and sub scale.
- f. Maximum value & Minimum Value are the numbers on the two ends of a scale. They can be negative numbers. But the values allowed to be input are limited by the length of value. For example, when the length of value is set to **be hexadecimal**, the maximum and the minimum value cannot be input as -4000.

Follow the Scale setting mentioned above; you will have a scale as shown below.



5. Bar Graph setting

| Refer Device | | Direction Setting | |
|---------------|---------|--------------------|------------|
| <u>\$2100</u> | | From Bottom to Top | p <u> </u> |
| Value Type | Unsign | ed 🗾 | |
| Value Length | 16 Bits | • | |
| Max Value | 65535 | | OK |
| Min Value | 0 | | Cancel |

- a. Related Device: Choose the VFD Communication Port that you need.
- b. Direction Setting: Click on the drop down menu to choose one of the following directions: From Bottom to Top, From Top to Bottom, From Left to Right or From Right to Left.
- c. Maximum Value & Minimum Value: They define the range covered by the maximum value and minimum value. If a value is smaller than or equal to the minimum value, then the bar graph will be blank. If a value is bigger or equal to the maximum value, then the bar graph will be full. If a value is between minimum and maximum value, then the bar graph will be filled proportionally.

6. Button [®] : Currently this function only allows the Keypad to switch pages, other functions are not yet available. Text input function and Image inserted functions are not yet supported.

Double click on ¹ to open set up window.

| Write in Read Function Key Value Length Value Length Current State 0 Total States 0 Iter Length Current State 0 Iter Length Current State 0 Iter Length Iter Length Iter Length Call Iter Length | Button Type Page Jump | Page Jump Setting Page No | | ngle Frame 👤 |
|--|-----------------------|------------------------------------|--------------------------|-----------------------------|
| Value Type Value Type Current State O Itsex Level Itsex Level Itsex It | T Read | | Text Alignment Middle | Bitmap Alignment |
| Cument State 0 _ [None] Bitmap Read | | | Graph Input | |
| Bitmap Clear | 1- | C After Writing C Set User Level 0 | [None] | Bitmap Read Bitmap Clear |

<Button Type> allows users set up buttons' functions. <Page Jump> and <Constant Setting> are the only two currently supported functions.

A [Page Jump] function setting

- Page Jump setting: After you choose the Page Jump function in the drop down list, you will see this Page Jump Setting Menu
- <Function Key> allows you to assign functions to the following keys on the KPC-CC01 keypad: F1, F2, F3, F4, Up, Down, Left and Right. Please note that the Up and Down keys are locked by TPEditor. These two keys cannot be programmed. If you want to program Up and Down keys, go to Tool→Function Key Settings (F)→Re-Define Up/Down Key(R).

| ools(T) Window(W) Help(H) Communication Settings(C) AutoSave Setup(A) | | |
|---|--------------------------|-----------------|
| Function Key Setting(F) Page Size(S) Grid Setting(G) | Re-Define Up/Down Key(R) | |
| Guia Setting(G) Language Setting(L) | | - TP Page |
| | | E-O: Boot Pa |

 Button Text: This function allows user to name buttons. For example, key in <Next Page> in the empty space, a button will have the wording <Next Page> displayed on it.

B [Constant setting] function

This function is to set up the memory address' value of the VFD or PLC. When pressing the <function button> set up in before, a value will be written to the memory address of the <Constant Setting>. This function can be used as initializing a variable.

| Button Type 🛛 🖸 | notal Setting 🔄 | Constant Setting | 22007200200000 | | Single Prince |
|--------------------------------|-----------------|------------------|----------------|--|---|
| Write-in F Real | | | | Foat Setting Text Alignment Middle • Middle • | 5x8 • Eitmap Alignment Middle • Middle • |
| Value Length Value Type | I6Bm • | Coll Collection | e Reset | Graph lapot | |
| Countral State | | C Alter Writing | r set | (Nong) | Bitmap Read Bitmap Clear |
| Button Text | 1 | | - | OR | Centel |

7. Clock Display Setting : The setup window of the Clock Display is shown as the image below. Time, Day or Date can be displayed on the keypad.

Open a new file and click once in that window, you will see the following

In the clock display setting, you can choose to display Time, Day or Date on the Keypad. To adjust time, go to #9 on the Keypad's menu. You can also adjust Frame Setting, Font Setting and Alignment.

| | Frame Setting | No Frame | • |
|------------------|---------------|-------------|----------|
| | Font Setting | Align Left | |
| Time Association | Alignment | 5x8 | <u>.</u> |
| G TP Toor | a fline | n Day in Da | le . |
| C FLC Time | 08 | Cancel | |

8. Multi-state bitmap . The setup window of the multi-state is shown as the image below. This object reads the bit's property value of the PLC. It defines what image or wording is when this bit is 0 or when this bit is 1. Set the initial status to be 0 or 1 to define the displayed image or wording.

| Refer Device | | |
|--|--------------|-----------------------------|
| | Graph Input: | |
| C Value Value Type Value Longth Totel States | [None] | Bitmap Read Bitmap Clear |
| Total States 2 + Current State 0 - | Text Input | Font Setting |
| | OK | Cancel |

9. Unit Measurement Click once on this Button: Open a new file and double click on that window, you will see the following

| nits Setting | | |
|----------------|------|--------|
| Metrology Type | Time | |
| Unit Name | ms | • |
| OK | | Cancel |

Choose from the drop down list the Metrology and the Unity Name that you need. As for Metrology, you have the following choices Length, Square Measure, Volume/Solid Measure, Weight, Speed, Time and Temperature. The unit name changes automatically when you change metrology type. 10. Numeric Input Setting

This menu allows you to provide parameters or communication ports and to input numbers.

Click once on this button

Open a new file and double click on that window, you will see the following:

| Numeric Input Se | Hing | | | |
|--|--|------------------------------------|------------------|------|
| Refer Device Wzie F Read | <u> </u> | | No France | • |
| F Punction Key | - | Hosi. Alignment Vert. Alignment | Middle Middle | • |
| - | | Call Setting | _ | - 61 |
| Value Type Value Length | Unsignad • | | | - |
| Value Setting Initiger Number Decimal Number | 5 <u>•</u> | C Arter Water | | * |
| Limit Setting Min Value | 0 | User Lovel | 0 💌 | |
| Mar Value | 65333 | OK | Cancel | 1 |

- a. Related Device: There are two blank spaces to fill in, one is <Write> and another one is <Read>. Input the numbers that you want to display and the corresponding numbers of a parameter and that of a communication port. For example, input 012C to Read and Write Parameter P01-44.
- b. OutLine Setting: The Frame setting, Font setting, Vertical Alignment and Horizontal Alignment are the same as mentioned before. Click on the drop down menu and choose the setting that you need.
- c. Function key: The setting here allows you to program keys on the keypad. Press the key on the menu then the corresponding key on the keypad will start to blink, then press Enter to confirm the setting.
- d. Value Type & Value Length: These two factors influence the range of the Minimum and Maximum Value of the Limit Setting. Please note that the corresponding supporting values for CH2000 have to be 16bits. The 32bits values are not supported.
- e. Value Setting: This part is set automatically by the keypad itself.
- f. Limit Setting: Input the range the security setting here.
- g. For example, if you set Function Key as F1, Minimum Value as 0 and Maximum Value ias 4, then press F1 on Keypad Then you can press Up and Down key on the keypad to increase or decrease the value. Press Enter Key on the keypad to confirm your setting. You can also go to parameter table 01-44 to verify if your input correctly the value.
- 11. Download TP Page : Press Up or Down key on the keypad until you reach #13 PC Link.

Then press Enter on the keypad and you will see the word "Waiting" on keypad's screen. Now choose a page that you have created then go to Communication $(M) \rightarrow W$ rite to TP(W) to start downloading the page to the keypad

When you see the word Completed on the keypad's screen, that means the download is done. Then you can press ESC on the keypad to go back to the menu of the keypad.

| (2) Terre (10) Toda 175 even 1967) (dell) Wanhi Compile(1) Objects(1) () | seal Fage Settings (2) Global Settings (2) Communication (1) Tools (7) Window (W) Halp (4). | Sector Co |
|---|---|--|
| | 6 | a a) where we have a second se |
| Page 4 | | (2704 (-) (-) (-) (-) (-) (-) (-) (-) (-) (-) |
| SUI HH:MM | N | Prenty |
| (c) Class) Office d | and the Hands Name of | |
| CLink 1: 0 aiting | PC Link 1: 2170 Receiving | PC Link 1: 3640 Completed |
| 0% | 58% | 100% |

- 3) Edit Main Page
 - On the bottom right-hand corner of the HMI, click on a page number to edit or go to VIEW >HMI page to start editing main page. As shown in the image, the following objects are available. From left to right: Static Text, ASCII Display, Static Bitmap, Scale, Bar Graph, Button, Clock Display, Multi-state bit map, Units, Numeric Input and 11 geometric bitmaps and lines of different width. The application of Static Text, Static Bitmap, and geometric bitmap is the same as the editing startup page.

| | to Trible 0 boothge |
|--|---------------------------|
| | |
| | |
| | |
| | Terange |
| | |
| | |
| | |

2. Numric/ASCII Display : To add a Numeric/ASCII Display object to a screen, double click on the object to set up Related Devices, Frame Setting , Fonts and Alignment.

| Refer Device | | | Frame Setting Font Setting | No Frame | | • |
|----------------|----------|----------|-------------------------------|------------|---|---|
| Value Type | Unsigned | Ŧ | Alignment | Align Left | • | |
| Value Length | 16 Bits | * | 🔽 Leading Zeros | | | |
| Integer Number | 5 | Ŧ | F Arithmetic | | | |
| Decimal Number | 0 | - | OK | Cancel | 1 | |

Related Device: Choose the VFD Communication Port that you need, if you want to read output frequency (H), set the VFD Communication Port to \$2202. For other values, please refer to ACMD ModBus Comm Address List.

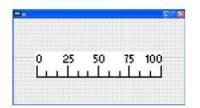
| | Refer Device | |
|----------------|---------------------|-------|
| C PLC | T Device Name S | |
| ♂ VFD | Absolute Adds. 2100 | |
| | 012345 | OK |
| Set PLC ID 1 | 6789AB | Clear |
| TP Port COM1 - | CDEF./ | Close |

3. Scale Setting ¹¹¹: On the Tool Bar, click on this ¹¹¹ for Scale Setting. You can also edit Scale Setting in the Property Window on the right hand side of your computer screen.

| Scale Setting | |
|--|----------------------|
| Scale Position Top Scale Side Normal Direction | Font Setting 5x8 |
| Value Length 16 Bits 💌 | Main Scale 5 |
| Max Value 100 | Sub Scale 2 |
| Min Value 0 | Cancel |

- i. Scale Position: Click on the drop down list to choose which position that you need to place a scale.
- ii. Scale Side: Click on the drop down list to choose if you want to number your scale from smaller number to bigger number or from big to small. Click OK to accept this setting or click Cancel to abort.
- iii. Font Setting: Click on the drop down list to choose the Font setting that you need then click OK to accept the setting or click Cancel to abort.
- iv. Value Length: Click on the drop down to choose 16bits or 32 bits. Then click OK to accept the setting or click Cancel to abort.
- v. Main Scale & Sub Scale: In order to divide the whole scale into equal parts, key in the numbers of your choices for main scale and sub scale.
- vi. Maximum value & Minimum Value are the numbers on the two ends of a scale. They can be negative numbers. But the values allowed to be input are limited by the length of value. For example, when the length of value is set to **be hexadecimal**, the maximum and the minimum value cannot be input as -4000.

Follow the Scale setting mentioned above; you will have a scale as shown below.



4. Bar Graph setting

| Refer Device | | Direction Setting | |
|---------------|---------|--------------------|--------|
| <u>\$2100</u> | | From Bottom to Top | - |
| Value Type | Unsign | ed. 🗾 | |
| Value Length | 16 Bits | • | |
| Max Value | 65535 | | OK |
| Min Value | 0 | | Cancel |

- i. Related Device: Choose the VFD Communication Port that you need.
- ii. Direction Setting: Click on the drop down menu to choose one of the following directions: From Bottom to Top, From Top to Bottom, From Left to Right or From Right to Left.
- iii. Maximum Value & Minimum Value: They define the range covered by the maximum value and minimum value. If a value is smaller than or equal to the minimum value, then the bar graph will be blank. If a value is bigger or equal to the maximum value, then the bar graph will be full. If a value is between minimum and maximum value, then the bar graph will be filled proportionally.
- 5. Button ¹ : Currently this function only allows the Keypad to switch pages, other functions are not yet available. Text input function and Image inserted functions are not yet supported.

Double click on ¹⁶ to open set up window.

| | Frame Setting Single Frame |
|--|---|
| Write-in Read Function Key | Font Setting 5x8 - Text Alignment Middle Middle Middle Middle |
| Value Length Call | Graph Input |
| Cument State O I I User Level O I | [None]Bitmap Read |

<Button Type> allows users set up buttons' functions. <Page Jump> and <Constant Setting> are the only two currently supported functions.

A [Page Jump] function setting

- Page Jump setting: After you choose the Page Jump function in the drop down list, you will see this Page Jump Setting Menu
- <Function Key> allows you to assign functions to the following keys on the KPC-CC01 keypad: F1, F2, F3, F4, Up, Down, Left and Right. Please note that the Up and Down keys are locked by TPEditor. These two keys cannot be programmed. If you want to program Up and Down keys, go to Tool→Function Key Settings (F)→Re-Define Up/Down Key(R).

| Communication Settings(C) AutoSave Setup(A) | | |
|--|--------------------------|--|
| Function Key Setting(F) | Re-Define Up/Down Key(R) | |
| Page Size(S) Frid Setting(G) | | |
| Language Setting(L) 🕨 🕨 | | |
| | | |

 Button Text: This function allows user to name buttons. For example, key in <Next Page> in the empty space, a button will have the wording <Next Page> displayed on it.

B [Constant setting] function

This function is to set up the memory address' value of the VFD or PLC. When pressing the <function button> set up in before, a value will be written to the memory address of the <Constant Setting>. This function can be used as initializing a variable.

| lutton Setting | | Constant Setting | | | |
|-----------------------------------|--------------------|-----------------------------------|----------------|----------------|---------------------------------------|
| Botton Type | ownant Setting 💽 💌 | 10 | - | DATE: | Single Frace 💌 |
| Watte-in F ^{art} Real | | | | Text Alignment | 518 • Eitmap Alignment Middle • |
| 🕫 Function Key | [F] | | | Midde • | Middle 💽 |
| Value Length | 16805 • | IT Call | | Gisph lapot | |
| Value Type | Unsigned | P Belice Woning C After Woning | e Ree C Set | | |
| Content State | 0 • | | | [Non#] | Bitmap Read |
| Total Burea | P ± | User Level | 0 💌 | | Bitmap Clear |
| Button Text | 1 | | _ | OR | Cincel |

6. Clock Display Setting 1: The setup window of the Clock Display is shown as the image below. Time, Day or Date can be displayed on the keypad.

Open a new file and click once in that window, you will see the following In the clock display setting, you can choose to display Time, Day or Date on the Keypad. To adjust time, go to #9 on the Keypad's menu. You can also adjust Frame Setting, Font Setting and Alignment.

| Clock Display Settin | 8 | | |
|----------------------|---------------|------------|------|
| | Frame Setting | No Frame | • |
| | Font Setting | Align Left | • |
| Time Association | Alignroent | 528 | • |
| 6 TP Ime | a fine (| n Day in D | tate |
| C FLCTure | OK | Cancel | |

7. Multi-state bitmap Y: The setup window of the multi-state is shown as the image below. This object reads the bit's property value of the PLC. It defines what image or wording is when this bit is 0 or when this bit is 1. Set the initial status to be 0 or 1 to define the displayed image or wording.

| Refer Device | | |
|--|-------------|-----------------------------|
| M0 | Graph Input | |
| C Value Value Type Value Longth Total States | [None] | Bitmap Read Bitmap Clear |
| Total States 2 | Test Input | Font Setting |
| | OK | Cancel |

8. Unit Measurement Click once on this Button: Open a new file and double click on that window, you will see the following

| | - | |
|----------------|------|---------------------------------------|
| Metrology Type | Time | · · · · · · · · · · · · · · · · · · · |
| Unit Name | ms | |

Choose from the drop down list the Metrology and the Unity Name that you need. As for Metrology, you have the following choices Length, Square Measure, Volume/Solid Measure, Weight, Speed, Time and Temperature. The unit name changes automatically when you change metrology type.

9. Numeric Input Setting

This menu allows you to provide parameters or communication ports and to input numbers.

Click once on this button

Open a new file and double click on that window, you will see the following:

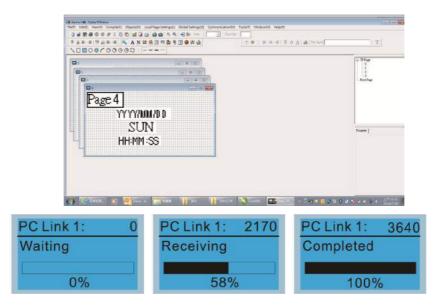
| Numeric Input Se | tting | | | × |
|---|-------------|--|------------------|---|
| Refer Device Wzie ┌─ Read | | OutLine Setting Bane Setting Ront Setting | No France |] |
| F Function Key Authority | | Host. Alignment Vert. Alignment Call Setting | Middle Middle | |
| Value Type | Unsigned | | I. | |
| Value Length Value Setting Integer Number Decimal Number | 5 | © Eeffexe Wata | | |
| Limit Setting Min Value Mar Value | 0 65335 | User Level OK | 0 💌 Canadi | 1 |

- h. Related Device: There are two blank spaces to fill in, one is <Write> and another one is <Read>. Input the numbers that you want to display and the corresponding numbers of a parameter and that of a communication port. For example, input 012C to Read and Write Parameter P01-44.
- i. OutLine Setting: The Frame setting, Font setting, Vertical Alignment and Horizontal Alignment are the same as mentioned before. Click on the drop down menu and choose the setting that you need.
- j. Function key: The setting here allows you to program keys on the keypad. Press the key on the menu then the corresponding key on the keypad will start to blink, then press Enter to confirm the setting.
- k. Value Type & Value Length: These two factors influence the range of the Minimum and Maximum Value of the Limit Setting. Please note that the corresponding supporting values for CH2000 have to be 16bits. The 32bits values are not supported.
- I. Value Setting: This part is set automatically by the keypad itself.
- m. Limit Setting: Input the range the security setting here.

- n. For example, if you set Function Key as F1, Minimum Value as 0 and Maximum Value ias 4, then press F1 on Keypad Then you can press Up and Down key on the keypad to increase or decrease the value. Press Enter Key on the keypad to confirm your setting. You can also go to parameter table 01-44 to verify if your input correctly the value.
- 10. Download TP Page : Press Up or Down key on the keypad until you reach #13 PC Link.

Then press Enter on the keypad and you will see the word "Waiting" on keypad's screen. Now choose a page that you have created then go to Communication (M) \rightarrow Write to TP(W) to start downloading the page to the keypad

When you see the word Completed on the keypad's screen, that means the download is done. Then you can press ESC on the keypad to go back to the menu of the keypad.



10-4 Digital Keypad KPC-CC01 Fault Codes and Descriptions

Following fault codes and description are for digital keypad KPC-CC01 with version V1.01 and version higher.

| LCM Display * | Description | Corrective Actions |
|-----------------------------------|--|---|
| Fault FrEr kpdFlash Read Er | Keypad flash memory read error | An error has occurred on keypad's flash memory. 1. Press RESET on the keypad to clear errors. 2. Verify what kind of error has occurred on keypad's flash memory. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your authorized local dealer. |
| Fault FSEr kpdFlash Save Er | Keypad flash memory save error | An error has occurred on keypad's flash memory. 1. Press RESET on the keypad to clear errors. 2. Press RESET on the keypad to clear errors. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your authorized local dealer. |
| Fault FPEr kpdFlash Pr Er | Keypad flash memory parameter error | Errors occurred on parameters of factory setting. It might be caused by firmware update. 1. Press RESET on the keypad to clear errors. 2. Verify if there's any problem on Flash IC. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| Fault VFDr Read VFD Info Er | Keypad flash memory when read AC drive data error | Keypad can't read any data sent from VFD. Verify if the keypad is properly connect to the motor drive by a communication cable such as RJ-45. Press RESET on the keypad to clear errors. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| Fault CPUEr CPUError | and then power on again the system. | A Serious error has occurred on keypad's CPU. 1. Verify if there's any problems on CPU clock? 2. Verify if there's any problem on Flash IC? 3. Verify if there's any problem on RTC IC? 4. Verify if the communication quality of the RS485 is good? 5. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |

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Warning Code

| LCM Display * | Description | Corrective Actions |
|--|--------------------------------------|--|
| HAND Warning CE01 Comm Command Er | Modbus function code error | Motor drive doesn't accept the communication command sent from keypad. 1. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ-45. 2. Press RESET on the keypad to clear errors. If none of the solution above works, contact your local authorized dealer. |
| Warning CE02 Comm Address Er | Modbus data address error | Motor rive doesn't accept keypad's communication address. 1. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ-45. 2. Press RESET on the keypad to clear errors. If none of the solution above works, contact your local authorized dealer. |
| HAND Warning CE03 Comm Data Error | Modbus data value error | Motor drive doesn't accept the communication data sent from keypad. 1. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ-45. 2. Press RESET on the keypad to clear errors. If none of the solution above works, contact your local authorized dealer. |
| Warning CE04 Comm Slave Error | Modbus slave drive error | Motor drive cannot process the communication command sent from keypad. 1. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ-45. 2. Press RESET on the keypad to clear errors. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| Warning CE10 KpdComm Time Out | Modbus transmission time-Out | Motor drive doesn't respond to the communication command sent from keypad. 1. Verify if the keypad is properly connected to the motor drive on the communication contact by a communication cable such as RJ-45. 2. Press RESET on the keypad to clear errors. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| HAND Warning TPNO TP No Object | Object not supported by TP Editor | Keypad's TP Editor uses unsupported object. 1. Verify how the TP editor should use that object. |

File Copy Setting Fault Description

| LCM Display * | Description | Corrective Actions |
|--------------------------------|----------------------------------|--|
| File 1 Err 1 Read Only | | The property of the parameter/file is read-only and cannot be written to. 1. Verify the specification on the user manual. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Write Fail | Fail to write parameter and file | An error occurred while write to a parameter/file. 1. Verify if there's any problem on the Flash IC. 2. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above work, contact your local authorized dealer. |
| File 1 Err VFD Running | AC drive is in operating status | A setting cannot be made while motor drive is in operation. 1. Verify if the drive is not in operation. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Pr Lock | AC drive parameter is locked | A setting cannot be made because a parameter is locked. 1. Verify if the parameter is locked or not. If it is locked, unlock it and try to set up the parameter again. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Pr Changing | AC drive parameter changing | A setting cannot be made because a parameter is being modified. 1. Verify if the parameter is being modified. If it is not being modified, try to set up that parameter again. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Fault Code | Fault code | A setting cannot be made because an error has occurred on the motor drive. 1. Verify if there's any error occurred on the motor dive. If there isn't any error, try to make the setting again. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Warning Code | Warning code | A setting cannot be made because of a warning message given to the motor drive. 1. Verify if there's any warning message given to the motor drive. If the solution above doesn't work, contact your local authorized dealer. |
| File 1 Err Type Dismatch | File type dismatch | Data need to be copied are not same type, so the setting cannot be made. 1. Verify if the products' serial numbers need to be copied fall in the category. If they are in the same category, try to make the setting again. If the solution above doesn't work, contact your authorized dealer. |
| File 1 Err Password Lock | File is locked with password | A setting cannot be made, because some data are locked. 1. Verify if the data are unlocked or able to be unlocked. If the data are unlocked, try to make the setting again. 2. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |

Chapter 10 Digital Keypad

| LCM Display * | Description | Corrective Actions |
|-----------------------------------|---------------------------------|---|
| File 1 Err 10 Password Fail | File version dismatch | A setting cannot be made because the password is incorrect. 1. Verify if the password is correct. If the password is correct, try to make the setting again. 2. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| File 1 Err Version Fail | AC drive copy function time-out | A setting cannot be made, because the version of the data is incorrect. 1. Verify if the version of the data matches the motor drive. If it matches, try to make the setting again. If none of the solution above works, contact your local authorized dealer. |
| File 1 Err VFD Time Out | Other keypad error | A setting cannot be made, because data copying timeout expired. 1. Redo data copying. 2. Verify if copying data is authorized. If it is authorized, try again to copy data. 3. Shut down the system, wait for ten minutes, and then power on again the system. If none of the solution above works, contact your local authorized dealer. |
| File 1 Err Keypad Issue | Other AC drive error | This setting cannot be made, due to other keypad issues. (Reserved functions) If such error occurred, contact your local authorized dealer. |
| File 1 Err VFD Issue | File is locked with password | This setting cannot be made, due to other motor drive issues. (Reserved functions). If such error occurred, conatct your local authorized dealer. |

* The content in this chapter only applies on V1.01 and above of KPC-CC01 keypad.

Chapter 11 Summary of Parameter Settings

This chapter provides summary of parameter settings for user to gather the parameter setting ranges, factory settings and set parameters. The parameters can be set, changed and reset by the digital keypad.

1) $\cancel{}$: the parameter can be set during operation

2) For more detail on parameters, please refer to Ch12 Description of Parameter Settings.

00 Drive Parameters

IM: Induction Motor; PM: Permanent Magnet Motor

| Pr. | Explanation | Settings | Factory Setting |
|-------|---|---|--------------------|
| 00-00 | Identity Code of the AC Motor Drive | 4: 230V, 1HP 5: 460 V, 1HP 6: 230V,2HP 7: 460 V, 2HP 8: 230V, 3HP 9: 460 V, 3HP 10: 230V, 5HP 11: 460 V, 5HP 12: 230V, 7.5HP 13: 460 V, 7.5HP 14: 230V, 10HP 15: 460V, 10HP 16: 230V, 15HP 17: 460V, 15HP 18: 230V, 20HP 20: 230V, 25HP 21: 460V, 20HP 22: 230V, 30HP 23: 460V, 30HP 24: 230V, 40HP 25: 460V, 40HP 26: 230V, 50HP 27: 460V, 50HP 28: 230V, 60HP 29: 460V, 60HP 30: 230V, 75HP 31: 460V, 75HP 31: 460V, 10HP 33: 460V, 10HP 34: 230V, 10HP 35: 460V, 125HP 35: 460V, 125HP 37: 460V, 15HP 41: 460V, 25HP 41: 460V, 25HP 41: 460V, 25HP 41: 460V, 25HP 41: 460V, 15HP 41: 460V, 375HP 41: 460V, 425HP 51: 460V, 425HP 51: 460V, 425HP 51: 460V, 600HP | Read |
| 00-01 | Display AC Motor Drive Rated Current | Display by models | Read only |

| | 00-02 | Parameter Reset | 0: No function 1: Read only 5: Reset KWH display to 0 6: Reset PLC (including CANopen Master Index) 7: Reset CANopen Index (Slave) 8: keypad lock 9: All parameters are reset to factory settings(base frequency is 50Hz) 10: All parameters are reset to factory settings (base frequency is 60Hz) | 0 |
|---|-------|-----------------------------------|---|---|
| × | 00-03 | Start-up Display Selection | 0: F (frequency command) 1: H (output frequency) 2: U (multi-function display, see Pr.00-04) 3: A (output current) | 0 |
| * | 00-04 | Content of Multi-function Display | 3: A (output current) 0: Display output current (A) 1: Display counter value (c) 2: Display actual output frequency (H.) 3: Display DC-BUS voltage (v) 4: Display output voltage (E) 5: Display output power angle (n) 6: Display output power in kW (P) 7: Display actual motor speed rpm (r) 8: Display estimate output torque % (t) 9: Display PG feedback (G) (refer to Pr.10-00,10-01) 10: Display PID feedback in % (b) 11: Display PID feedback in % (b) 11: Display ACI in % (2.) 13: Display ACI in % (2.) 13: Display AUI in % (3.) 14: Display AUI in % (3.) 14: Display the temperature of IGBT in oC (i.) 15: Display the temperature of capacitance in oC (c.) 16: The status of digital input (ON/OFF) (i) 17: The status of digital output (ON/OFF) (o) 18: Multi-step speed (S) 19: The corresponding CPU pin status of digital input (d) 20: The corresponding CPU pin status of digital output (0.) 21: Actual motor position (PG1 of PG card) (P.) 22: Pulse input frequency (PG2 of PG card) (S.) 23: Pulse input position (PG2 of PG card) (G.) 24: Position command tracing error (E.) 25: Overload count (0.00~100.00%) (o.) 26: Ground Fault GFF (Unit :%)(G.) 27: DC Bus voltage ripple (Unit: Vdc) (r.) 28: Display PLC data D1043 (C) 29: Display PLC data D1043 (C) 29: Display PLC outpat motor revolution during operation (PG card plug in and Z phase signal input) (Z.) 33: Motor actual position during operation (when PG card is connected)(q) 34: Operation speed of fan (%) (F.) 35: Control Mode display: 0= Speed control mode (SPD), 1= torque control mode (TOR) (t.) 36: Present operating carrier frequency of drive (Hz) (J.) 37: Reserved 38: Display drive status (6.) | 3 |
| | | | 38: Display drive status (6.) | |

| | | | 39: Display estimated output torque, positive and negative, using Nt-m as unit (t 0.0: positive torque; -0.0: negative torque (C.) 40: Torque Command, unit %(L) 41: KWH, unit KWH(J) 42: PID Reference, unit % (h.) 43: PID offset (%) (o.) 44: PID Output Fcmd(Hz) (b.) 45: Hardware version | | |
|---|-------|--|--|--------------|--|
| | 00-05 | Coefficient Gain in Actual Output Frequency | 0~160.00 | 1 | |
| | 00-06 | Software Version | Read only | #.# | |
| × | 00-07 | Parameter Protection Password Input | 0~65535 0~3: the times of password attempts | 0 | |
| × | 00-08 | Parameter Protection Password Setting | 0 ~ 65535 0: No password protection / password is entered correctly (Pr00-07) 1: Parameter is locked | 0 | |
| × | 00-09 | Reserved | | | |
| | 00-10 | Control Mode | 0: Speed mode 1: Point-to-Point position control 2: Torque mode 3: Home mode | 0 | |
| | 00-11 | Control of Speed Mode | 0: VF (IM V/f control) 1: VFPG (IM V/f control+ Encoder) 2: SVC(IM Sensorless vector control) 3: FOCPG (IM FOC vector control+ encoder) 4: FOCPG (PM FOC vector control + Encoder) 5: FOC Sensorless (IM field oriented sensorless vector control) 6: PM Sensorless (PM field oriented sensorless vector control) 7: IPM Sensor-less (IPM motor field oriented sensor-less control) | 0 | |
| | 00-12 | Point-to-Point Position mode | 0: Relative position 1: Absolute position | 0 | |
| | 00-13 | Torque Mode Control | 0: TQCPG (IM Torque control + Encoder) 1: TQCPG (PM Torque control + Encoder) 2: TQC Sensorless (IM Sensorless torque control) | 0 | |
| | 00-14 | Reserved | | | |
| | 00-15 | Reserved | | | |
| × | 00-16 | Duty Selection | 3: Super Heavy Duty | 3 | |
| | | | Super Heavy Duty 230V 1-15HP 5~15KHz 20-100HP 5~15KHz | 8 6 | |
| | 00-17 | Carrier Frequency | Super Heavy Duty 460V1-20HP5~15KHz20-100HP5~15KHz125-375HP4~10KHz | 8 6 5 | |
| | 00-18 | B Reserved | | | |
| | 00-19 | PLC Command Mask | Bit 0: Control command by PLC force control Bit 1: Frequency command by PLC force control Bit 2: Position command by PLC force control Bit 3: Torque command by PLC force control | Read only | |
| × | 00-20 | Source of Master Frequency Command (AUTO) | 0: Digital keypad 1: RS-485 serial communication 2: External analog input (Pr.03-00) | 0 | |

| × | 00-21 | Source of the Operation Command (AUTO) | 3: External UP/DOWN terminal 4: Pulse input without direction command (Pr.10-16 without direction) 5: Pulse input with direction command (Pr.10-16) 6: CANopen communication card 7: Reserved 8: Communication card (no CANopen card) 0: Digital keypad 1: External terminals. Keypad STOP disabled. 2: RS-485 serial communication. Keypad STOP disabled. 3: CANopen communication card 4: Reserved 5: Communication card (no CANopen card) | 0 |
|---|-------|---|--|--------------|
| × | 00-22 | Stop Method | 0: Ramp to stop 1: Coast to stop 0: Enable forward/reverse | 0 |
| × | 00-23 | Control of Motor Direction | 1: Reverse disable 2: Forward disable | 0 Bood |
| | 00-24 | Memory of Frequency Command | Read only | Read only |
| | 00-25 | User Defined Characteristics | Bit 0^{3} : user defined decimal place 0000b: no decimal place 0010b: two decimal place 0011b: three decimal place Bit 4^{15} : user define on unit 000xh: Hz 001xh: rpm 002xh: % 003xh: kg 004xh: M/S 005xh: kW 006xh: HP 007xh: PPM 007xh: PPM 008xh: I / m 009xh: kg/s 00Axh: kg/m 00Bxh: kg/h 00Cxh: lb/s 00Dxh: lb/h 00Fxh: ft/s 010xh: ft/s 010xh: ft/m 011xh: M 012xh: ft 013xh: degC 014xh: degF 015xh: mbar 016xh: bar 017xh: Pa 018xh: kPa 019xh: mWG 01Axh: inWG 01Axh: inWG 01Axh: inWG 01Axh: inWG 01Axh: inWG 01Axh: inWG 01Axh: m3/s 022xh: m3/h 023xh: GPM 024xh: CFM | 0 |

| | 00-26 | Max. User Defined Value | 0: Disable 0~65535 (when Pr.00-25 set to no decimal place) 0.0~6553.5 (when Pr.00-25 set to 1 decimal place) 0.0~655.35 (when Pr.00-25 set to 2 decimal place) 0.0~65.535 (when Pr.00-25 set to 3 decimal place) | 0 |
|---|---------------------|--|---|--------------|
| | 00-27 | User Defined Value | Read only | Read Only |
| | 00-28 | Reserved | | Only |
| | 00-29 | LOCAL/REMOTE Selection | 0: Standard HOA function 1: Switching Local/Remote, the drive stops 2: Switching Local/Remote, the drive runs as the REMOTE setting for frequency and operation status 3: Switching Local/Remote, the drive runs as the LOCAL setting for frequency and operation status 4: Switching Local/Remote, the drive runs as LOCAL setting when switch to Local and runs as REMOTE setting when switch to Remote for frequency and operation status. | 0 |
| N | 00-30 | Source of the Master Frequency Command (HAND) | 0: Digital keypad 1: RS-485 serial communication 2: External analog input (Pr.03-00) 3: External UP/DOWN terminal 4: Pulse input without direction command (Pr.10-16 without direction) 5: Pulse input with direction command (Pr.10-16) 6: CANopen communication card 7: Reserved 8: Communication card (no CANopen card) | 0 |
| M | 00-31 | Source of the Operation Command (HAND) | 0: Digital keypad 1: External terminals. Keypad STOP disabled. 2: RS-485 serial communication. Keypad STOP disabled. 3: CANopen communication card 4: Reserved 5: Communication card (not include CANopen card) | 0 |
| × | 00-32 | Digital Keypad STOP Function | 0: STOP key disable 1: STOP key enable | 0 |
| | 00-33 ~ 00-39 | Reserved | | |
| | 00-40 | Homing mode | Z Y X Homing mode Z pulse setting Home limit Note: Forward run = clockwise (CW) Reverse run = counterclockwise (CCW) 0: Forward run to home. Set PL forward limit as check point. 1: Reverse run (CCW) to home. Set NL reverse limit (CCWL) as check point. 2: Forward run to home. Set ORG: OFF→ON as check point. 3: Reverse to home. Set ORG: OFF→ON as check point. 4: Forward run and search for Z-pulse as check point. | 0000 |

| | | | | 5: Forward run and search for Z-pulse as check point. 6: Forward run to home. Set ORG: ON→OFF as check point. 7: Reverse run to home. Set ORG: ON→OFF as check point. 8: Define current position as home. | |
|---|---------------------|-------------------------------|-----|--|-------|
| | | | Y | Set X to 0, 1, 2, 3, 6, 7 first. 0: reverse run to Z pulse 1: continue forward run to Z pulse 2: Ignore Z pulse | |
| | | | z | When home limit is reached, set X to 2, 3, 4, 5, 6, 7 first. | |
| | | | | 0: display the error 1: reverse the direction | |
| | 00-41 | Homing by frequency 1 | 0.0 | 00~600.00Hz | 8.00 |
| | 00-42 | Homing by frequency 2 | 0.0 | 00~600.00Hz | 2.00 |
| | 00-43 ~ 00-47 | Reserved | | | |
| × | 00-48 | Display Filter Time (Current) | 0.0 | 001~65.535 sec | 0.100 |
| × | 00-49 | Display Filter Time (Keypad) | 0.0 | 001~65.535 sec | 0.100 |
| | 00-50 | Software Version (date) | Re | ad only | ##### |
| | 00-51 | Descend | | | |
| | ~ 00-61 | Reserved | | | |

11-6

01 Basic Parameters

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|----------------------------------|---|--------------------|
| | 01-00 | Max. Operation Frequency | 50.00~600.00Hz | 60.00/ 50.00 |
| | 01-01 | Output Frequency of Motor 1 | 0.00~600.00Hz | 60.00/ 50.00 |
| | 01-02 | Output Voltage of Motor 1 | 230V: 0.0V~255.0V 460V: 0.0V~510.0V | 200.0 400.0 |
| | 01-03 | Mid-point Frequency 1 of Motor 1 | 0.00~600.00Hz | 3.00 |
| × | 01-04 | Mid-point Voltage 1 of Motor 1 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 11.0 22.0 |
| | 01-05 | Mid-point Frequency 2 of Motor 1 | 0.00~600.00Hz | 0.50 |
| × | 01-06 | Mid-point Voltage 2 of Motor 1 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 2.0 4.0 |
| | 01-07 | Min. Output Frequency of Motor 1 | 0.00~600.00Hz | 0.00 |
| × | 01-08 | Min. Output Voltage of Motor 1 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 0.0 0.0 |
| | 01-09 | Start-Up Frequency | 0.00~600.00Hz | 0.50 |
| × | 01-10 | Output Frequency Upper Limit | 0.00~600.00Hz | 600.00 |
| × | 01-11 | Output Frequency Lower Limit | 0.00~600.00Hz | 0 |
| × | 01-12 | Accel. Time 1 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-13 | Decel Time 1 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-14 | Accel Time 2 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-15 | Decel Time 2 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-16 | Accel Time 3 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-17 | Decel Time 3 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-18 | Accel Time 4 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-19 | Decel Time 4 | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| * | 01-20 | JOG Acceleration Time | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |
| × | 01-21 | JOG Deceleration Time | Pr.01-45=0: 0.00~600.00 second Pr.01-45=1: 0.00~6000.0 second AC drive with power greater than 30HP: 60.00/60.0 | 10.00 10.0 |

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|--|--|--------------------|
| × | 01-22 | JOG Frequency | 0.00~600.00Hz | 6.00 |
| × | 01-23 | 1st/4th Accel/decel Frequency | 0.00~600.00Hz | 0.00 |
| × | 01-24 | S-curve Acceleration Begin Time 1 | Pr.01-45=0: 0.00~25.00 second Pr.01-45=1: 0.0~250.0 second | 0.20 0.2 |
| × | 01-25 | S-curve Acceleration Arrival Time 2 | Pr.01-45=0: 0.00~25.00 second Pr.01-45=1: 0.0~250.0 second | 0.20 0.2 |
| × | 01-26 | S-curve Deceleration Begin Time 1 | Pr.01-45=0: 0.00~25.00 second Pr.01-45=1: 0.0~250.0 second | 0.20 0.2 |
| × | 01-27 | S-curve Deceleration Arrival Time 2 | Pr.01-45=0: 0.00~25.00 second Pr.01-45=1: 0.0~250.0 second | 0.20 0.2 |
| | 01-28 | Skip Frequency 1 (upper limit) | 0.00~600.00Hz | 0.00 |
| | 01-29 | Skip Frequency 1 (lower limit) | 0.00~600.00Hz | 0.00 |
| | 01-30 | Skip Frequency 2 (upper limit) | 0.00~600.00Hz | 0.00 |
| | 01-31 | Skip Frequency 2 (lower limit) | 0.00~600.00Hz | 0.00 |
| | 01-32 | Skip Frequency 3 (upper limit) | 0.00~600.00Hz | 0.00 |
| | 01-33 | Skip Frequency 3 (lower limit) | 0.00~600.00Hz | 0.00 |
| | 01-34 | Zero-speed Mode | 0: Output waiting 1: Zero-speed operation 2: Fmin (Refer to Pr.01-07, 01-41) | 0 |
| | 01-35 | Output Frequency of Motor 2 | 0.00~600.00Hz | 60.00/ 50.00 |
| | 01-36 | Output Voltage of Motor 2 | 230V: 0.0V~255.0V 460V: 0.0V~510.0V | 200.0 400.0 |
| | 01-37 | Mid-point Frequency 1 of Motor 2 | 0.00~600.00Hz | 3.00 |
| × | 01-38 | Mid-point Voltage 1 of Motor 2 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 11.0 22.0 |
| | 01-39 | Mid-point Frequency 2 of Motor 2 | 0.00~600.00Hz | 0.50 |
| × | 01-40 | Mid-point Voltage 2 of Motor 2 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 2.0 4.0 |
| | 01-41 | Min. Output Frequency of Motor 2 | 0.00~600.00Hz | 0.00 |
| × | 01-42 | Min. Output Voltage of Motor 2 | 230V: 0.0V~240.0V 460V: 0.0V~480.0V | 0.0 0.0 |
| | 01-43 | V/f Curve Selection | 0: V/f curve determined by Pr.01-00~01-08 1: Curve to the power of 1.5 2: Curve to the power of 2 | 0 |
| M | 01-44 | Optimal Acceleration/Deceleration Setting | 0: Linear accel. /decel. 1: Auto accel.; linear decel. 2: Linear accel.; auto decel. 3: Auto accel./decel. 4: Linear, stall prevention by auto accel./decel. (limit by Pr.01-12~01-21) | 0 |
| | 01-45 | Time Unit for Accel. /Decel. and S Curve | 0: Unit: 0.01 sec 1: Unit: 0.1sec | 0 |
| | 01-46 | CANopen Quick Stop Time | Pr. 01-45=0: 0.00~600.00 sec Pr. 01-45=1: 0.0~6000.0 sec | 1.00 |

02 Digital Input/Output Parameters

| Pr. | Explanation | Settings | Factory Setting |
|-------|--|---|--------------------|
| 02-00 | 2-wire/3-wire Operation Control | 0: 2-wire mode, power on for operation control 1: 2-wire mode 2, power on for operation control 2: 3-wire, power on for operation control | 0 |
| 02-01 | Multi-function Input Command 1 (MI1) | 0: No function | 1 |
| 02-02 | Multi-function Input Command 2 (MI2) | 1: Multi-step speed command 1/multi-step position command 1 | 2 |
| 02-03 | Multi-function Input Command 3 (MI3) | 2: Multi-step speed command 2/multi-step position command 2 | 3 |
| 02-04 | Multi-function Input Command 4 (MI4) | 3: Multi-step speed command 3/multi-step position command 3 | 4 |
| 02-05 | Multi-function Input Command 5 (MI5) | 4: Multi-step speed command 4/multi-step position command 4 | 0 |
| 02-06 | Multi-function Input Command 6 (MI6) | 5: Reset | 0 |
| 02-07 | Multi-function Input Command 7 (MI7) | 6: JOG command (By KPC-CC01 or external control) | 0 |
| 02-08 | Multi-function Input Command 8 (MI8) | 7: Acceleration/deceleration speed inhibit | 0 |
| 02-26 | Input terminal of I/O extension card (MI10) | 8: The 1 st , 2 nd acceleration/deceleration time selection | 0 |
| 02-27 | Input terminal of I/O extension card (MI11) | 9: The 3 rd , 4 th acceleration/deceleration time selection | 0 |
| 02-28 | Input terminal of I/O extension card (MI12) | 10: EF Input (Pr.07-20) | 0 |
| 02-29 | Input terminal of I/O extension card (MI13) | 11: B.B input from external (Base Block) | 0 |
| 02-30 | Input terminal of I/O extension card (MI14) | 12: Output stop | 0 |
| 02-31 | Input terminal of I/O extension | 13: Cancel the setting of optimal accel. /decel. time | 0 |
| | card (MI15) | 14: Switch between motor 1 and motor 2 | |
| | | 15: Operation speed command from AVI | |
| | | 16: Operation speed command from ACI | |
| | | 17: Operation speed command from AUI | |
| | | 18: Emergency stop (Pr.07-20) | |
| | | 19: Digital up command | |
| | | 20: Digital down command 21: PID function disabled | |
| | | 22: Clear counter | |
| | | 23: Input the counter value (MI6) | |
| | | 24: FWD JOG command | |
| | | 25: REV JOG command | |
| | | 26: TQC/FOCmodel selection | |
| | | 27: ASR1/ASR2 selection | |
| | | 28: Emergency stop (EF1) | |
| | | 29: Signal confirmation for Y-connection | |
| | | 30: Signal confirmation for Δ -connection | |
| | | 31: High torque bias (Pr.11-30) | |
| | | 32: Middle torque bias (Pr.11-31) 33: Low torque bias (Pr.11-32) | |
| | | 34: Switch between multi-step position and | |
| | | multi-speed control | |
| | | 35: Enable single point position control | |
| | | 36: Enable multi-step position learning function (valid | |
| | | at stop) | |
| | | 37: Full position control pulse command input enable | |
| | | 38: Disable EEPROM write function | |

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|--|--------------------|
| | | | 39: Torque command direction | |
| | | | 40: Force coast to stop | - |
| | | | 41: HAND switch 42: AUTO switch | - |
| | | | 43: Enable resolution selection (Pr.02-48) | - |
| | | | 44: Reversed direction homing | - |
| | | | 45: Forward direction homing | |
| | | | 46: Homing (ORG) | _ |
| | | | 47: Homing function enable | _ |
| | | | 48: Mechanical gear ratio switch 49: Drive enable | - |
| | | | 50: Master dEb action input | - |
| | | | 51: Selection for PLC mode bit0 | - |
| | | | 52: Selection for PLC mode bit1 | |
| | | | 53: Trigger CANopen quick stop | |
| | | | 54: Reserved | _ |
| | | | 55: Brake release 56: Local/Remote Selection | _ |
| | | | 57~70: Reserved | - |
| ŀ | 00.00 | | 0: up/down by the accel. /decel. time | 0 |
| | 02-09 | UP/DOWN key mode | 1: up/down constant speed (Pr.02-10) | 0 |
| | 02-10 | Constant speed. The Accel. /Decel. Speed of the UP/DOWN Key | 0.01~1.00Hz/ms | 0.01 |
| | 02-11 | Digital Input Response Time | 0.000~30.000 second | 0.005 |
| | 02-12 | Digital Input Mode Selection | 0000h~FFFFh (0: N.O.; 1: N.C.) | 0000 |
| - | 02-13 | Multi-function Output 1 RY1 | 0: No function | 11 |
| | 02-14 | Multi-function Output 2 RY2 | 1: Operation Indication | 1 |
| - | 02-16 | Multi-function Output 3 (MO1) | 2: Operation speed attained | 0 |
| | 02-17 | Multi-function Output 4 (MO2) | 3: Desired frequency attained 1 (Pr.02-22) | 66 |
| | 02-36 | Output terminal of the I/O extension card (MO10) | 4: Desired frequency attained 2 (Pr.02-24) | 0 |
| | 02-37 | Output Terminal of I/O Extension Card (MO11) | 5: Zero speed (Frequency command) | 0 |
| | 02-38 | Output Terminal of I/O Extension Card (MO12) | 6: Zero speed, include STOP(Frequency command) | 0 |
| | 02-39 | Output Terminal of I/O Extension Card (MO13) | 7: Over torque 1(Pr.06-06~06-08) | 0 |
| | 02-40 | Output Terminal of I/O Extension Card (MO14) | 8: Over torque 2(Pr.06-09~06-11) | 0 |
| | 02-41 | Output Terminal of I/O Extension Card (MO15) | 9: Drive is ready | 0 |
| | 02-42 | Output Terminal of I/O Extension Card (MO16) | 10: Low voltage warning (LV) (Pr.06-00) | 0 |
| | 02-43 | Output Terminal of I/O Extension Card (MO17) | 11: Malfunction indication | 0 |
| | 02-44 | Output Terminal of I/O Extension Card (MO18) | 12: Mechanical brake release(Pr.02-32) | 0 |
| | 02-45 | Output Terminal of I/O Extension Card (MO19) | 13: Overheat warning (Pr.06-15) | 0 |
| | 02-46 | Output Terminal of I/O Extension Card (MO20) | 14: Software brake signal indication(Pr.07-00) | 0 |
| | | | 15: PID feedback error | |
| | | | 16: Slip error (oSL) | |

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|--|--------------------|
| | | | 17: Terminal count value attained, does not return to 0 (Pr.02-20) 18: Preliminary count value attained, returns to 0 (Pr.02-19) 19: Base Block 20: Warning output 21: Over voltage warning 22: Over-current stall prevention warning 23: Over-voltage stall prevention warning 24: Operation mode indication 25: Forward command 26: Reverse command 27: Output when current >= Pr.02-33 (>= 02-33) 28: Output when current <=Pr.02-33(<= 02-33) 29: Output when frequency >= Pr.02-34 (>= 02-34) 30: Output when frequency <= Pr.02-34 (<= 02-34) 31: Y-connection for the motor coil 32: \triangle -connection for the motor coil 33: Zero speed (actual output frequency) 34: Zero speed include stop(actual output frequency) 35: Error output selection 1(Pr.06-23) 36: Error output selection 1(Pr.06-24) 37: Error output selection 1(Pr.06-25) 38: Error output selection 4(Pr.06-26) 39: Position attained (Pr.10-19) 40: Speed attained (including Stop) 41: Multi-position attained 42: Crane function 43: Actual motor speed slower than Pr.02-47 44: Low current output (use with Pr.06-71~06-73) 45: UVW Output Electromagnetic valve Switch 46: Master dEb warning output 47: Closed brake output 48: Reserved 49: Homing action complete 50: Output for CANopen control 51: Output for CANopen control 51: Output for S485 53~62: Reserved 63: Advance Crane Output 64-65: Reserved 66: SO N.O. output 67: Analog signal level achieved 68: SO N.C. output | |
| * | 02-18 | Multi-function output direction | 0000h~FFFFh (0: N.O.; 1: N.C.) | 0000 |
| * | 02-19 | Terminal counting value attained (returns to 0) | 0~65500 | 0 |
| * | 02-20 | Preliminary counting value attained (not return to 0) | 0~65500 | 0 |
| * | 02-21 | Digital Output Gain (DFM) | 1~166 | 1 |
| * | 02-22 | Desired Frequency Attained 1 | 0.00~600.00Hz | 60.00/ 50.00 |
| * | 02-23 | The Width of the Desired Frequency Attained 1 | 0.00~600.00Hz | 2.00 |
| * | 02-24 | Desired Frequency Attained 2 | 0.00~600.00Hz | 60.00/ 50.00 |
| * | 02-25 | The Width of the Desired Frequency Attained 2 | 0.00~600.00Hz | 2.00 |
| | 02-32 | Brake Delay Time | 0.000~65.000 sec. | 0.000 |

| | Pr. | Explanation | Settings | Factory Setting |
|---|--------------------|---|---|--------------------|
| ~ | 02-33 | Current Detect | 0~100% | 0 |
| ~ | 02-34 | Speed Area Set | 0.00~600.00Hz (Motor speed when using PG Card) | 3.00 |
| * | 02-35 | External Operation Control Selection after Reset and Activate | 0: Disable 1: Drive runs if run command exists after reset | 0 |
| ~ | 02-47 | Zero-speed Level of Motor | 0~65535 rpm | 0 |
| ~ | 02-48 | Max. Frequency of Resolution Switch | 0.01~600.00Hz | 60.00 |
| ~ | 02-49 | Switch the delay time of Max. output frequency | 0.000~65.000 sec. | 0.000 |
| ~ | 02-50 | Status of Multi-function Input Terminal | Monitor the status of multi-function input terminals | Read only |
| | 02-51 | Status of Multi-function Output Terminal | Monitor the status of multi-function output terminals | Read only |
| | 02-52 | Display External Output terminal occupied by PLC | Monitor the status of PLC input terminals | Read only |
| | 02-53 | Display Analog Input Terminal occupied by PLC | Monitor the status of PLC output terminals | Read |
| | 02-54 | Display the Frequency Command Executed by External Terminal | Read only | Read only |
| | 02-55 | Reserved | | |
| | 02-56 | Release Brake Check | 0.000~65.000 sec | 0.000 sec |
| | 02-57 | FWD Brake Current | 0~100% | 0 |
| | 02-58 | FWD Brake Frequency | 0.00~600.00Hz | 0.00 |
| | 02-59 | REV Release Current | 0~100% | 0 |
| | 02-60 | REV Brake Current | 0~100% | 0 |
| | 02-61 | REV Release Frequency | 0.00~600.00Hz | 0.00 |
| | 02-62 | REV Brake Frequency | 0.00~600.00Hz | 0.00 |
| | 02-63 | Speed Area Band (P02-34) | 0.00~600.00Hz | 0.00 |
| | 02-64 | LLACC Mode | 0: Disable | 0 |
| | | | 1: Enable | |
| | 02-65 | LLACC Active Frequency | 0.00~600.00Hz | 0.00 |
| | 02-66 | LLACC FWD Active Current | 0~100% | 0 |
| | 02-67 | LLACC REV Active Current | 0~100% | 0 |
| | 02-68 | LLACC Delay Time | 0.000~65.000 sec | 0.000 |
| | 02-69 | LLACC Target Frequency | 0.00~01-00 Hz | 0.00H |
| | | | 0: No IO Card | |
| | | | 1: EMC-BPS01 Card | |
| | 02-70 IO Card Type | 2: No IO Card | | |
| | | IO Card Type | 3: No IO Card | 0 |
| | 02-70 | | 4: EMC-D611A Card | |
| | | | 5: EMC-D42A Card | |
| | | | 6: EMC-R6AA Card | |
| | | | 7: No IO Card | |

03 Analog Input/Output Parameters

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|--|--------------------|
| × | 03-00 | Analog Input Selection (AVI) | 0: No function | 1 |
| × | 03-01 | Analog Input Selection (ACI) | 1: Frequency command (speed limit under torque control mode) | 0 |
| × | 03-02 | Analog Input Selection (AUI) | 2: Torque command (torque limit under speed mode) | 0 |
| | | | 3: Torque compensation command | |
| | | | 4: PID target value | |
| | | | 5: PID feedback signal | |
| | | | 6: PTC thermistor input value | |
| | | | 7: Positive torque limit | |
| | | | 8: Negative torque limit | |
| | | | 9: Regenerative torque limit | |
| | | | 10: Positive/negative torque limit | |
| | | | 11: PT100 thermistor input value | |
| | | | 12: Reserved | |
| | | | 13: PID Offset (%) (h.) | |
| | | | 14~17: Reserved | |
| × | 03-03 | Analog Input Bias (AVI) | -100.0~100.0% | 0 |
| × | 03-04 | Analog Input Bias (ACI) | -100.0~100.0% | 0 |
| × | 03-05 | Analog Positive Voltage Input Bias (AUI) | -100.0~100.0% | 0 |
| × | 03-06 | Reserved | | |
| × | 03-07 | Positive/negative Bias Mode (AVI) | 0: No bias 1: Lower than or equal to bias | |
| × | 03-08 | Positive/negative Bias Mode (ACI) | 2: Greater than or equal to bias 3: The absolute value of the bias voltage while serving | 0 |
| × | 03-09 | Positive/negative Bias Mode (AUI) | as the center 4: Serve bias as the center | |
| | 03-10 | Analog Frequency Command for Reverse Run | 0: Negative frequency is not valid. Forward and reverse run is controlled by digital keypad or external terminal. 1: Negative frequency is valid. Positive frequency = forward run; negative frequency = reverse run. Direction can not be switched by digital keypad or external terminal control. | 0 |
| × | 03-11 | Analog Input Gain (AVI) | -500.0~500.0% | 100.0 |
| × | 03-12 | Analog Input Gain (ACI) | -500.0~500.0% | 100.0 |
| × | 03-13 | Analog Positive Input Gain (AUI) | -500.0~500.0% | 100.0 |
| × | 03-14 | Analog Negative Input Gain (AUI) | -500.0~500.0% | 100.0 |
| × | 03-15 | Analog Input Filter Time (AVI) | 0.00~20.00 sec. | 0.01 |
| × | 03-16 | Analog Input Filter Time (ACI) | 0.00~20.00 sec. | 0.01 |
| × | 03-17 | Analog Input Filter Time (AUI) | 0.00~20.00 sec. | 0.01 |
| N | 03-18 | Addition Function of the Analog | 0: Disable (AVI, ACI, AUI) 1: Enable | 0 |

| 1 | | 1 | | |
|---|--------|--------------------------------|--|--------------|
| | | | 0: Disable | |
| * | 03-19 | ACI Signal Loss | 1: Continue operation at the last frequency 2: Decelerate to 0Hz | 0 |
| | | | 3: Stop immediately and display ACE | |
| ~ | 03-20 | Multi-function Output 1 (AFM1) | 0: Output frequency (Hz) | 0 |
| ~ | 03-23 | Multi-function Output 2 (AFM2) | 1: Frequency command (Hz) | 0 |
| | | | 2: Motor speed (Hz) | |
| | | | 3: Output current (rms) | |
| | | | 4: Output voltage | |
| | | | 5: DC Bus voltage | |
| | | | 6: Power factor | |
| | | | 7: Power | |
| | | | 8: Output torque 9: AVI | |
| | | | 10: ACI | |
| | | | 11: AUI | |
| | | | 12: lq current | |
| | | | 13: Iq feedback value | |
| | | | 14: Id current | |
| | | | 15: Id feedback value | |
| | | | 16: Vq-axis voltage 17: Vd-axis voltage | |
| | | | 18: Torque command | |
| | | | 19: PG2 frequency command | |
| | | | 20: CANopen analog output | |
| | | | 21: RS485 analog output | |
| | | | 22: Communication card analog output | |
| | | | 23: Constant voltage/current output | |
| ~ | 03-21 | Gain of Analog Output 1 (AFM1) | 0~500.0% | 100.0 |
| | ~~ ~~ | Analog Output 1 when in REV | 0: Absolute output voltage | |
| ~ | 03-22 | Direction (AFM1) | 1: Reverse output 0V; Positive output 0-10V 2: Reverse output 5-0V; Positive output 5-10V | 0 |
| ~ | 03-24 | Gain of Analog Output 2 (AFM2) | 0~500.0% | 100.0 |
| | 00 2 1 | | | |
| | | | 0: Absolute output voltage | |
| ~ | 03-25 | Analog Output 2 when in REV | 1: Output 0V in REV direction; output 0-10V in FWD direction | 0 |
| | 00 20 | Direction (AFM2) | 2: Output 5-0V in REV direction; output 5-10V in FWD | Ũ |
| | | | direction | |
| ~ | 03-26 | Reserved | | |
| ~ | 03-27 | AFM2 Output Bias | -100.00~100.00% | 0.00 |
| | | | 0: 0-10V | |
| ~ | 03-28 | AVI Selection | 1: 0-20mA | 0 |
| | | | 2: 4-20mA | |
| | 00.00 | | 0: 4-20mA | <u>,</u> |
| ~ | 03-29 | ACI Selection | 1: 0-10V | 0 |
| ļ | | | 2: 0-20mA | |
| * | 03-30 | Status of PLC Output Terminal | Monitor the status of PLC output terminals | Read only |
| | 03-31 | AFM2 0-20mA Output Selection | 0: 0-20mA Output 1: 4-20mA Output | 0 |
| | 03-32 | AFM1 DC output setting level | 0.00~100.00% | 0.00 |
| | 03-33 | AFM2 DC Output Setting Level | 0.00~100.00% | 0.00 |
| | 03-34 | Reserved | 1 | |
| l | | | | |

| 03- | -35 | AFM1 filter output time | 0.00 ~ 20.00 Seconds | 0.01 |
|-----------------|------------|---|---|--------|
| 03- | -36 | AFM2 filter output time | 0.00 ~ 20.00 Seconds | 0.01 |
| 03- | | Reserved | | |
| 03- | | neserveu | | |
| 03- | -44 | MO by AI level | 0: AVI 1: ACI 2: AUI | 0 |
| 03- | -45 | Al Upper level | -100% ~ +100% | 50% |
| 03- | -46 | Al Lower level | -100% ~ +100% | 10% |
| 03- ~ 03- | ~ | Reserved | | |
| 03- | | Analog Input Curve Selection | 0: Regular Curve 1: 3 point curve of AVI 2: 3 point curve of ACI 3: 3 point curve of AVI & ACI 4: 3 point curve of AUI 5: 3 point curve of AVI & AUI 6: 3 point curve of ACI & AUI 7: 3 point curve of AVI & ACI & AUI | 0 |
| 03- | -51 | AVI Low Point | Pr.03-28=0, 0.00~10.00V Pr.03-28≠0, 0.00~20.00mA | 0.00 |
| 03- | -52 | AVI Proportional Low Point | 0.00~100.00% | 0.00 |
| 03- | -53 | AVI Mid Point | Pr.03-28=0, 0.00~10.00V | 5.00 |
| | F 4 | | Pr.03-28≠0, 0.00~20.00mA | |
| 03- | -54 | AVI Proportional Mid Point | 0.00~100.00% | 50.00 |
| 03- | -55 | AVI High Point | Pr.03-28=0, 0.00~10.00V Pr.03-28≠0, 0.00~20.00mA | 10.00 |
| 03- | -56 | AVI Proportional High Point | 0.00~100.00% | 100.00 |
| 03- | -57 | ACI Low Point | Pr.03-29=1, 0.00~10.00V Pr.03-29≠1, 0.00~20.00mA | 4.00 |
| 03- | -58 | ACI Proportional Low Point | 0.00~100.00% | 0.00 |
| 03- | -59 | ACI Mid Point | Pr.03-29=1, 0.00~10.00V Pr.03-29≠1, 0.00~20.00mA | 12.00 |
| 03- | -60 | ACI Proportional Mid Point | 0.00~100.00% | 50.00 |
| 03- | -61 | ACI High Point | Pr.03-29=1, 0.00~10.00V Pr.03-29≠1, 0.00~20.00mA | 20.00 |
| 03- | -62 | ACI Proportional High Point | 0.00~100.00% | 100.00 |
| 03- | -63 | Positive AUI Voltage Low Point | 0.00~10.00V | 0.00 |
| 03- | -64 | Positive AUI Voltage Proportional Low Point | 0.00~100.00% | 0.00 |
| 03- | -65 | Positive AUI Voltage Mid Point | 0.00~10.00V | 5.00 |
| 03- | -66 | Positive AUI Voltage Proportional Mid Point | 0.00~100.00% | 50.00 |
| 03- | -67 | Positive AUI Voltage High Point | 0.00~10.00V | 10.00 |
| 03- | -68 | Positive AUI Voltage Proportional High Point | 0.00~100.00% | 100.00 |
| 03- | -69 | Negative AUI Voltage Low Point | 0.00~ -10.00V | 0.00 |
| 03- | -70 | Negative AUI Voltage Proportional Low Point | 0.00~ -100.00% | 0.00 |
| 03- | -71 | Negative AUI Voltage Mid Point | 0.00~ -10.00V | -5.00 |

| 03-72 | Negative AUI Voltage Proportional Mid Point | 0.00~ -100.00% | -50.00 |
|-------|---|----------------|---------|
| 03-73 | Negative AUI Voltage High Point | 0.00~ -10.00V | -10.00 |
| 03-74 | Negative AUI Voltage Proportional High Point | 0.00~ -100.00% | -100.00 |

04 Multi-step Speed Parameters

| • - | Pr. | Explanation | Settings | Factory Setting |
|-----|-------|-------------------------------------|---------------|--------------------|
| × | 04-00 | 1st Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-01 | 2nd Step Speed Frequency | 0.00~600.00Hz | 0 |
| N | 04-02 | 3rd Step Speed Frequency | 0.00~600.00Hz | 0 |
| N | 04-03 | 4th Step Speed Frequency | 0.00~600.00Hz | 0 |
| N | 04-04 | 5th Step Speed Frequency | 0.00~600.00Hz | 0 |
| N | 04-05 | 6th Step Speed Frequency | 0.00~600.00Hz | 0 |
| N | 04-06 | 7th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-07 | 8th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-08 | 9th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-09 | 10th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-10 | 11th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-11 | 12th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-12 | 13th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-13 | 14th Step Speed Frequency | 0.00~600.00Hz | 0 |
| × | 04-14 | 15th Step Speed Frequency | 0.00~600.00Hz | 0 |
| | 04-15 | Position command 1 (revolution) | -30000~30000 | 0 |
| × | 04-16 | Position command 1 (pulse) | -32767~32767 | 0 |
| | 04-17 | Position command 2 (revolution) | -30000~30000 | 0 |
| × | 04-18 | Position command 2 (pulse) | -32767~32767 | 0 |
| | 04-19 | Position command 3 (revolution) | -30000~30000 | 0 |
| × | 04-20 | Position command 3 (pulse) | -32767~32767 | 0 |
| | 04-21 | Position command 4 (revolution) | -30000~30000 | 0 |
| × | 04-22 | Position command 4 (pulse) | -32767~32767 | 0 |
| | 04-23 | Position command 5 (revolution) | -30000~30000 | 0 |
| * | 04-24 | Position command 5 (pulse) | -32767~32767 | 0 |
| | 04-25 | Position command 6 (revolution) | -30000~30000 | 0 |
| × | 04-26 | Position command 6 (pulse) | -32767~32767 | 0 |
| | 04-27 | Position command 7 (revolution) | -30000~30000 | 0 |
| × | 04-28 | Position command 7 (pulse) | -32767~32767 | 0 |
| | 04-29 | Position command 8 (revolution) | -30000~30000 | 0 |
| × | 04-30 | Position command 8 (pulse) | -32767~32767 | 0 |
| | 04-31 | Position command 9 (revolution) | -30000~30000 | 0 |
| × | 04-32 | Position command 9 (pulse) | -32767~32767 | 0 |
| | 04-33 | Position command 10 (revolution) | -30000~30000 | 0 |
| × | 04-34 | Position command 10 (pulse) | -32767~32767 | 0 |
| | 04-35 | Position command 11 (revolution) | -30000~30000 | 0 |
| × | 04-36 | Position command 11 (pulse) | -32767~32767 | 0 |

| | Pr. | Explanation | Settings | Factory Setting |
|---|---------------------|-------------------------------------|--------------|--------------------|
| | 04-37 | Position command 12 (revolution) | -30000~30000 | 0 |
| ~ | 04-38 | Position command 12 (pulse) | -32767~32767 | 0 |
| | 04-39 | Position command 13 (revolution) | -30000~30000 | 0 |
| ~ | 04-40 | Position command 13 (pulse) | -32767~32767 | 0 |
| | 04-41 | Position command 14 (revolution) | -30000~30000 | 0 |
| ~ | 04-42 | Position command 14 (pulse) | -32767~32767 | 0 |
| | 04-43 | Position command 15 (revolution) | -30000~30000 | 0 |
| ~ | 04-44 | Position command 15 (pulse) | -32767~32767 | 0 |
| | 04-45 ~ 04-49 | Reserved | | |
| ~ | 04-50 | PLC Buffer 0 | 0~65535 | 0 |
| ~ | 04-51 | PLC Buffer 1 | 0~65535 | 0 |
| ~ | 04-52 | PLC Buffer 2 | 0~65535 | 0 |
| ~ | 04-53 | PLC Buffer 3 | 0~65535 | 0 |
| ~ | 04-54 | PLC Buffer 4 | 0~65535 | 0 |
| ~ | 04-55 | PLC Buffer 5 | 0~65535 | 0 |
| ~ | 04-56 | PLC Buffer 6 | 0~65535 | 0 |
| ~ | 04-57 | PLC Buffer 7 | 0~65535 | 0 |
| ~ | 04-58 | PLC Buffer 8 | 0~65535 | 0 |
| ~ | 04-59 | PLC Buffer 9 | 0~65535 | 0 |
| ~ | 04-60 | PLC Buffer 10 | 0~65535 | 0 |
| ~ | 04-61 | PLC Buffer 11 | 0~65535 | 0 |
| ~ | 04-62 | PLC Buffer 12 | 0~65535 | 0 |
| ~ | 04-63 | PLC Buffer 13 | 0~65535 | 0 |
| * | 04-64 | PLC Buffer 14 | 0~65535 | 0 |
| * | 04-65 | PLC Buffer 15 | 0~65535 | 0 |
| * | 04-66 | PLC Buffer 16 | 0~65535 | 0 |
| * | 04-67 | PLC Buffer 17 | 0~65535 | 0 |
| * | 04-68 | PLC Buffer 18 | 0~65535 | 0 |
| * | 04-69 | PLC Buffer 19 | 0~65535 | 0 |

05 Motor Parameters

| | Pr. | Explanation | Settings | Factory Setting |
|---|---------------------|---|---|--------------------|
| | 05-00 | Motor Auto Tuning | 0: No function 1: Rolling test for induction motor(IM) (Rs, Rr, Lm, Lx, no-load current) 2: Static test for induction motor(IM) 3: No function 4: Rolling test for PM motor magnetic pole 5: Rolling test for PM motor 6: Rolling test for IM motor flux curve 12: FOC Sensorless inertia estimation 13: High frequency and blocked rotor test for PM motor | 0 |
| | 05-01 | Full-load Current of Induction Motor 1(A) | 10~120% of drive's rated current | #.## |
| × | 05-02 | Rated Power of Induction Motor 1(kW) | 0~655.35kW | #.## |
| × | 05-03 | Rated Speed of Induction Motor 1 (rpm) | 0~65535 1710(60Hz 4poles) ; 1410(50Hz 4 poles) | 1710 |
| | 05-04 | Pole Number of Induction Motor | 2~20 | 4 |
| | 05-05 | No-load Current of Induction Motor 1 (A) | 0~ Pr.05-01 factory setting | #.## |
| | 05-06 | Stator Resistance (Rs) of Induction Motor 1 | 0~65.535Ω | #.### |
| | 05-07 | Rotor Resistance (Rr) of Induction Motor 1 | 0~65.535Ω | #.### |
| | 05-08 | Magnetizing Inductance (Lm) of Induction Motor 1 | 0~6553.5mH | #.# |
| | 05-09 | Stator Inductance (Lx) of Induction Motor 1 | 0~6553.5mH | #.# |
| | 05-10 ~ 05-12 | Reserved | | |
| | 05-13 | Full-load Current of Induction Motor 2 (A) | 10~120% | #.## |
| × | 05-14 | Rated Power of Induction Motor 2 (kW) | 0~655.35kW | #.## |
| × | 05-15 | Rated Speed of Induction Motor 2 (rpm) | 0~65535 1710(60Hz 4 poles) ; 1410(50Hz 4 poles) | 1710 |
| | 05-16 | Pole Number of Induction Motor 2 | 2~20 | 4 |
| | 05-17 | No-load Current of Induction Motor 2 (A) | 0~ Pr.05-01 factory setting | #.## |
| | 05-18 | Stator Resistance (Rs) of Induction Motor 2 | 0~65.535Ω | #.### |
| | 05-19 | Rotor Resistance (Rr) of Induction Motor 2 | 0~65.535Ω | #.### |
| | 05-20 | Magnetizing Inductance (Lm) of Induction Motor 2 | 0~6553.5mH | #.# |
| | 05-21 | Stator Inductance (Lx) of Induction Motor 2 | 0~6553.5mH | #.# |
| × | 05-22 | Induction Motor 1/ 2 Selection | 1: motor 1 2: motor 2 | 1 |
| M | 05-23 | Frequency for Y-connection/△-connection Switch of Induction Motor | 0.00~600.00Hz | 60.00 |
| × | 05-24 | Y-connection/△-connection Switch of Induction Motor | 0: Disable 1: Enable | 0 |

| | Deley Time for | | |
|-------|---|---|-------|
| 05-25 | Delay Time for Y-connection/A-connection | 0.000~60.000 sec. | 0.200 |
| 00 20 | Switch of Induction Motor | 0.000 00.000 sec. | 0.200 |
| 05-26 | Accumulative Watt-second of Motor in Low Word (W-sec) | Read only | #.# |
| 05-27 | Accumulative Watt-second of Motor in High Word (W-sec) | Read only | #.# |
| 05-28 | Accumulative Watt-hour of Motor (W-Hour) | Read only | #.# |
| 05-29 | Accumulative Watt-hour of Motor in Low Word (KW-Hour) | Read only | #.# |
| 05-30 | Accumulative Watt-hour of Motor in High Word (KW-Hour) | Read only | #.# |
| 05-31 | Accumulative Motor Operation Time (Min) | 00~1439 | 0 |
| 05-32 | Accumulative Motor Operation Time (day) | 00~65535 | 0 |
| 05-33 | Induction Motor and Permanent Magnet Motor Selection | 0: Induction Motor 1: Permanent Magnet Motor 2: IPM | 0 |
| 05-34 | Full-load current of Permanent Magnet Motor | 0.00~655.35Amps | 0.00 |
| 05-35 | Rated Power of Permanent Magnet Motor | 0.00~655.35kW | 0.00 |
| 05-36 | Rated speed of Permanent Magnet Motor | 0~65535rpm | 2000 |
| 05-37 | Pole number of Permanent Magnet Motor | 0~65535 | 10 |
| 05-38 | Inertia of Permanent Magnet Motor | 0.0~6553.5 kg.cm ² | 0.0 |
| 05-39 | Stator Resistance of PM Motor | 0.000~65.535Ω | 0.000 |
| 05-40 | Permanent Magnet Motor Ld | 0.00~655.35mH | 0.000 |
| 05-41 | Permanent Magnet Motor Lq | 0.00~655.35mH | 0.000 |
| 05-42 | PG Offset angle of PM Motor | 0.0~360.0° | 0.0 |
| 05-43 | Ke parameter of PM Motor | 0~65535 (Unit: V/1000rpm) | 0 |

06 Protection Parameters

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|--|----------------------------------|
| * | 06-00 | Low Voltage Level | 230V: Frame A to D: 150.0~220.0Vdc Frame E and frames above E: 190.0~220.0V 460V: Frame A to D: 300.0~440.0Vdc Frame E and frames above E: 380.0~440.0V | 180.0 200.0 360.0 400.0 |
| * | 06-01 | Over-voltage Stall Prevention | 0: Disabled 230V: 0.0~450.0Vdc 460V: 0.0~900.0Vdc | 380.0 760.0 |
| ~ | 06-02 | Selection for Over-voltage Stall Prevention | 0: Traditional over-voltage stall prevention 1: Smart over-voltage prevention | 0 |
| * | 06-03 | Over-current Stall Prevention during Acceleration | Supper Heavy Duty: 0~180%(100%: drive's rated current) | 150 |
| * | 06-04 | Over-current Stall Prevention during Operation | Super Heavy Duty: 0~200%(100%: drive's rated current) | 120 150 |
| * | 06-05 | Accel. /Decel. Time Selection of Stall Prevention at Constant Speed | 0: by current accel/decel time 1: by the 1st accel/decel time 2: by the 2nd accel/decel time 3: by the 3rd accel/decel time 4: by the 4th accel/decel time 5: by auto accel/decel | 0 |
| * | 06-06 | Over-torque Detection Selection (OT1) | 0: No function 1: Over-torque detection during constant speed operation, continue to operate after detection 2: Over-torque detection during constant speed operation, stop operation after detection 3: Over-torque detection during operation, continue to operate after detection 4: Over-torque detection during operation, stop operation after detection | 0 |
| ~ | 06-07 | Over-torque Detection Level (OT1) | 10~250% (100%: drive's rated current) | 120 |
| ~ | 06-08 | Over-torque Detection Time (OT1) | 0.0~60.0 sec. | 0.1 |
| * | 06-09 | Over-torque Detection Selection (OT2) | 0: No function 1: Over-torque detection during constant speed operation, continue to operate after detection 2: Over-torque detection during constant speed operation, stop operation after detection 3: Over-torque detection during operation, continue to operation after detection 4: Over-torque detection during operation, stop operation after detection | 0 |
| * | 06-10 | Over-torque Detection Level (OT2) | 10~250% (100%: drive's rated current) | 120 |
| ~ | 06-11 | Over-torque Detection Time (OT2) | 0.0~60.0 sec. | 0.1 |
| ~ | 06-12 | Current Limit | 0~250% (100%: drive's rated current) | 150 |
| * | 06-13 | Electronic Thermal Relay Selection (Motor 1) | 0: Inverter motor 1: Standard motor 2: Disable | 2 |
| ~ | 06-14 | Electronic Thermal Characteristic for Motor 1 | 30.0~600.0 sec. | 60.0 |
| * | 06-15 | Heat Sink Over-heat (OH) Warning | 0.0~110.0℃ | 85.0 |

| Pr. | Explanation | Settings | Factory Setting |
|-------|------------------------------------|--|--------------------|
| 06-16 | Stall Prevention Limit Level | 0~100% (Pr.06-03, Pr.06-04) | 50 |
| 06-17 | Present Fault Record | 0: No fault record | 0 |
| 06-18 | Second Most Recent Fault Record | 1: Over-current during acceleration (ocA) | 0 |
| 06-19 | Third Most Recent Fault Record | 2: Over-current during deceleration (ocd) | 0 |
| 06-20 | Fourth Most Recent Fault Record | 3: Over-current during constant speed(ocn) | 0 |
| 06-21 | Fifth Most Recent Fault Record | 4: Ground fault (GFF) | 0 |
| 06-22 | Sixth Most Recent Fault Record | 5: IGBT short-circuit (occ) | 0 |
| 06-22 | Sixth Most Recent Fault Record | 5: IGBT short-circuit (occ) 6: Over-current at stop (ocS) 7: Over-voltage during acceleration (ovA) 8: Over-voltage during deceleration (ovA) 9: Over-voltage during constant speed (ovn) 10: Over-voltage during deceleration (LvA) 11: Low-voltage during deceleration (LvA) 12: Low-voltage during deceleration (LvA) 13: Low-voltage during deceleration (LvA) 13: Low-voltage during constant speed (Lvn) 14: Stop mid-low voltage (LvS) 15: Phase loss protection (OrP) 16: IGBT over-heat (OH1) 17: Capacitance over-heat (OH2) 18: tH10 (TH1 open: IGBT over-heat protection error) 19: tH20 (TH2 open: capacitance over-heat protection error) 20: Reserved 21: Drive over-load (oL) 22: Electronics thermal relay 1 (EoL1) 23: Electronics thermal relay 2 (EoL2) 24: Motor overheat (OH3) (PTC) 25: Reserved 26: Over-torque 1 (ot1) 27: Over-torque 2 (ot2) 28: Low current (uC) 29: Home limit error (LMIT) 30: Memory write-in error (cF1) 31: Memory read-out error (cF2) 32: Reserved 33: U-phase current detection error (cd3) 36: Clamp current detection error (cd3) 36: Clamp current detection error (cd3) 36: Clamp current detection error (Hd1) 38: Over-voltage detection error (Hd2) 39: Ground current detection error (Hd2) 39: Ground current detection error (Hd3) 40: Auto tuning error (AUE) 41: PID feedback loss (AFE) 42: PG feedback loss (AFE) 42: PG ref loss (PGF2) 44: Analog current input loss (ACE) 49: External fault input (EF) 50: Emergency stop (EF1) 51: External Sase Block (bb) 52: Password error (PGeE) | |

| | Pr. | Explanation | Settings | Factory Setting |
|--------|-------|---|--|--------------------|
| | | | 53: Reserved | |
| | | | 54: Communication error (CE1) | |
| | | | 55: Communication error (CE2) | |
| | | | 56: Communication error (CE3) | |
| | | | 57: Communication error (CE4) | |
| | | | 58: Communication Time-out (CE10) | |
| | | | 59: PU Time-out (CP10) | - |
| | | | 60: Brake transistor error (bF) | - |
| | | | 61: Y-connection/ | - |
| | | | 62: Decel. Energy Backup Error (dEb) | - |
| | | | 63: Slip error (oSL) | - |
| | | | 64: Electromagnet switch error (ryF) | - |
| | | | | - |
| | | | 65 : PG Card Error (PGF5) | _ |
| | | | 66~67: Reserved | _ |
| | | | 68: Sensorless estimated speed has wrong direction | _ |
| | | | 69: Sensorless estimated speed is over-speed | _ |
| | | | 70: Sensorless estimated speed deviated | |
| | | | 71: Reserved | |
| | | | 72: STO loss 1 | |
| | | | 73: External safety gate S1 |] |
| | | | 74~75: Reserved | - |
| | | | 76: STO | - |
| | | | 77: STO loss 2 | - |
| | | | 78: STO loss 3 | - |
| | | | 79: U phase over current (Uocc) | - |
| | | | | - |
| | | | 80: V phase over current (Vocc) | _ |
| | | | 81: W phase over current (Wocc) | _ |
| | | | 82: U phase output phase loss (OPHL) | _ |
| | | | 83: V phase output phase loss (OPHL) | _ |
| | | | 84: W phase output phase loss (OPHL) | |
| | | | 85: PG-02U ABZ hardware disconnection | |
| | | | 86: PG-02U UVW hardware disconnection | |
| | | | 87~89: Reserved | |
| | | | 90: Inner PLC function is forced to stop | |
| | | | 100: Reserved | 1 |
| | | | 101: CANopen software disconnect1 (CGdE) | - |
| | | | 102: CAN open software disconnect2 (CHbE) | - |
| | | | 103: CANopen synchronous error (CSYE) | - |
| | | | 104: CANopen hardware disconnect (CbFE) | - |
| | | | 105: CANopen index setting error (CldE) | - |
| | | | | _ |
| | | | 106: CANopen slave station number setting error | |
| | | | (CAdE) | - |
| | | | 107: CANopen index setting exceed limit (CFrE) | _ |
| | | | 111: Internal communication overtime error(InrCOM) | |
| 1 | 06-23 | Fault Output Option 1 | 0~65535(refer to bit table for fault code) | 0 |
| , , | 06-24 | Fault Output Option 2 | 0~65535(refer to bit table for fault code) | 0 |
| | 06-25 | Fault Output Option 3 | 0~65535(refer to bit table for fault code) | 0 |
| | 06-26 | Fault Output Option 4 | 0~65535(refer to bit table for fault code) | 0 |
| | 06.07 | Electronic Thermal Relay | 0: Inverter motor | |
| - | 06-27 | Selection 2 (Motor 2) | 1: Standard motor 2: Disable | 2 |
| 1 | 06-28 | Electronic Thermal Characteristic for Motor 2 | 30.0~600.0 sec | 60.0 |
| • | 06-29 | PTC Detection Selection | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning | 0 |

| Pr. | Explanation | Settings | Factory Setting |
|-------|--|---|--------------------|
| 06-30 | PTC Level | 0.0~100.0% | 50.0 |
| 06-31 | Frequency Command for Malfunction | 0.00~655.35 Hz | Read only |
| 06-32 | Output Frequency at Malfunction | 0.00~655.35 Hz | Read only |
| 06-33 | Output Voltage at Malfunction | 0.0~6553.5 V | Read only |
| 06-34 | DC Voltage at Malfunction | 0.0~6553.5 V | Read only |
| 06-35 | Output Current at Malfunction | 0.00~655.35 Amp | Read only |
| 06-36 | IGBT Temperature at Malfunction | 0.0~6553.5 ℃ | Read only |
| 06-37 | Capacitance Temperature at Malfunction | 0.0~6553.5 ℃ | Read only |
| 06-38 | Motor Speed in rpm at Malfunction | 0~65535 | Read only |
| 06-39 | Torque Command at Malfunction | 0~65535 | Read only |
| 06-40 | Status of Multi-function Input Terminal at Malfunction | 0000h~FFFFh | Read only |
| 06-41 | Status of Multi-function Output Terminal at Malfunction | 0000h~FFFFh | Read only |
| 06-42 | Drive Status at Malfunction | 0000h~FFFFh | Read only |
| 06-43 | Reserved | | Unit |
| 06-44 | STO Alarm Latch | 0: STO Alarm Latch 1: STO Alarm no Latch | 0 |
| 06-45 | Treatment to Output Phase Loss Detection (OPHL) | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning | 3 |
| 06-46 | Deceleration Time of Output Phase Loss | 0.000~65.535 sec | 0.500 |
| 06-47 | Current Bandwidth | 0.00~655.35% | 1.00 |
| 06-48 | DC Brake Time of Output Phase Loss | 0.000~65.535 sec | 0.100 |
| 06-49 | Reserved | | |
| 06-50 | Reserved | | |
| 06-51 | Reserved | | |
| 06-52 | Reserved | | |
| 06-53 | Treatment for the detected Input Phase Loss (OrP) | 0: warn and ramp to stop 1: warn and coast to stop | 0 |
| 06-54 | Reserved | I I | |
| 06-55 | Derating Protection | 0: constant rated current and limit carrier wave by load current and temperature 1: constant carrier frequency and limit load current by setting carrier wave 2: constant rated current(same as setting 0), but close current limit | 0 |
| 06-56 | PT100 Detected Level 1 | 0.000~10.000V | 5.000 |
| 06-57 | PT100 Detected Level 2 | 0.000~10.000V | 7.000 |
| 06-58 | PT100 Level 1 Frequency Protect | 0.00~600.00Hz | 0.00 |

| Pr. | Explanation | Settings | Factory Setting |
|-------|---------------------------------------|--|--------------------|
| 06-59 | Reserved | | |
| 06-60 | Software Detection GFF Current Level | 0.0~6553.5 % | 60.0 |
| 06-61 | Software Detection GFF Filter Time | 0.0~6553.5 % | 0.10 |
| 06-62 | Disable Level of dEb | 230V series: 0.0~220.0 Vdc 460V series: 0.0~440.0 Vdc | 180.0 /360.0 |
| 06-63 | Fault Record 1 (Day) | 0~65535 days | Read only |
| 06-64 | Fault Record 1 (Min) | 0~1439 min | Read only |
| 06-65 | Fault Record 2 (Day) | 0~65535 days | Read only |
| 06-66 | Fault Record 2 (Min) | 0~1439 min | Read only |
| 06-67 | Fault Record 3 (Day) | 0~65535 days | Read only |
| 06-68 | Fault Record 3 (Min) | 0~1439 min | Read only |
| 06-69 | Fault Record 4 (Day) | 0~65535 days | Read only |
| 06-70 | Fault Record 4 (Min) | 0~1439 min | Read only |
| 06-71 | Low Current Setting Level | 0.0 ~ 6553.5 % | 0.0 |
| 06-72 | Low Current Detection Time | 0.00 ~ 655.35sec | 0.00 |
| 06-73 | Treatment for low current | 0 : No function 1 : Warn and coast to stop 2 : Warn and ramp to stop by 2nd deceleration time 3 : Warn and operation continue | 0 |

07 Special Parameters

| • | Pr. Explanation | | Settings | Factory Setting | | |
|---|---|--|--|--------------------|--|--|
| × | 07-00 | Software Brake Level | 230V: 350.0~450.0Vdc 460V: 700.0~900.0Vdc | 380.0 760.0 | | |
| × | 07-01 | DC Brake Current Level | 0~100% | 0 | | |
| × | 07-02 | DC Brake Time at Start-up | 0.0~60.0 sec. | 0.0 | | |
| × | 07-03 | DC Brake Time at Stop | 0.0~60.0 sec. | 0.0 | | |
| × | 07-04 | Startup Frequency for DC Brake | 0.00~600.00Hz | 0.00 | | |
| × | 07-05 | Maximum Power Loss Duration | 1~200% | 100 | | |
| × | 07-06 Restart after Momentary Power Loss 0: Stop operation 1: Speed search for last frequency command 2: Speed search for minimum output frequency | | | | | |
| × | 07-07 | Maximum Power Loss Duration | | | | |
| × | 07-08 | Base Block Time | 0.1~5.0 sec. | 0.5 | | |
| × | 07-09 | Current Limit for Speed Search | 20~200% | 50 | | |
| × | 07-10 | Treatment to Restart After Fault | 0: Stop operation 1: Speed search starts with current speed 2: Speed search starts with minimum output frequency | 0 | | |
| × | 07-11 | Number of Times of Auto Restart After Fault | 0~10 | 0 | | |
| × | 07-12 | Speed Search during Start-up | 0: Disable 1: Speed search for maximum output frequency 2: Speed search for start-up motor frequency 3: Speed search for minimum output frequency | 0 | | |
| × | 07-13 | Decel. Time to Momentary Power Loss | 0: Disable 1~6: DCBUS control, Auto decel. time | 0 | | |
| × | 07-14 | DEB Return Time | 0.0~25.0 sec. | 0.0 | | |
| × | 07-15 | Dwell Time at Accel. | 0.00 ~ 600.00 sec. | 0.00 | | |
| × | 07-16 | Dwell Frequency at Accel. | 0.00 ~ 600.00Hz | 0.00 | | |
| × | 07-17 | Dwell Time at Decel. | 0.00 ~ 600.00 sec. | 0.00 | | |
| × | 07-18 | Dwell Frequency at Decel. | 0.00 ~ 600.00Hz | 0.00 | | |
| M | 07-19 | 9 Fan Cooling Control 9 F | | 0 | | |
| × | 07-20 | Emergency Stop (EF) & Force to Stop Selection | 0: Coast stop 1: By deceleration Time 1 2: By deceleration Time 2 3: By deceleration Time 3 4: By deceleration Time 4 5: System Deceleration 6: Automatic Deceleration | 0 | | |
| × | 07-21 | Auto Energy-saving Operation | 0: Disable 1: Enable | 0 | | |
| × | 07-22 | Energy-saving Gain | 10~1000% | 100 | | |

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|--|--------------------|
| * | 07-23 | Auto Voltage Regulation(AVR) Function | 0: Enable AVR 1: Disable AVR 2: Disable AVR during deceleration | 0 |
| * | 07-24 | Filter Time of Torque Compensation (V/F and SVC control mode) | 0.001~10.000 sec. | 0.020 |
| * | 07-25 | Filter Time of Slip Compensation (V/F and SVC control mode) | 0.001~10.000 sec. | 0.100 |
| * | 07-26 | Torque Compensation Gain (V/F and SVC control mode) | 0~10 | 0 |
| * | 07-27 | Slip Compensation Gain (V/F and SVC control mode) | 0.00~10.00 | 0.00 |
| ~ | 07-28 | Reserved | | |
| ~ | 07-29 | Slip Deviation Level | 0.0~100.0% | 0 |
| ~ | 07-30 | Detection Time of Slip Deviation | 0.0~10.0 sec. | 1.0 |
| * | 07-31 | Over Slip Treatment | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning | 0 |
| * | 07-32 | Motor Hunting Gain | 0~10000 | 1000 |
| | 07-33 | Auto Reset Time for Restart after Fault | 0.0~6000.0 sec. | 60.0 |

08 High-function PID Parameters

| | Pr. | Explanation | Settings | Factory Setting | | |
|---|--|---|--|--------------------|--|--|
| Ņ | 08-00 | Input Terminal for PID Feedback | No function Negative PID feedback: on analogue input acc. To setting 5 of Pr. 03-00 to Pr.03-02. Negative PID feedback from PG card (Pr.10-15, skip direction) Negative PID feedback from PG card (Pr.10-15) Positive PID feedback from external terminal AVI (Pr.03-00) Positive PID feedback from PG card (Pr.10-15, skip direction) Positive PID feedback from PG card (Pr.10-15, skip direction) Positive PID feedback from PG card (Pr.10-15, skip direction) Positive PID feedback from PG card (Pr.10-15) Negative PID feedback from Communication protocol Positive PID feedback from communication protocol | 0 | | |
| N | 08-01 | Proportional Gain (P) | 0.0~500.0% | 1.0 | | |
| × | 08-02 | Integral Time (I) | 0.00~100.00 sec. | 1.00 | | |
| × | 08-03 | Derivative Control (D) | 0.00~1.00 sec. | 0.00 | | |
| × | 08-04 | Upper Limit of Integral Control | 0.0~100.0% | 100.0 | | |
| × | 08-05 | PID Output Frequency Limit | 0.0~110.0% | 100.0 | | |
| | 08-06 | PID feedback value by communication protocol | 0.00~200.00% | 0.00 | | |
| × | 08-07 | PID Delay Time | 0.0~2.5 sec. | 0.0 | | |
| × | 08-08 | Feedback Signal Detection Time | 0.0~3600.0 sec. | 0.0 | | |
| × | 08-09 | Feedback Signal Fault Treatment | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: Warn and operate at last frequency | 0 | | |
| × | 08-10 | Sleep Reference Point | 0.00 ~ 600.00Hz | 0.00 | | |
| * | 08-11 | Wakeup Reference Point | 0.00 ~ 600.00Hz | 0.00 | | |
| × | 08-12 | Sleep Time | 0.0 ~ 6000.0 sec. | 0.0 | | |
| × | 08-13 | PID Deviation Level | 1.0 ~ 50.0% | 10.0 | | |
| × | 08-14 | PID Deviation Time | 0.1~300.0 sec. | 5.0 | | |
| × | 08-15 | Filter Time for PID Feedback | 0.1~300.0 sec. | 5.0 | | |
| × | 08-16 | PID Compensation Selection | 0: Parameter setting 1: Reserved | 0 | | |
| × | 08-17 | PID Compensation | -100.0~+100.0% | 0 | | |
| | 08-18 | Setting of Sleep Mode Function | 0: Follow PID output command 1: Follow PID feedback signal | 0 | | |
| | 08-19 | Wakeup Integral Limit | 0.0~200.0% | 50.0 | | |
| | 08-20 | PID Mode Selection | 0: Serial connection 1: Parallel connection | 0 | | |
| | 08-21 | Enable PID to Change Operation Direction | 0: Operation direction can be changed 1: Operation direction can not be changed | 0 | | |
| | 08-22 | Wakeup Delay Time | 0.00~600.00 Seconds | 0.00 | | |
| | 08-23PID Control FlagBit 0 = 1, PID reverse running must follow the setting of Pr00-23. Bit 0 = 0, PID reverse running follow PID's calculated value. | | | | | |

09 Communication Parameters

| | Pr. | Explanation | Settings | Factory Setting |
|---|---------------------|--|--|--------------------|
| × | 09-00 | COM1 Communication Address | 1~254 | 1 |
| × | 09-01 | COM1 Transmission Speed | 4.8~115.2Kbps | 9.6 |
| * | 09-02 | COM1 Transmission Fault Treatment | 0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning and continue operation | 3 |
| ~ | 09-03 | COM1 Time-out Detection | 0.0~100.0 sec. | 0.0 |
| * | 09-04 | COM1 Communication Protocol | 1: 7N2 (ASCII) 2: 7E1 (ASCII) 3: 7O1 (ASCII) 4: 7E2 (ASCII) 5: 7O2 (ASCII) 6: 8N1 (ASCII) 7: 8N2 (ASCII) 8: 8E1 (ASCII) 9: 8O1 (ASCII) 10: 8E2 (ASCII) 11: 8O2 (ASCII) 12: 8N1 (RTU) 13: 8N2 (RTU) 14: 8E1 (RTU) 15: 8O1 (RTU) 16: 8E2 (RTU) 17: 8O2 (RTU) | 1 |
| * | 09-05 ~ 09-08 | Reserved | | |
| × | 09-08 | Response Delay Time | 0.0~200.0ms | 2.0 |
| ~ | 09-10 | Main Frequency of the Communication | 0.00~600.00Hz | 60.00 |
| ~ | 09-11 | Block Transfer 1 | 0~65535 | 0 |
| ~ | 09-12 | Block Transfer 2 | 0~65535 | 0 |
| × | 09-13 | Block Transfer 3 | 0~65535 | 0 |
| * | 09-14 | Block Transfer 4 | 0~65535 | 0 |
| * | 09-15 | Block Transfer 5 | 0~65535 | 0 |
| * | 09-16 | Block Transfer 6 | 0~65535 | 0 |
| * | 09-17 | Block Transfer 7 | 0~65535 | 0 |
| * | 09-18 | Block Transfer 8 | 0~65535 | 0 |
| * | 09-19 | Block Transfer 9 | 0~65535 | 0 |
| * | 09-20 | Block Transfer 10 | 0~65535 | 0 |
| * | 09-21 | Block Transfer 11 | 0~65535 | 0 |
| * | 09-22 | Block Transfer 12 | 0~65535 | 0 |
| * | 09-23 | Block Transfer 13 | 0~65535 | 0 |
| * | 09-24 | Block Transfer 14 | 0~65535 | 0 |
| * | 09-25 | Block Transfer 15 | 0~65535 | 0 |
| * | 09-26 | Block Transfer 16 | 0~65535 | 0 |

| Pr. | Explanation | Settings | Factory Setting |
|------------|----------------------------------|--|--------------------|
| 09-27 | Deserved | | |
| ~ 09-29 | Reserved | | |
| 09-30 | Communication Decoding Method | 0: Decoding Method 1 1: Decoding Method 2 | 1 |
| 09-31 | Internal Communication Protocol | 0: Modbus 485 -1: Internal Communication Slave 1 -2: Internal Communication Slave 2 -3: Internal Communication Slave 3 -4: Internal Communication Slave 4 -5: Internal Communication Slave 5 -6: Internal Communication Slave 6 -7: Internal Communication Slave 7 -8: Internal Communication Slave 8 -9: Reserved -10: Internal Communication Master -11: Reserve -12: Internal PLC Control | 0 |
| 09-32 | Reserved | | |
| 09-33 | PLC command force to 0 | 0~65535 | 0 |
| 09-34 | Reserved | | |
| 09-35 | PLC Address | 1~254 | 2 |
| 09-36 | CANopen Slave Address | 0: Disable 1~127 | 0 |
| 09-37 | CANopen Speed | 0: 1M 1: 500k 2: 250k 3: 125k 4: 100k (Delta only) 5: 50k | 0 |
| 09-38 | Reserved | · | |
| 09-39 | CANopen Warning Record | bit 0: CANopen Guarding Time out bit 1: CANopen Heartbeat Time out bit 2: CANopen SYNC Time out bit 3: CANopen SDO Time out bit 4: CANopen SDO buffer overflow bit 5: Can Bus Off bit 6: Error protocol of CANopen | 0 |
| 09-40 | CANopen Decoding Method | 0: Delta defined decoding method 1: CANopen DS402 Standard | 1 |
| 09-41 | CANopen Communication Status | 0: Node Reset State 1: Com Reset State 2: Boot up State 3: Pre Operation State 4: Operation State 5: Stop State | Read Only |
| 09-42 | CANopen Control Status | 0: Not ready for use state 1: Inhibit start state 2: Ready to switch on state 3: Switched on state 4: Enable operation state 7: Quick Stop Active state 13: Err Reaction Activation state 14: Error state | Read Only |

| Pr. | Explanation | Settings | Factory Setting | | | | |
|---------------------|---|--|--------------------|--|--|--|--|
| 09-43 | Reset CANopen Index | bit0: reset address 20XX to 0. bit1: reset address 264X to 0 bit2: reset address 26AX to 0 bit3: reset address 60XX to 0 | 65535 | | | | |
| 09-44 | Reserved | | | | | | |
| 09-45 | CANopen Master Function | 0: Disable 1: Enable | 0 | | | | |
| 09-46 | CANopen Master Address | 1~127 | 100 | | | | |
| 09-47 ~ 09-59 | Reserved | | | | | | |
| 09-60 | Identifications for Communication Card | 0: No communication card 1: DeviceNet Slave 2: Profibus-DP Slave 3: CANopen Slave/Master 4: Modbus-TCP Slave 5: Ethernet/IP Slave 6~8: Reserved | ## | | | | |
| 09-61 | Firmware Version of Communication Card | Read only | ## | | | | |
| 09-62 | Product Code | Read only | ## | | | | |
| 09-63 | Error Code | Read only | ## | | | | |
| 09-64 | | | | | | | |
| ~ 09-69 | Reserved | | | | | | |
| 09-70 | Address of Communication Card | DeviceNet: 0-63 Profibus-DP: 1-125 | 1 | | | | |
| 09-71 | Setting of DeviceNet Speed | Standard DeviceNet: 0: 125Kbps 1: 250Kbps 2: 500Kbps Non standard DeviceNet: (Delta Only) 0: 10Kbps 1: 20Kbps 2: 50Kbps 3: 100Kbps 4: 125Kbps 5: 250Kbps 6: 500Kbps 7: 800Kbps 8: 1Mbps 0: Disable In this mode, baud rate can only be 0,1,2,3 in standard DeviceNet speed | 2 | | | | |
| 09-72 | Speed | 1: Enable In this mode, the baud rate of DeviceNet can be same as CANopen (0-8). | 0 | | | | |
| 09-73 | Reserved | | | | | | |
| 09-74 | Reserved | | | | | | |
| 09-75 | IP Configuration of the Communication Card | 0: Static IP 1: Dynamic IP (DHCP) | 0 | | | | |
| 09-76 | IP Address 1 of the Communication Card | 0~255 | 0 | | | | |
| 09-77 | IP Address 2 of the Communication Card | 0~255 | 0 | | | | |

| Pr. | Explanation | Settings | Factory Setting |
|-------|--|--|--------------------|
| 09-78 | IP Address 3 of the Communication Card | 0~255 | 0 |
| 09-79 | IP Address 4 of the Communication Card | 0~255 | 0 |
| 09-80 | Address Mask 1 of the Communication Card | 0~255 | 0 |
| 09-81 | Address Mask 2 of the Communication Card | 0~255 | 0 |
| 09-82 | Address Mask 3 of the Communication Card | 0~255 | 0 |
| 09-83 | Address Mask 4 of the Communication Card | 0~255 | 0 |
| 09-84 | Getway Address 1 of the Communication Card | 0~255 | 0 |
| 09-85 | Getway Address 2 of the Communication Card | 0~255 | 0 |
| 09-86 | Getway Address 3 of the Communication Card | 0~255 | 0 |
| 09-87 | Getway Address 4 of the Communication Card | 0~255 | 0 |
| 09-88 | Password for Communication Card (Low word) | 0~255 | 0 |
| 09-89 | Password for Communication Card (High word) | 0~255 | 0 |
| 09-90 | Reset Communication Card | 0: No function 1: Reset, return to factory setting | 0 |
| 09-91 | Additional Setting for Communication Card | Bit0: Enable IP filter Bit 1: Enable to write internet parameters (1bit). This bit will change to disable when it finishes saving the internet parameter updates. Bit 2: Enable login password (1bit). This bit will be changed to disable when it finishes saving the internet parameter updates. | 0 |
| 09-92 | Status of Communication Card | Bit 0: password enable When the communication card is set with password, this bit is enabled. When the password is clear, this bit is disabled. | 0 |

10 Speed Feedback Control Parameters

IM: Induction Motor; PM: Permanent Magnet Motor

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|--|---|--------------------|
| | 10-00 | Encoder Type Selection | 0: Disable 1: ABZ 2: ABZ (Delta Encoder for Delta servo motor) 3: Resolver 4: ABZ/UVW 5: MI8 single phase pulse input | 0 |
| | 10-01 | Encoder Pulse | 1~20000 | 600 |
| | 10-02 | Encoder Input Type Setting | 0: Disable 1: Phase A leads in a forward run command and phase B leads in a reverse run command 2: Phase B leads in a forward run command and phase A leads in a reverse run command 3: Phase A is a pulse input and phase B is a direction input. (low input=reverse direction, high input=forward direction) 4: Phase A is a pulse input and phase B is a direction input. (low input=forward direction, high input=forward direction) 5: Single-phase input | 0 |
| ~ | 10-03 | Output Setting for Frequency Division (denominator) | 1~255 | 1 |
| × | 10-04 | Electrical Gear at Load Side A1 | 1~65535 | 100 |
| ~ | 10-05 | Electrical Gear at Motor Side B1 | 1~65535 | 100 |
| × | 10-06 | Electrical Gear at Load Side A2 | 1~65535 | 100 |
| × | 10-07 | Electrical Gear at Motor Side B2 | 1~65535 | 100 |
| * | 10-08 | Treatment for Encoder Feedback Fault | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop | 2 |
| ~ | 10-09 | Detection Time of Encoder Feedback Fault | 0.0~10.0sec 0: No function | 1.0 |
| ~ | 10-10 | Encoder Stall Level | 0~120% 0: No function | 115 |
| × | 10-11 | Detection Time of Encoder Stall | 0.0 ~ 2.0sec | 0.1 |
| * | 10-12 | Treatment for Encoder Stall | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop | 2 |
| × | 10-13 | Encoder Slip Range | 0~50% (0: disable) | 50 |
| ~ | 10-14 | Detection Time of Encoder Slip | 0.0~10.0sec | 0.5 |
| * | 10-15 | Treatment for Encoder Stall and Slip Error | 0: Warn and keep operation 1: Warn and ramp to stop 2: Warn and coast to stop | 2 |
| * | 10-16 | Pulse Input Type Setting | 0: Disable 1: Phase A leads in a forward run command and phase B leads in a reverse run command 2: Phase B leads in a forward run command and phase A leads in a reverse run command 3: Phase A is a pulse input and phase B is a direction input. (L=reverse direction, H=forward direction). 4: Phase A is a pulse input and phase B is a direction input. (L=forward direction, H=reverse direction). | 0 |
| ~ | 10-17 | Electrical Gear A | 1~65535 | 100 |
| N | 10-18 | Electrical Gear B | 1~65535 | 100 |

| | Pr. | Explanation | Settings | Factory Setting | |
|---|---------------------|---|--|--------------------|--|
| ~ | 10-19 | Positioning for Encoder Position | 0~65535pulse | 0 | |
| ~ | 10-20 | Range for Encoder Position Attained | 0~65535pulse | 10 | |
| ~ | 10-21 | Filter Time (PG2) | 0~65.535 sec | 0.100 | |
| | 10-22 | Speed Mode (PG2) | 0: Electronic Frequency 1: Mechanical Frequency (base on pole pair) | 0 | |
| | 10-23 | Reserved | | | |
| ~ | 10-24 | FOC&TQC Function Control | 0~65535 | 0 | |
| ~ | 10-25 | FOC Bandwidth of Speed Observer | 1.0~100.0Hz | 40.0 | |
| ~ | 10-26 | FOC Minimum Stator Frequency | 0.0~2.0%fN | 2.0 | |
| ~ | 10-27 | FOC Low-pass Filter Time Constant | 1~1000ms | 50 | |
| ~ | 10-28 | FOC Excitation Current Rise Time | 33~100%Tr | 100 | |
| ~ | 10-29 | Top Limit of Frequency Deviation | 0.00~100.00Hz | 20.00 | |
| | 10-30 | Resolver Pole Pair | 1~50 | 1 | |
| ~ | 10-31 | I/F Mode, current command | 0~150%Irated (Rated current % of the drive) | 40 | |
| ~ | 10-32 | PM Sensorless Observer Bandwidth for High Speed Zone | 0.00~600.00Hz | 5.00 | |
| | 10-33 | Reserved | | | |
| ~ | 10-34 | PM Sensorless Observer Low-pass Filter Gain | 0.00~655.35 Hz | 1.00 | |
| | 10-35 | ARM(Kp) | 1~3 | 1 | |
| | 10-36 | ARM(Ki) | 1~3 | 1 | |
| ~ | 10-37 | PM Sensorless Control Word | 0000~FFFFh | 0000 | |
| | 10-38 | Reserved | | | |
| ~ | 10-39 | Frequency when switch from I/F Mode to PM sensorless mode. | 0.00~600.00Hz | 20.00 | |
| * | 10-40 | Frequency when switch from PM sensorless observer mode to V/F mode. | 0.00~600.00Hz | 20.00 | |
| ~ | 10-41 | I/F mode, low pass-filter time | 0.0~6.0sec | 0.2 | |
| ~ | 10-42 | Initial Angle Detection Time | 0~20ms | 5 | |
| ~ | 10-43 | PG card version | 0~655.35 | Read only | |
| | 10-44 ~ 10-48 | Reserved | | | |
| ~ | 10-49 | Zero Voltage Time while Start Up | 0~65.353 sec. | 0.2 sec. | |
| ~ | 10-50 | Reverse Angle Limit (Electrical angle) | 0~30.00 degree | 10.00 | |
| ~ | 10-51 | Injection Frequency | 0~2000Hz | 500Hz | |
| ~ | 10-52 | Injection Magnitude | 0.0~200.0V | 15/30V | |

11 Advanced Parameters

IM: Induction Motor; PM: Permanent Magnet Motor

| | Pr. | Explanation | Settings | Factory Setting |
|---|-------|---|---|--------------------|
| * | 11-00 | System Control | bit 0: Auto tuning for ASR and APR bit 1: Inertia estimate (only for FOCPG mode) bit 2: Zero servo bit 3: Dead Time compensation closed Bit 7: Selection to save or not save the frequency Bit 8: Maximum speed of point to point position control | 0 |
| * | 11-01 | Per Unit of System Inertia | 1~65535 (256=1PU) | 400 |
| * | 11-02 | ASR1/ASR2 Switch Frequency | 5.00~600.00Hz | 7.00 |
| * | 11-03 | ASR1 Low-speed Bandwidth | 1~40Hz (IM)/ 1~100Hz (PM) | 10 |
| * | 11-04 | ASR2 High-speed Bandwidth | 1~40Hz (IM)/ 1~100Hz (PM) | 10 |
| * | 11-05 | Zero-speed Bandwidth | 1~40Hz (IM)/ 1~100Hz (PM) | 10 |
| * | 11-06 | ASR Control (P) 1 | 0~40Hz (IM)/ 1~100Hz (PM) | 10 |
| ~ | 11-07 | ASR Control (I) 1 | 0.000~10.000 sec | 0.100 |
| * | 11-08 | ASR Control (P) 2 | 0~40Hz (IM)/ 0~100Hz (PM) | 10 |
| * | 11-09 | ASR Control (I) 2 | 0.000~10.000 sec | 0.100 |
| * | 11-10 | P Gain of Zero Speed | 0~40Hz (IM)/ 0~100Hz (PM) | 10 |
| * | 11-11 | I Gain of Zero Speed | 0.000~10.000 sec | 0.100 |
| ~ | 11-12 | Gain for ASR Speed Feed Forward | 0~100% | 0 |
| * | 11-13 | PDFF Gain | 0~200% | 30 |
| ~ | 11-14 | Low-pass Filter Time of ASR Output | 0.000~0.350 sec | 0.008 |
| * | 11-15 | Notch Filter Depth | 0~20db | 0 |
| * | 11-16 | Notch Filter Frequency | 0.00~200.00Hz | 0.0 |
| * | 11-17 | Forward Motor Torque Limit | 0~500% | 200 |
| * | 11-18 | Forward Regenerative Torque Limit | 0~500% | 200 |
| * | 11-19 | Reverse Motor Torque Limit | 0~500% | 200 |
| * | 11-20 | Reverse Regenerative Torque Limit | 0~500% | 200 |
| ~ | 11-21 | Gain Value of Flux Weakening Curve for Motor 1 | 0~200% | 90 |
| * | 11-22 | Gain Value of Flux Weakening Curve for Motor 2 | 0~200% | 90 |
| ~ | 11-23 | Speed Response of Flux Weakening Area | 0~150% | 65 |
| * | 11-24 | APR Gain | 0.00~40.00Hz (IM)/ 0~100.00Hz (PM) | 10.00 |
| * | 11-25 | Gain Value of APR Feed Forward | 0~100 | 30 |
| * | 11-26 | APR Curve Time | 0.00~655.35 sec | 3.00 |
| * | 11-27 | Max. Torque Command | 0~500% | 100 |
| * | 11-28 | Source of Torque Offset | 0: No function 1: Analog signal input (Pr.03-00) 2: RS485 communication (Pr.11-29) 3: Control by external terminal (Pr.11-30~11-32) | 0 |

| | Pr. | Explanation | Settings | Factory Setting | |
|---|-------|---|---|--------------------|--|
| ~ | 11-29 | Torque Offset Setting | 0~100% | 0.0 | |
| ~ | 11-30 | High Torque Offset | 0~100% | 30.0 | |
| ~ | 11-31 | Middle Torque Offset | 0~100% | 20.0 | |
| ~ | 11-32 | Low Torque Offset | 0~100% | 10.0 | |
| * | 11-33 | Source of Torque Command | 0: Digital keypad 1: RS-485 communication (Pr.11-34) 2: Analog input (Pr.03-00) 3: CANopen 4: Reserved 5: Communication extension card | 0 | |
| ~ | 11-34 | Torque Command | -100.0~+100.0% (Pr.11-27*11-34) | 0 | |
| ~ | 11-35 | Filter Time of Torque Command | 0.000~1.000sec | 0.000 | |
| × | 11-36 | Speed Limit Selection | 0: Set by Pr.11-37 (Forward speed limit) and Pr.11-38 (Reverse speed limit) 1: Set by Pr.11-37,11-38 and Pr.00-20 (Source of Master Frequency Command) 2: Set by Pr.00-20 (Source of Master Frequency Command). | 0 | |
| ~ | 11-37 | Forward Speed Limit (torque mode) | 0~120% | 10 | |
| ~ | 11-38 | Reverse Speed Limit (torque mode) | 0~120% | 10 | |
| | 11-39 | Zero Torque Command Mode | 0: Torque mode 1: Speed mode | 0 | |
| | 11-40 | Command Source of Point-to-Point Position Control | 0: External terminal 1: Reserved 2: RS485 3: CAN 4: PLC 5: Communication card | 0 | |
| | 11-41 | Reserved | 1 | | |
| | 11-42 | System Control Flags | 0000~FFFFh | 0000 | |
| | 11-43 | Max. Frequency of Point- to-Point Position Control | 0.00~327.67Hz | 10.00 | |
| | 11-44 | Accel. Time of Point-to Point Position Control | 0.00~655.35 sec | 1.00 | |
| | 11-45 | Decel. Time of Point-to Point Position Control | 0.00~655.35 sec | 3.00 | |

Chapter 12 Description of Parameter Settings

00 Drive Parameters

✓ This parameter can be set during operation.

GG - GG Identity Code of the AC Motor Drive

Factory Setting: #.#

Settings Read Only

Factory Setting: #.#

Settings Read Only

Pr. 00-00 displays the identity code of the AC motor drive. Using the following table to check if Pr.00-01 setting is the rated current of the AC motor drive. Pr.00-01 corresponds to the identity code Pr.00-00.

| 0001/ 0 | | | | | | | | | | |
|--|-------------|-----|-----|-----|-----|-----|----|----|------|--|
| | 230V Series | | | | | | | | | |
| Frame | | A | ۱ | | | В | | 0 |) | |
| kW | 0.75 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 | 15 | 18.5 | |
| HP | 1.0 | 2.0 | 3.0 | 5.0 | 7.5 | 10 | 15 | 20 | 25 | |
| Pr.00-00 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | |
| Rated Current for Super Heavy Duty (A) | 5 | 8 | 11 | 17 | 25 | 33 | 49 | 65 | 75 | |
| | | | | | | | | | | |
| Frame | | D | | E | = | F | | | | |
| kW | 22 | 30 | 37 | 45 | 50 | 75 | | | | |
| HP | 30 | 40 | 50 | 60 | 75 | 100 | | | | |
| Pr.00-00 | 22 | 24 | 26 | 28 | 30 | 32 | | | | |
| Rated Current for Super Heavy Duty (A) | 90 | 120 | 146 | 180 | 215 | 255 | | | | |

| 460V Series | | | | | | | | | | | | | | |
|--|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|--|
| Frame | A | | | | | | В | | | | C | | | |
| kW | 0.75 | 1.5 | 2. | 2 3 | 3.7 | 5.5 | 7.5 | 11 | 15 | 5 1 | 8.5 | 22 | 30 | |
| HP | 1 | 2 | 3 | 3 | 5 | 7.5 | 10 | 15 | 20 |) 2 | 25 | 30 | 40 | |
| Pr.00-00 | 5 | 7 | 9 | | 11 | 13 | 15 | 17 | 19 | 2 | 21 | 23 | 25 | |
| Rated Current for Super Heavy Duty (A) | 3.0 | 4.0 | 6. | 0 9 | 9.0 | 12 | 18 | 24 | 32 | 2 3 | 38 | 45 | 60 | |
| | | | | | | | | | | | | | | |
| Frame | D | | | | | E | F | | G | | H | | | |
| kW | 37 | 45 | 55 | 75 | 90 | 110 | 132 | 160 | 185 | 220 | 280 |) | | |
| HP | 50 | 60 | 75 | 100 | 125 | 150 | 175 | 215 | 250 | 300 | 375 | ; | | |
| Pr.00-00 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | | | |
| Rated Current for Super Heavy Duty (A) | 73 | 91 | 110 | 150 | 180 | 220 | 250 | 310 | 370 | 450 | 550 | | | |

Parameter Reset

Factory Setting: 0

Factory setting: 3

- Settings 0: No Function 1: Write protection for parameters 5: Reset KWH display to 0 6: Reset PLC (including CANopen Master Index)
 - 7: Reset CANopen Index (Slave)
 - 8: keypad lock
 - 9: All parameters are reset to factory settings(base frequency is 50Hz)
 - 10: All parameters are reset to factory settings (base frequency is 60Hz)
- When it is set to 1, all parameters are read only except Pr.00-02~00-08 and it can be used with password setting for password protection. It needs to set Pr.00-02 to 0 before changing other parameter settings.
- When it is set to 9 or 10: all parameters are reset to factory settings. If password is set in Pr.00-08, input the password set in Pr.00-07 to reset to factory settings.
- When it is set to 5, KWH display value can be reset to 0 even when the drive is operating. Pr. 05-26, 05-27, 05-28, 05-29, 05-30 reset to 0.
- When it is set to 6: clear internal PLC program (includes the related settings of PLC internal CANopen master)
- When it is set to 7: reset the related settings of CANopen slave.

Start-up Display Selection
 Factory setting: 0
 Settings 0: Display the frequency command (F)
 1: Display the actual output frequency (H)
 O: Display the actual output frequency (H)

- 2: Display User define (U)
- 3: Output current (A)
- This parameter determines the start-up display page after power is applied to the drive. User defined choice display according to the setting in Pr.00-04.

Content of Multi-function Display

Settings 0: Display output current (A)

- 1: Display counter value (c)
- 2: Display actual output frequency (H.)
- 3: Display DC-BUS voltage (v)
- 4: Display output voltage (E)
- 5: Display output power angle (n)
- 6: Display output power in kW (P)
- 7: Display actual motor speed rpm (r = 00: positive speed; -00 negative speed)
- 8: Display estimate output torque % (t = 00: positive torque; -00 negative torque) (t)

- 9: Display PG feedback (G) (refer to Note 1)
- 10: Display PID feedback in % (b)
- 11: Display AVI in % (1.), 0~10V/4-20mA/0-20mA corresponds to 0~100% (Refer to Note 2)
- 12: Display ACI in % (2.), 4~20mA/0~10V/0-20mA corresponds to 0~100% (Refer to Note 2)
- 13: Display AUI in % (3.), -10V~10V corresponds to -100~100%(Refer to Note 2)
- 14: Display the temperature of IGBT in oC (i.)
- 15: Display the temperature of capacitance in oC (c.)
- 16: The status of digital input (ON/OFF) refer to Pr.02-12 (i) (Refer to Note3)
- 17: Display digital output status ON/OFF (Pr.02-18) (o) (refer to NOTE 4)
- 18: Display the multi-step speed that is executing (S)
- 19: The corresponding CPU pin status of digital input (d) (refer to NOTE 3)
- 20: The corresponding CPU pin status of digital output (0.) (refer to NOTE4)
- 21: Actual motor position (PG1 of PG card). When the motor direction changes or the drive stops, the counter will start from 0 (display value restarts counting from 0) (Max. 65535) (P.)
- 22: Pulse input frequency (PG2 of PG card) (S.)
- 23: Pulse input position (PG2 of PG card) (max. 65535) (q.)
- 24: Position command tracing error (E.)
- 25: Overload counting (0.00~100.00%) (o.) (Refer to Note 6)
- 26: GFF Ground Fault (Unit :%)(G.)
- 27: DC Bus voltage ripple (Unit: Vdc)(r.)
- 28: Display PLC register D1043 data (C) display in hexadecimal
- 29: Display PM motor pole section (EMC-PG01U application) (4.)
- 30 : Display output of user defined (U)
- 31 : H page x 00-05 Display user Gain(K)
- 32: Number of actual motor revolution during operation (PG card plug in and Z phase signal input) (Z.)
- 33: Motor actual position during operation (when PG card is connected)(q)
- 34: Operation speed of fan(%) (F.)
- 35: Control Mode display: 0= Speed control mode (SPD), 1= torque control mode (TQR) (t.)
- 36: Present operating carrier frequency of drive (Hz) (J.)
- 37: Reserved
- 38: Display drive status (6.) (Refer to Note 7)
- 40: Torque command, unit: %(L.)
- 41: KWH display, unit: KWH(J)
- 42: PID reference, unit: %(h.)

- 43: PID offset, unit: %(o.)
- 44: PID output frequency, unit: Hz(b.)
- 45: Hardware version

1. When Pr.10-01 is set to 1000 and Pr.10-02 is set to 1/2, the display range for PG feedback will be from 0 to 4000.

When Pr.10-01 is set to 1000 and Pr.10-02 is set to 3/4/5, the display range for PG feedback will be from 0 to 1000.

Home position: If it has Z phase, Z phase will be regarded as home position. Otherwise, home position will be the encoder start up position.

- It can display negative values when setting analog input bias (Pr.03-03~03-10). Example: assume that AVI input voltage is 0V, Pr.03-03 is 10.0% and Pr.03-07 is 4 (Serve bias as the center).
- 3. Example: If REV, MI1 and MI6 are ON, the following table shows the status of the terminals. 0: OFF, 1: ON

| Terminal | MI15 | MI14 | MI13 | MI12 | MI11 | MI10 | MI8 | MI7 | MI6 | MI5 | MI4 | MI3 | MI2 | MI1 | REV | FWD |
|----------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Status | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

MI10~MI15 are the terminals for extension cards (Pr.02-26~02-31).

If REV, MI1 and MI6 are ON, the value is 0000 0000 1000 0110 in binary and 0086h in HEX. When Pr.00-04 is set to "16" or "19", it will display "0086h" with LED U is ON on the keypad KPC-CE01. The setting 16 is the status of digital input by Pr.02-12 setting and the setting 19 is the corresponding CPU pin status of digital input, the FWD/REV action and the three-wire MI are not controlled by Pr.02-12. User can set to 16 to monitor digital input status and then set to 19 to check if the wire is normal.

 Assume that RY1: Pr.02-13 is set to 9 (Drive ready). After applying the power to the AC motor drive, if there is no other abnormal status, the contact will be ON. The display status will be shown as follows.
 N.O. switch status:

| Terminal | | Rese | erved | | | Rese | erved | | | Rese | erved | | MO2 | MO1 | Reserved | RY2 | RY1 |
|----------|---|------|-------|---|---|------|-------|---|---|------|-------|---|-----|-----|----------|-----|-----|
| Status | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

At the meanwhile, if Pr.00-04 is set to 17 or 20, it will display in hexadecimal "0001h" with LED U is ON on the keypad. The setting 17 is the status of digital output by Pr.02-18 setting and the setting 20 is the corresponding CPU pin status of digital output. User can set 17 to monitor the digital output status and then set to 20 to check if the wire is normal.

- 5. Setting 8: 100% means the motor rated torque. Motor rated torque = (motor rated power $x60/2\pi$)/motor rated speed
- 6. If Pr.00-04 = 25, when display value reaches 100.00%, the drive will show "oL" as an overload warning.

7. If Pr.00-04 = 38,

Bit 0: The drive is running forward.

Bit 1: The drive is running backward.

- Bit 2: The drive is ready.
- Bit 3: Errors occurred on the drive.
- Bit 4: The drive is running.
- Bit 5: Warnings on the drive.



Coefficient Gain in Actual Output Frequency

Factory Setting: 1

Factory Setting: #.#

Factory Setting: 0

This parameter is to set coefficient gain in actual output frequency. Set Pr.00-04= 31 to display the calculation result on the screen (calculation = output frequency * Pr.00-05).

30 - 35 Software Version

Settings Read only

B - **B** - **B** Parameter Protection Password Input

Settings 1~9998, 10000~65535

Display 0~3 (the times of password attempts)

- This parameter allows user to enter their password (which is set in Pr.00-08) to unlock the parameter protection and to make changes to the parameter.
- Pr.00-07 and Pr.00-08 are used to prevent the personal misoperation.
- When the user have forgotten the password, clear the setting by input 9999 and press ENTER key, then input 9999 again and press Enter within 10 seconds. After decoding, all the settings will return to factory setting.

✓ 00-08 Parameter Protection Password Setting

Factory Setting: 0

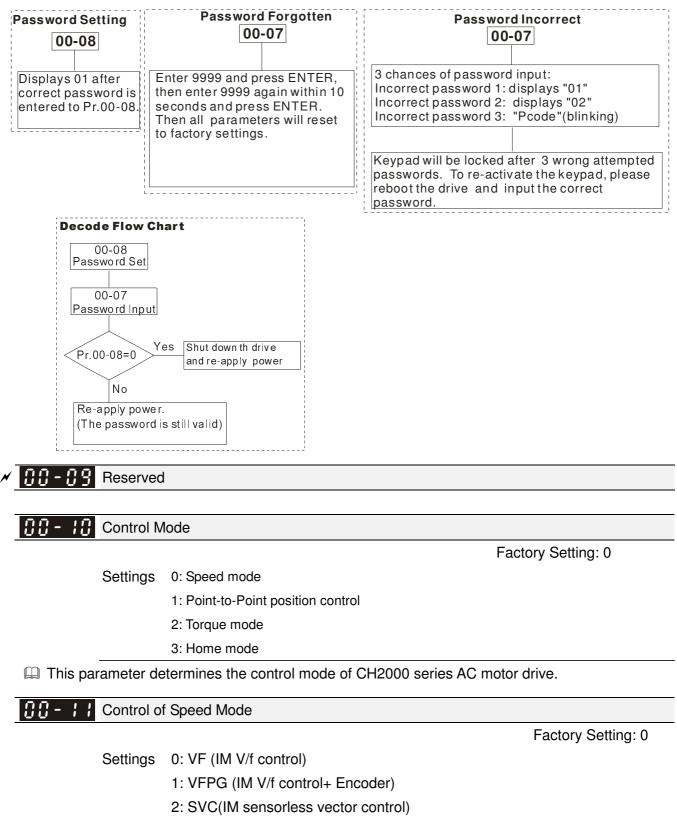
Settings 1~9998, 10000~65535

- 0: No password protection / password is entered correctly (Pr00-07)
- 1: Password has been set
- To set a password to protect your parameter settings. If the display shows 0, no password is set nor password has been correctly entered in Pr.00-07. All parameters can then be changed, including Pr.00-08. The first time you can set a password directly. After successful setting of password the display will show 1. Be sure to write down the password for later use. To cancel the parameter lock, set the parameter to 0 after inputting correct password into Pr. 00-07.
- How to retrieve parameter protection after decoding by Pr.00-07:

Method 1: Re-enter the password to Pr.00-08 (input the password once). Method 2: After reboots, password function will be recovered.

Method 3: Input any value into Pr.00-07 (Do not enter the password).

Password Decode Flow Chart



- 3: FOCPG (IM FOC vector control+ encoder)
- 4: FOCPG (PM FOC vector control + Encoder)
- 5: FOC Sensorless (IM field oriented sensorless vector control)
- 6 : PM Sensorless (PM field oriented sensorless vector control)
- 7 : IPM Sensor-less (IPM motor field oriented sensor-less control)

Description: This parameter determines the control method of the AC motor drive:

0: (IM V/f control): user can design proportion of V/f as required and can control multiple motors simultaneously.

1: (IM V/f control + Encoder): user can use optional PG card with encoder for the closed-loop speed control.

2: (IM Sensorless vector control): get the optimal control by the auto-tuning of motor parameters.

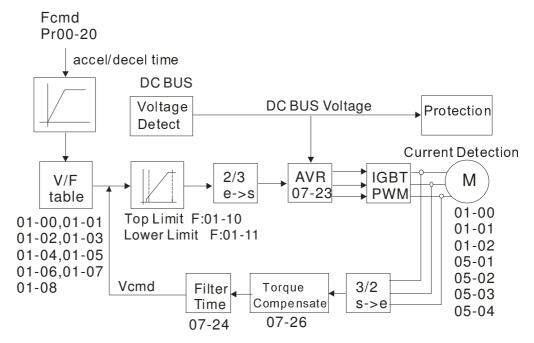
3: (IM FOC vector control+ encoder): besides torque increases, the speed control will be more accurate (1:1000).

4: (PM FOC vector control + Encoder): besides torque increases, the speed control will be more accurate (1:1000).

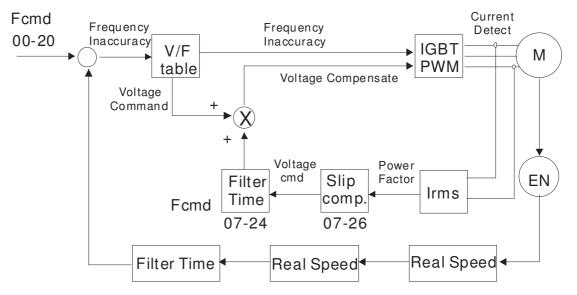
5: FOC Sensorless: IM field oriented sensorless vector control

6: PM Sensorless (PM field oriented sensorless vector control)

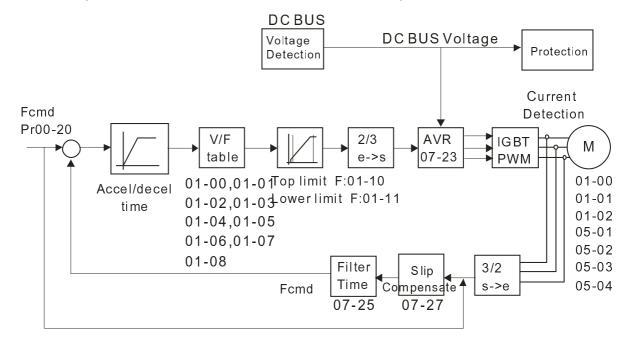
When setting Pr.00-11 to 0, the V/F control diagram is shown as follows.



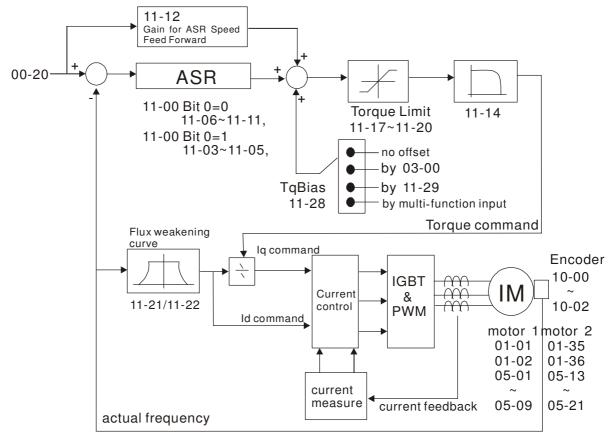
When setting Pr.00-11 to 1, the V/F control + encoder diagram is shown as follows.



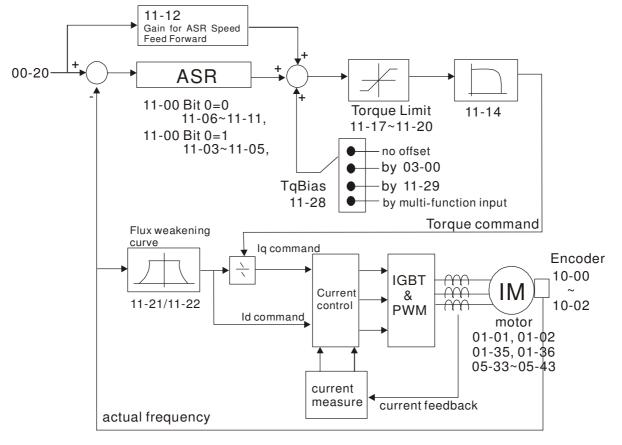
When setting Pr.00-11 to 2, the sensorless vector control diagram is shown as follows.



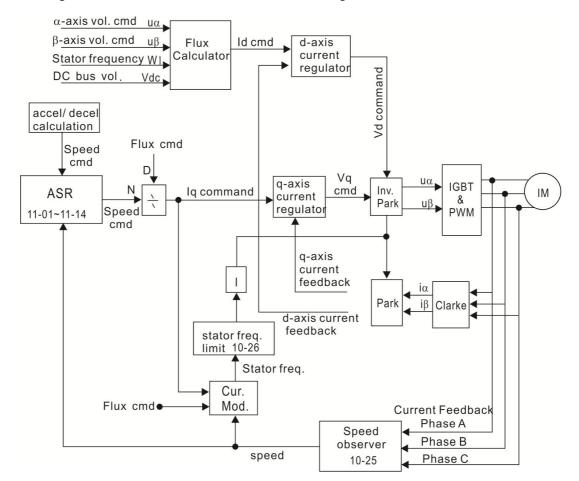
When setting Pr.00-11 to 3, the FOCPG control diagram is shown as follows.





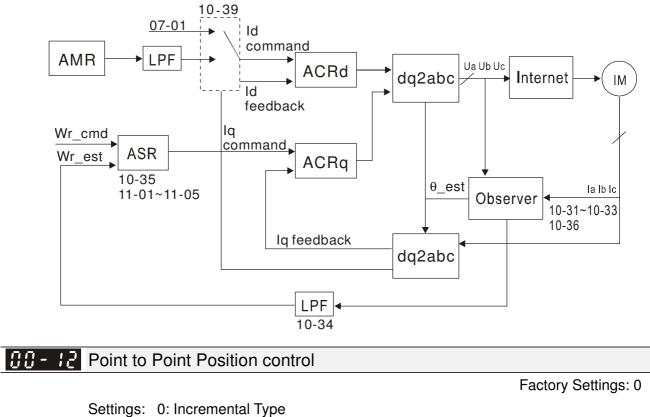


When setting Pr.00-11 to 5, FOC sensorless control diagram is shown as follows.



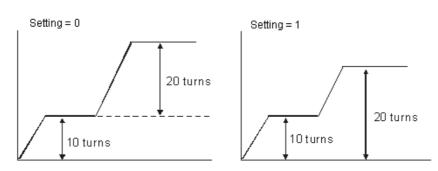
Chapter 12 Description of Parameter Settings

When setting Pr.00-11 to 6, PM FOC sensorless control diagram is shown as follows:



1: Absolute Type

 \square Pr. 00-12 = 0 is incremental type P2P; Pr.00-12 = 1 is absolute type P2P



✓ **33 - 13** Control of Torque Mode

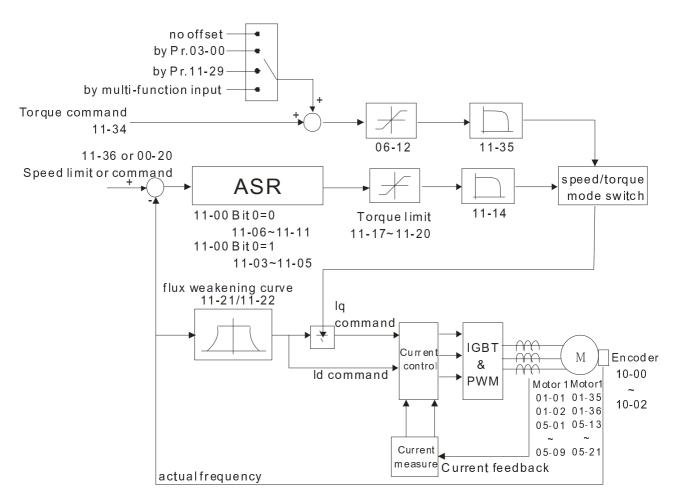
Factory Setting: 0

Settings 0: TQCPG (IM Torque control + Encoder)

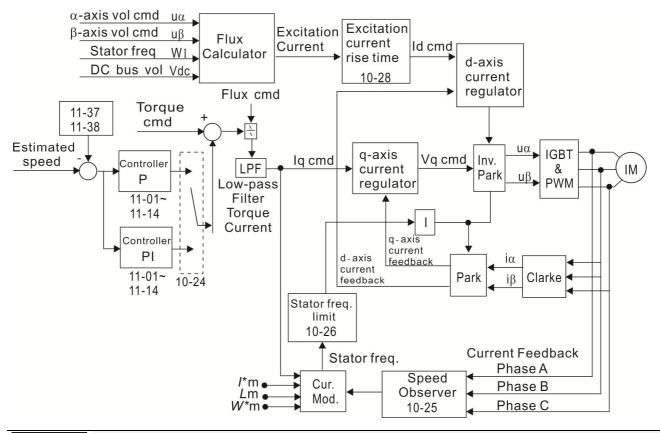
1: TQCPG (PM Torque control + Encoder)

2: TQC Sensorless (IM Sensorless torque control)

I TQCPG control diagram is shown in the diagram below:



I TQC Sensorless control diagram is shown in the following diagram:



Reserved

00-15 Reserved

33 - 15 Load Selection

Settings 3: Super Heavy Duty

Super Heavy Duty: over load, rated output current 200% in 3 second (150%, 1 minute). Refer to Pr.00-17 for the setting of carrier wave. Refer to chapter specifications or Pr.00-01 for the rated current.

G - **Carrier Frequency**

Factory setting: Table below

Factory Setting: 3

Settings 2~15kHz

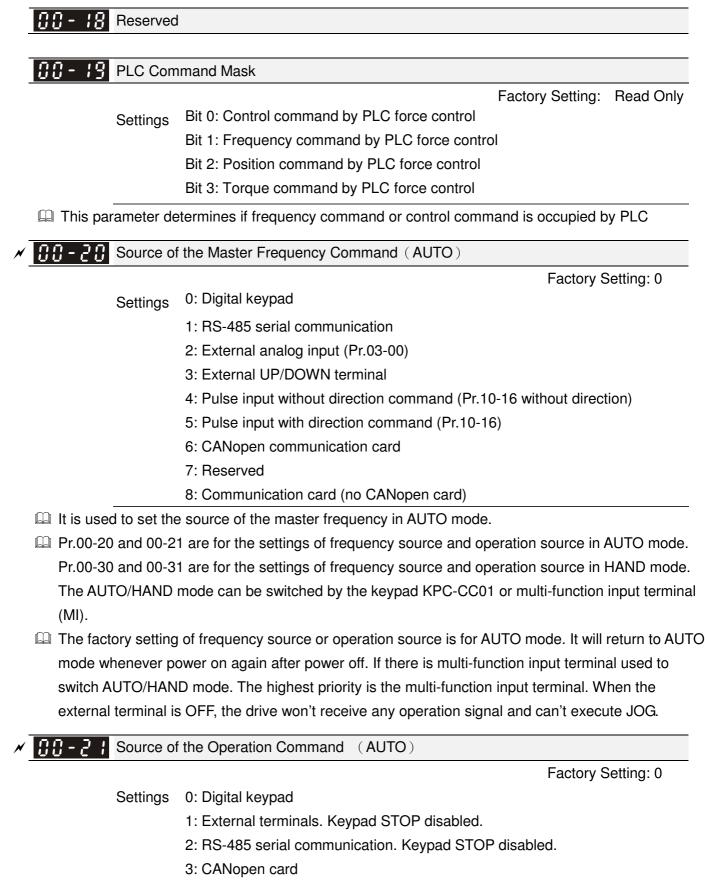
Description: This parameter determinates the PWM carrier frequency of the AC motor drive.

| | 230V Series | | | | | |
|------------------|--------------------|--------------------|--|--|--|--|
| Models | 1-15HP [0.75-11kW] | 20-100HP [15-75kW] | | | | |
| Setting Range | 05~15kHz | 05~15kHz | | | | |
| Super Heavy Duty | 8kHz | 6kHz | | | | |
| Factory Setting | | | | | | |

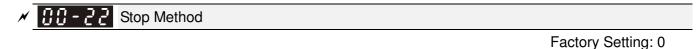
| | 460V Series | | | | | |
|------------------|--------------------|----------------------|----------------------|--|--|--|
| Models | 1-20HP [0.75-15kW] | 25-100HP [18.5-75kW] | 125-375HP [90-280kW] | | | |
| Setting Range | 05~15kHz | 05~15kHz | 04~10kHz | | | |
| Super Heavy Duty | 8kHz | 6kHz | 5kHz | | | |
| Factory Setting | | | | | | |

| | Carrier Frequency | Acoustic Noise | Electromagnetic Noise or Leakage Current | Heat Dissipation | Current Wave |
|---|----------------------|-------------------|--|---------------------|-----------------|
| | 1kHz | Significant | Minimal | Minimal | |
| | 8kHz | Ĩ | Ī | Î | |
| - | 15kHz | Ļ | Ļ | | |
| | | Minimal | Significant | Significant | |

- From the table, we see that the PWM carrier frequency has a significant influence on the electromagnetic noise, AC motor drive heat dissipation, and motor acoustic noise. Therefore, if the surrounding noise is greater than the motor noise, lower the carrier frequency is good to reduce the temperature rise. Although it is quiet operation in the higher carrier frequency, the entire wiring and interference resistance should be considerate.
- When the carrier frequency is higher than the factory setting, it needs to protect by decreasing the carrier frequency. See Pr.06-55 for the related setting and details.



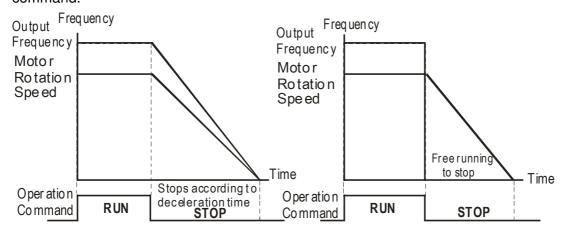
- 4: Reserved
- 5: Communication card (not includes CANopen card)
- It is used to set the source of the operation frequency in AUTO mode.
- When the operation command is controlled by the keypad KPC-CC01, keys RUN, STOP and JOG (F1) are valid.



Settings 0: Ramp to stop

1:Coast to stop

The parameter determines how the motor is stopped when the AC motor drive receives a valid stop command.



Rampto Stop and Coast to Stop

- Ramp to stop: the AC motor drive decelerates from the setting of deceleration time to 0 or minimum output frequency (Pr. 01-09) and then stop (by Pr.01-07).
- Coast to stop: the AC motor drive stops the output instantly upon a STOP command and the motor free runs until it comes to a complete standstill.

(1) It is recommended to use "ramp to stop" for safety of personnel or to prevent material from being wasted in applications where the motor has to stop after the drive is stopped. The deceleration time has to be set accordingly.

(2) If the motor free running is allowed or the load inertia is large, it is recommended to select "coast to stop". For example, blowers, punching machines and pumps

The stop method of the torque control is also set by Pr.00-22.

Control of Motor Direction

Factory Setting: 0

Settings 0: Enable forward/ reverse

- 1: Disable reverse
- 2: Disable forward
- This parameter enables the AC motor drives to run in the forward/reverse Direction. It may be used to prevent a motor from running in a direction that would consequently injure the user or damage the equipment.

Memory of Frequency Command

Factory Setting: Read Only

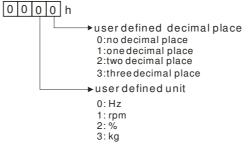
Settings Read only

If keypad is the source of frequency command, when Lv or Fault occurs the present frequency command will be saved in this parameter.

User Defined Characteristics

| | Factory Setting: 0 |
|---|----------------------|
| Settings Bit 0~3: user defined decimal place | i iiiii ji comingi c |
| Settings Bit 0~3: user defined decimal place 0000b: no decimal place | |
| 0001b: one decimal place | |
| 0010b: two decimal place | |
| 0011b: three decimal place | |
| Bit 4~15: user defined unit | |
| 000xh: Hz | |
| 001xh: rpm | |
| 002xh: % | |
| 003xh: kg | |
| 004xh: M/S | |
| 005xh: kW | |
| 006xh: HP | |
| 007xh: PPM | |
| 008xh: l / m | |
| 009xh: kg/s | |
| 00Axh: kg/m | |
| 00Bxh: kg/h | |
| 00Cxh: Ib/s | |
| 00Dxh: lb/m | |
| 00Exh: lb/h | |
| 00Fxh: ft/s | |
| 010xh: ft/m | |
| 011xh: M | |
| 012xh: ft | |
| 013xh: degC | |
| 014xh: degF | |
| 015xh: mbar 016xh: bar | |
| 017xh: Pa | |
| 018xh: kPa | |
| 019xh: mWG | |
| 01Axh: inWG | |
| 01Bxh: ftWG | |
| 01Cxh: Psi | |
| 01Dxh: Atm | |
| 01Exh: L/s | |
| 01Fxh: L/m | |
| 020xh: L/h | |
| 021xh: m3/s | |
| 022xh: m3/h | |
| 023xh: GPM | |
| 024xh: CFM | |

- Bit 0~3: Control F page, unit of user defined value (Pr00-04 =d10, PID feedback) and the decimal point of Pr00-26 which supports up to 3 decimal points.
- Bit 4~15: Control F page, unit of user defined value (Pr00-04=d10, PID feedback) and the display units of Pr00-26 which supports up to 4 units



33 - 25 Max. User Defined Value

Factory Setting: 0

Settings 0: Disable

0~65535 (when Pr.00-25 set to no decimal place) 0.0~6553.5 (when Pr.00-25 set to 1 decimal place)

0.0~655.35 (when Pr.00-25 set to 2 decimal place)

0.0~65.535 (when Pr.00-25 set to 3 decimal place)

When Pr.00-26 is NOT set to 0. The user defined value is enabled. The value of this parameter should correspond to the frequency setting at Pr.01-00.

Example:

When the frequency at Pr. 01-00=60.00Hz, the max. user defined value at Pr. 00-26 is 100.0%. That also means Pr.00-25 is set at 0021h to select % as the unit.

The drive will display as Pr.00-25 setting when Pr.00-25 is properly set and Pr.00-26 is not 0.

User Defined Value

Settings Read only

Factory Setting: Read only

Pr.00-27 will show user defined value when Pr.00-26 is not set to 0.

User defined function is valid when:

1. Pr.00-20 is set to digital keypad control

- 2. RS-285 communication input control.
- 3. PID function enabled

Reserved

- 2 2 LOCAL/REMOTE Selection

Factory Setting: 0

Settings 0: Standard HOA function

- 1: Switching Local/Remote, the drive stops
- 2: Switching Local/Remote, the drive runs as the REMOTE setting for frequency and operation status
- 3: Switching Local/Remote, the drive runs as the LOCAL setting for frequency and operation status
- 4: Switching Local/Remote, the drive runs as LOCAL setting when switch to Local and runs as REMOTE setting when switch to Remote for frequency and operation status.
- The factory setting of Pr.00-29 is 0 (standard Hand-Off-Auto function). The AUTO frequency and source of operation can be set by Pr.00-20 and Pr.00-21, and the HAND frequency and source of operation can be set by Pr.00-30 and Pr.00-31. AUTO/HAND mode can be selected or switched by using digital keypad (KPC-CC01) or setting multi-function input terminal MI= 41, 42.
- When external terminal MI is set to 41 and 42 (AUTO/HAND mode), the settings Pr.00-29=1,2,3,4 will be disabled. The external terminal has the highest priority among all command, Pr.00-29 will always function as Pr.00-29=0, standard HOA mode.

- When Pr.00-29 is not set to 0, Local/Remote function is enabled, the top right corner of digital keypad (KPC-CC01) will display "LOC" or "REM" (the display is available when KPC-CC01 is installed with firmware version higher than version 1.021). The LOCAL frequency and source of operation can be set by Pr.00-20 and Pr.00-21, and the REMOTE frequency and source of operation can be set by Pr.00-30 and Pr.00-31. Local/Remote function can be selected or switched by using digital keypad (KPC-CC01) or setting external terminal MI=56. The AUTO key of the digital keypad now controls for the REMOTE function and HAND key now controls for the LOCAL function.
- When MI is set to 56 for LOC/REM selection, if Pr.00-29 is set to 0, then the external terminal is disabled.
- When MI is set to 56 for LOC/REM selection, if Pr.00-29 is not set to 0, the external terminal has the highest priority of command and the ATUO/HAND keys will be disabled.

Source of the Master Frequency Command (HAND)

Factory Setting: 0

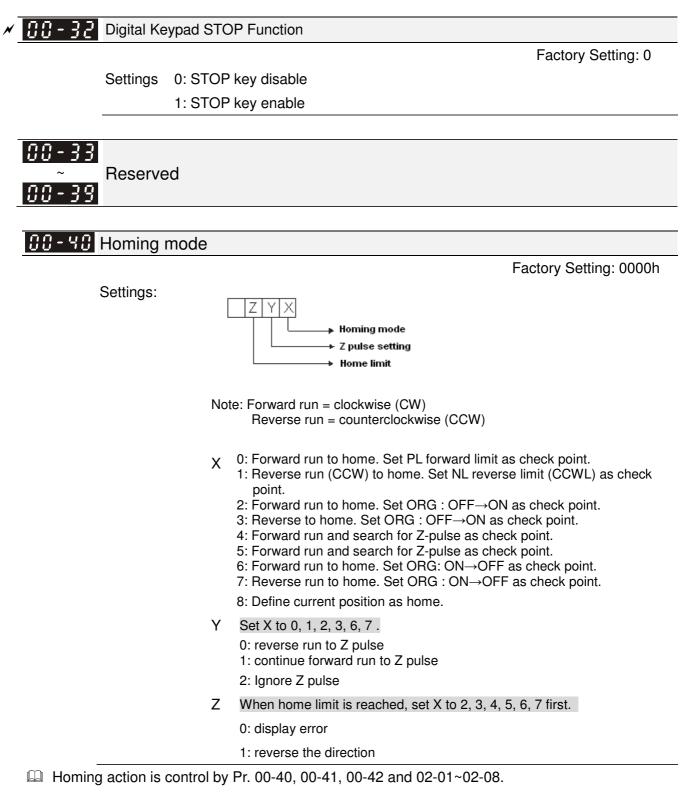
- Settings 0: Digital keypad
 - 1: RS-485 serial communication
 - 2: External analog input (Pr.03-00)
 - 3: External UP/DOWN terminal
 - 4: Pulse input without direction command (Pr.10-16 without direction)
 - 5: Pulse input with direction command (Pr.10-16)
 - 6: CANopen communication card
 - 7: Reserved
 - 8: Communication card (no CANopen card)

It is used to set the source of the master frequency in HAND mode.

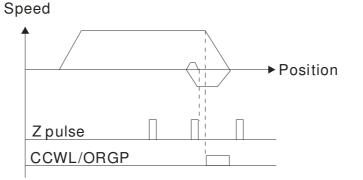
✓ 33 - 3 ↓ Source of the Operation Command (HAND)

Factory Setting: 0

- Settings 0: Digital keypad
 - 1: External terminals. Keypad STOP disabled.
 - 2: RS-485 serial communication. Keypad STOP disabled.
 - 3: CANopen communication card
 - 4: Reserved
 - 5: Communication card (not include CANopen card
- It is used to set the source of the operation frequency in HAND mode.
- Pr.00-20 and 00-21 are for the settings of frequency source and operation source in AUTO mode.
 Pr.00-30 and 00-31 are for the settings of frequency source and operation source in HAND mode.
 The AUTO/HAND mode can be switched by the keypad KPC-CC01 or multi-function input terminal (MI).
- The factory setting of frequency source or operation source is for AUTO mode. It will return to AUTO mode whenever power on again after power off. If there is multi-function input terminal used to switch AUTO/HAND mode. The highest priority is the multi-function input terminal. When the external terminal is OFF, the drive won't receive any operation signal and can't execute JOG.



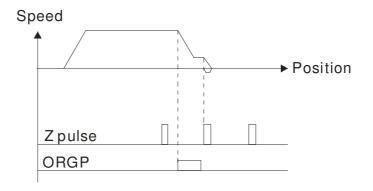
1. When Y=0, X=0 or Y=0, X=2



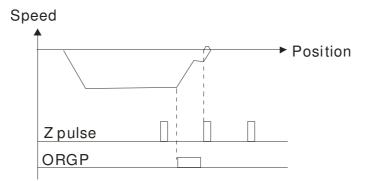
2. When Y=0, X=1 or Y=0, X=3



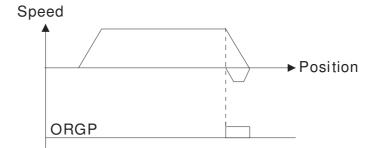
3. When Y=1, X=2



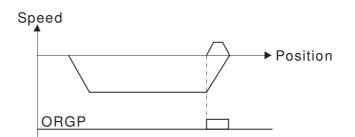
4. When Y=1, X=3



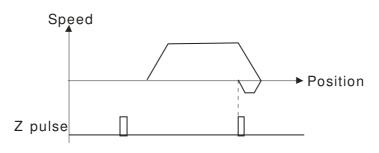
5. When Y=2, X=2



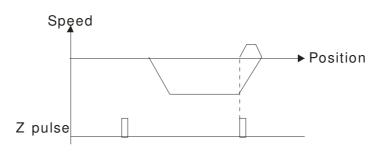
6. When Y=2, X=3



7. When Y=2, X=4



8. When Y=2, X=5



30 - 4 1 Homing by Frequency 1

Factory Setting: 8.00

Settings 0.00~600.00Hz

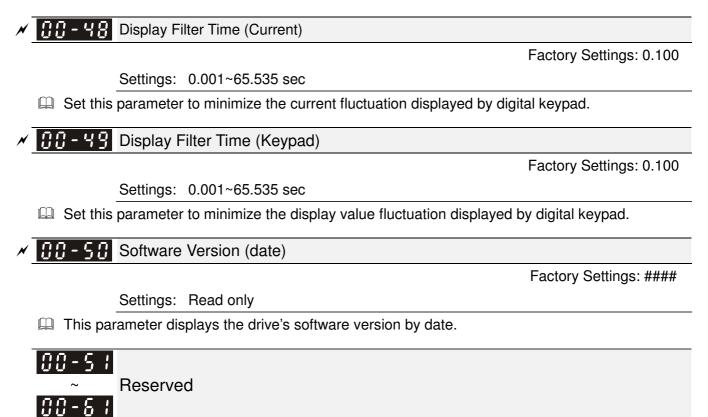
CONTRACT Homing by Frequency 2

Factory Setting: 2.00

Settings 0.00~600.00Hz

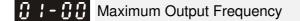
- Control by Multi-function Input Terminal Pr. 02-01~02-08 (44~47).
 - 44: Reverse direction homing
 - 45: Forward direction homing
 - 46: Homing (ORG)
 - 47: Homing function enabled
- If the drive is not control by CAN or PLC, set Pr.00-10 =1 (Control mode = P2P position control) and set external output terminal to 47 (homing function enable) for homing.
- When Pr.00-10 is set to 3, after homing is complete, user must set control mode setting Pr.00-10 to 1 in order to perform P2P position control.

00-43 ~ Reserved



Group 1 Basic Parameters

✓ This parameter can be set during operation.



Factory Setting: 60.00/50.00

Settings 50.00~600.00Hz

This parameter determines the AC motor drive's Maximum Output Frequency. All the AC motor drive frequency command sources (analog inputs 0 to +10V, 4 to 20mA, 0 to 20mAand ±10V) are scaled to correspond to the output frequency range.

| | | (base frequency and motor rated frequency) |
|-------|-----------------------------|--|
| 01-35 | Output Frequency of Motor 2 | (base frequency and motor rated frequency) |

Factory Setting: 60.00/50.00

Settings 0.00~600.00Hz

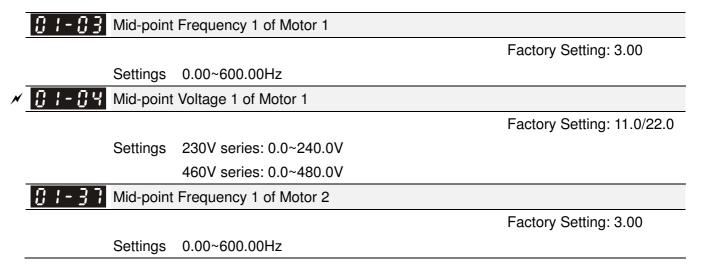
- This value should be set according to the rated frequency of the motor as indicated on the motor nameplate. If the motor is 60Hz, the setting should be 60Hz. If the motor is 50Hz, it should be set to 50Hz.
- **()** I **() ()**Output Voltage of Motor 1 (base frequency and motor rated frequency)**()** I **() ()**Output Voltage of Motor 2 (base frequency and motor rated frequency)

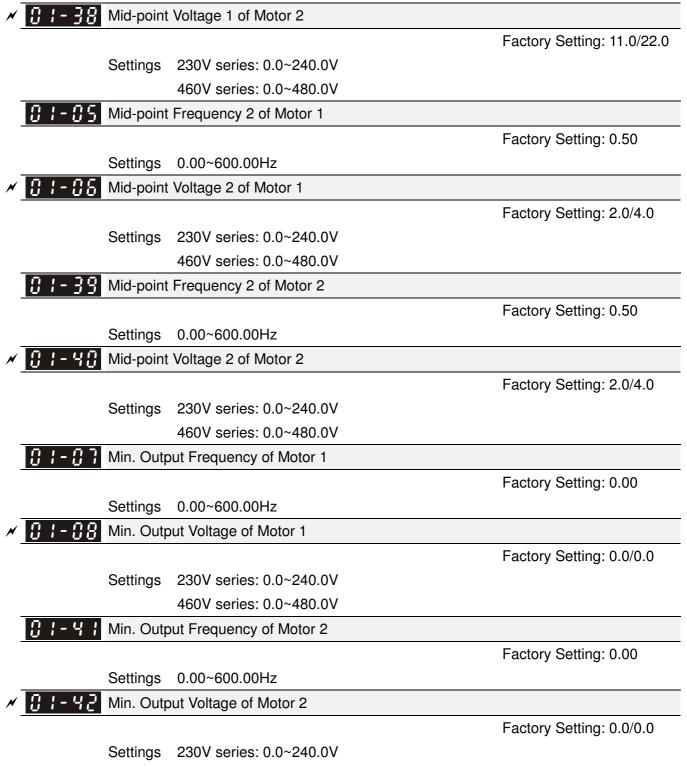
Factory Setting: 200.0/400.0

Settings 230V series: 0.0~255.0V

460V series: 0.0~510.0V

- This value should be set according to the rated voltage of the motor as indicated on the motor nameplate. If the motor is 220V, the setting should be 220.0. If the motor is 200V, it should be set to 200.0.
- There are many motor types in the market and the power system for each country is also difference. The economic and convenience method to solve this problem is to install the AC motor drive. There is no problem to use with the different voltage and frequency and also can amplify the original characteristic and life of the motor.

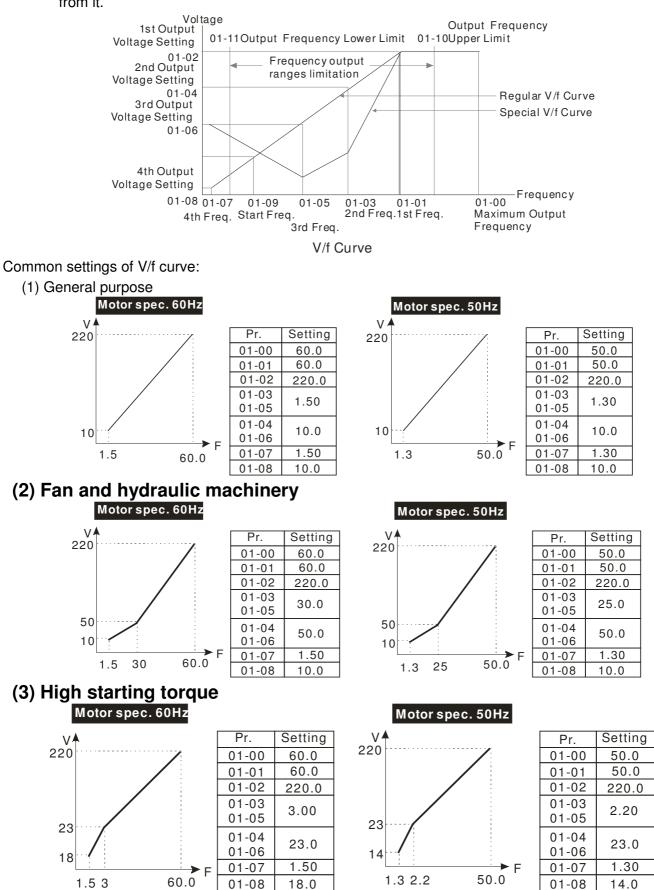




460V series: 0.0~480.0V

- V/f curve setting is usually set by the motor's allowable loading characteristics. Pay special attention to the motor's heat dissipation, dynamic balance, and bearing lubricity, if the loading characteristics exceed the loading limit of the motor.
- There is no limit for the voltage setting, but a high voltage at low frequency may cause motor damage, overheat, and stall prevention or over-current protection. Therefore, please use the low voltage at the low frequency to prevent motor damage.
- Pr.01-35 to Pr.01-42 is the V/f curve for the motor 2. When multi-function input terminals Pr.02-01~02-08 and Pr.02-26 ~Pr.02-31 are set to 14 and enabled, the AC motor drive will act as the 2nd V/f curve.

The V/f curve for the motor 1 is shown as follows. The V/f curve for the motor 2 can be deduced from it.



Start-Up Frequency

Factory Setting: 0.50

Settings 0.0~600.00Hz

- When start frequency is higher than the min. output frequency, drives' output will be from start frequency to the setting frequency. Please refer to the following diagram for details.
- General Form Form Formand,

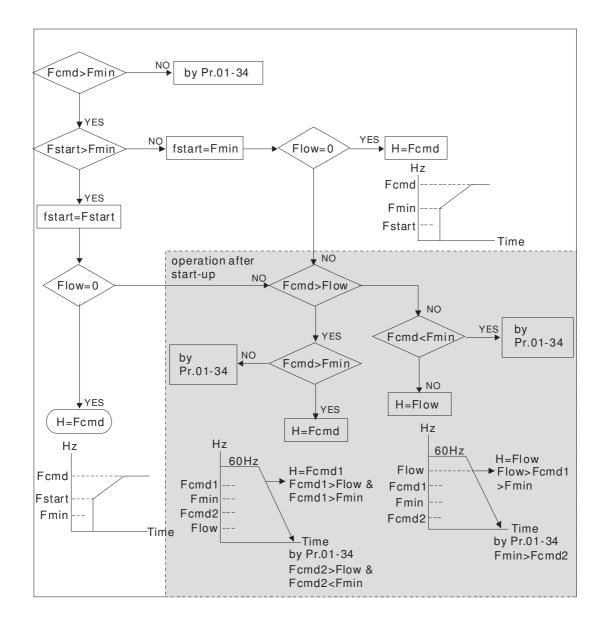
Fstart=start frequency (Pr.01-09),

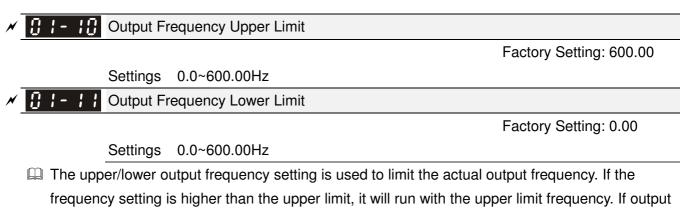
fstart=actual start frequency of drive,

Fmin=4th output frequency setting (Pr.01-07/Pr.01-41),

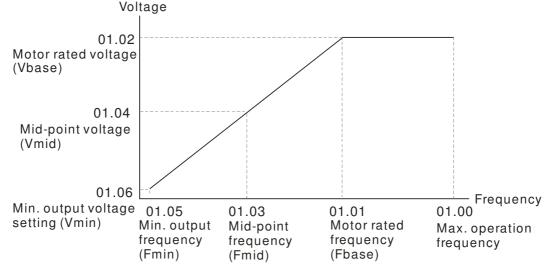
Flow=output frequency lower limit (Pr.01-11)

- Generation Found F
 - \square If Flow<Fcmd $\,^{,-}\,$ drive will run with Fcmd directly.
 - If Flow>=Fcmd, drive will run with Fcmd firstly, then, accelerate to Flow according to acceleration time.
- The drive's output will stop immediately when output frequency has reach to Fmin during deceleration.





- frequency lower than output frequency lower limit and frequency setting is higher than min. frequency, it will run with lower limit frequency. The upper limit frequency should be set to be higher than the lower limit frequency.
- \square Pr.01-10 setting must be \ge Pr.01-11 setting.
- Upper output frequency will limit the max. Output frequency of drive. If frequency setting is higher than Pr.01-10, the output frequency will be limited by Pr.01-10 setting.
- When the drive starts the function of slip compensation (Pr.07-27) or PID feedback control, drive output frequency may exceed frequency command but still be limited by this setting.
- Related parameters: Pr.01-00 Max. Operation Frequency and Pr.01-11 Output Frequency Lower Limit



- Lower output frequency will limit the min. output frequency of drive. When drive frequency command or feedback control frequency is lower than this setting, drive output frequency will limit by the lower limit of frequency.
- When the drive starts, it will operate from min. output frequency (Pr.01-05) and accelerate to the setting frequency. It won't limit by lower output frequency setting.
- The setting of output frequency upper/lower limit is used to prevent personal misoperation, overheat due to too low operation frequency or damage due to too high speed.
- If the output frequency upper limit setting is 50Hz and frequency setting is 60Hz, max. output frequency will be 50Hz.
- If the output frequency lower limit setting is 10Hz and min. operation frequency setting (Pr.01-05) is 1.5Hz, it will operate by 10Hz when the frequency command is greater than Pr.01-05 and less than 10Hz. If the frequency command is less than Pr.01-05, the drive will be in ready status and no output.

□ If the frequency output upper limit is 60Hz and frequency setting is also 60Hz, it won't exceed 60Hz even after slip compensation. If the output frequency needs to exceed 60Hz, it can increase output frequency upper limit or max. operation frequency.

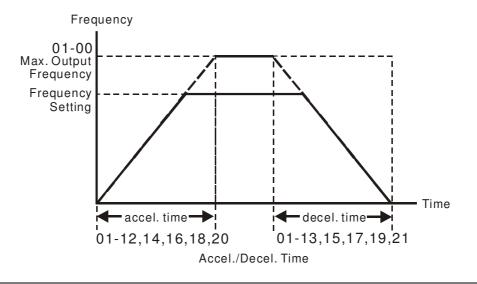
| - | | |
|---|------------|-----------------------|
| × | 81-15 | Accel. Time 1 |
| × | 01-13 | Decel. Time 1 |
| × | 01-14 | Accel. Time 2 |
| × | 01-15 | Decel. Time 2 |
| × | 01-16 | Accel. Time 3 |
| N | [] -] | Decel. Time 3 |
| N | 01-18 | Accel. Time 4 |
| N | 01-19 | Decel. Time 4 |
| N | 01-20 | JOG Acceleration Time |
| × | 01-21 | JOG Deceleration Time |

Factory Setting: 10.00/10.0 Factory Setting for AC drive with power greater than 30HP: 60.00/60.0

Settings Pr.01-45=0: 0.00~600.00 seconds

Pr.01-45=1: 0.00~6000.00 seconds

- The Acceleration Time is used to determine the time required for the AC motor drive to ramp from 0Hz to Maximum Output Frequency (Pr.01-00).
- The Deceleration Time is used to determine the time require for the AC motor drive to decelerate from the Maximum Output Frequency (Pr.01-00) down to 0Hz.
- The Acceleration/Deceleration Time is invalid when using Pr.01-44 Optimal Acceleration/Deceleration Setting.
- The Acceleration/Deceleration Time 1, 2, 3, 4 are selected according to the Multi-function Input Terminals settings. The factory settings are Accel./Decel. time 1.
- When enabling torque limits and stalls prevention function, actual accel./decel. time will be longer than the above action time.
- Please note that it may trigger the protection function (Pr.06-03 Over-current Stall Prevention during Acceleration or Pr.06-01 Over-voltage Stall Prevention) when the setting of accel./decel. time is too short.
- Please note that it may cause motor damage or drive protection enabled due to over current during acceleration when the setting of acceleration time is too short.
- Please note that it may cause motor damage or drive protection enabled due to over current during deceleration or over-voltage when the setting of deceleration time is too short.
- It can use suitable brake resistor (see Chapter 06 Accessories) to decelerate in a short time and prevent over-voltage.
- When enabling Pr.01-24~Pr.01-27, the actual accel./decel. time will be longer than the setting.



JOG Frequency

Factory Setting: 6.00

Settings 0.00~600.00Hz

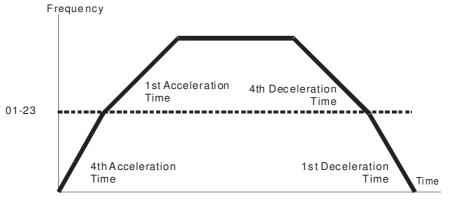
- Both external terminal JOG and key "F1" on the keypad KPC-CC01 can be used. When the jog command is ON, the AC motor drive will accelerate from 0Hz to jog frequency (Pr.01-22). When the jog command is OFF, the AC motor drive will decelerate from Jog Frequency to zero. The Jog Accel./Decel. time (Pr.01-20, Pr.01-21) is the time that accelerates from 0.0Hz to Pr.01-22 JOG Frequency.
- The JOG command can't be executed when the AC motor drive is running. In the same way, when the JOG command is executing, other operation commands are invalid except forward/reverse commands and STOP key on the digital keypad.
- It does not support JOG function in the optional keypad KPC-CE01.

✓ [] : - 2 3 1st/4th Accel./decel. Frequency

Factory Setting: 0.00

Settings 0.00~600.00Hz

- The transition from acceleration/deceleration time 1 to acceleration/deceleration time 4, may also be enabled by the external terminals. The external terminal has priority over Pr. 01-23.
- When using this function, please set S-curve acceleration time as 0 if 4th acceleration time is set too short.



1 st/4 th Acceleration/Deceleration Frequency Switching

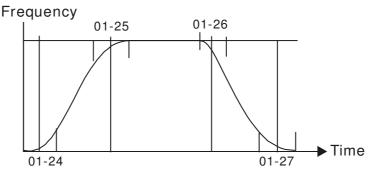
| | C !- 24 S-curve Acceleration Begin Time 1 |
|---|---|
| N | 3 1 - 25 S-curve Acceleration Arrival Time 2 |
| N | 3 1-28 S-curve Deceleration Begin Time 1 |
| × | C - 2 7 S-curve Deceleration Arrival Time 2 |

Factory Setting: 0.20/0.2

```
Settings Pr.01-45=0: 0.00~25.00 seconds
Pr.01-45=1: 0.00~250.0 seconds
```

- It is used to give the smoothest transition between speed changes. The accel./decel. curve can adjust the S-curve of the accel./decel. When it is enabled, the drive will have different accel./decel. curve by the accel./decel. time.
- \square The S-curve function is disabled when accel./decel. time is set to 0.
- $\label{eq:when Pr.01-12, 01-14, 01-16, 01-18 } \ensuremath{\mathbb{Pr}.01-24} \ensuremath{\text{and Pr}.01-25}, \\ \ensuremath{\mathsf{The Actual Accel. Time}} = \ensuremath{\mathsf{Pr}.01-12, 01-14, 01-16, 01-18} + (\ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-25})/2 \\ \ensuremath{\mathbb{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-25})/2 \\ \ensuremath{\mathbb{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-25})/2 \\ \ensuremath{\mathbb{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-25})/2 \\ \ensuremath{\mathbb{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-24} + \ensuremath{\mathsf{Pr}.01-25} + \ensuremath{\mathsf{Pr}.01-24} + \e$
- $\label{eq:when Pr.01-13, 01-15, 01-17, 01-19} \\ \ge Pr.01-26 \ and \ Pr.01-27,$

The Actual Decel. Time = Pr.01-13, 01-15, 01-17, 01-19 + (Pr.01-26 + Pr.01-27)/2

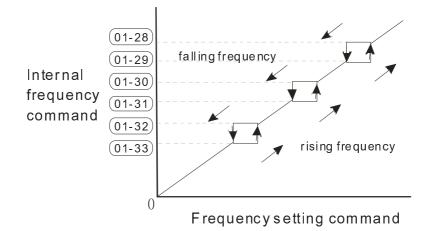


| C I - 28 Skip Frequency 1 (upper limit) |
|--|
| G I - 29 Skip Frequency 1 (lower limit) |
| C I - 3C Skip Frequency 2 (upper limit) |
| C !- 3 ! Skip Frequency 2 (lower limit) |
| C !- 32 Skip Frequency 3 (upper limit) |
| C 1-33 Skip Frequency 3 (lower limit) |

Factory Setting: 0.00

Settings 0.00~600.00Hz

- These parameters are used to set the skip frequency of the AC drive. But the frequency output is continuous. There is no limit for the setting of these six parameters and can be used as required.
- The skip frequencies are useful when a motor has vibration at a specific frequency bandwidth. By skipping this frequency, the vibration will be avoided. It offers 3 zones for use.
- □ These parameters are used to set the skip frequency of the AC drive. But the frequency output is continuous. The limit of these six parameters is 01-28≥01-29≥01-30≥01-31≥01-32≥01-33. This function will be invalid when setting to 0.0.
- The setting of frequency command (F) can be set within the range of skip frequencies. In this moment, the output frequency (H) will be limited by these settings.
- When accelerating/decelerating, the output frequency will still pass the range of skip frequencies.



**G ! -] ** Zero-speed Mode

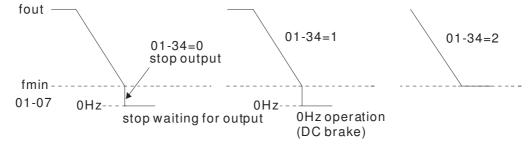
Factory Setting: 0

Settings 0: Output waiting

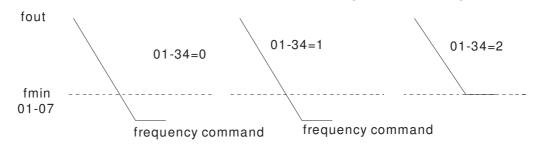
1: Zero-speed operation

2: Fmin (Refer to Pr.01-07, 01-41)

- Description When the frequency is less than Fmin (Pr.01-07 or Pr.01-41), it will operate by this parameter.
- When it is set to 0, the AC motor drive will be in waiting mode without voltage output from terminals U/V/W.
- When setting 1, it will execute DC brake by Vmin(Pr.01-08 and Pr.01-42) in V/f, FOC Sensorless, and SVC modes. It executes zero-speed operation in VFPG and FOCPG mode.
- When it is set to 2, the AC motor drive will run by Fmin (Pr.01-07, Pr.01-41) and Vmin (Pr.01-08, Pr.01-42) in V/F, VFPG, SVC, FOC Sensorless and FOCPG modes.
- In V/F, VFPG, SVC and FOC Sensorless modes



In FOCPG mode, when Pr.01-34 is set to 2, it will act according Pr.01-34 setting.

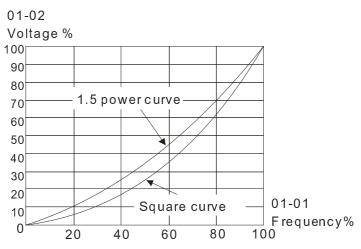


V/f Curve Selection

Factory Setting: 0

Settings 0: V/f curve determined by group 01

- 1: 1.5 power curve
- 2: Square curve
- When setting to 0, refer to Pr.01-01~01-08 for motor 1 V/f curve. For motor 2, please refer to Pr.01-35~01-42.
- \square When setting to 1 or 2, 2nd and 3rd voltage frequency setting are invalid.
- If motor load is variable torque load (torque is in direct proportion to speed, such as the load of fan or pump), it can decrease input voltage to reduce flux loss and iron loss of the motor at low speed with low load torque to raise the entire efficiency.
- When setting higher power V/f curve, it is lower torque at low frequency and is not suitable for rapid acceleration/deceleration. It is recommended NOT to use this parameter for the rapid acceleration/deceleration.



✓ ① I - Ч Ч Optimal Acceleration/Deceleration Setting

Factory Setting: 0

Settings 0: Linear accel./decel.

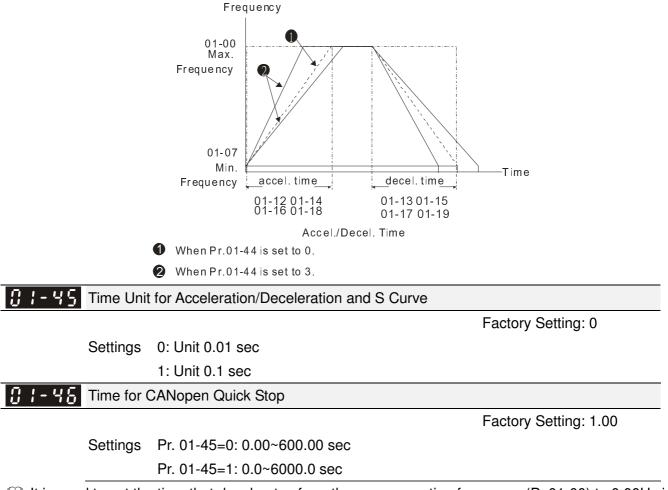
1: Auto accel., linear decel.

2: Linear accel., auto decel.

- 3: Auto accel./decel. (auto calculate the accel./decel. time by actual load)
- 4: Stall prevention by auto accel./decel. (limited by 01-12 to 01-21)
- Setting 0 Linear accel./decel.: it will accelerate/decelerate according to the setting of Pr.01-12~01-19.
- Setting to Auto accel./decel.: it can reduce the mechanical vibration and prevent the complicated auto-tuning processes. It won't stall during acceleration and no need to use brake resistor. In addition, it can improve the operation efficiency and save energy.
- Setting 3 Auto accel./decel. (auto calculate the accel./decel. time by actual load): it can auto detect the load torque and accelerate from the fastest acceleration time and smoothest start current to the setting frequency. In the deceleration, it can auto detect the load re-generation and stop the motor smoothly with the fastest decel. time.

Chapter 12 Description of Parameter Settings

Setting 4 Stall prevention by auto accel./decel. (limited by 01-12 to 01-21): if the acceleration/deceleration is in the reasonable range, it will accelerate/decelerate by Pr.01-12~01-19. If the accel./decel. time is too short, the actual accel./decel. time is greater than the setting of accel./decel. time.



It is used to set the time that decelerates from the max. operation frequency (Pr.01-00) to 0.00Hz in CANopen control.

02 Digital Input/Output Parameter

✓ This parameter can be set during operation.

2-wire/3-wire Operation Control

Factory Setting: 0

- Settings 0: 2 wire mode 1 1: 2 wire mode 2
 - 2: 3 wire mode
- □ It is used to set the operation control method:

| Pr.02-00 | Control Circuits of the External Terminal |
|--|--|
| 0 2-wire mode 1 FWD/STOP REV/STOP | FWD/STOP REV/STOP GO FWD:("OPEN":STOP) ("CLOSE":FWD) REV:("OPEN": STOP) DCM VFD-CH |
| 1 2-wire mode 2 RUN/STOP REV/FWD | RUN/STOP FWD/REV CO FWD/REV CO FWD/REV CO CLOSE": RUN) REV:("OPEN": STOP) ("CLOSE": RUN) CLOSE": REV) DCM VFD-CH |
| 2 3-wire operation control | STOP FWD "CLOSE":RUN STOP RUN MI1 "OPEN":STOP REV/FWD REV/FWD "OPEN": FWD CLOSE": REV DCM VFD-CH |

3 2 - 3 1 Multi-function Input Command 1 (MI1) (MI1= STOP command when in 3-wire operation control)

Factory Setting: 1 50-50 Multi-function Input Command 2 (MI2) Factory Setting: 2 82-83 Multi-function Input Command 3 (MI3) Factory Setting: 3 02-04 Multi-function Input Command 4 (MI4) Factory Setting: 4 82-851 Multi-function Input Command 5 (MI5) 82-85 Multi-function Input Command 6 (MI6) 02-07 Multi-function Input Command 7 (MI7) 02-08 Multi-function Input Command 8 (MI8) 82-26 Input terminal of I/O extension card (MI10) 62-23 Input terminal of I/O extension card (MI11) Input terminal of I/O extension card (MI12) Input terminal of I/O extension card (MI13) 117 ציק

B 2 - **3 B** Input terminal of I/O extension card (MI14)

- Input terminal of I/O extension card (MI15)

Factory Setting: 0

Settings

0: no function

1: multi-step speed command 1/multi-step position command 1

2: multi-step speed command 2/multi-step position command 2

3: multi-step speed command 3/multi-step position command 3

4: multi-step speed command 4/multi-step position command 4 5: Reset

6: JOG command (By KPC-CC01 or external control)

7: acceleration/deceleration speed not allow

8: the 1st, 2nd acceleration/deceleration time selection

9: the 3rd, 4th acceleration/deceleration time selection

10: EF Input (Pr.07-20)

11: B.B input from external (Base Block)

12: Output stop

13: cancel the setting of the optimal acceleration/deceleration time

14: switch between motor 1 and motor 2

15: operation speed command from AVI

16: operation speed command from ACI

17: operation speed command from AUI

18: Emergency stop (Pr.07-20)

19: Digital up command

20: Digital down command

21: PID function disabled

22: Clear counter

23: Input the counter value (MI6)

24: FWD JOG command

25: REV JOG command

26: FOCG/TQC model selection

27: ASR1/ASR2 selection

28: Emergency stop (EF1)

29: Signal confirmation for Y-connection

30: Signal confirmation for Δ -connection

31: High torque bias (Pr.11-30)

32: Middle torque bias (Pr.11-31)

33: Low torque bias (Pr.11-32)

34: Switch between multi-step position and multi-speed control

35: Enable position control

36: Enable multi-step position learning function (valid at stop)

37: Enable pulse position input command

38: Disable write EEPROM function

39: Torque command direction

40: Force coast to stop

41: HAND switch

42: AUTO switch

43: Enable resolution selection (Pr.02-48)

44: Reverse direction homing

45: Forward direction homing

46: Homing ORG

47: Homing function enable

48: Mechanical gear ratio switch

49: Drive enable

50: Master dEb action input

51: Selection for PLC mode bit0

52: Selection for PLC mode bit1

53: Trigger CANopen quick stop

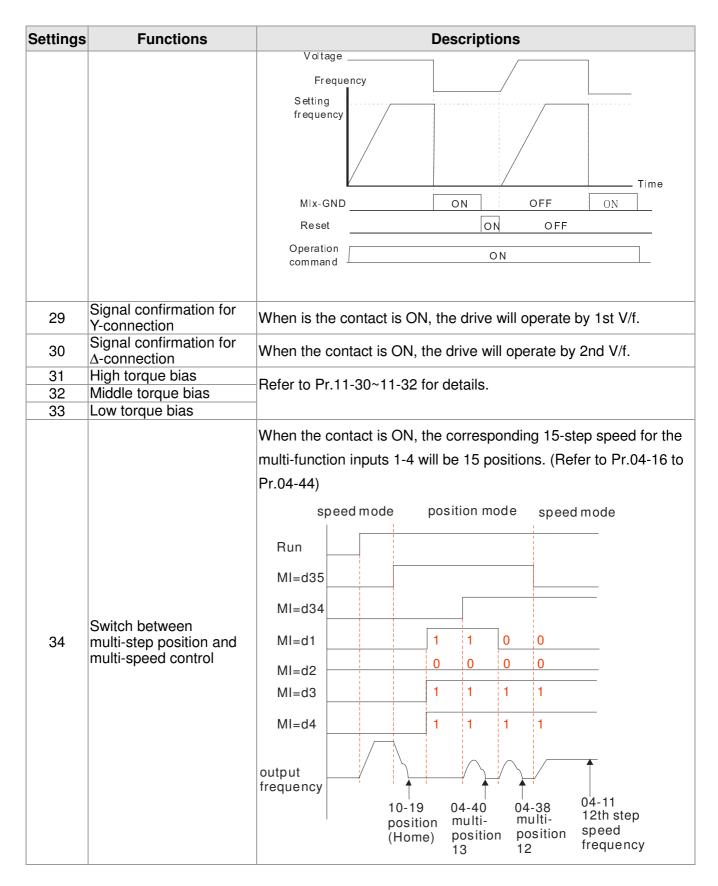
54: Reserved 55: Brake Release 56: Local/Remote Selection 57~70: Reserve

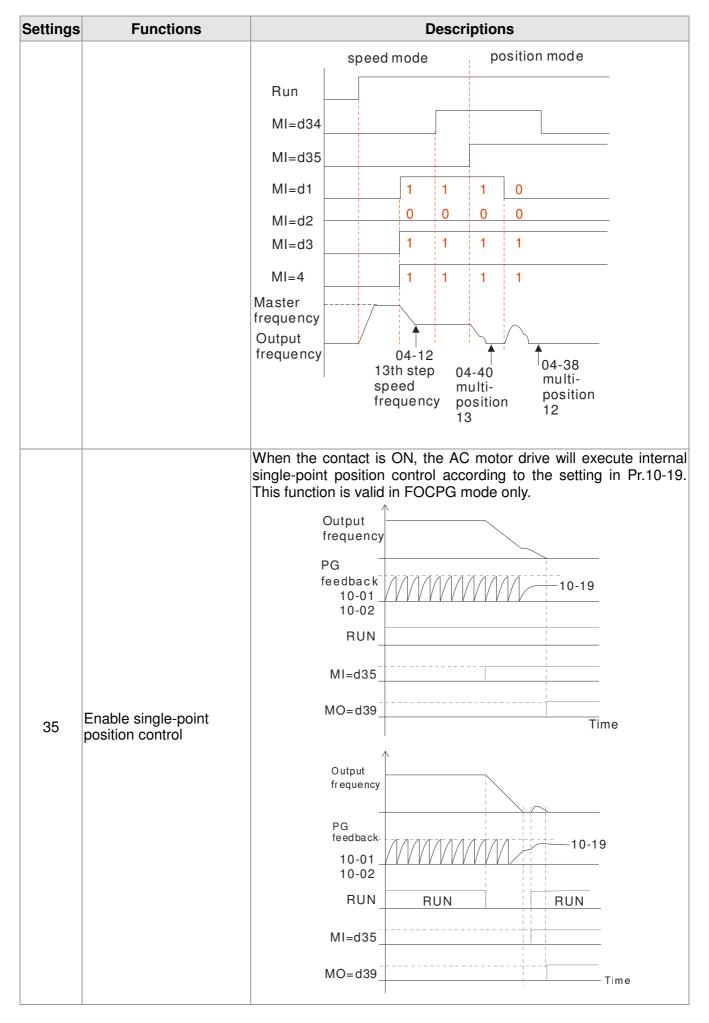
- I This parameter selects the functions for each multi-function terminal.
- The terminals of Pr.02-26~Pr.02-29 are virtual and set as MI10~MI13 when using with optional card EMC-D42A. Pr.02-30~02-31 are virtual terminals.
- When being used as a virtual terminal, it needs to change the status (0/1: ON/OFF) of bit 8-15 of Pr.02-12 by digital keypad KPC-CC01 or communication.
- If Pr.02-00 is set to 3-wire operation control. Terminal MI1 is for STOP contact. Therefore, MI1 is not allowed for any other operation.
- Summary of function settings (Take the normally open contact for example, ON: contact is closed, OFF: contact is open)

| Settings | Functions | Descriptions | | | | | |
|----------|---|---|--|--|--|--|--|
| 0 | No Function | | | | | | |
| 1 | Multi-step speed command 1/multi-step position command 1 | | | | | | |
| 2 | Multi-step speed command 2/ multi-step position command 2 | 15 step speeds could be conducted through the digital status of the 4 terminals, and 16 in total if the master speed is included. (Refer to Parameter set 4) | | | | | |
| 3 | Multi-step speed command 3/ multi-step position command 3 | | | | | | |
| 4 | Multi-step speed command 4/ multi-step position command 4 | | | | | | |
| 5 | Reset | After the error of the drive is eliminated, use this terminal to rese the drive. | | | | | |
| 6 | JOG Command | This function is valid when the source of operation command is external terminals. Before executing this function, it needs to wait for the drive stop completely. During running, it can change the operation direction and STOP key on the keypad is valid. Once the external terminal receives OFF command, the motor will stop by the JOG deceleration time. Refer to Pr.01-20~01-22 for details. | | | | | |
| | | of motor 1 JOG accel. time 01-20 MIX-GND ON OFF | | | | | |
| 7 | Acceleration/deceleration Speed Inhibit | When this function is enabled acceleration and deceleration is | | | | | |

| Settings | Functions | Descriptions |
|----------|--|--|
| 8 | The 1 st , 2 nd acceleration or deceleration time | Frequency Setting frequency Accel.inhibit area Accel.inhibit Accel.inhibit area Actual operation frequency Decel.inhibit Decel.inhibit area Actual operation frequency Decel.inhibit area Mlx-GND ON ON ON Operation ON command OFF The acceleration/deceleration time of the drive could be selected from this function or the digital status of the terminals; there are 4 |
| 9 | selection The 3 rd , 4 th acceleration or deceleration time selection | acceleration/deceleration speeds in total for selection. |
| 10 | | For external fault input. Motor drive will decelerate by Pr.07-20 setting, keypad will show EF. (it will have fault record when external fault occurs). Until the causes of fault are eliminated, the drive can keep running after resetting. |
| | External B.B. Input (Base Block) | When this contact is ON, output of the drive will be cut off immediately, and the motor will be free run and keypad will display B.B. signal. Refer to Pr.07-08 for details. |
| 12 | Output Stop (Output pause) | If this contact is ON, output of the drive will be cut off immediately, and the motor will then be free run. And once it is turned to OFF, the drive will accelerate to the setting frequency. Voltage Frequency Setting frequency MIx-GND ON OFF ON Operation command ON |
| | Cancel the setting of the optimal accel./decel. time | Before using this function, Pr.01-44 should be set to 01/02/03/04 first. When this function is enabled, OFF is for auto mode and ON is for linear accel./decel. |
| 14 | Switch between drive settings 1 and 2 | When the contact is ON: use motor 2 parameters. OFF: use motor 1 parameters. |
| | Operation speed command form AVI | When the contact is ON, the source of the frequency will force to be AVI. (If the operation speed commands are set to AVI, ACI and AUI at the same time. The priority is $AVI > ACI > AUI$) |
| | Operation speed command form ACI | When the contact is ON, the source of the frequency will force to be ACI. (If the operation speed commands are set to AVI, ACI and AUI at the same time. The priority is $AVI > ACI > AUI$) |
| | Operation speed command form AUI | When this function is enabled, the source of the frequency will force to be AUI. (If the operation speed commands are set to AVI, ACI and AUI at the same time. The priority is AVI > ACI > AUI) |
| 18 | Emergency Stop (07-20) | When the contact is ON, the drive will ramp to stop by Pr.07-20 setting. |

| Settings | Functions | Descriptions |
|----------|--|--|
| 19 | Digital Up command | When the contact is ON, the frequency will be increased and decreased. If this function is constantly ON, the frequency will be |
| 20 | Digital Down command | increased/decreased by Pr.02-09/Pr.02-10. |
| 21 | PID function disabled | When the contact is ON, the PID function is disabled. |
| 22 | Clear counter | When the contact is ON, it will clear current counter value and display "0". Only when this function is disabled, it will keep counting upward. |
| 23 | Input the counter value (multi-function input command 6) | The counter value will increase 1 once the contact is ON. It needs to be used with Pr.02-19. |
| 24 | FWD JOG command | This function is valid when the source of operation command is external terminals. When the contact is ON, the drive will execute forward Jog command. When execute JOG command under torque mode, the drive will automatically switch to speed mode; after JOG command is done, the drive will return to torque mode. |
| 25 | REV JOG command | This function is valid when the source of operation command is external terminals. When the contact is ON the drive will execute reverse Jog command. When execute JOG command under torque mode, the drive will automatically switch to speed mode; after JOG command is done, the drive will return to torque mode. |
| | | When the contact is ON: TQCPG mode. |
| 26 | | When the contact is OFF: FOCPG mode. |
| | FOCPG/TQCPG mode selection | RUN/STOP command RUN STOP Multi-function input terminal is set to 26 |
| | | (torque/speed OFF ON OFF ON mode switch) |
| | | 03-00~02=1 speed speed limit speed speed limit (AVI/AUI/ACI is command command command |
| | | 03-00~02=2 torque torque (AVI/AUI/ACI is limit torque limit torque torque command) command |
| | | control sp eed sp eed sp eed mode control torque control torque control control control control control (decel.to stop) |
| | | Switch timing for t orque/speed control (00-10=0/4, multi-function inputterminal is set to 26) |
| 27 | ASR1/ASR2 selection | When the contact is ON: speed will be adjusted by ASR 2 setting. OFF: speed will be adjusted by ASR 1 setting. Refer to Pr.11-02 for details. |
| 28 | Emergency stop (EF1) | When the contact is ON, the drive will execute emergency stop and display EF1 on the keypad. The motor won't run and be in the free run until the fault is cleared after pressing RESET" (EF: External Fault) |





| Settings | Functions | Descriptions | |
|----------|---|--|-------|
| | | When the contact is ON/OFF, the drive will base the multi-functi inputs 1-4 ON/OFF status to find the corresponding multi-step positions and write current motor position into such correspondi multi-step position. | |
| | | $1011_{2}=11$ $1010_{2}=10$ corresponds to to Pr.04-36 Pr.04-34 | |
| | | MI=d1 1 0 0 | |
| 36 | Enable multi-step position learning function (valid at stop) | MI=d2 | |
| | (valid at stop) | MI=d3 | |
| | | MI=d4 1 1 1 | |
| | | MI=d36 | |
| | | Writing the motor position into the Pr.04-36 Writing the motor position into the Pr.04-34 | l |
| | | When Pr.00-20 is set to 4 or 5 and this contact is ON, the ir pulse of PG card is position command. When using this functio is recommended to set Pr.11-25 to 0. Example: please refer to the following diagram when using faction with MI=d35 return to home position,. | n, it |
| | | MI=d35 | |
| 37 | Full position control pulse command input | MO=d39 | |
| | enable | MI=d37 | |
| | | command internal positioning output frequency | |
| 38 | Disable EEPROM write function (Parameters written disable) | When this contact is ON, write to EEPROM is disabled. (Chan parameters will not be saved after power off) | ged |
| 39 | Torque command direction | For torque control (Pr.00-10=2), when torque command is AV ACI, the contact is ON and it is negative torque. | 'l or |
| | | When this contact is ON during the operation, the drive will free | |

| Settings | Functions | Descriptions | | | | | |
|----------|-------------------------------|---|--|--|--|--|--|
| 41 | HAND switch | When MI is switched to off status, it executes a STOP command., If MI is switched to off during operation, the drive will also stop. Using koursed KPC CC01 to switch between UAND/AUTO | | | | | |
| 42 | AUTO switch | 2. Using keypad KPC-CC01 to switch between HAND/AUTO, the drive will stop first then switch to the HAND or AUTO status. 3. On the digital keypad KPC-CC01, it will display current drive status (HAND/OFF/AUTO). Bit 1 Bit 0 OFF 0 OFF 0 AUTO 0 HAND 1 OFF 1 | | | | | |
| 43 | Enable resolution selection | Refer to Pr.02-48 for details. | | | | | |
| 44 | Reverse direction NLhoming | Signal input for reverse direction limit switch. When this terminal is ON, the drive will react to the setting in Pr.00-40, 00-41, 00-42 accordingly to execute homing in a reverse direction (counter clockwise). Note: NL means input terminal detection is negative-edge triggered or be regarded as NO(Normal Open) | | | | | |
| 45 | Forward direction PL homing | Signal input for forward direction limit switch. When this terminal is ON, the drive will react to the setting in Pr.00-40, 00-41, 00-42 accordingly to execute homing in a forward direction (clockwise). Note: PL means input terminal detection is positive-edge triggered or be regarded as NC(Normal Close) | | | | | |
| 46 | Homing ORG | ORG point input. When this terminal is ON, the drive will refer to the setting in Pr.00-40, 00-41, 00-42 accordingly to execute homing. | | | | | |
| 47 | Homing function enable | Pr.00-10 = 3 (homing mode), if the external terminal MIx=47 is OFF, the drive will ignore the home command and execute Point to Point position control. | | | | | |
| 48 | Mechanical gear ratio switch | When this contact is ON, the mechanical gear ratio switch will be the second group A2/B2 (refer to Pr.10-08 and Pr.10-09). | | | | | |
| 49 | Drive enable | When drive=enable, RUN command is valid. When drive= disable, RUN command is invalid. When drive is in operation, motor coast to stop. This function will interact with MO=51 | | | | | |
| 50 | Master dEb action input | Input the message setting in this parameter when dEb occurs to Master. This will ensure dEb also occurs to Slave, then Master and Slave will stop simultaneously. | | | | | |
| 51 | Selection for PLC mode bit0 | PLC status Disable PLC function (PLC 0) 0 0 | | | | | |
| 52 | Selection for PLC mode bit1 | Disable PLC function (PLC 0)00Trigger PLC to operation (PLC 1)01Trigger PLC to stop (PLC 2)10No function11 | | | | | |
| 53 | Enable CANopen quick stop | When this function is enabled under CANopen control, it will change to quick stop. Refer to Chapter 15 for more details. | | | | | |
| 54 | Reserved | | | | | | |
| 55 | Brake Release | #MI=55 needs to be used with Pr02-56. After setting the value (time) of Pr02-56, if there is no signal input, motor drive will show error Brk, and mechanical brake will be enabled immediately. #The default setting of Pr02-56 is 0. If the value is not 0, the brake signal checking will be activated. If there is no signal input after | | | | | |

| Settings | Functions | | | Descr | iptions |
|----------|------------------------|----------------------------------|----------------------------------|------------------------------------|---|
| | | | ting (Pr02-56) any other sett | | e will show Brk error, no matter if rake control |
| | | Run comma – | (output to | q.>=Pr02-34 and rrent>=Pr02 33) | |
| | | Output Fre MO=63 | iq. | Pr02-32 | |
| | | – MI=55 – | ' | Pr02-56 | After setting time is reached, if there is no brake release signal Motor drive will display Brk error |
| 56 | LOCAL/REMOTE Selection | Pr.00-29 When P will displ | 9) r.00-29 is not | t set to 0, o status. (It w | OCAL/REMOTE mode(refer to n the digital keypad KPC-CC01 it vill display on the KPC-CC01 if the n 1.021). |
| | | | | Bit 0 | |
| | | | REM | 0 | |
| | | | LOC | 1 | |
| 57~70 | Reserved | | | | |

✓ ⑦ 2 - ⑦ 9 UP/DOWN Key Mode

Factory Setting: 0

Settings 0: Up/down by the accel/decel time

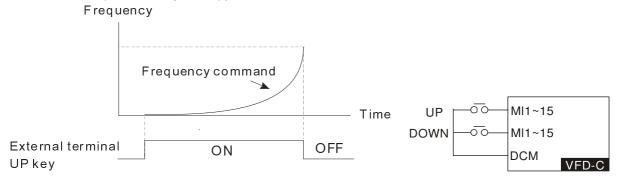
1: Up/down constant speed (Pr.02-10)

✓ 32 - 13 Constant speed. The Accel. /Decel. Speed of the UP/DOWN Key

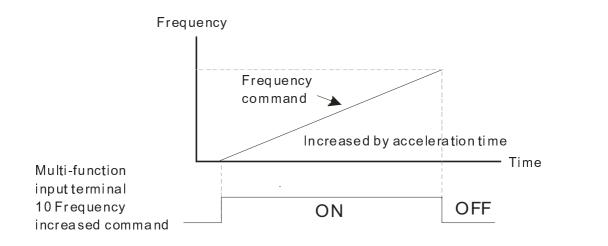
Factory Setting: 0.01

Settings 0.01~1.00Hz/ms

- These settings are used when multi-function input terminals are set to 19/20. Refer to Pr.02-09 and 02-10 for the frequency up/down command.
- Pr.02-09 set to 0: it will increase/decrease frequency command (F) by the external terminal UP/DOWN key as shown in the following diagram. In this mode, it also can be controlled by UP/DOWN key on the digital keypad.



Pr.02-09 set to 1: it will increase/decrease frequency command (F) by the setting of acceleration/deceleration (Pr.01-12~01-19) and only be valid during operation.



✓ B2 - 11 Digital Input Response Time

Factory Setting: 0.005

Settings 0.000~30.000 sec

- This parameter is used to set the response time of digital input terminals FWD, REV and MI1~MI8.
- It is used for digital input terminal signal delay and confirmation. The delay time is confirmation time to prevent some uncertain interference that would cause error in the input of the digital terminals. Under this condition, confirmation for this parameter would improve effectively, but the response time will be somewhat delayed.
- When using MI8 as encoder pulse feedback input, this parameter will not be referred

Factory Setting: 0000

Settings 0000h~FFFFh (0:N.O;1:N.C)

- Description: The setting of this parameter is in hexadecimal.
- This parameter is to set the status of multi-function input signal (0: Normal Open ; 1: Normal Close) and it is not affected by the SINK/SOURCE status.
- Bit0 is for FWD terminal, bit1 is for REV terminal and bit2 to bit15 is for MI1 to MI14.
- Diser can change terminal status by communicating.

For example, MI1 is set to 1 (multi-step speed command 1), MI2 is set to 2 (multi-step speed command 2). Then the forward + 2^{nd} step speed command=1001(binary)=9 (Decimal). Pr.02-12=9 needs to be set by communication to run forward with 2nd step speed. No need to wire any multi-function terminal.

| Bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|----------|------------|
| MI14 | MI13 | MI12 | MI11 | MI10 | MI9 | MI8 | MI7 | MI6 | MI5 | MI4 | MI3 | MI2 | MI1 | \times | \searrow |

32-13 Multi-function Output 1 (Relay1)

Factory Setting: 11

2 - 14 Multi-function Output 2 (Relay2)

Factory Setting: 1

| × | 82 - 18 | Multi-function Output 3 (MO1) | |
|---|---------|--|---------------------|
| | | | Factory Setting: 66 |
| × | 02-13 | Multi-function Output 4 (MO2) | |
| | | | Factory Setting: 0 |
| × | 82-38 | Output terminal of I/O extension card (MO10) or (RA10) | |
| × | 02-37 | Output terminal of I/O extension card (MO11) or (RA11) | |
| × | 86 - 38 | Output terminal of I/O extension card (MO12) or (RA12) | |
| × | 82-38 | Output terminal of I/O extension card (MO13) or (RA13) | |
| × | 02-40 | Output terminal of I/O extension card (MO14) or (RA14) | |
| × | 02-41 | Output terminal of I/O extension card (MO15) or (RA15) | |
| × | 82-42 | Output terminal of I/O extension card (MO16) | |
| × | 02-43 | Output terminal of I/O extension card (MO17) | |
| N | 02-44 | Output terminal of I/O extension card (MO18) | |
| N | 02-45 | Output terminal of I/O extension card (MO19) | |
| N | 82-48 | Output terminal of the I/O extension card (MO20) | |

Factory Setting: 0

Settings

0: No function

- 1: Operation Indication
- 2: Operation speed attained
- 3: Desired frequency attained 1 (Pr.02-22)
- 4: Desired frequency attained 2 (Pr.02-24)
- 5: Zero speed (Frequency command)
- 6: Zero speed, include STOP(Frequency command)
- 7: Over torque 1(Pr.06-06~06-08)
- 8: Over torque 2(Pr.06-09~06-11)

9: Drive is ready

- 10: Low voltage warning (LV) (Pr.06-00)
- 11: Malfunction indication
- 12: Mechanical brake release(Pr.02-32)
- 13: Overheat warning (Pr.06-15)
- 14: Software brake signal indication(Pr.07-00)
- 15: PID feedback error
- 16: Slip error (oSL)
- 17: Terminal count value attained (Pr.02-20; not return to 0)
- 18: Preliminary count value attained (Pr.02-19; returns to 0)
- 19: Base Block
- 20: Warning output
- 21: Over voltage warning
- 22: Over-current stall prevention warning
- 23: Over-voltage stall prevention warning

- 24: Operation mode indication
- 25: Forward command
- 26: Reverse command
- 27: Output when current >= Pr.02-33 (>= 02-33)
- 28: Output when current <= Pr.02-33 (<= 02-33)
- 29: Output when frequency >= Pr.02-34 (>= 02-34)
- 30: Output when frequency <= Pr.02-34 (<= 02-34)
- 31: Y-connection for the motor coil
- 32: \triangle -connection for the motor coil
- 33: Zero speed (actual output frequency)
- 34: Zero speed include stop(actual output frequency)
- 35: Error output selection 1(Pr.06-23)
- 36: Error output selection 2(Pr.06-24)
- 37: Error output selection 3(Pr.06-25)
- 38: Error output selection 4(Pr.06-26)
- 39: Position attained (Pr.10-19)
- 40: Speed attained (including Stop)
- 41: Multi-position attained
- 42: Crane function
- 43: Actual motor speed slower than Pr.02-47
- 44: Low current output (Pr.06-71 to Pr.06-73)
- 45: UVW Output Electromagnetic valve On/Off Switch
- 46: Master dEb action output
- 47: Closed brake output
- 48: Reserved
- 49: Homing action complete
- 50: Output for CANopen control
- 51: Output for communication card
- 52: Output for RS485
- 53~62: Reserved
- 63: Advance Crane Output
- 64~65: Reserved
- 66: SO N.O. output
- 67: Analog signal level achieved
- 68: SO. N.C output
- III This parameter is used for setting the function of multi-function terminals.
- Pr.02-36~Pr.02-41 requires additional extension cards to display the parameters, the choices of optional cards are EMC-D42A and EMC-R6AA.
- The optional card EMC-D42A provides 2 output terminals and can be used with Pr.02-36~02-37.
- The optional card EMC-R6AA provides 6 output terminals and can be used with Pr.02-36~02-41.
- Summary of function settings (Take the normally open contact for example, ON: contact is closed, OFF: contact is open)

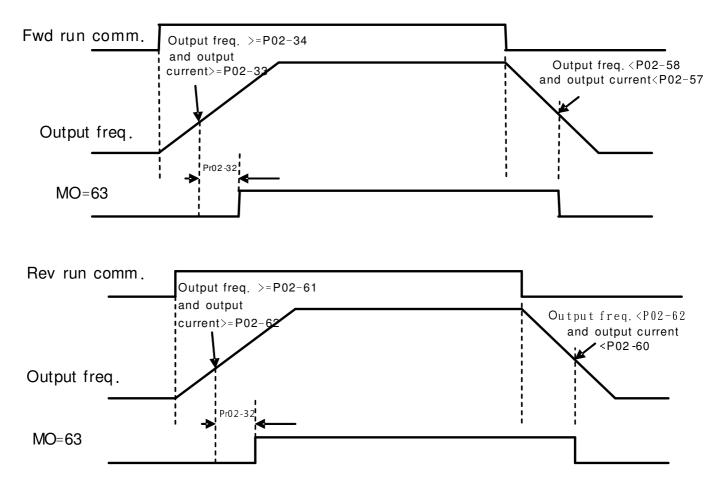
| Settings | Functions | Descriptions | | | | |
|----------|---|--|--|--|--|--|
| 0 | No Function | | | | | |
| 1 | Operation Indication | Active when the drive is not at STOP. | | | | |
| 2 | Master Frequency Attained | Active when the AC motor drive reaches the output frequency setting. | | | | |
| 3 | Desired Frequency Attained 1 (Pr.02-22) | Active when the desired frequency (Pr.02-22) is attained. | | | | |
| 4 | Desired Frequency Attained 2 (Pr.02-24) | Active when the desired frequency (Pr.02-24) is attained. | | | | |
| 5 | Zero Speed (frequency command) | Active when frequency command =0. (the drive should be at RUN mode) | | | | |
| 6 | Zero Speed with Stop (frequency command) | Active when frequency command =0 or stop. | | | | |
| 7 | Over Torque 1 | Active when detecting over-torque. Refer to Pr.06-07 (over-torque detection level-OT1) and Pr.06-08 (over-torque detection time-OT1). Refer to Pr.06-06~06-08. | | | | |
| 8 | Over Torque 2 | Active when detecting over-torque. Refer to Pr.06-10 (over-torque detection level-OT2) and Pr.06-11 (over-torque detection time-OT2). Refer to Pr.06-09~06-11. | | | | |
| 9 | Drive Ready | Active when the drive is ON and no abnormality detected. | | | | |
| 10 | Low voltage warn (Lv) | Active when the DC Bus voltage is too low. (refer to Pr.06-00 low voltage level) | | | | |
| 11 | Malfunction Indication | Active when fault occurs (except Lv stop). | | | | |
| 12 | Mechanical Brake Release (Pr.02-32) | When drive runs after Pr.02-32, it will be ON. This function should be used with DC brake and it is recommended to use contact "b"(N.C). | | | | |
| 13 | Overheat | Active when IGBT or heat sink overheats to prevent OH turn of the drive. (refer to Pr.06-15) | | | | |
| 14 | Software Brake Signal Indication | Active when the soft brake function is ON. (refer to Pr.07-00) | | | | |
| 15 | PID Feedback Error | Active when the feedback signal is abnormal. | | | | |
| 16 | Slip Error (oSL) | Active when the slip error is detected. | | | | |
| 17 | Terminal Count Value Attained (Pr.02-20; not return to 0) | Active when the counter reaches Terminal Counter Value (Pr.02-19). This contact won't active when Pr.02-20>Pr.02-19. | | | | |
| 18 | Preliminary Counter Value Attained (Pr.02-19; returns to 0) | Active when the counter reaches Preliminary Counter Value (Pr.02-19). | | | | |
| 19 | External Base Block input (B.B.) | Active when the output of the AC motor drive is shut off during base block. | | | | |
| 20 | Warning Output | Active when the warning is detected. | | | | |
| 21 | Over-voltage Warning | Active when the over-voltage is detected. | | | | |
| 22 | Over-current Stall Prevention Warning | Active when the over-current stall prevention is detected. | | | | |
| 23 | Over-voltage Stall prevention Warning | Active when the over-voltage stall prevention is detected. | | | | |
| 24 | Operation Mode Indication | Active when the operation command is controlled by external terminal. (Pr.00-20≠0) | | | | |
| 25 | Forward Command | Active when the operation direction is forward. | | | | |
| 26 | Reverse Command | Active when the operation direction is reverse. | | | | |
| 27 | Output when Current >= Pr.02-33 | Active when current is >= Pr.02-33. | | | | |
| 28 | Output when Current <= Pr.02-33 | Active when current is <= Pr.02-33 | | | | |
| 29 | Output when frequency >= Pr.02-34 | Active when frequency is >= Pr.02-34. | | | | |
| 30 | Output when Frequency <= Pr.02-34 | Active when frequency is <= Pr.02-34. | | | | |
| 31 | Y-connection for the Motor Coil | Active when PR.05-24 is less than Pr.05-23 and time is more than Pr.05-25. | | | | |

| Settings | Functions | | | Description | ns | | | |
|----------|--|---|--|---|---|--|--|--|
| 32 | | Active when PR.05-24 is higher than Pr.05-23 and time is more | | | | | | |
| 32 | | 1 | than Pr.05-25. | | | | | |
| 33 | Zero Speed (actual output frequency) | Active when the actual output frequency is 0. (the drive should be at RUN mode) | | | | | | |
| 34 | Zero Speed with Stop (actual output frequency) | Active whe | en the actual c | output frequen | icy is 0 or Sto | р. | | |
| 35 | Error Output Selection 1 (Pr.06-23) | Active whe | en Pr.06-23 is | ON. | | | | |
| 36 | Error Output Selection 2 (Pr.06-24) | Active whe | en Pr.06-24 is | ON. | | | | |
| 37 | Error Output Selection 3 (Pr.06-25) | Active whe | en Pr.06-25 is | ON. | | | | |
| 38 | Error Output Selection 4 (Pr.06-26) | Active whe | en Pr.06-26 is | ON. | | | | |
| 39 | Position Attained (Pr.10-19) | Active whe | en the PG pos | ition control p | oint reaches l | Pr.10-19. | | |
| 40 | Speed Attained (including zero speed) | stop. | • | | • | , , | | |
| | | outputted. multi-positi current sta | current position action status of these three terminals will be outputted. Example: if setting Pr.02-36~02-38 to 41 and only the multi-position of the second point has been done. Therefore, current status is RA (ON), RA (OFF) and MO1 (OFF). In this way, their status is 010. Bit0 is RA and so on. | | | | | |
| | | | | | | Pr.02-13=41 | | |
| | | Pr.04-16 | 0 | 0 | 0 | 1 | | |
| | | Pr.04-18 | 0 | 0 | an Pr.05-23 and time is more ency is 0. (the drive should be ency is 0 or Stop. point reaches Pr.10-19. reaches frequency setting or on input terminals to 41. The hese three terminals will be -36~02-38 to 41 and only the has been done. Therefore, and MO1 (OFF). In this way, on. RY2 RY1 100 1100 1000 1000 1000 1000 1000 1 | | | |
| | | Pr.04-20 | 0 | 0 | | 1 | | |
| 41 | Multi-position Attained | Pr.04-24 0 1 0 1 | | | | | | |
| | | | | | | | | |
| | | Pr.04-28 | 0 | 1 | | 1 | | |
| | | Pr.04-30 | 1 | 0 | | 0 | | |
| | | Pr.04-32 | 1 | 0 | | | | |
| | | Pr.04-34 | 1 | 0 | 1 | 0 | | |
| | | Pr.04-36 | 1 | 0 | 1 | I | | |
| | | Pr.04-38 | 1 | 1 | 0 | 0 | | |
| | | Pr.04-40 | 1 | 1 | 0 | 1 | | |
| | | Pr.04-42 | 1 | 1 | 1 | 0 | | |
| | | Pr.04-44 | 1 | 1 | 1 | 1 | | |
| 42 | Crane Function | This function needs to be used with Pr02-32, Pr02-33, Pr02-34, Pr02-57 and Pr.02-58. The brake will be released when output frequency and current reach the setting level after brake delay time. When output frequency>= Pr02-34 and output current>= Pr02-33, MO=42 will be activated after time setting at Pr02-32 When output frequency< Pr02-58, or output current <pr02-57, MO=42 will not be activate. See crane output time sequence chart for reference</pr02-57, | | | | | | |
| 43 | Motor Zero-speed Output (Pr.02-47) | Active when motor actual speed is less than Pr.02-47. | | | | | | |
| 44 | Low Current Output | This function | on needs to b | e used with P | r.06-71 ~ Pr.0 | 6-73 | | |
| 45 | UVW Phase Magnet Contractor ON/ OFF Switch | Under MO=45 magnet For br Pr.02-3 | FOCPG cont (electromagr tic contactor w ake control, 1=T1 sec | rol mode, se netic contract ill follow the dr set MO=12 (mechanical | t MI=49 (driv or On/Off sw ive status to b (mechanical I brake delay | ve enable) and vitch), then the e On or Off. prake release), v time); then | | |

| Settings | Functions | | D | escriptions | | |
|----------|-------------------------------|---|--|------------------------------------|---|--|
| | | and Pr.07 | -03 = T2 (DC b | rake current a | DC brake time at start up) at stop). It is recommend to control during zero-speed | |
| | | Enable Contactor | | ON ON | | |
| | | | AC Driver U(T1) V(T2) W(T3) | MC MOx=45 MIx | Motor IM 3~ | |
| 46 | Master dEb signal output | When dEb arises at Master, MO will send a dEb signal to Slave. Then Slave will follow Master's command and decelerate to stop simultaneously. | | | | |
| 47 | Brake Release at Stop | be ON if the be OFF when | frequency is le n brake delay t Output Frequency | ess than Pr.0 ime exceeds | Output Frequency | |
| | | Multi-funct Out MO=c | put | | → 02-32 ← Time | |
| 48 | Reserved | | | | | |
| 49 | Homing Action Complete | Controlled by For example, | homing action CANopen mu if to control R table of the C | Ilti-output tern Y2, then the I | Pr02-14 = 50. | |
| | | physical terminal | Setting of related parameters | Attribute | Corresponding Index | |
| 50 | Output for CANopen control | RY1 | P2-13 = 50 | RW | The bit 0 at 2026-41 | |
| | | RY2 | P2-14 = 50 | RW | The bit 1 at 2026-41 | |
| | | MO1 | P2-16 = 50 | RW | The bit 2 at 2026-41 | |
| | | MO2 | P2-17 = 50 | RW | The bit 3 at 2026-41 | |
| | | MO10 | | ۸/۱ | The bit 4 at 2026-41 | |
| | | RY10 | P2-36=50 | RW | The bit 5 at 2026-41 | |

| Settings | Functions | Descriptions | | | | |
|----------|----------------------------------|--|--|---|--|--|
| | | MO11 | D0 07 50 | | The bit 6 at 2026-41 | |
| | | RY11 | P2-37 = 50 | RW | The bit 7 at 2026-41 | |
| | | RY12 | P2-38 = 50 | RW | The bit 8 at 2026-41 | |
| | | RY13 | P2-39 = 50 | RW | The bit 9 at 2026-41 | |
| | | RY14 | P2-40 = 50 | RW | The bit 10 at 2026-41 | |
| | | RY15 | P2-41= 50 | RW | The bit 0 at 2026-41 | |
| | | | apter 15-3-5 f | or more informa | ation | |
| | | For commun (CMC-MOD | ication outpu | t of communica | ation cards and CMC-DN01) | |
| | | physical terminal | Setting of related parameters | Attribute | Corresponding Address | |
| | | RY1 | P2-13 = 51 | RW | The bit 0 2640 | |
| | | RY2 | P2-14 = 51 | RW | The bit 1 2640 | |
| | | | P2-15 = 51 | RW | The bit 2 2640 | |
| 51 | Output for communication card | MO1 | P2-16 = 51 | RW | The bit 3 2640 | |
| | | MO2 | P2-17 = 51 | RW | The bit 4 2640 | |
| | | MO3 | P2-18 = 51 | RW | The bit 5 2640 | |
| | | MO4 | P2-19 = 51 | RW | The bit 6 2640 | |
| | | MO5 | P2-20 = 51 | RW | The bit 7 2640 | |
| | | MO6 | P2-21 = 51 | RW | The bit 8 2640 | |
| | | MO7 | P2-22 = 51 | RW | The bit 9 2640 | |
| | | MO8 | P2-23 = 51 | RW | The bit 10 2640 | |
| 52 | Output for RS-485 | For RS-485 | outout | | | |
| 53~62 | Reserved | 1 | • | | | |
| 63 | Advance Crane Output | Pr02-57~Pr0 The brake w reach the se This function parameters, |)2- 62. ill be release tting level aft separates th which is suita | er brake delay t ne brake contro able for complic | frequency and current time. I conditions into eight cated application | |
| | | reference | k advance cr | ane output time | e sequence chart for | |
| 64~65 | Reserved | | | | | |
| 66 | SO N.O. output | Drive | status | Safety ou N.O. (MO=66) | tput status N.C. (MO=68) | |
| 68 | SO N.C. output | S | nal run TO ~STL3 | Open Close Close | Close Open Open | |
| 67 | Analog signal level achieved | | | | Pr.03-45 AI upper level. hat Pr.03-46 AI lower | |





Once the operating command is given, then when the output frequency and output current reach the setting level, the brake will be released after brake delay time.

During the operation, if the frequency command is less than the brake releasing frequency, reset manually frequency command to MAX (brake releasing frequency, brake holding frequency) to operate.

Once the brake is released, it will not be held unless a stop command is give or certain errors are occurred.

Once the stop operating command is given, then when the output frequency or output current is lower than the setting level, the brake holding operation will hold immediately the brake without delay time.

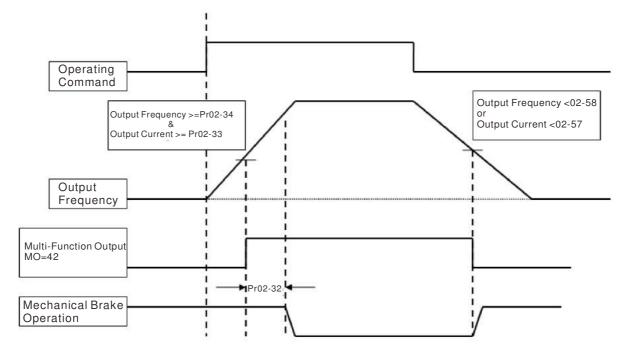
#To FWD brake releasing: Send operating command then set output frequency >= Pr02-34 and set output current >= Pr02-33, delay Pr02-32 to release brake.

#To REV brake releasing: Send operating command then set output frequency >= Pr02-61 and set output current >= Pr02-59, delay Pr02-32 to release brake.

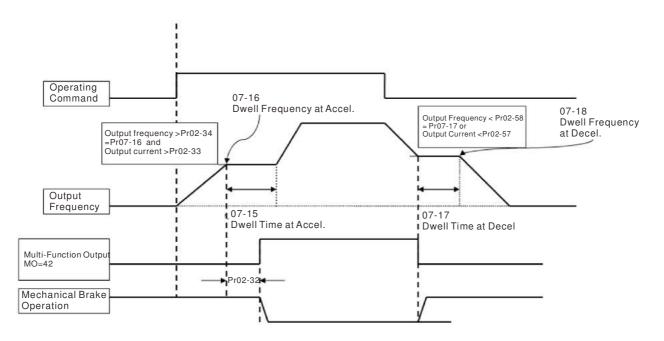
#To FWD brake holding: Send stop operating command and set output frequency < Pr02-58 or set output current < Pr02-57, release immediately the brake.

#To REV brake holding: Send stop operating command and set output frequency < Pr02-62 or set output currency < Pr02-60, release immediately the brake.

Crane Application:



It is recommended to use Dwell function as shown in the following:



32 - 18 Multi-function Output Setting

Factory Setting: 0000

Settings 0000h~FFFFh (0:N.O.; 1:N.C.)

- Description: The setting of this parameter is in hexadecimal.
- This parameter is set via bit setting. If a bit is 1, the corresponding output acts in the opposite way. Example:

If Pr02-13=1 and Pr02-18=0, Relay 1 is ON when the drive runs and is open when the drive is stopped.

If Pr02-13=1 and Pr02-18=1, Relay 1 is open when the drive runs and is closed when the drive is stopped.

Bit setting

| bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|----------|------|------|
| MO20 | MO19 | MO18 | MO17 | MO16 | MO15 | MO14 | MO13 | MO12 | MO11 | MO10 | MO2 | MO1 | Reserved | RY2 | RY1 |

X 32 - 19 Terminal Counting Value Attained (return to 0)

Factory Setting: 0

Settings 0~65535

- The counter trigger can be set by the multi-function terminal MI6 (set Pr.02-06 to 23). Upon completion of counting, the specified output terminal will be activated (Pr.02-13~02-14, Pr.02-36, 02-37 is set to 18). Pr.02-19 can't be set to 0.
- When the display shows c5555, the drive has counted 5,555 times. If display shows c5555•, it means that real counter value is between 55,550 to 55,559.

Preliminary Counting Value Attained (not return to 0)

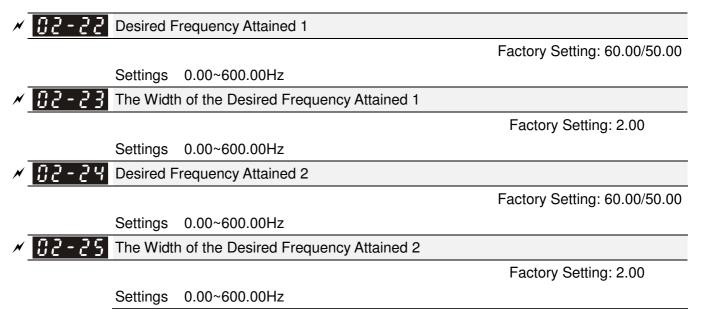
Factory Setting: 0

Settings 0~65535

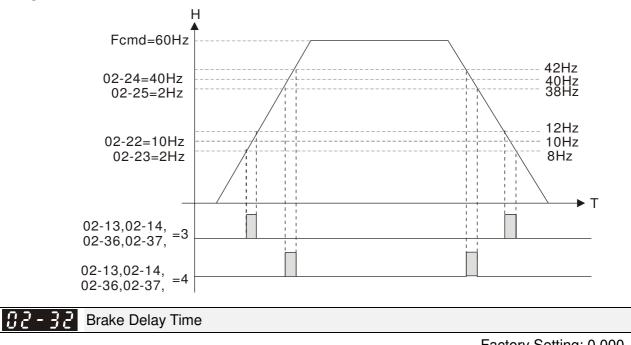
When the counter value counts from 1 and reaches this value, the corresponding multi-function output terminal will be activated, provided one of Pr. 02-13, 02-14, 02-36, 02-37 set to 17 (Preliminary Count Value Setting). This parameter can be used for the end of the counting to make the drive runs from the low speed to stop.

| Display value <u>c0000 c000 i c0002</u> [00-04=01] TRG [02-06=23] | :0003 c0004 | c8085 c808 ; | |
|---|-------------|--------------|--|
| (output signal) | | _3002 | → → → 1.0msec The width of trigger signal |
| Preliminary Counter Value RY1 Pr.02-13=17 02-13, 02-14, 02-36, 02-3 | 02-20=3 | | |
| Terminal Counter Value 02-14=17 RY2 Pr.02-14=18 | | 02-19=5 | |
| 12 - 2 / Digital Output Gain (DFM) | | | |
| | | Fac | ctory Setting: 1 |
| Settings 1~166 | | | |

It is used to set the signal for the digital output terminals (DFM-DCM) and digital frequency output (pulse X work period=50%). Output pulse per second = output frequency X Pr.02-21.



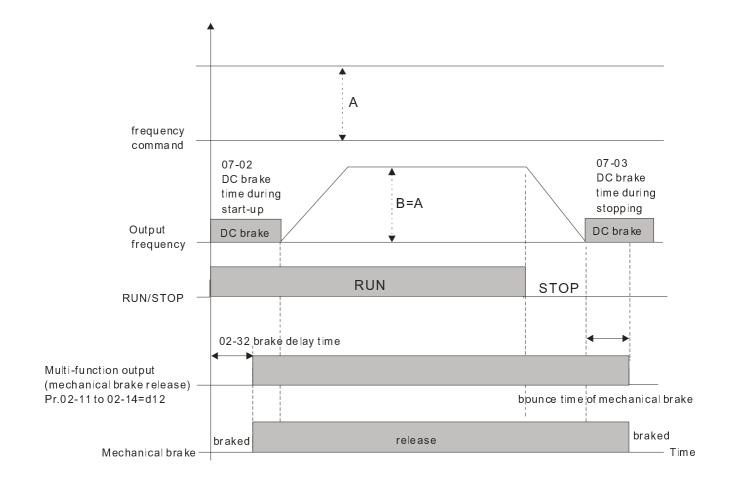
Once output frequency reaches desired frequency and the corresponding multi-function output terminal is set to 3 or 4 (Pr.02-13, 02-14, 02-36, and 02-37), this multi-function output terminal will be ON.



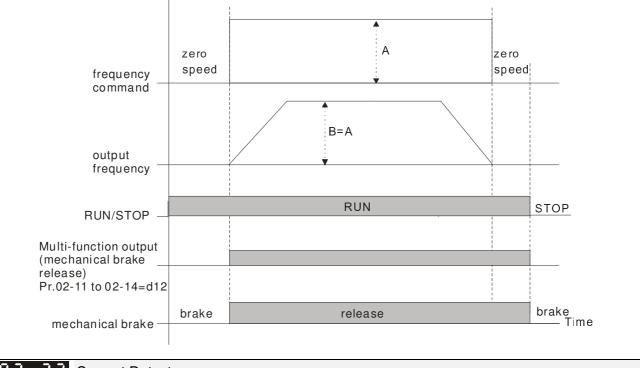
Settings 0.000~65.000 sec

Factory Setting: 0.000

When the AC motor drive runs after Pr.02-32 delay time, the corresponding multi-function output terminal (12: mechanical brake release) will be ON. It is recommended to use this function with DC brake.



If this parameter is used without DC brake, it will be invalid. Refer to the following operation timing.



Current Detect

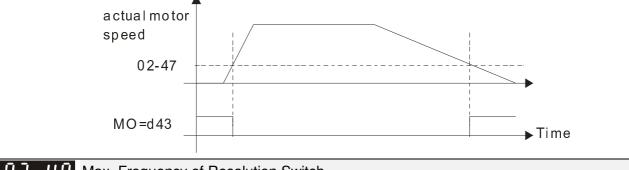
Factory Setting: 0

Settings 0~100%

When output current is higher or equal to Pr.02-33, it will activate multi-function output terminal (Pr.02-13, 02-14, 02-16, and 02-17 is set to 27).

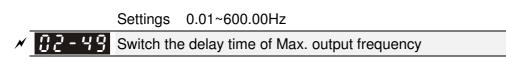
When output current is lower or equal to Pr.02-33, it will activate multi-function output terminal (Pr.02-13, 02-14, 02-16, and 02-17 is set to 28).

172 - 24 Speed Area Set Factory Setting: 3.00 Settings 0.00~600.00Hz When output frequency is higher or equal to Pr.02-34, it will activate the multi-function terminal (Pr.02-13, 02-14, 02-16, 02-17 is set to 29). When output frequency is lower or equal to Pr.02-34, it will activate the multi-function terminal (Pr.02-13, 02-14, 02-16, 02-17 is set to 30). External Operation Control Selection after Reset and Activate × 82-3 Factory Setting: 0 Settings 0: Disable 1: Drive runs if the run command still exists after reset or re-boots. Setting 1: Status 1: After the drive is powered on and the external terminal for RUN keeps ON, the drive will run. Status 2: After clearing fault once a fault is detected and the external terminal for RUN keeps ON, the drive can run after pressing RESET key. <u>112 - 4</u> Zero-speed Level of Motor Factory Setting: 0 Settings 0~65535 rpm This parameter should be used with the multi-function output terminals (set to 43). It needs to be used with PG cared and motor with encoder feedback. This parameter is used to set the level of motor zero-speed. When the actual speed is lower than this setting, the corresponding multi-function output terminal 43 will be ON as shown as follows.



Max. Frequency of Resolution Switch

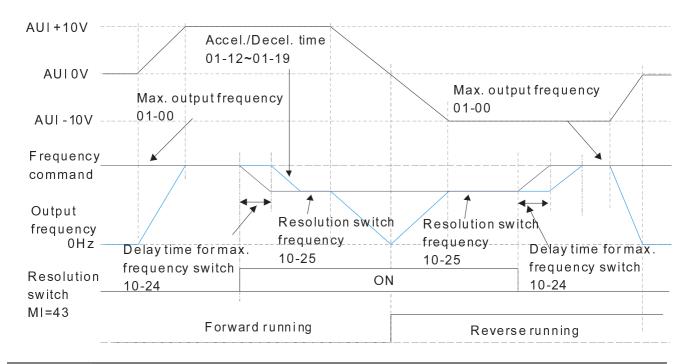
Factory Setting: 60.00



Factory Setting: 0.000

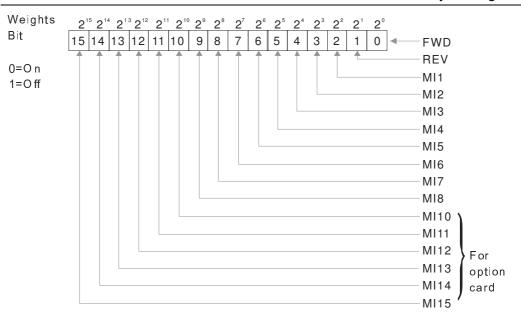
Settings 0.000~65.000 sec

It is used to improve the unstable speed or unstable position due to the insufficient of analog resolution. It needs to be used with external terminal (set to 43). After setting this parameter, it needs to adjust the analog output resolution of controller simultaneously by this setting.



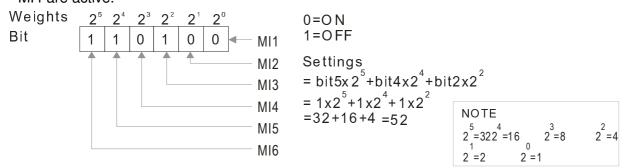
32 - 53 Display the Status of Multi-function Input Terminal

Factory Setting: Read only



Given For Example:

If Pr.02-50 displays 0034h (Hex), i.e. the value is 52, and 110100 (binary). It means MI1, MI3 and MI4 are active.

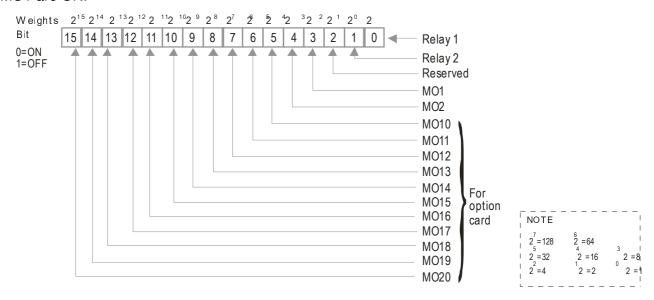




Factory Setting: Read only

Given Example:

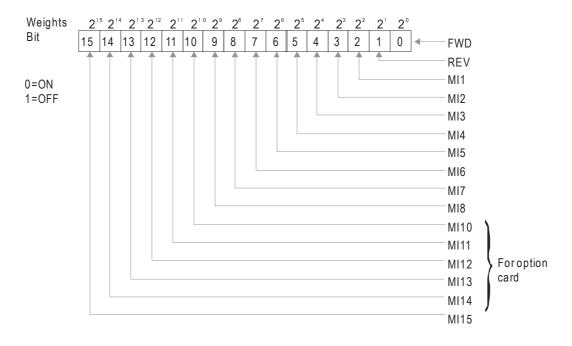
If Pr.02-51 displays 000Bh (Hex), i.e. the value is 11, and 1011 (binary). It means RY1, RY2 and MO1 are ON.



32-52 Display External Output terminal occupied by PLC

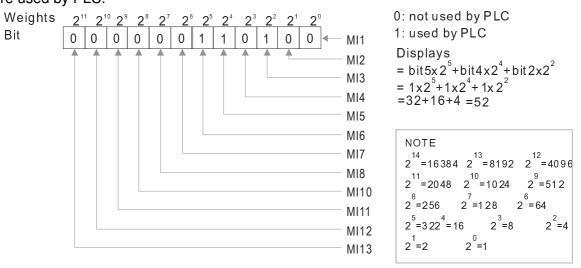
Factory Setting: Read only

P.02-52 shows the external multi-function input terminal that used by PLC.



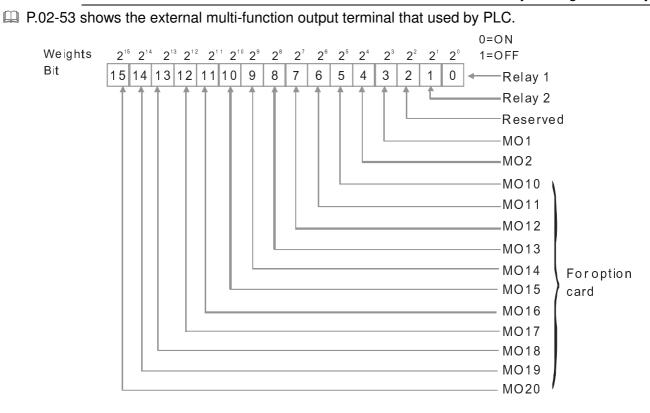
Given For Example:

When Pr.02-52 displays 0034h(hex) and switching to 110100 (binary), it means MI1, MI3 and MI4 are used by PLC.



B2-53 Display Multi-function Output Terminal occupied by PLC

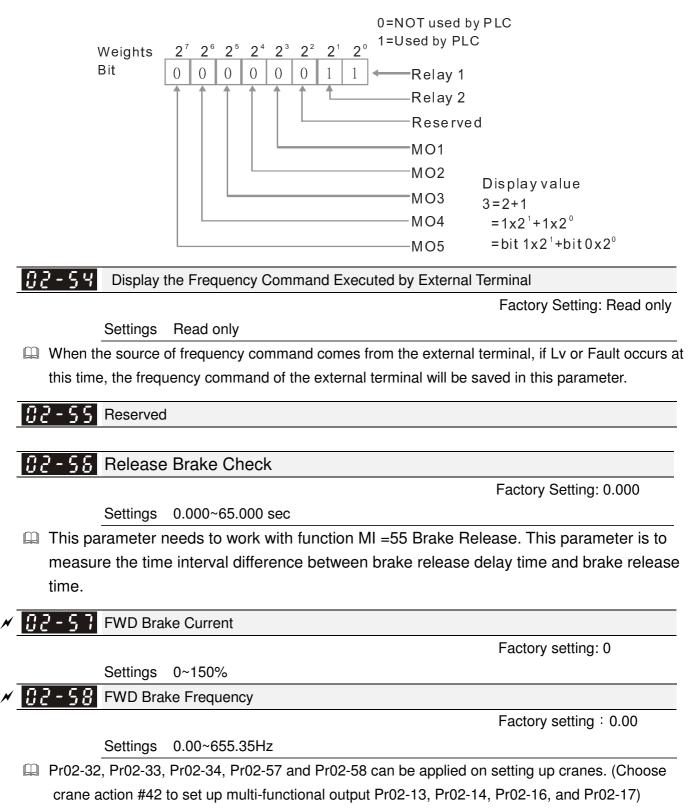
Factory Setting: Read only



| NOTE | | |
|---------------------|--------------------|-------------------|
| 2 ⁷ =128 | 2 ⁶ =64 | |
| 2 ⁵ =32 | 2 = 16 | 2 ³ =8 |
| 2 ² =4 | 2 ¹ =2 | 2 ⁰ =1 |

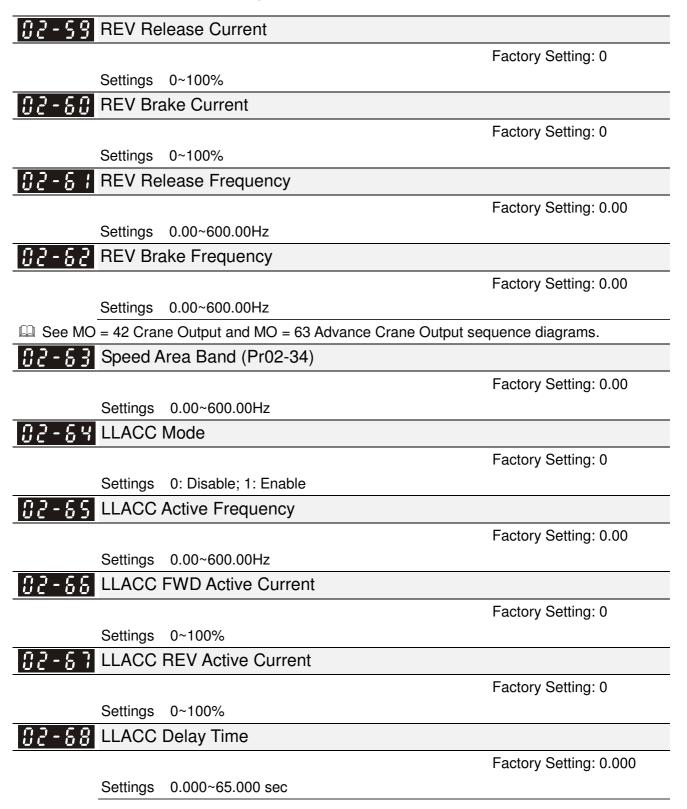
General For Example:

If the value of Pr.02-53 displays 0003h (Hex), it means RY1and RY2 are used by PLC.



When output current of a drive is higher than the setting of Pr02-33 Pivot Point of the Current (>=02-33) and when output frequency is higher than the setting of Pr02-34 Pivot Point of the Frequency (>= 02-34), choose #42 to set up Multi-functional output Pr02-13, Pr02-14, Pr02-16 and Pr002-17 after the delay time set at Pr02-32.

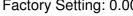
- When the Pivot Point of the Current 's setting 02-57≠0 and when the output current of the drive is lower than the setting of Pr02-57 (<02-57), or when the output frequency is lower than the setting of Pr02-58 (<02-58), the disable the setting #42 of the multi-functional output Pr02-13, Pr02-14, Pr02-16, Pr02-17
- When Pr02-57 = 0, the output current is lower than setting of Pr02-33 Pivot Point of the current (<02-33) or when output frequency is lower than the setting of Pr02-58(<02-58), disable the setting of #42 of the multi-functional output Pr02-13, Pr02-14, Pr02-16, Pr02-17.

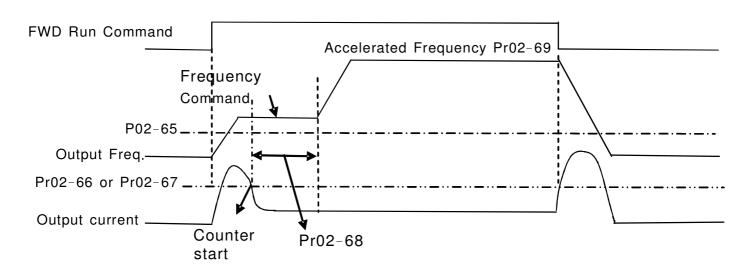




Factory Setting: 0.00

Settings 0.00~01.00 Hz

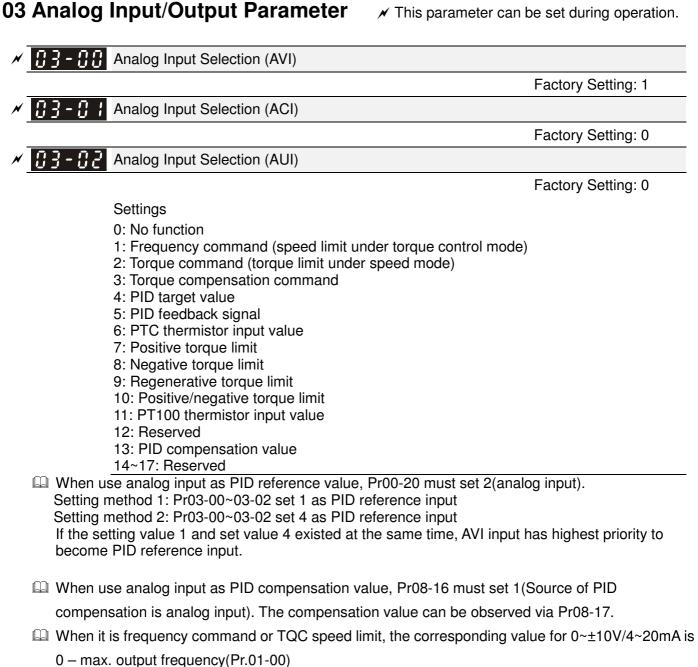




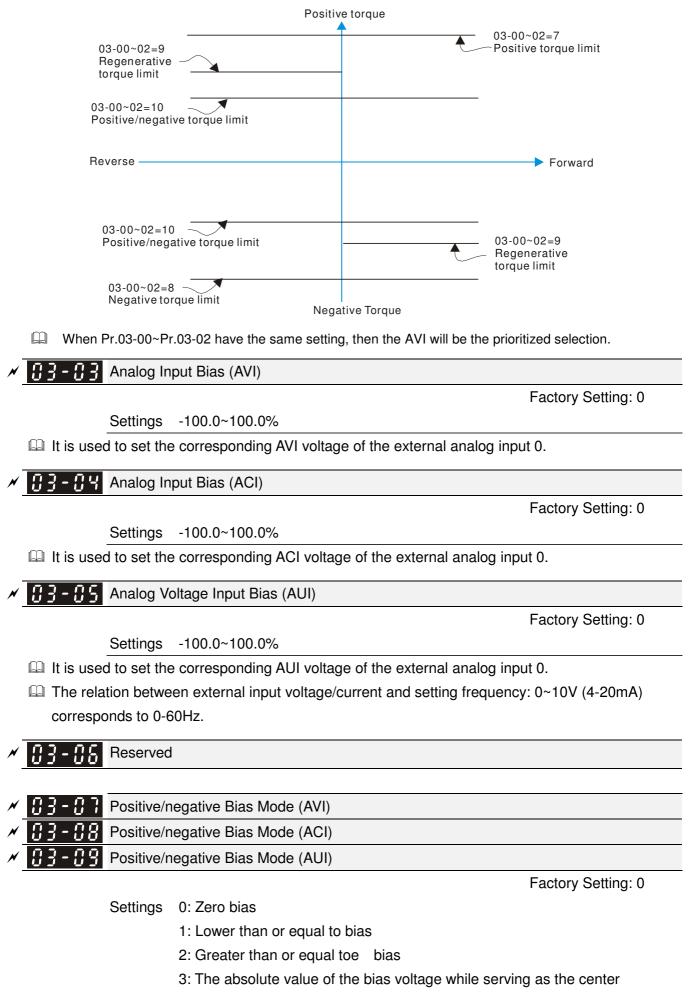
- Pr02-65 is to set the least action frequency of LLACC. When output frequency reaches frequency command (which is higher than Pr02-65), if the current level is lower than Pr02-66, the counter will start to count until the time set by Pr02-68. During counting, if the conditions above are met, the speed will increase to Pr02-69;
- During the counting, all conditions need to be met to enable LLACC, or it will be disabled until next start.
- In the setting of LLACC, if Pr02-69 is higher than Pr01-00 and Pr01-01, they are required to be modified, and 01-12 (1st ACC time) also needs to be recalculated.

[] -] [] IO Card Type

Factory Setting: 0 Settings 0: No IO Card 1: EMC-BPS01 Card 2: No IO Card 3: No IO Card 4: EMC-D611A Card 5: EMC-D42A Card 6: EMC-R6AA Card 7: No IO Card

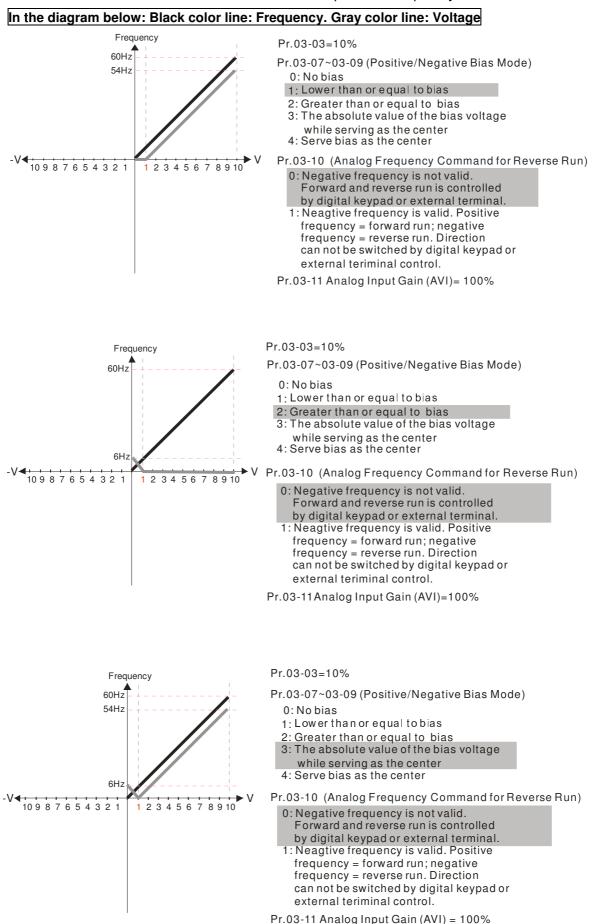


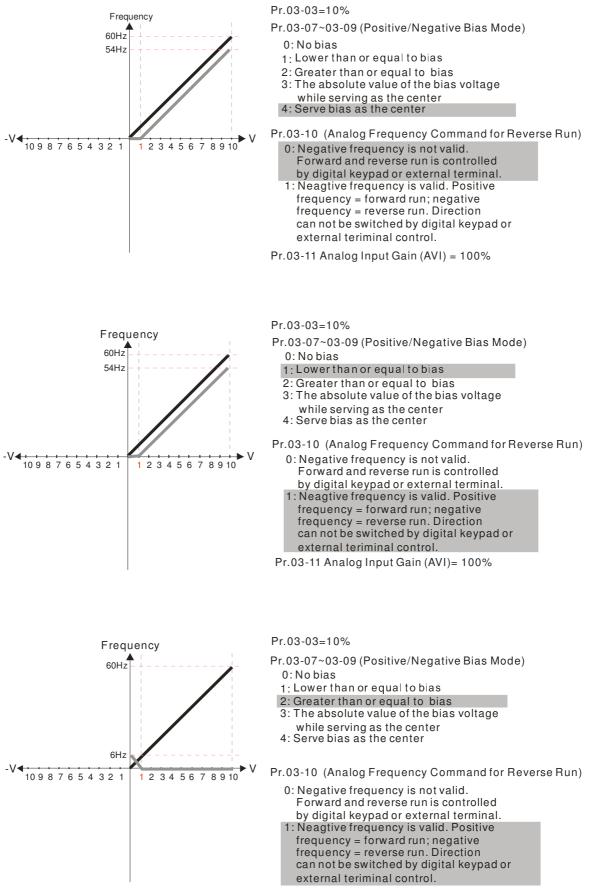
- \square When it is torque command or torque limit, the corresponding value for $0 \sim \pm 10V/4 \sim 20$ mA is 0 -max. output torque (Pr.11-27).
- \square When it is torque compensation, the corresponding value for $0^{\pm}10V/4^{2}0$ mA is 0 rated torque.



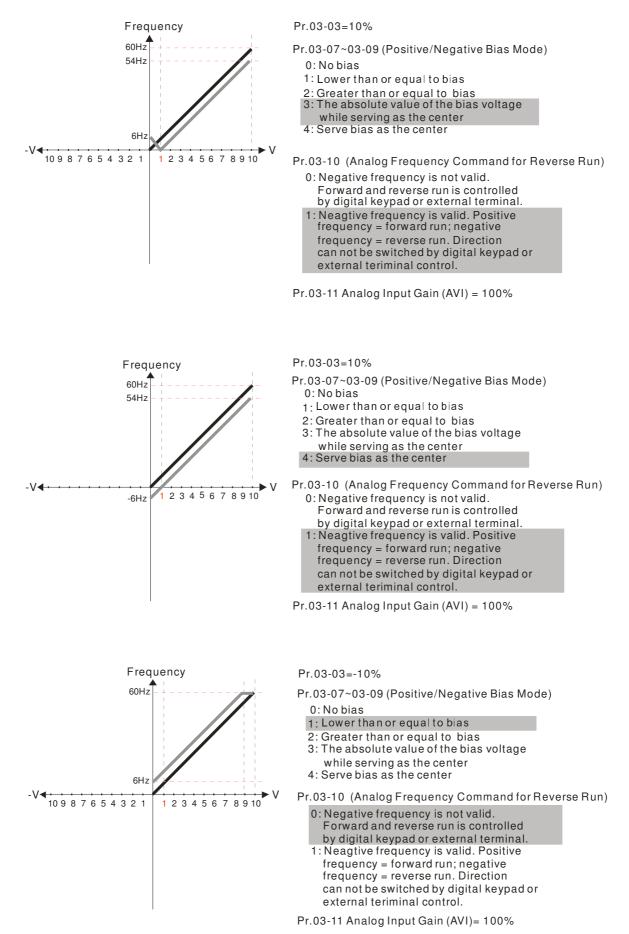
4: Serve bias as the center

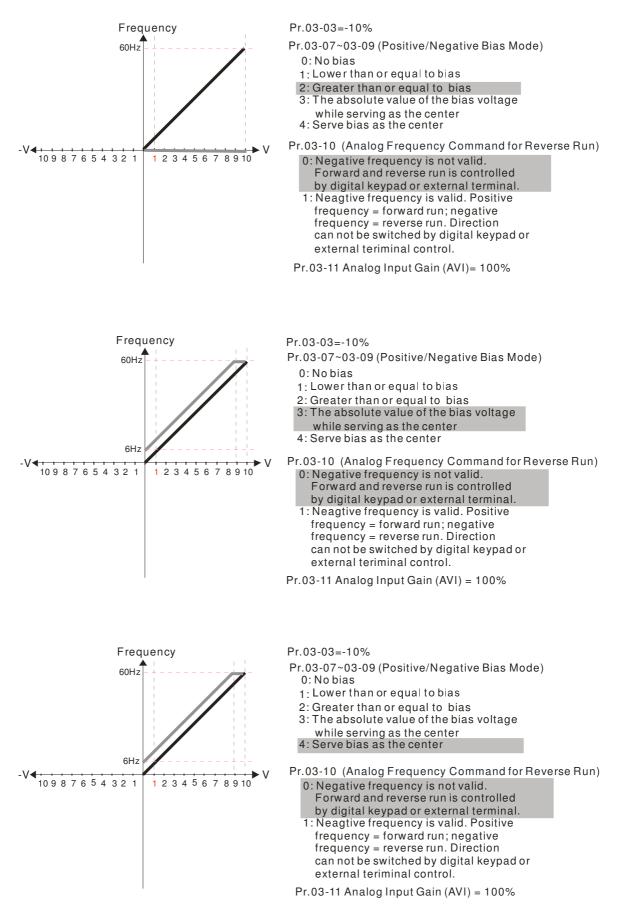
In a noisy environment, it is advantageous to use negative bias to provide a noise margin. It is recommended NOT to use less than 1V to set the operation frequency.

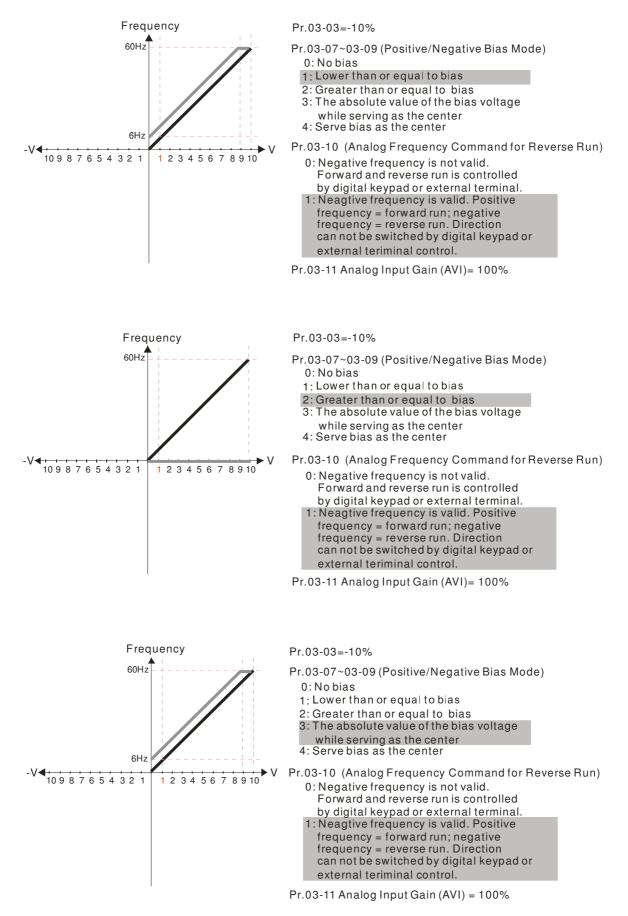


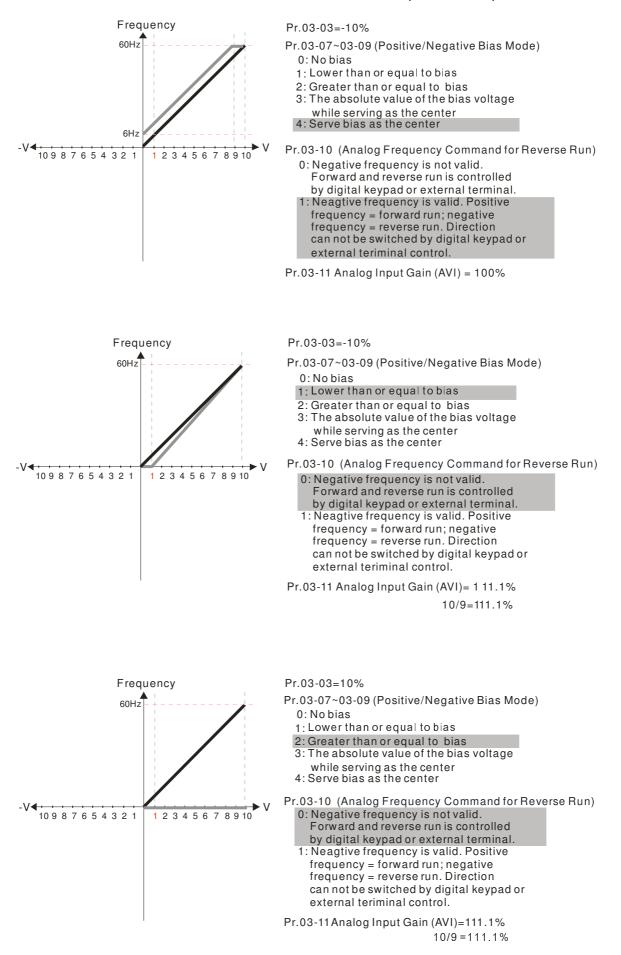


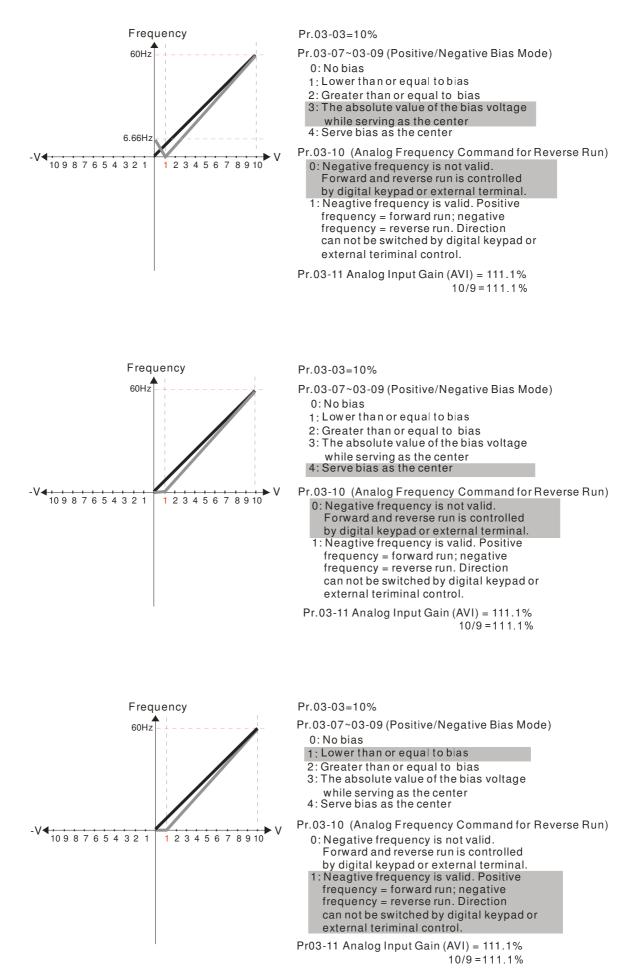
Pr.03-11Analog Input Gain (AVI)= 100%



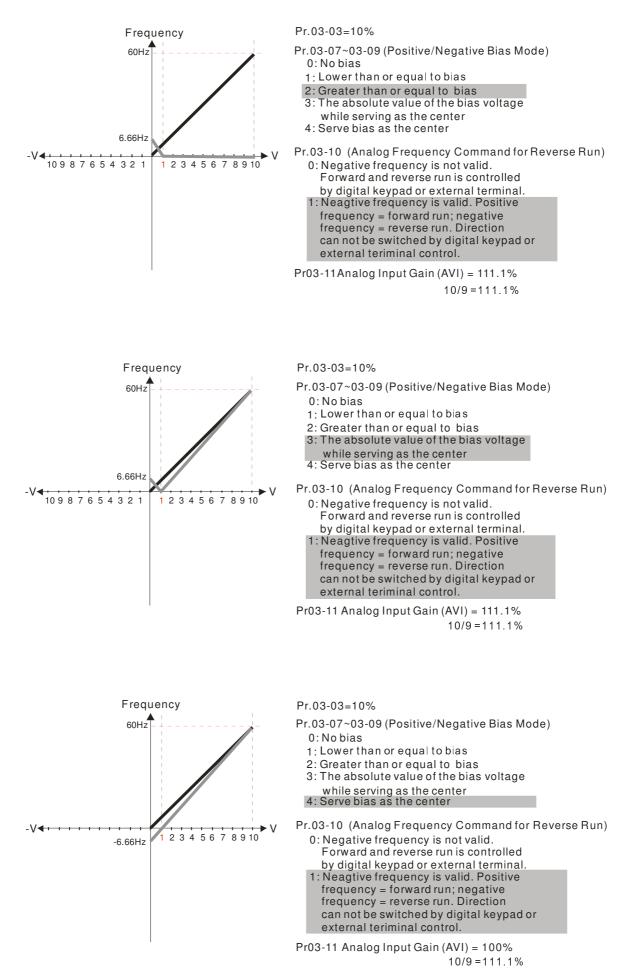


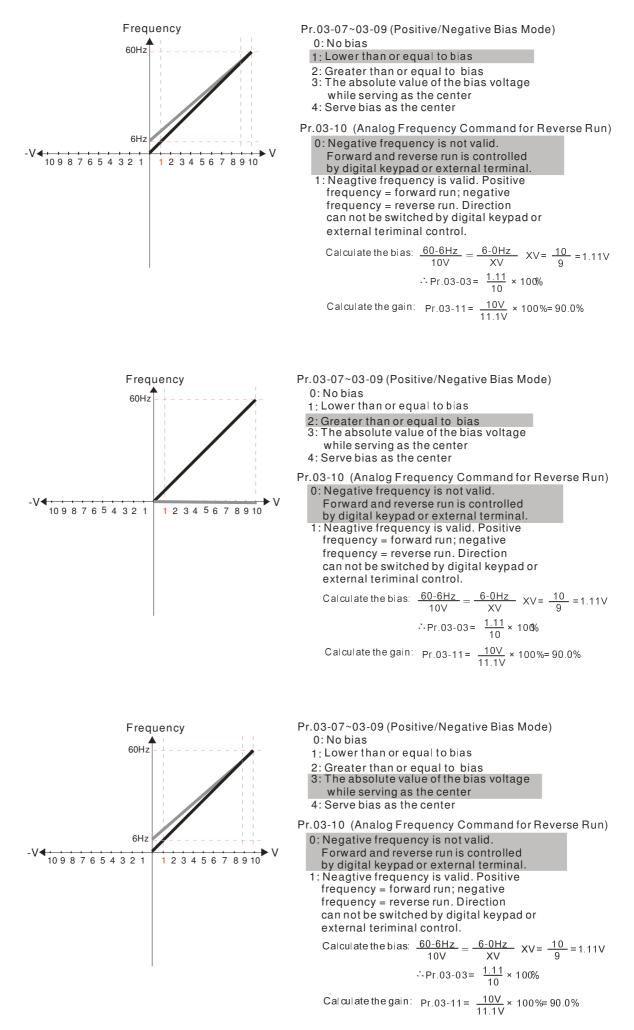




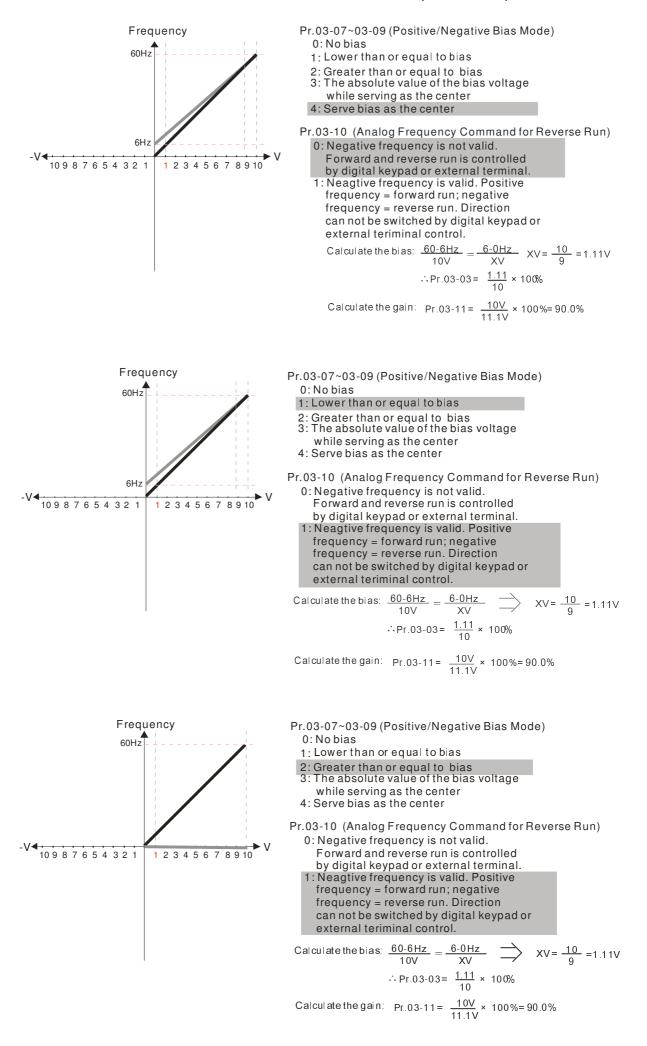


12-03-9

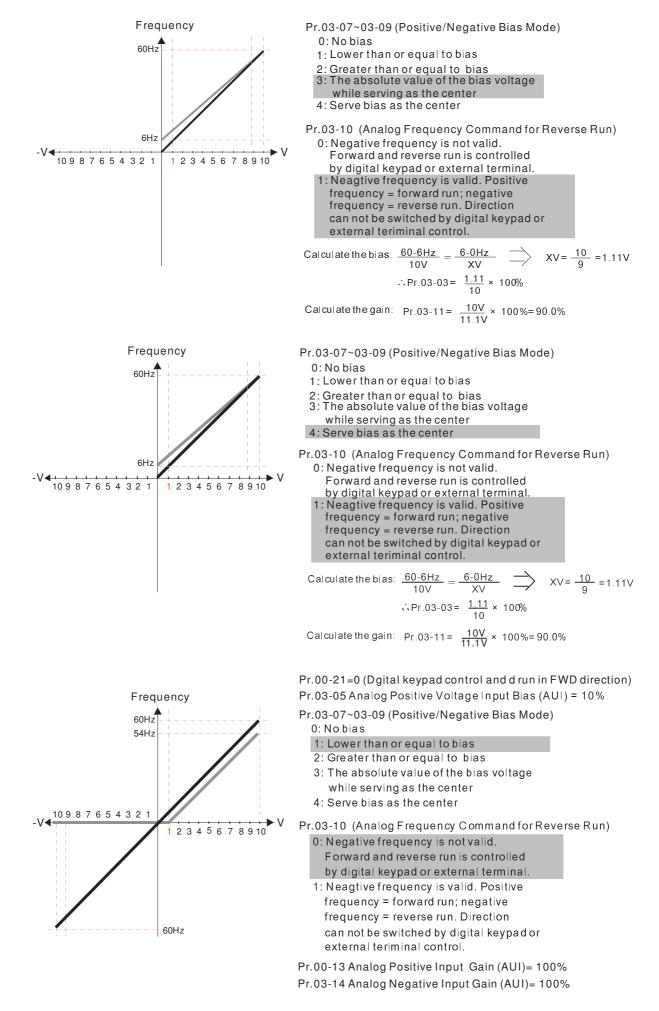


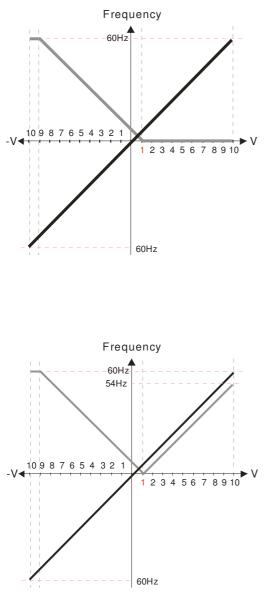


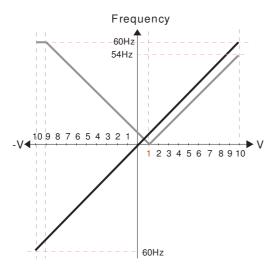
Chapter 12 Description of Parameter Settings



Chapter 12 Description of Parameter Settings







Chapter 12 Description of Parameter Settings

Pr.00-21=0 (Dgital keypad control and d run in FWD direction)

- Pr.03-05 Analog Positive Voltage Input Bias (AUI) = 10%
- Pr.03-07~03-09 (Positive/Negative Bias Mode)
 - 0:Nobias
 - 1: Lower than or equal to bias
 - 2: Greater than or equal to bias
 - 3: The absolute value of the bias voltage while serving as the center
 - 4: Serve bias as the center
- Pr.03-10 (Analog Frequency Command for Reverse Run)
 - 0: Negative frequency is not valid. Forward and reverse run is controlled by digital keypad or external terminal.
 - 1: Neagtive frequency is valid. Positive frequency = forward run; negative frequency = reverse run. Direction can not be switched by digital keypad or external teriminal control.
- Pr.00-13 Analog Positive Input Gain (AUI)= 100%
- Pr.03-14 Analog Negative Input Gain (AUI)= 100%

Pr.00-21=0 (Dgital keypad control and d run in FWD direction) Pr.03-05 Analog Positive Voltage Input Bias (AUI) = 10%

- Pr.03-07~03-09 (Positive/Negative Bias Mode)
 - 0: Nobias
 - 1: Lower than or equal to bias
 - 2: Greater than or equal to bias
- 3: The absolute value of the bias voltage while serving as the center
- 4: Serve bias as the center

 $Pr.03-10 ~(Analog \, Frequency \, Command \, for \, Reverse \, Run)$

- 0: Negative frequency is not valid. Forward and reverse run is controlled by digital keypad or external terminal.
- 1: Neagtive frequency is valid. Positive
- frequency = forward run; negative frequency = reverse run. Direction can not be switched by digital keypad or external teriminal control.

Pr.00-13 Analog Positive Input Gain (AUI)= 100%

Pr.03-14 Analog Negative Input Gain (AUI)= 100%

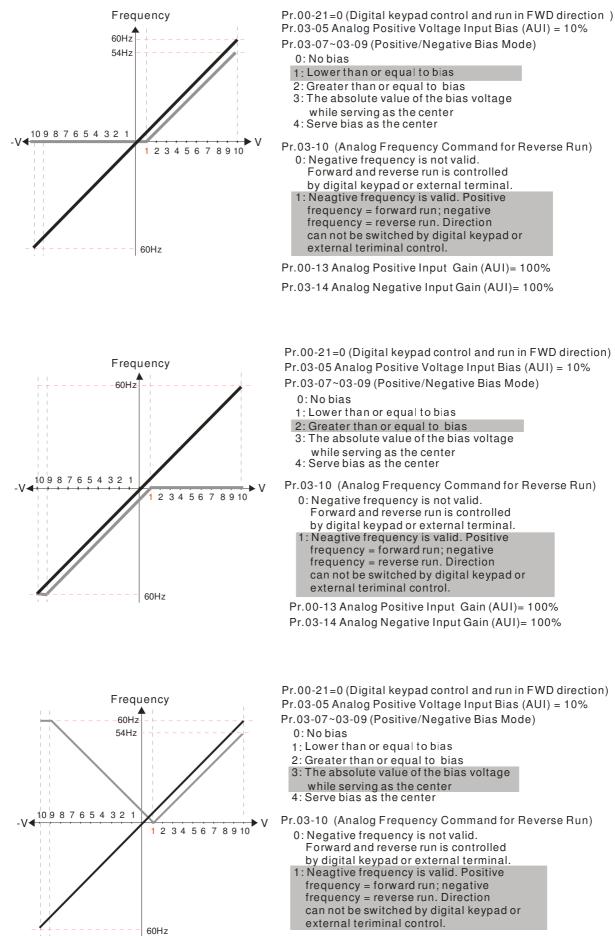
Pr.00-21=0 (Dgital keypad control and d run in FWD direction) Pr.03-05 Analog Positive Voltage Input Bias (AUI) = 10%

- Pr.03-07~03-09 (Positive/Negative Bias Mode) 0: Nobias
 - 1: Lower than or equal to bias
 - 2: Greater than or equal to bias
 - 3: The absolute value of the bias voltage
 - while serving as the center

4: Serve bias as the center

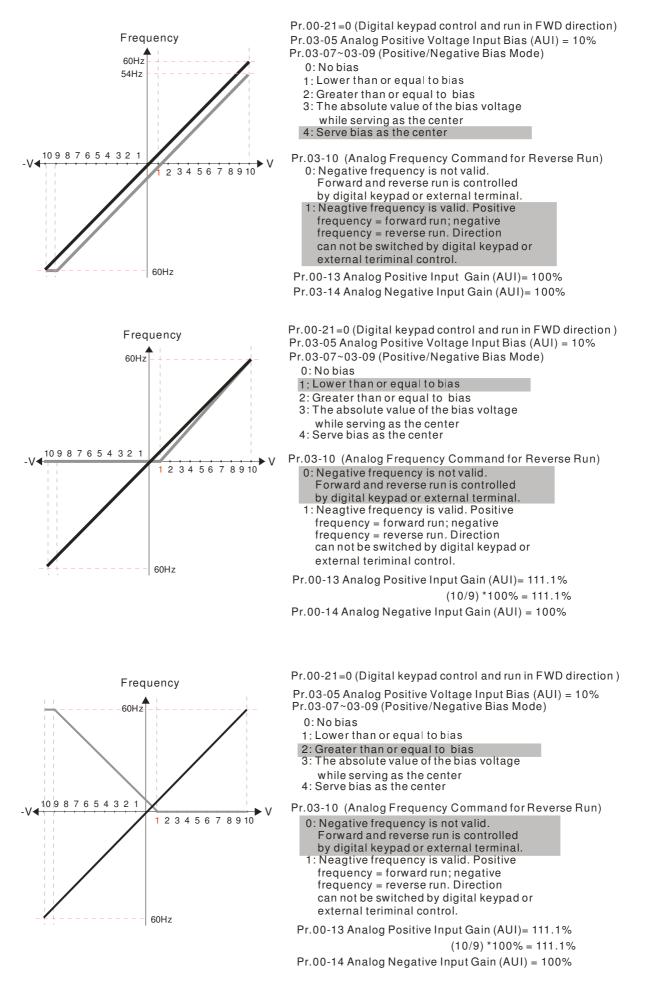
Pr.03-10 (Analog Frequency Command for Reverse Run)

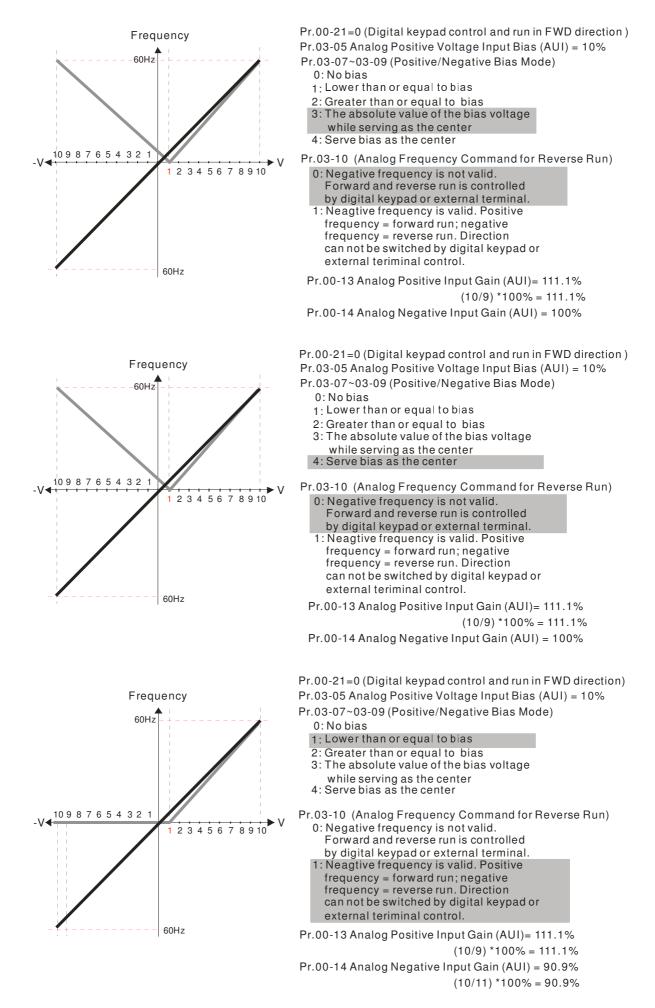
- 0: Negative frequency is not valid.
- Forward and reverse run is controlled by digital keypad or external terminal.
- 1: Neagtive frequency is valid. Positive frequency = forward run; negative frequency = reverse run. Direction can not be switched by digital keypad or external teriminal control.
- Pr.00-13 Analog Positive Input Gain (AUI)= 100%
- Pr.03-14 Analog Negative Input Gain (AUI)= 100%

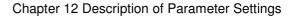


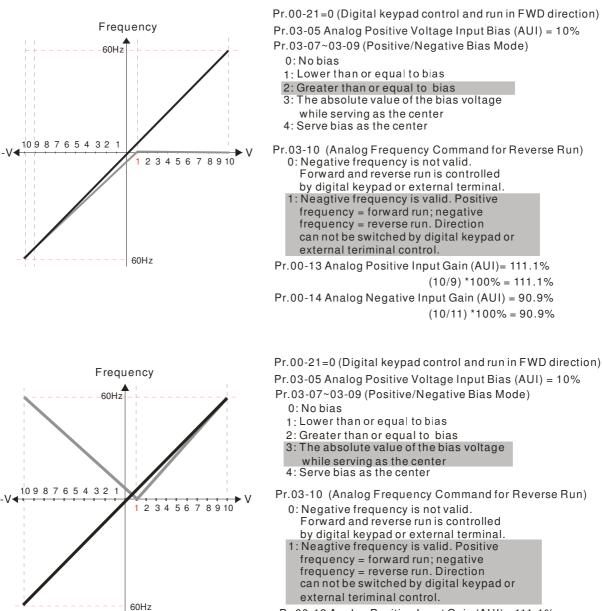
Pr.00-13 Analog Positive Input Gain (AUI)= 100% Pr.03-14 Analog Negative Input Gain (AUI)= 100%

Chapter 12 Description of Parameter Settings

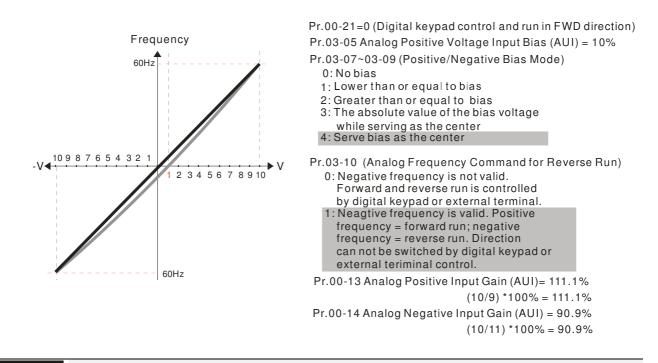








Pr.00-13 Analog Positive Input Gain (AUI)= 111.1% (10/9) *100% = 111.1% Pr.00-14 Analog Negative Input Gain (AUI) = 90.9% (10/11) *100% = 90.9%



A 11 - 111 Analog Frequency Command for Reverse Run

Factory Setting: 0

- Settings 0: Negative frequency is not valid. Forward and reverse run is controlled by digital keypad or external terminal.
 - 1: Negative frequency is valid. Positive frequency = forward run; negative frequency = reverse run. Run direction can not be switched by digital keypad or the external terminal control.
- Parameter 03-10 is used to enable reverse run command when a negative frequency (negative bias and gain) is input to AVI or ACI analog signal input.

| × | Image: Second |
|---|---|
| × | Image: Second state Image: Second state< |
| × | Analog Positive Input Gain (AUI) |
| N | 3 - 14 Analog Negative Input Gain (AUI) |

Factory Setting: 100.0

Settings -500.0~500.0%

Parameters 03-03 to 03-14 are used when the source of frequency command is the analog voltage/current signal.

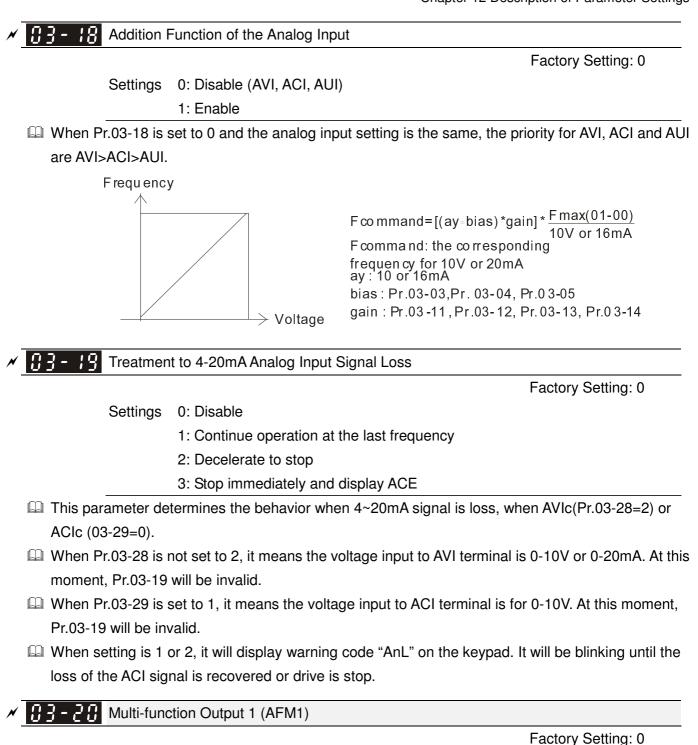
| × | C3 - 15 Analog Input Filter Time (AVI) |
|---|---|
| N | 3 - 18 Analog Input Filter Time (ACI) |
| N | 33- 17 Analog Input Filter Time (AUI) |

Factory Setting: 0.01

Settings 0.00~20.00 sec

I These input delays can be used to filter noisy analog signal.

When the setting of the time constant is too large, the control will be stable but the control response will be slow. When the setting of time constant is too small, the control response will be faster but the control may be unstable. To find the optimal setting, please adjust the setting according to the control stable or response status.



Multi-function Output 2 (AFM2)

Factory Setting: 0

Settings 0~23

Function Chart

| Settings | Functions | Descriptions | | | | | |
|----------|------------------------|--|--|--|--|--|--|
| 0 | Output frequency (Hz) | Max. frequency Pr.01-00 is regarded as 100%. | | | | | |
| 1 | Frequency command (Hz) | Max. frequency Pr.01-00 is regarded as 100%. | | | | | |
| 2 | Motor speed (Hz) | 600Hz is regarded as 100% | | | | | |
| 3 | Output current (rms) | (2.5 X rated current) is regarded as 100% | | | | | |
| 4 | Output voltage | (2 X rated voltage) is regarded as 100% | | | | | |
| 5 | DC Bus Voltage | 450V (900V)=100% | | | | | |

| 6 | Power factor | -1.000~1.000=100% |
|----|---|---|
| 7 | Power | Rated power is regarded as 100% |
| 8 | Output torque | Full-load torque is regarded as 100% |
| 9 | AVI | 0~10V=0~100% |
| 10 | ACI | 0~20mA=0~100% |
| 11 | AUI | -10~10V=0~100% |
| 12 | q-axis current (Iq) | (2.5 X rated current) is regarded as 100% |
| 13 | q-axis feedback value (Iq) | (2.5 X rated current) is regarded as 100% |
| 14 | d-axis current (Id) | (2.5 X rated current) is regarded as 100% |
| 15 | d-axis feedback value (Id) | (2.5 X rated current) is regarded as 100% |
| 16 | q-axis voltage (Vq) | 250V (500V) =100% |
| 17 | d-axis voltage(Vd) | 250V (500V) =100% |
| 18 | Torque command | Rated torque is regarded as 100% |
| 19 | PG2 frequency command | Max. frequency Pr.01-00 is regarded as 100%. |
| 20 | Output for CANopen control | For CANopen analog output |
| 21 | RS485 analog output | For communication output (CMC-MOD01, CMC-EIP01, CMC-PN01, CMC-DN01) |
| 22 | Analog output for communication card | For communication output (CMC-MOD01, CMC-EIP01, CMC-PN01, CMC-DN01) |
| 23 | Constant voltage/current output | Pr.03-32 and Pr.03-33 controls voltage/current output level |
| | | 0~100% of Pr.03-32 corresponds to 0~10V of AFM1. |

✓ ☐ 3 - 2 / Gain of Analog Output 1 (AFM1)

Factory Setting: 100.0

✓ **[]] - 2 Ч** Gain of Analog Output 2 (AFM2)

Factory Setting: 100.0

Settings 0~500.0%

It is used to adjust the analog voltage level (Pr.03-20) that terminal AFM outputs.

 \square This parameter is set the corresponding voltage of the analog output 0.



Factory Setting: 0

✓ 3 - 2 5 Analog Output 2 when in REV Direction (AFM2)

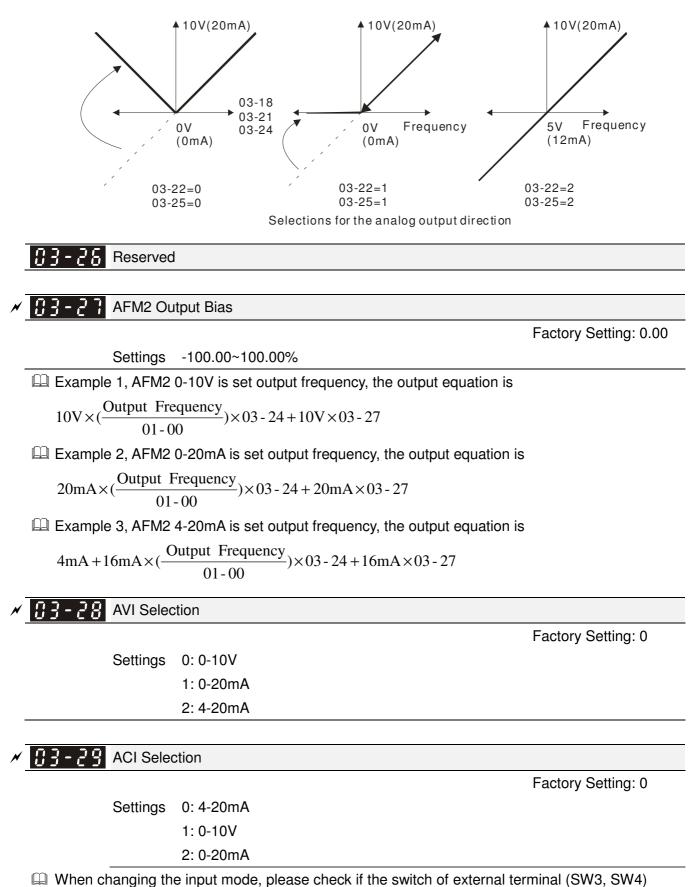
Factory Setting: 0

Settings 0: Absolute value in REV direction

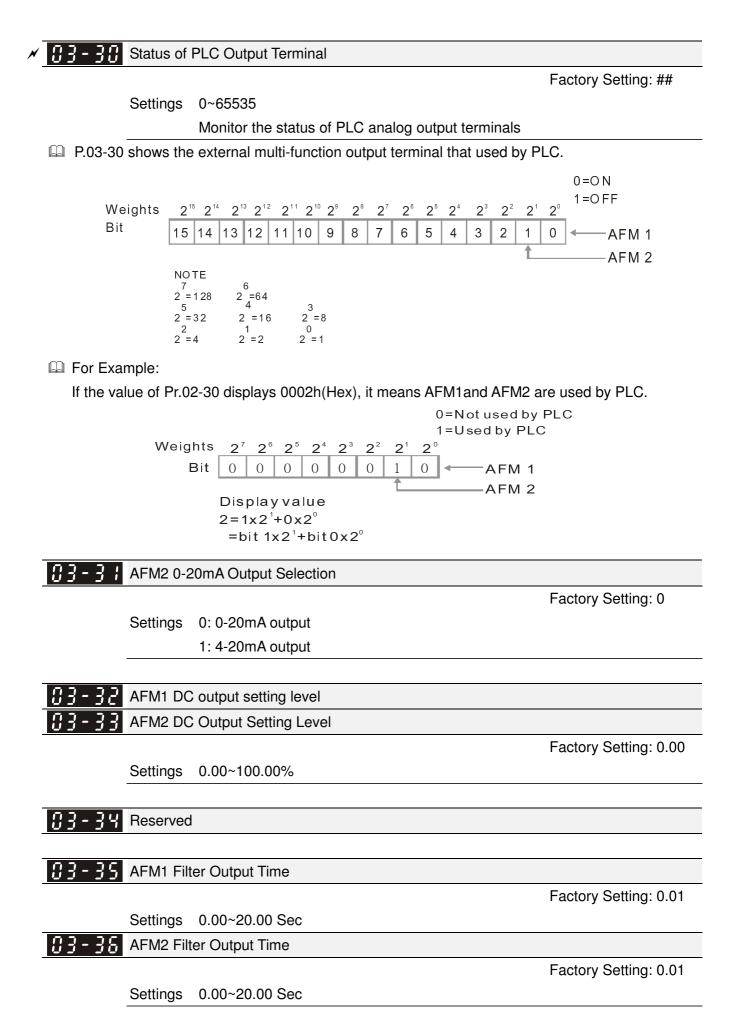
1: Output 0V in REV direction; output 0-10V in FWD direction

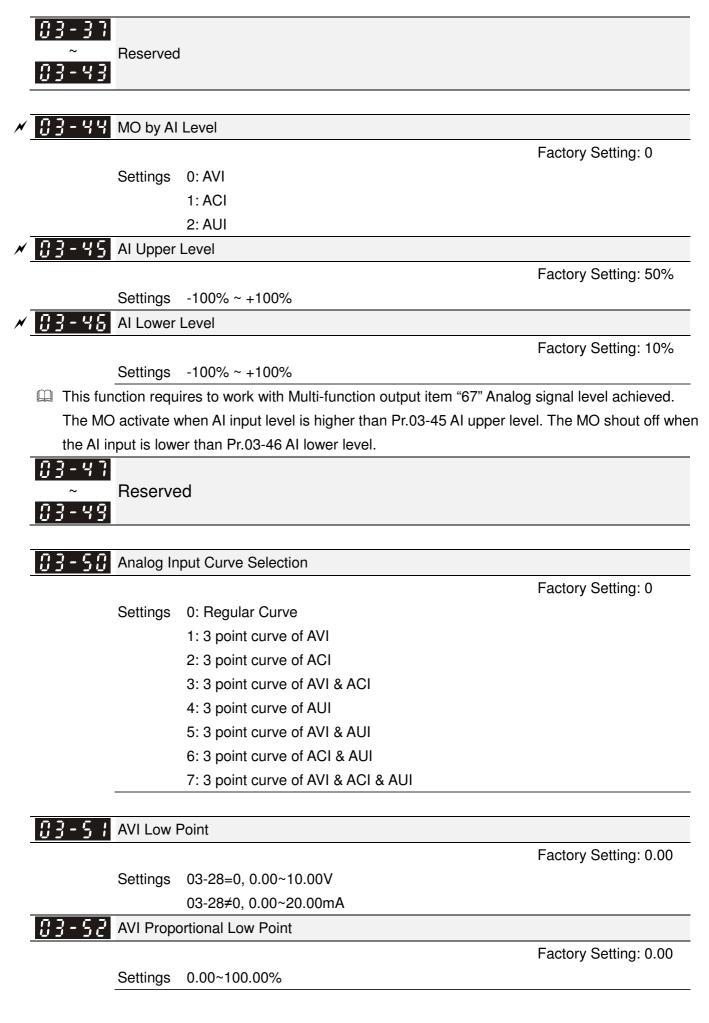
2: Output 5-0V in REV direction; output 5-10V in FWD direction

Chapter 12 Description of Parameter Settings

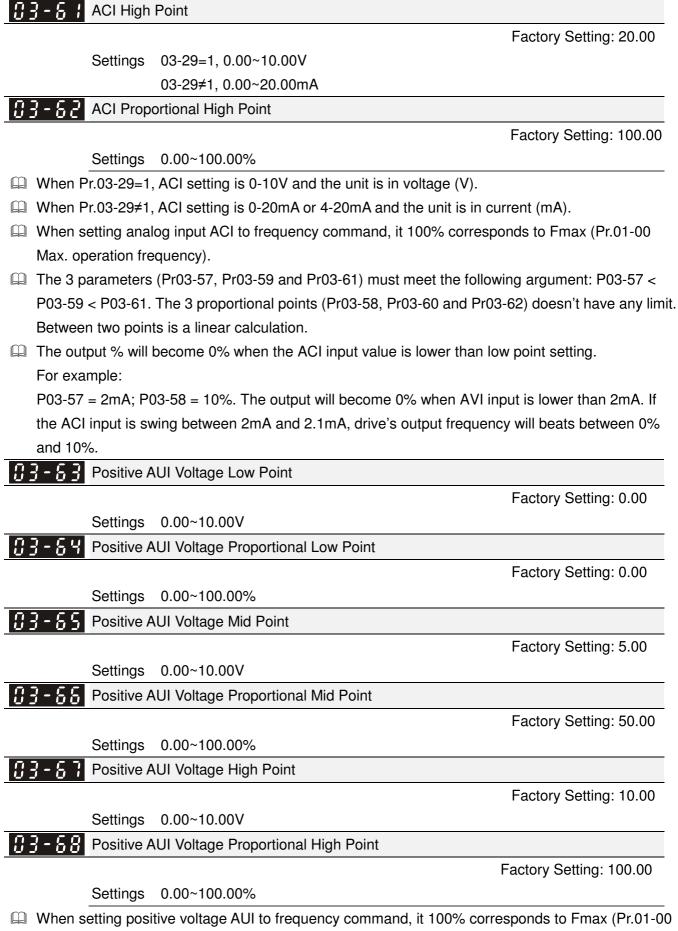


corresponds to the setting of Pr.03-28~03-29.

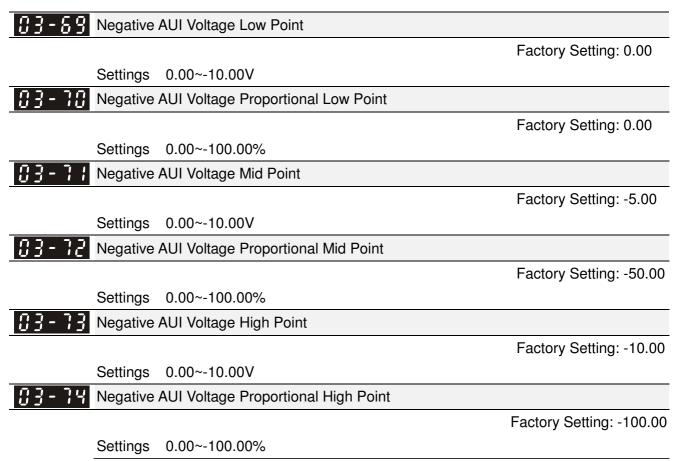




| 13-53 <mark>avi m</mark> i | l Point | |
|--|---|--|
| | | Factory Setting: 5.00 |
| Setting | s 03-28=0, | 0.00~10.00V |
| | 03-28≠0, (| 0.00~20.00mA |
| 3-54 AVI Pr | portional Mid | I Point |
| | - | Factory Setting: 50.0 |
| Setting | s 0.00~100. | |
| | h Point | |
| | | Factory Setting: 10.0 |
| Setting | s 03-28-0 | 0.00~10.00V |
| Cotting | | 0.00~20.00mA |
| 3-55 AVI Pr | | |
| <u> </u> | portional ring | |
| 0 | 0.00.100 | Factory Setting: 100 |
| Settine | | |
| | | ng is 0-10V and the unit is in voltage (V). |
| | | ng is 0-20mA or 4-20mA and the unit is in current (mA). |
| - | • • | /I to frequency command, it 100% corresponds to Fmax (Pr.01-0 |
| Max. operation | frequency). | |
| The 3 paramet | "- (D-00 E1 I | Drog EQ and Drog EQ) represent the fallowing a reprint DOQ Ef |
| 1 | IS (PIU3-51, I | Pr03-53 and Pr03-53) must meet the following argument: P03-51 |
| | | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any |
| P03-53 < P03- | 5. The 3 prop | |
| P03-53 < P03- Between two p | 5. The 3 prop ints is a linea | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any |
| P03-53 < P03- Between two p | 5. The 3 prop ints is a linea | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. |
| P03-53 < P03- Between two p The output % v or example: | 5. The 3 prop ints is a linea ill become 0% | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. % when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw | 5. The 3 prop pints is a linea ill become 0% 2 = 10%. The pen 1V and 1. | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw | 5. The 3 prop pints is a linea ill become 0% 2 = 10%. The pen 1V and 1. | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. % when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw | 5. The 3 prop pints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw | 5. The 3 prop pints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. % when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 41, 0.00~10.00V 51, 0.00~20.00mA |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting | 5. The 3 prop pints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. % when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 41, 0.00~10.00V 51, 0.00~20.00mA |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. % when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 41, 0.00~10.00V 51, 0.00~20.00mA |
| P03-53 < P03- Between two p The output % v or example: D3-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Lov | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. 6 output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting 3 - 5 8 ACI Pu Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ pportional Low s 0.00~100. | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. 6 output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting 3 - 5 8 ACI Pu Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ pportional Low s 0.00~100. | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 .00% |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3-57 ACI Lo Setting 3-58 ACI P Setting 3-59 ACI M | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Low s 0.00~100. d Point | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 .00% |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3 - 5 7 ACI Lo Setting 3 - 5 8 ACI Pu Setting | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Low s 0.00~100. d Point s 03-29=1, 0 | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 .00% Factory Setting: 12.0 0.00~10.00V |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3 - 5 ? ACI Lo Setting 3 - 5 ? ACI Pr Setting 3 - 5 ? ACI M | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Low s 0.00~100. d Point s 03-29=1, 0 03-29≠1, 0 | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 (1, 0.00~10.00V (1, 0.00~20.00mA W Point Factory Setting: 0.00 .00% Factory Setting: 12.0 0.00~10.00V 0.00~20.00mA |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3 - 5 ? ACI Lo Setting 3 - 5 ? ACI Pr Setting 3 - 5 ? ACI M | 5. The 3 prop ints is a linea ill become 0% 2 = 10%. The een 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Low s 0.00~100. d Point s 03-29=1, 0 | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 .00% Factory Setting: 12.0 0.00~10.00V 0.00~20.00mA d Point |
| P03-53 < P03- Between two p The output % v or example: 03-51 = 1V; P03- put is swing betw 3-5 ACI Lo Setting 3-58 ACI Pr Setting 3-58 ACI Pr Setting Setting | 5. The 3 prop ints is a lineal ill become 0% 2 = 10%. The en 1V and 1. w Point s Pr.03-29= Pr.03-29≠ portional Low s 0.00~100. d Point s 03-29=1, 0 03-29≠1, 0 portional Mic | portional points (Pr03-52, Pr03-54 and Pr03-56) doesn't have any ar calculation. The ACI and AUI are same as AVI. 6 when the AVI input value is lower than low point setting. e output will become 0% when AVI input is lower than 1V. If the A 1V, drive's output frequency will beats between 0% and 10% Factory Setting: 4.00 1, 0.00~10.00V 1, 0.00~20.00mA w Point Factory Setting: 0.00 .00% Factory Setting: 12.0 0.00~10.00V 0.00~20.00mA d Point Factory Setting: 50.0 |



- Max. operation frequency) and the motor runs in forward direction.
- Three of the positive voltage AUI points can be set according to user's demand on voltage and proportion, there is no setting limit for AUI points.



- When setting negative voltage AUI to frequency command, it 100% corresponds to Fmax (Pr.01-00 Max. operation frequency) and the motor runs in reverse direction.
- Three of the negative voltage AUI points can be set according to user's demand on voltage and proportion; there is no setting limit for AUI points.
- The 3 parameters (Pr03-69, Pr03-71 and Pr03-73) must meet the following argument: P03-69 < P03-71 < P03-73. The 3 proportional points (Pr03-70, Pr03-72 and Pr03-74) doesn't have any limit. Between two points is a linear calculation.
- The output % will become 0% when the negative AUI input value is lower than low point setting. For example:

P03-63=-1V; P03-64 = 10%. The output will become 0% when AUI input is bigger than -1V. If the AUI input is swing between -1V and -1.1V, drive's output frequency will beats between 0% and 10%.

04 Multi-Step Speed Parameters

✓ This parameter can be set during operation.

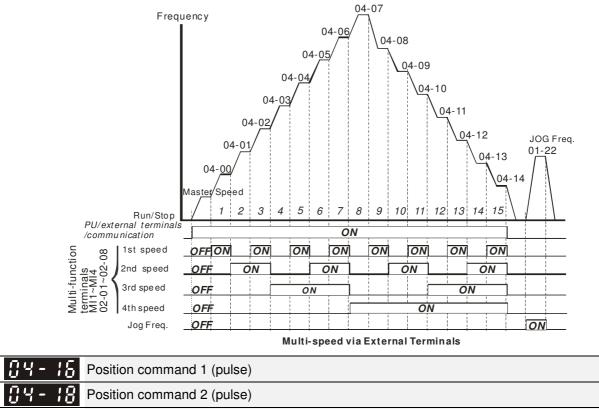
| × | 04-00 | 1st Step Speed Frequency |
|---|-------|---------------------------|
| × | 04-01 | 2nd Step Speed Frequency |
| N | 04-02 | 3rd Step Speed Frequency |
| × | 04-03 | 4th Step Speed Frequency |
| × | 04-04 | 5th Step Speed Frequency |
| × | 04-05 | 6th Step Speed Frequency |
| N | 04-06 | 7th Step Speed Frequency |
| N | 04-07 | 8th Step Speed Frequency |
| × | 04-08 | 9th Step Speed Frequency |
| × | 04-09 | 10th Step Speed Frequency |
| × | 04-10 | 11th Step Speed Frequency |
| × | 04-;; | 12th Step Speed Frequency |
| N | 84-15 | 13th Step Speed Frequency |
| N | 84-13 | 14th Step Speed Frequency |
| × | 84-14 | 15th Step Speed Frequency |

Factory Setting: 0.00

Settings 0.00~600.00Hz

The Multi-function Input Terminals (refer to setting 1~4 of Pr.02-01~02-08 and 02-26~02-31) are used to select one of the AC motor drive Multi-step speeds (max. 15 speeds). The speeds (frequencies) are determined by Pr.04-00 to 04-14 as shown in the following.

- The run/stop command can be controlled by the external terminal/digital keypad/communication via Pr.00-21.
- \square Each one of multi-step speeds can be set within 0.0~600.0Hz during operation.
- Explanation for the timing diagram for multi-step speeds and external terminals The Related parameter settings are:
 - 1. Pr.04-00~04-14: setting multi-step speeds (to set the frequency of each step speed)
 - 2. Pr.02-01~02-08, 02-26~02-31: setting multi-function input terminals (multi-step speed 1~4)
 - Related parameters: 01-22 JOG Frequency, 02-01 Multi-function Input Command 1 (MI1), 02-02 Multi-function Input Command 2 (MI2), 02-03 Multi-function Input Command 3 (MI3), 02-04 Multi-function Input Command 4 (MI4)



| × | 04-18 | Position command 2 (pulse) |
|---|----------------|-----------------------------|
| N | 04-20 | Position command 3 (pulse) |
| × | 84-85 | Position command 4 (pulse) |
| × | 04-54 | Position command 5 (pulse) |
| × | 84-28 | Position command 6 (pulse) |
| × | 85-28 | Position command 7 (pulse) |
| × | 04-30 | Position command 8 (pulse) |
| N | 04-32 | Position command 9 (pulse) |
| × | 04-34 | Position command 10 (pulse) |
| × | 04-36 | Position command 11 (pulse) |
| N | 04-38 | Position command 12 (pulse) |
| N | 04-40 | Position command 13 (pulse) |
| N | 04-45 | Position command 14 (pulse) |
| N | <u>[]</u> 4-44 | Position command 15 (pulse) |
| - | | Eastary Satting: 0 |

Factory Setting: 0

Settings -32767~32767

Please refer to Pr.02-01~02-08 (Multi-function Input Command) for description on setting 34 (Switch between multi-step position and multi-speed control) and setting 36 (Enable multi-step position learning function).

| Multi-step position corresponding | MI4 | MI3 | MI2 | MI1 | Multi-step speed corresponding |
|-----------------------------------|-----|-----|-----|-----|--|
| 10-19 | 0 | 0 | 0 | 0 | Positioning for Encoder Position |
| 04-16 Position command 1 (pulse) | 0 | 0 | 0 | 1 | 04-00 1 st step speed frequency |
| 04-18 Position command 2 (pulse) | 0 | 0 | 1 | 0 | 04-01 2 nd step speed frequency |
| 04-20 Position command 3 (pulse) | 0 | 0 | 1 | 1 | 04-02 3 rd step speed frequency |

| 0 | 1 | 0 | 0 | 04-03 4 th step speed frequency |
|---|-------------|---|---|---|
| 0 | 1 | 0 | 1 | 04-04 5 th step speed frequency |
| 0 | 1 | 1 | 0 | 04-05 6 th step speed frequency |
| 0 | 1 | 1 | 1 | 04-06 7 th step speed frequency |
| 1 | 0 | 0 | 0 | 04-07 8 th step speed frequency |
| 1 | 0 | 0 | 1 | 04-08 9 th step speed frequency |
| 1 | 0 | 1 | 0 | 04-09 10 th step speed frequency |
| 1 | 0 | 1 | 1 | 04-10 11 th step speed frequency |
| 1 | 1 | 0 | 0 | 04-11 12 th step speed frequency |
| 1 | 1 | 0 | 1 | 04-12 13 th step speed frequency |
| 1 | 1 | 1 | 0 | 04-13 14 th step speed frequency |
| 1 | 1 | 1 | 1 | 04-14 15 th step speed frequency |
| | 0 0 0 | 0 1 0 1 0 1 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 | 0 1 0 0 1 1 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 1 0 | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ |

| Image: Second state Position command 1 (revolution) |
|---|
| Image: Position command 2 (revolution) |
| D 4 - 19 Position command 3 (revolution) |
| B H - 2 F Position command 4 (revolution) |
| D Y - 2 3 Position command 5 (revolution) |
| D 4 - 25 Position command 6 (revolution) |
| D 4 - 2 7 Position command 7 (revolution) |
| D 4 - 2 9 Position command 8 (revolution) |
| Image: Position command 9 (revolution) |
| Image: Position command 10 (revolution) |
| 04-35 Position command 11 (revolution) |
| Position command 12 (revolution) |
| Position command 13 (revolution) |
| Image: Second system Position command 14 (revolution) |
| Position command 15 (revolution) |

D To switch the target position of the external terminal, set external terminal parameters to

Pr.02-01=1, Pr.02-02=2, Pr.02-03=3, Pr.02-04= 4 by selecting the P2P target position via multi-step speed.

Setting: Target Position = $04-15 \times (10-01^*4) + 04-16$

| Multi-step Speed Status | Target Position of P2P | | | Maximum S | Speed of P2P |
|----------------------------|------------------------|-------|--------------|--------------|--------------|
| 0000 | | 0 | 11-00 bit8=0 | 11-00 bit8=1 | |
| 0001 | Position 1 | 04-15 | 04-16 | 11-43 | 04-00 |
| 0010 | Position 2 | 04-17 | 04-18 | | 04-01 |
| 0011 | Position 3 | 04-19 | 04-20 | | 04-02 |
| 0100 | Position 4 | 04-21 | 04-22 | | 04-03 |
| 0101 | Position 5 | 04-23 | 04-24 | | 04-04 |
| 0110 | Position 6 | 04-25 | 04-26 | | 04-05 |
| 0111 | Position 7 | 04-27 | 04-28 | | 04-06 |
| 1000 | Position 8 | 04-29 | 04-30 | 11-43 | 04-07 |

Chapter 12 Description of Parameter Settings

| Multi-step Speed Status | Target Position of P2P | | | Maximum S | peed of P2P |
|----------------------------|------------------------|-------|-------|-----------|-------------|
| 1001 | Position 9 | 04-31 | 04-32 | | 04-08 |
| 1010 | Position 10 | 04-33 | 04-34 | | 04-09 |
| 1011 | Position 11 | 04-35 | 04-36 | | 04-10 |
| 1100 | Position 12 | 04-37 | 04-38 | | 04-11 |
| 1101 | Position 13 | 04-39 | 04-40 | | 04-12 |
| 1110 | Position 14 | 04-41 | 04-42 | | 04-13 |
| 1111 | Position 15 | 04-43 | 04-44 | | 04-14 |

- ✓ 34-58 PLC Buffer 0
- ✓ ③Ч-5 ↓ PLC Buffer 1
- ✓ <u>34-52</u> PLC Buffer 2
- ✓ <u>04-53</u> PLC Buffer 3
- ✓ <u><u><u></u></u> <u></u> ∀ − <u></u> ⊆ <u></u> ↓ </u>
- ✓ <u>04-55</u> PLC Buffer 5
- ✓ <u>04-55</u> PLC Buffer 6
- ✓ <u>04-57</u> PLC Buffer 7
- ✓ <u>04-58</u> PLC Buffer 8
- ✓ <u>04-59</u> PLC Buffer 9
- ✓ <u>84-88</u> PLC Buffer 10
- ✓ <u>③Ч-5</u> PLC Buffer 11
- ✓ <u>84-82</u> PLC Buffer 12

- ✓ <u>04-55</u> PLC Buffer 15
- ✓ 04-66
 ✓ 04-66
 PLC Buffer 16
 ✓ 04-60
 PLC Buffer 17
- ✓ 84-58
 PLC Buffer 18
- ✓ 84-88
 ✓ 84-88
 PLC Buffer 19
 - Factory Setting: 0 Settings 0~65535
 - Can be combined with PLC or HMI programming for variety application.

05 Motor Parameters

✓ This parameter can be set during operation.

| | Factory Setting: 0 |
|----------|---|
| Settings | 0: No function |
| | 1: Rolling test for induction motor (Rs, Rr, Lm, Lx, no-load current) |
| | 2: Rolling test for induction motor |
| | 3: No function |
| | 4: Rolling test for PM motor magnetic pole |
| | 5: Rolling test for PM motor |
| | 6: Rolling test for IM motor flux curve |
| | 12: FOC Sensorless inertia estimation |
| | 13: High frequency and blocked rotor test for PM motor parameter |

Induction Motor

3.

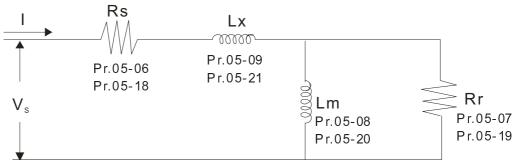
Press [Run] to begin auto tuning. The measured value will be written into motor 1 (Pr.05-05) ~05-09, Rs, Rr, Lm, Lx, no-load current) and motor 2 (Pr.05-17 to Pr.05-21) automatically.

To begin AUTO-Tuning in rolling test:

- Make sure that all the parameters are set to factory settings and the motor wiring is correct. 1.
- Make sure the motor has no-load before executing auto-tuning and the shaft is not connected 2. to any belt or gear motor. It is recommended to set to 2 if the motor can't separate from the load.

| | Matar 1 Daramatar | Matax 0 Deverator |
|-------------------------|-------------------|-------------------|
| | Motor 1 Parameter | Motor 2 Parameter |
| Motor Rated Frequency | 01-01 | 01-35 |
| Motor Rated Voltage | 01-02 | 01-36 |
| Motor Full-load Current | 05-01 | 05-13 |
| Motor Rated Power | 05-02 | 05-14 |
| Motor Rated Speed | 05-03 | 05-15 |
| Motor Pole Numbers | 05-04 | 05-16 |

- Set Pr.05-00=1 and press [Run], the drive will begin auto-tuning. Please be aware of the 4. motor that it starts spinning as [Run] is pressed.
- When auto-tuning is completed, please check if the measured values are written into motor 1 5. (Pr.05-05 ~05-09) and motor 2 (Pr.05-17 ~05-21) automatically.
- 6. Mechanical equivalent circuit



% If Pr.05-00 is set to 2 (static test), user needs to input the no-load current value of motor into Pr.05-05 for motor 1/Pr.05-17 for motor 2.

Chapter 12 Description of Parameter Settings

- Set Pr.05-00=6 to begin rolling test for IM motor flux curve. This function is available when the drive is in FOC/TQC Sensorless control. User may begin auto-tuning after setting up the motor information.
 - Set up Pr.01-01, 01-02, 05-01~05-04 according to the motor nameplate information •
 - ☑ Set Pr.05-00=6 and press [Run], make sure no loading is applied to the motor before setting Pr.05-00 to 6 and before performing auto-tuning.
- When Pr.05-00=12, the drive begins FOC Sensorless inertia estimation for IM motor. This function is available when the drive is in FOC/TQC Sensorless control. User may begin auto-tuning after setting up the motor information.
 - ☑ Note: Make sure the motor parameters (no-load current, Rs, Rr, Lm and Lx) of the drive are set before performing Pr.05-00=12 (auto-tuning for FOC Sensorless interior estimation for IM motor).
- 1. Set Pr.00-10=2 (torque mode)
- 2. Set Pr. 00-13=2 (TQCPG, Open-loop torque mode)
- 3. Set Pr. 05-00=12 and press [Run] to begin FOC Sensorless inertia measure
- 4. When the process of inertia estimation is completed, check Pr.11-01 (unit: PU Q8) and see if the measured value is acceptable.

Set up Sensorless FOC Mode

- 1. Set Pr.00-10 = 0 (speed mode)
- 2. Set Pr.00-11 = 5 (FOC sensorless mode)
- 3. Set bit0 of Pr.11-00 to 1 (use ASR gain function to automatically adjust the ASR bandwidth in Pr.11-03,11-04,11-05)

- ☑ In torque/vector control mode, it is not recommended to have motors run in parallel.
- ☑ It is not recommended to use torque/vector control mode if motor rated power exceeds the rated power of the AC motor drive.
- ☑ When auto-tuning 2 motors, it needs to set multi-function input terminals (setting 14) or change Pr.05-22 for motor 1/motor 2 selection.
- ☑ The no-load current is usually 20~50% X rated current.
- The rated speed can not be greater than or equal to 120f/p (f = rated frequency Pr.01-01/01-35; P: number of motor poles Pr.05-04/05-16).

Permanent Magnet Motor (PM)

Set Pr.05-00= 5 or 13 and press [Run] to begin auto tuning for PM motor. The measured values will be written into Pr.05-39 (Rs), Pr.05-40 & 41 (Ld & Lq) and Pr.05-43 (PM motor's Ke parameter).

To begin AUTO-Tuning for PM motor in rolling test:

1. Make sure all the parameters are reset to factory setting and the motor wiring installation is correct.

- For PM motor, set Pr.05-33=1 and complete the following settings according to your motor specifications, Pr.05-34 rated current, Pr.05-35 rated power, Pr.05-36 rated speed and Pr. 05-37 pole number. The acceleration time and deceleration time should be set according to your motor capacity.
- 3. Set Pr.05-00 to 5 and press [Run] to begin auto tuning for PM motor. Please be aware of the motor that it starts spinning as [Run] is pressed.
- 4. When auto-tuning is completed, please check if the measured values are written into Pr.05-39~05-41 and Pr.05-43 automatically.
 - Set Pr.05-00=4 and press [Run] to begin auto-tuning for PM motor PG offset angle. The measured value will be written into Pr.05-42 automatically.
 - ☑ Note 1: When execute auto-tuning for PM motor PG origin, please make sure the encoder setting are correct (Pr.10-00, 10-01, 10-02), otherwise the PG origin measure error and motor stall may occur.
 - ☑ Note 2: If PM motor runs in an opposite direction of the drive's command, switch any two of the UVW cable and re-connect, then execute PG origin search again. It is crucial to execute auto-tuning after the switch otherwise PG origin measure error and motor stall may occur.

Auto-tuning process for measuring PG offset angle of PM motor:

- 1. Set Pr.05-00=5 and press RUN, or manually input the values into Pr. 01-01, 05-34~-541 and Pr.05-43.
- 2. It is strongly suggested to remove the motor and unload before beings auto-tuning.
- 3. Set Pr.05-00=4 and press [Run] to begin auto-tuning. Please be aware of the motor that it starts spinning as [Run] is pressed.
- 4. When auto-tuning is completed, please check if the PG offset angle is written into Pr.05-42 automatically.

ΝΟΤΕ

When auto-tuning for PM motor is completed and the control mode setting is done, it is recommend to turn the drive's power off and restart again to ensure the drive operates according to the motor parameter settings.

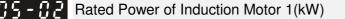
G 5 - **G 1** Full-load Current of Induction Motor 1 (A)

Unit: Amper Factory Setting: #.##

Settings 10 to 120% of drive's rated current

□ This value should be set according to the rated current of the motor as indicated on the motor nameplate. The factory setting is 90% X rated current.

Example: The rated current for 7.5HP (5.5kW) is 25 and factory setting is 22.5A. The range for setting will be 10~30A.(25*40%=10A and 25*120%=30A)



Factory Setting: #.##

Settings 0~655.35 kW

It is used to set rated power of the motor 1. The factory setting is the power of the drive.

G G G G G Rated Speed of Induction Motor 1 (rpm)

Factory Setting: 1710 (60Hz 4 poles) 1410 (50Hz 4 poles)

Settings 0~65535

It is used to set the rated speed of the motor and need to set according to the value indicated on the motor nameplate.

Before set up this parameter, you need to set up Pr05-04.

BS-BY Pole Number of Induction Motor 1

Settings 2~20

It is used to set the number of motor poles (must be an even number).

Set up Pr.05-04 before you set up Pr.05-03.

G S - **G S** No-load Current of Induction Motor 1 (A)

Unit: Amper

Factory Setting: 4

Factory Setting: #.##

Settings 0 to the factory setting in Pr.05-01

Definition The factory setting is 40% X rated current.

| 35 - 35 Stator Resistance(Rs) of Induction Motor 1 | |
|---|--|
| B 5 - B 7 Rotor Resistance(Rr) of Induction Motor 1 | |

Factory Setting: #.###

Settings 0~65.535Ω

| 85-88 | Magnetizing Inductance(Lm) of Induction Motor 1 |
|-------|---|
| 05-09 | Stator inductance(Lx) of Induction Motor 1 |

Factory Setting: #.#

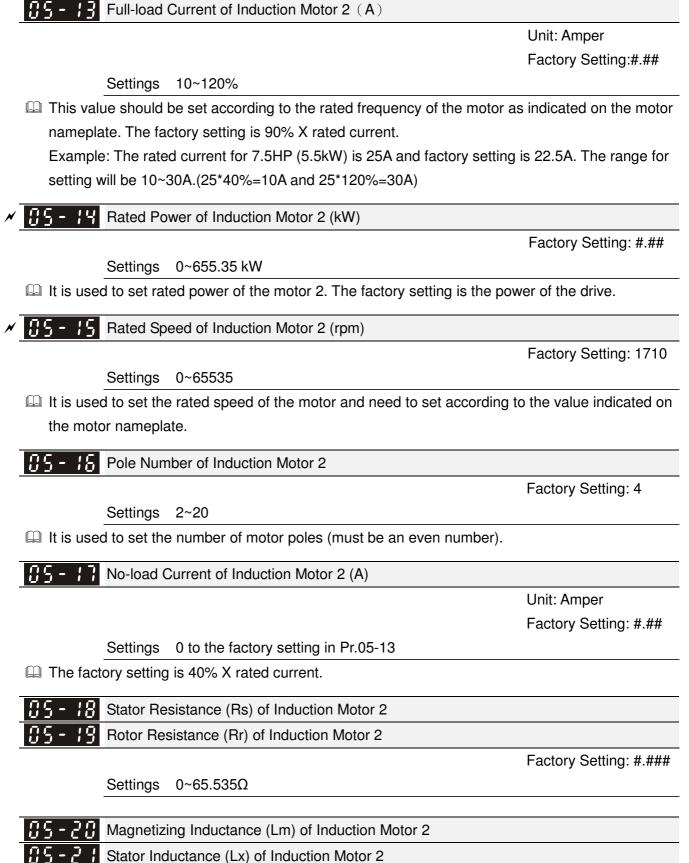
Settings 0~6553.5mH

 05 - 10

 ~

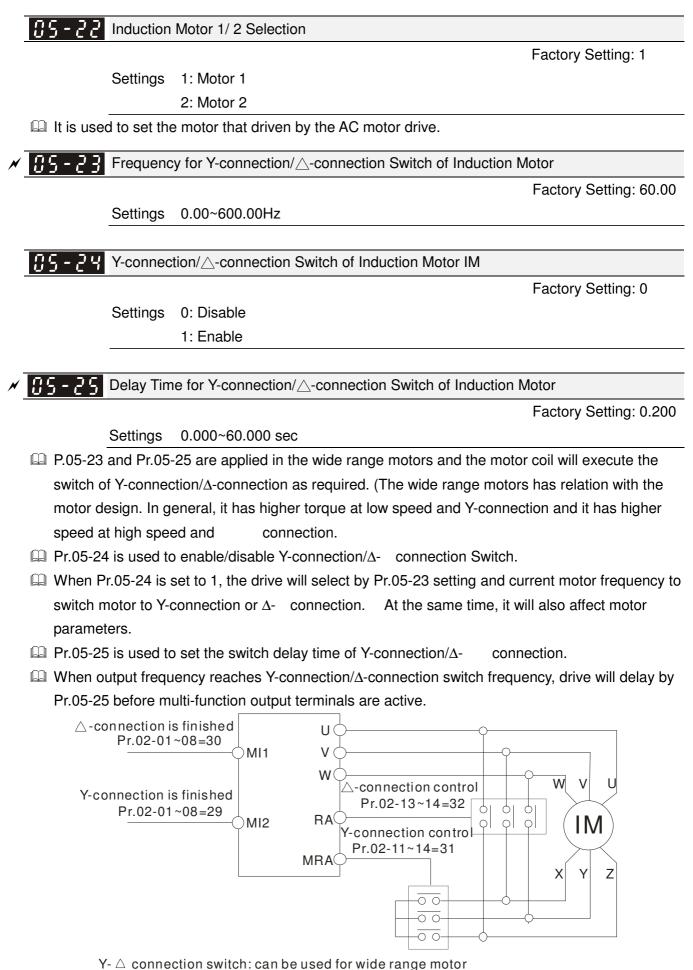
 Reserved

 05 - 12



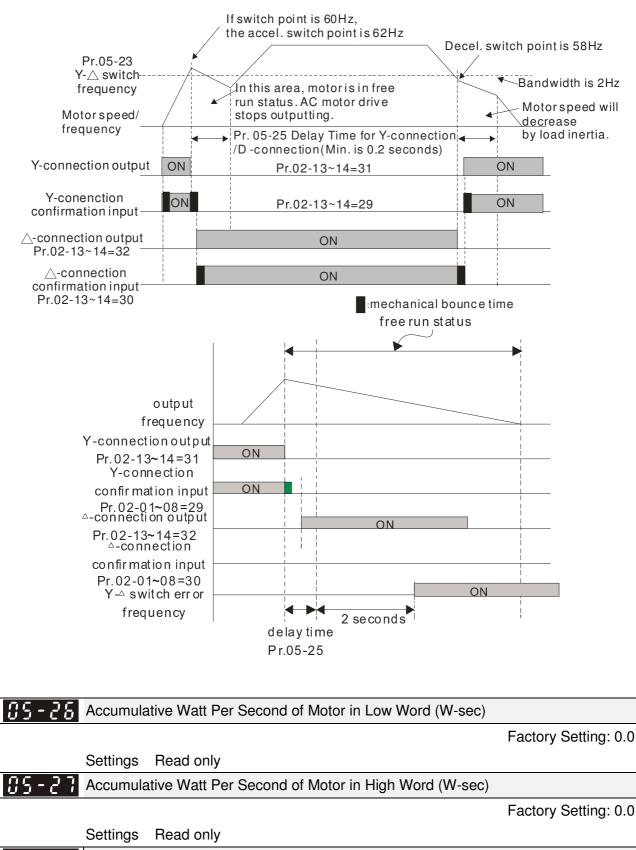
Factory Setting: #.#

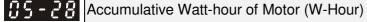
Settings 0~6553.5 mH



Y -connection for low speed: higher torque can be used for rigid tapping

 \triangle -connection for high speed: higher torque can be used for high-speed drilling





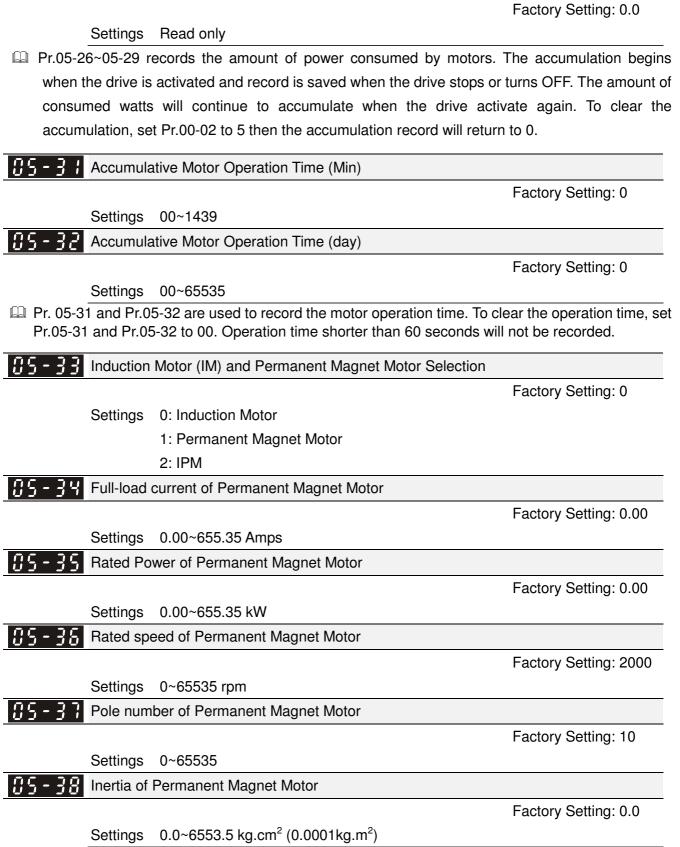
Factory Setting: 0.0



Factory Setting: 0.0

Settings Read only

Accumulative Watt-hour of Motor in High Word (KW-Hour)



This parameter setting is defined in **kg-cm²**. If this measure is not familiar to you, please refer to the chart below. (Delta's motor inertia chart is for reference purpose only.)

| Rated Power(kW) | 0.1 | 0.2 | 0.4 | 0.4 | 0.75 | 1 | 2 | |
|---------------------------|------------|--------------|------------|-----------|------------|------------|------------|------------|
| Rotor inertia (kg.m^2) | 3.70E-06 | 1.77E-05 | 2.77E-05 | 6.80E-05 | 1.13E-04 | 2.65E-04 | 4.45E-04 | |
| Delta Motor (Mid to H | ligh Iner | tia mode | el) | | | | | |
| Rated Power(kW) | 0.5 | 1 | 1.5 | 2 | 2 | 0.3 | 0.6 | 0.9 |
| Rotor inertia (kg.m^2) | 8.17E-04 | 8.41E-04 | 1.12E-03 | 1.46E-03 | 3.47E-03 | 8.17E-04 | 8.41E-04 | 1.12E-03 |
| ※ For more information | tion on m | notor iner | tia value, | please r | efer to Pr | .11-01. | | |
| 5 - 3 9 Stator Resista | ance of P | M Motor | | | | | | |
| | | | | | | Fa | actory Se | tting: 0.0 |
| Settings 0.0 | 00~65.5 | 35Ω | | | | | | |
| 5 - 48 Permanent M | lagnet Mo | otor Ld | | | | | | |
| | | | | | | Fa | actory Se | tting: 0.0 |
| Settings 0.0 | 0~655.3 | 5 mH | | | | | | |
| - 🕂 🕴 Permanent M | lagnet Mo | otor Lq | | | | | | |
| | | | | | | Fa | actory Se | tting: 0.0 |
| Settings 0.0 | 0~655.3 | 5 mH | | | | | | |
| FAR Offset and | gle of PN | l Motor | | | | | | |
| | | | | | | Fa | actory Se | tting: 0 |
| Settings 0.0 |)~360.0° | | | | | | | |
| When Pr.05-00 is set t | o 4, the c | drive will o | detect off | set angle | and write | e into Pr. | 05-42. | |
| - 4 3 Ke parameter | r of PM M | lotor | | | | | | |
| | | | | | | U | nit: V/100 | 00rpm |
| | | | | | | | | |

Settings 0~65535

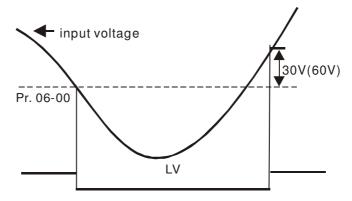
06 Protection Parameters

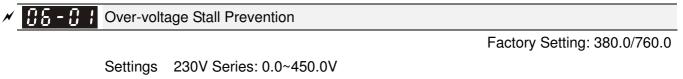
✓ This parameter can be set during operation.

| × 08-00 I | Low Voltage Level |
|-----------|-------------------|
|-----------|-------------------|

| | | Factory Setting: |
|----------|--|------------------|
| Settings | 230V Series: | |
| | Frame A to D: 150.0~ 220.0 Vdc | 180.0 |
| | Frame E and frames above E: 190.0~220.0V | 200.0 |
| | Frame A to D: | |
| | 460V Series: 300.0~440.0V | 360.0 |
| | Frame E and frames above E: 380.0~440.0V | 400.0 |

It is used to set the level. When the DC BUS voltage is lower than Pr06-00 Low voltage level, drive will stop output and free to stop.

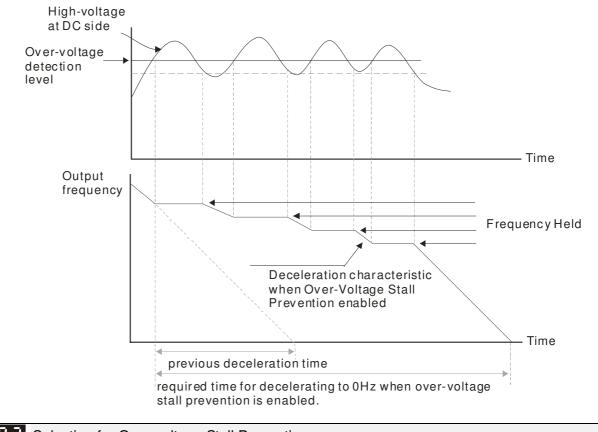




Settings 230V Series: 0.0~450.0V 460V Series:0.0~900.0V 0: Disabled

- When Pr.06-01 is set to 0.0, the over-voltage stall prevention function is disabled. When braking units or resistors are connected to the drive, this setting is suggested.
- During deceleration, the DC bus voltage may exceed its Maximum Allowable Value due to motor regeneration. When this function is enabled, the AC motor drive will not decelerate further and keep the output frequency constant until the voltage drops below the preset value again.
- This function is used for the occasion that the load inertia is unsure. When it stops in the usual load, the over-voltage won't occur during deceleration and fulfill the setting of deceleration time. Sometimes, it may not stop due to over-voltage during decelerating to stop when increasing the load regenerative inertia. At this moment, the AC drive will auto add the deceleration time until drive stop.
- When the over-voltage stall prevention is enabled, drive deceleration time will be larger than the setting.
- I When there is any problem as using deceleration time, refer to the following items to solve it.
 - 1. Add the suitable deceleration time.
 - 2. Add brake resistor (refer to appendix B-1 for details) to consume the electrical energy that regenerated from the motor with heat type.

Related parameters: Pr.01-13, 01-15, 01-17, 01-19 (settings of decel. time 1~4), Pr.02-13~02-14 (Multi-function Output 1 RY1, RY2), Pr. 02-16~02-17 Multi-function Output (MO1, 2)



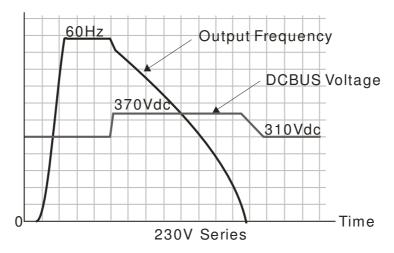
36 - 32 Selection for Over-voltage Stall Prevention

Factory Setting: 0

Settings 0: Traditional over-voltage stall prevention

1: Smart over-voltage prevention

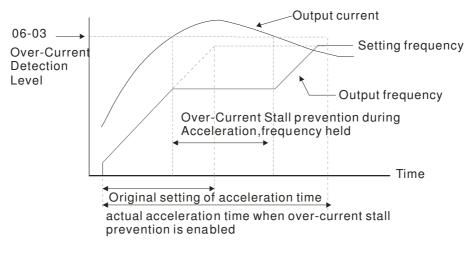
When Pr.06-02 is set to 1, the drive will maintain DCbus voltage when decelerating and prevent OV.



- 1 3 Over-current Stall Prevention during Acceleration

Settings Super Heavy duty: 0~180% (100%: drive's rated current) Factory Setting: 150

- Donly functional under VF, VFPG and SVC mode
- If the motor load is too large or drive acceleration time is too short, the AC drive output current may increase abruptly during acceleration and it may cause motor damage or trigger protection functions (OL or OC). This parameter is used to prevent this situation.
- During acceleration, the AC drive output current may increase abruptly and exceed the value specified by Pr.06-03 due to rapid acceleration or excessive load on the motor. When this function is enabled, the AC drive will stop accelerating and keep the output frequency constant until the current drops below the maximum value.
- When the over-current stall prevention is enabled, drive acceleration time will be larger than the setting.
- When the Over-Current Stall Prevention occurs due to too small motor capacity or in the factory setting, please decrease Pr.06-03 setting.
- Description when there is any problem by using acceleration time, refer to the following items to solve it.
- Related parameters: Pr.01-12, 01-14, 01-16, 01-18 (settings of accel. time 1~4), Pr.01-44
 - 1. Add the suitable acceleration time.
 - 2. Setting Pr.01-44 Optimal Acceleration/Deceleration Setting to 1, 3 or 4 (auto accel.)
- Optimal Acceleration/Deceleration Setting, Pr.02-13~02-14 (Multi-function Output 1 RY1, RY2), Pr. 02-16~02-17 Multi-function Output (MO1, 2)

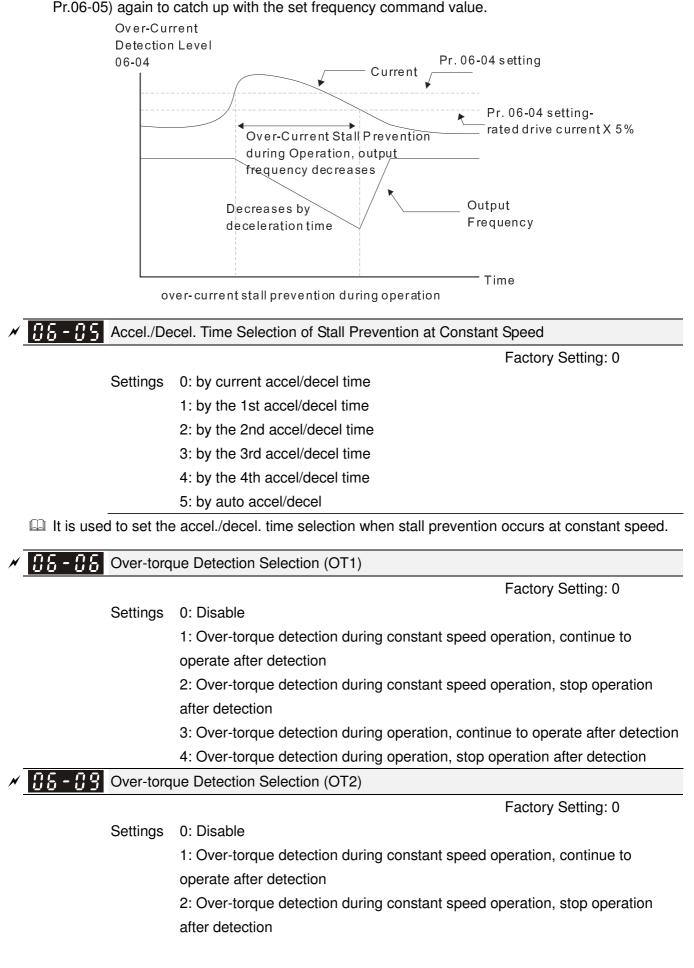




Settings Super Heavy Duty: 0~200% (100%: drive's rated current) Factory Setting: 150

- Donly functional under VF, VFPG and SVC mode
- It is a protection for drive to auto decrease output frequency when the motor is over-load abruptly during motor constant operation.
- If the output current exceeds the setting specified in Pr.06-04 when the drive is operating, the drive will decrease its output frequency (according to Pr.06-05) to prevent the motor stall. If the output

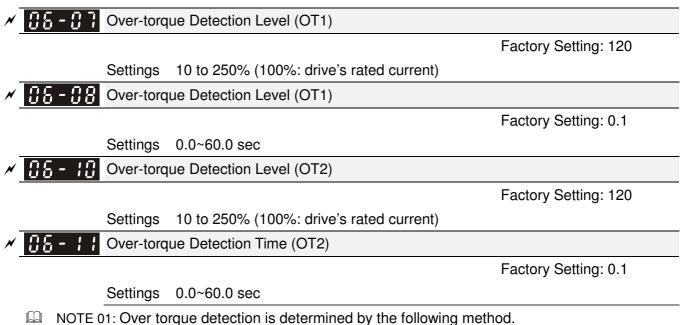
current is lower than the setting specified in Pr.06-04, the drive will accelerate (according to Pr.06.05) again to acted up with the set frequency command value



3: Over-torque detection during operation, continue to operation after detection

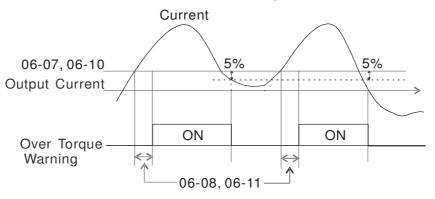
4: Over-torque detection during operation, stop operation after detection

- When Pr.06-06 and Pr.06-09 are set to 1 or 3, it will display a warning message and won't have an abnormal record.
- When Pr.06-06 and Pr.06-09 are set to 2 or 4, it will display a warning message and will have an abnormal record.



if the output current exceeds the over-torque detection level (Pr06-07, factory setting: 150%) and also exceeds Pr06-08, the Over Torque Detection will follow the setting of Pr06-06 and Pr06-09.

NOTE02: When Pr06-06 or Pr06-09 is set to 1 or 3, the motor drive will have the ot1/ot2 warning after Over Torque Detection. But the motor drive will keep running but only until the output current is smaller than the 5% of the rated current, the warning will be off.



NOTE03: When Pr06-06 or Pr06-09 is set to 2 or 4, the motor drive will have the ot1/ot2 fault after Over Torque Detection. Then the motor drive stop running until it is manually reset.

Current Limit

Factory Setting: 170

Settings 0~250% (100%: drive's rated current)

Pr.06-12 sets the maximum output current of the drive. Pr.06-12 and Pr.11-17 ~ Pr.11-20 are used to set the drive's output current limit. When the drive is in VF, SVC or VFPG control mode, output frequency will decreases as the output current reaches current limit. It is a current stall prevention.

| × | Electronic Thermal Relay Selection (Motor 1) | |
|---|---|--|
| N | B - 2 7 Electronic Thermal Relay Selection (Motor 2) | |
| - | Factory Setting: 2 | |

0: Constant torque output motor Settings

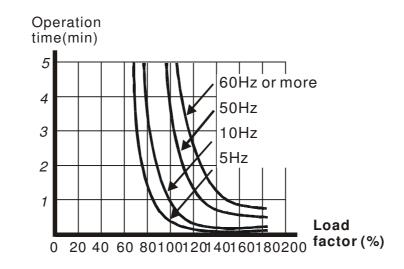
- 1: Variable torque output motor
- 2: Disable

It is used to prevent self-cooled motor overheats under low speed. User can use electronic thermal relay to limit driver's output power.

| × | CS- : Electronic Thermal Characteristic for Motor 1 | |
|---|---|--|
| × | 36 - 28 Electronic Thermal Characteristic for Motor 2 | |
| | Factory Setting: 60.0 | |

Settings 30.0~600.0 sec

Department of Pr.06-14 and Pr.06-28 to prevent the motor damaged from overheating. When it reaches the setting, it will display "EoL1/EoL2" and the motor will be in free running.



🗡 88 - 75 Heat Sink Over-heat (OH) Warning

Factory Setting: 85.0

Settings 0.0~110.0°C

Pr.06-15 sets the heatsink temperature level of the drive. The drive will output an overheating warning when the temperature exceeds the setting of Pr.06-15. If the setting of Pr.06-15 is higher than the default setting of the drive, the drive will use the default setting level for warning output. Capacitor (CAP) overheating level is set by the drive's default setting, it can not be adjusted.

| Over-hea | ting Level (℃ |) | Over-heating Level (°C) | | |
|-------------------|---------------|----------|--------------------------------------|----------|----------|
| Model | IGBT OH1 | CAP OH 2 | Model | IGBT OH1 | CAP OH 2 |
| VFD007CH23A-21 | 100 | 90 | VFD075CH43A-21 | 95 | 75 |
| VFD015CH23A-21 | 100 | 90 | VFD110CH43A-21 | 95 | 75 |
| VFD022CH23A-21 | 100 | 90 | VFD150CH43A-21 | 95 | 75 |
| VFD037CH23A-21 | 100 | 95 | VFD185CH43A-21 | 95 | 80 |
| VFD055CH23A-21 | 100 | 75 | VFD220CH43A-21 | 95 | 80 |
| VFD075CH23A-21 | 100 | 75 | VFD300CH43A-21 | 100 | 80 |
| VFD110CH23A-21 | 100 | 75 | VFD370CH43A-00/21; VFD370CH43S-21 | 95 | 60 |
| VFD150CH23A-21 | 95 | 75 | VFD450CH43A-00/21 | 95 | 60 |
| VFD185CH23A-21 | 95 | 70 | VFD550CH43A-00/21 | 100 | 60 |
| VFD220CH23A-00/21 | 95 | 70 | VFD750CH43A-00/21 | 100 | 60 |
| VFD300CH23A-00/21 | 95 | 60 | VFD900CH43A-00/21 | 100 | 60 |
| VFD370CH23A-00/21 | 95 | 60 | VFD1100CH43A-00/21 | 100 | 60 |
| VFD450CH23A-00/21 | 100 | 60 | VFD1320CH43A-00/21 | 100 | 60 |
| VFD550CH23A-00/21 | 100 | 60 | VFD1600CH43A-00/21 | 100 | 60 |
| VFD750CH23A-00/21 | 100 | 60 | VFD1850CH43A-00/21 | 100 | 65 |
| VFD007CH43A-21 | 100 | 90 | VFD2200CH43A-00/21 | 100 | 65 |
| VFD015CH43A-21 | 100 | 90 | VFD2800CH43A-00 | 100 | 65 |
| VFD022CH43A-21 | 100 | 95 | VFD2800CH43C-00/21 | 100 | 65 |
| VFD037CH43A-21 | 100 | 100 | | | |
| VFD055CH43A-21 | 100 | 95 | | | |

Stall Prevention Limit Level (Flux weakening area current stall prevention level)

Factory Setting: 50

Settings 0~100% (Refer to Pr.06-03, Pr.06-04)

When operation frequency is larger than Pr.01-01; e.g. Pr06-03=150%, Pr. 06-04=100% and Pr. 06-16=80%:

Calculate the Stall Prevention Level during acceleration: Pr.06-03 * Pr.06-16=150x80%=120%. Calculate the Stall Prevention Level at constant speed: Pr.06-04 * Pr.06-16=100x80%=80%.

| 35 - 17 Present Fault Record |
|--|
| 38 - 18 Second Most Recent Fault Record |
| 38 - 19 Third Most Recent Fault Record |
| 38-23 Fourth Most Recent Fault Record |
| 38-21 Fifth Most Recent Fault Record |
| 38-22 Sixth Most Recent Fault Record |
| Settings |

0: No fault record

1: Over-current during acceleration (ocA)

2: Over-current during deceleration (ocd)

- 3: Over-current during constant speed(ocn)
- 4: Ground fault (GFF)
- 5: IGBT short-circuit (occ)

- 6: Over-current at stop (ocS)
- 7: Over-voltage during acceleration (ovA)
- 8: Over-voltage during deceleration (ovd)
- 9: Over-voltage during constant speed (ovn)
- 10: Over-voltage at stop (ovS)
- 11: Low-voltage during acceleration (LvA)
- 12: Low-voltage during deceleration (Lvd)
- 13: Low-voltage during constant speed (Lvn)
- 14: Stop mid-low voltage (LvS)
- 15: Phase loss protection (OrP)
- 16: IGBT over-heat (oH1)
- 17: Capacitance over-heat (oH2) (for 40hp above)
- 18: tH1o (TH1 open: IGBT over-heat protection error)
- 19: tH2o (TH2 open: capacitance over-heat protection error)
- 20: Reserved
- 21: Drive over-load (oL)
- 22: Electronics thermal relay 1 (EoL1)
- 23: Electronics thermal relay 2 (EoL2)
- 24: Motor PTC overheat (oH3) (PTC)
- 25: Reserved
- 26: Over-torque 1 (ot1)
- 27: Over-torque 2 (ot2)
- 28: Low current (uC)
- 29: Home limit error (LMIT)
- 30: Memory write-in error (cF1)
- 31: Memory read-out error (cF2)
- 32: Reserved
- 33: U-phase current detection error (cd1)
- 34: V-phase current detection error (cd2)
- 35: W-phase current detection error (cd3)
- 36: Clamp current detection error (Hd0)
- 37: Over-current detection error (Hd1)
- 38: Over-voltage detection error (Hd2)
- 39: occ IGBT short circuit detection error (Hd3)
- 40: Auto tuning error (AUE)
- 41: PID feedback loss (AFE)
- 42: PG feedback error (PGF1)
- 43: PG feedback loss (PGF2)
- 44: PG feedback stall (PGF3)
- 45: PG slip error (PGF4)

- 46: PG ref loss (PGr1)
- 47: PG ref loss (PGr2)
- 48: Analog current input loss (ACE)
- 49: External fault input (EF)
- 50: Emergency stop (EF1)
- 51: External Base Block (bb)
- 52: Password error (PcodE)
- 53: Reserved
- 54: Communication error (CE1)
- 55: Communication error (CE2)
- 56: Communication error (CE3)
- 57: Communication error (CE4)
- 58: Communication Time-out (CE10)
- 59: PU Time-out (CP10)
- 60: Brake transistor error (bF)
- 61: Y-connection/ connection switch error (ydc)
- 62: Decel. Energy Backup Error (dEb)
- 63: Slip error (oSL)
- 64: Electromagnet switch error (ryF)
- 65 : PG Card Error (PGF5)
- 66~67: Reserved
- 68: Sensorless estimated speed has wrong direction
- 69: Sensorless estimated speed is over-speed
- 70: Sensorless estimated speed deviated
- 71: Reserved
- 72: STO loss 1
- 73: External safety gate S1
- 74~75: Reserved
- 76: STO
- 77: STO loss 2
- 78: STO loss 3
- 79: Uocc U phase over current (Detection begins as RUN is pressed, software protection)
- 80: Vocc V phase over current (Detection begins as RUN is pressed, software protection)
- 81: Wocc W phase over current (Detection begins as RUN is pressed, software protection)
- 82: OPHL U phase output phase loss
- 83: OPHL Vphase output phase loss
- 84: OPHL Wphase output phase loss
- 85~100: Reserved
- 101: CGdE CANopen software disconnect1
- 102: CHbE CANopen software disconnect2

103: CSYE CANopen synchronous error

104: CbFE CANopen hardware disconnect

105: CIdE CANopen index setting error

106: CAdE CANopen slave station number setting error

107: CFrE CANopen index setting exceed limit

108~110: Reserved

111: InrCOM Internal communication overtime error

- When the fault occurs and force stopping, it will record in this parameter.
- At stop with low voltage Lv (LvS warn, no record). During operation with mid-low voltage Lv (LvA, Lvd, Lvn error, will record).
- Setting 62: when dEb function is enabled, the drive will execute dEb and record to the Pr.06-17 to Pr.06-22 simultaneously.

| | 36-23 Fault Output Option 1 |
|---|------------------------------------|
| × | SE-24 Fault Output Option 2 |
| | 38-25 Fault Output Option 3 |
| N | 38-28 Fault Output Option 4 |
| | |

Factory Setting: 0

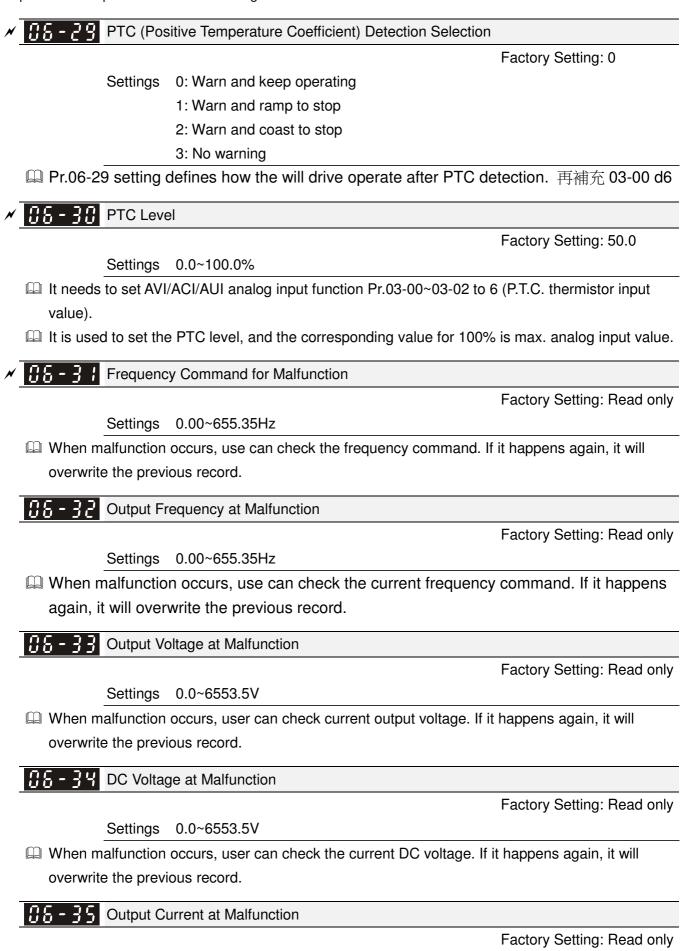
Settings 0 to 65535 sec (refer to bit table for fault code)

These parameters can be used with multi-function output (set to 35-38) for the specific requirement. When the fault occurs, the corresponding terminals will be activated (It needs to convert binary value to decimal value to fill in Pr.06-23 to Pr.06-26).

| Fault Cada | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 |
|---|---------|-------|------|------|------|------|------|
| Fault Code | current | Volt. | OL | SYS | FBK | EXI | CE |
| 0: No fault | | | | | | | |
| 1: Over-current during acceleration (ocA) | • | | | | | | |
| 2: Over-current during deceleration (ocd) | • | | | | | | |
| 3: Over-current during constant speed(ocn) | • | | | | | | |
| 4: Ground fault (GFF) | • | | | | | | |
| 5: IGBT short-circuit (occ) | • | | | | | | |
| 6: Over-current at stop (ocS) | • | | | | | | |
| 7: Over-voltage during acceleration (ovA) | | • | | | | | |
| 8: Over-voltage during deceleration (ovd) | | • | | | | | |
| 9: Over-voltage during constant speed (ovn) | | • | | | | | |
| 10: Over-voltage at stop (ovS) | | • | | | | | |
| 11: Low-voltage during acceleration (LvA) | | • | | | | | |
| 12: Low-voltage during deceleration (Lvd) | | • | | | | | |
| 13: Low-voltage during constant speed (Lvn) | | • | | | | | |
| 14: Stop mid-low voltage (LvS) | | • | | | | | |
| 15: Phase loss protection (OrP) | | • | | | | | |
| 16: IGBT over-heat (oH1) | | | • | | | | |

| 17: Capacitance over-heat (oH2) I | Fault Code | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 |
|--|--|------|-------|------|------|------|------|------|
| 18: H10 (TH1 open) • | | | Volt. | OL | SYS | FBK | EXI | CE |
| 19: H20 (TH2 open) • | | | | • | | | | |
| 20: Reserved 21: Drive over-load (oL) • | | | | • | | | | |
| 21: Drive over-load (oL) • </td <td></td> <td></td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> | | | | • | | | | |
| 22: Electronics thermal relay 1 (EoL1) • | | 1 | | | | | | |
| 23: Electronics thermal relay 2 (EoL2) • | | | | • | | | | |
| 24: Motor PTC overheat (oH3) (PTC) • | 22: Electronics thermal relay 1 (EoL1) | | | • | | | | |
| 25: Reserved 26: Over-torque 1 (ot1) • • • 27: Over-torque 2 (ot2) • • • 28: Low current (uC) • • • • 28: Low current (uC) • • • • • 29: Home limit error (LMIT) • • • • • 30: Memory write-in error (cF1) • • • • • • 31: Memory read-out error (cF2) • </td <td>23: Electronics thermal relay 2 (EoL2)</td> <td></td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> | 23: Electronics thermal relay 2 (EoL2) | | | • | | | | |
| 26: Over-torque 1 (ot1) • <td>24: Motor PTC overheat (oH3) (PTC)</td> <td></td> <td></td> <td>•</td> <td></td> <td></td> <td></td> <td></td> | 24: Motor PTC overheat (oH3) (PTC) | | | • | | | | |
| 27: Over-torque 2 (ot2) • <td>25: Reserved</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | 25: Reserved | | | | | | | |
| 28: Low current (uC) • • • • • 29: Home limit error (LMIT) • • • • • 30: Memory write-in error (cF1) • • • • • 31: Memory read-out error (cF2) • • • • • • 32: Reserved • • • • • • • • 33: U-phase current detection error (cd2) • | 26: Over-torque 1 (ot1) | | | • | | | | |
| 29: Home limit error (LMIT) Image: Constraint of the second s | 27: Over-torque 2 (ot2) | | | • | | | | |
| 30: Memory write-in error (cF1) • | 28: Low current (uC) | • | | | | | | |
| 31: Memory read-out error (cF2) • | 29: Home limit error (LMIT) | | | | | | • | |
| 32: Reserved 33: U-phase current detection error (cd1) • 34: V-phase current detection error (cd2) • 35: W-phase current detection error (cd3) • 36: Clamp current detection error (Hd0) • 37: Over-current detection error (Hd1) • 38: Over-voltage detection error (Hd2) • 39: occ IGBT short circuit detection error (Hd3) • 40: Auto tuning error (AUE) • 41: PID feedback loss (AFE) • 42: PG feedback error (PGF1) • 43: PG feedback loss (PGF2) • 44: PG feedback stall (PGF3) • 45: PG slip error (PGF4) • 46: PG ref loss (PGr1) • 47: PG ref loss (PGr2) • 48: Analog current input loss (ACE) • 49: External fault input (EF) • 50: Emergency stop (EF1) • 51: External Base Block (bb) • 52: Password error (PcodE) • 53: Reserved • | 30: Memory write-in error (cF1) | | | | • | | | |
| 33: U-phase current detection error (cd1) • • • 34: V-phase current detection error (cd2) • • • 35: W-phase current detection error (cd3) • • • 36: Clamp current detection error (Hd0) • • • • 37: Over-current detection error (Hd1) • • • • 38: Over-voltage detection error (Hd2) • • • • 39: occ IGBT short circuit detection error (Hd3) • • • • 40: Auto tuning error (AUE) • • • • • 41: PID feedback loss (AFE) •< | 31: Memory read-out error (cF2) | | | | • | | | |
| 34: V-phase current detection error (cd2) • • • • 35: W-phase current detection error (cd3) • • • • 36: Clamp current detection error (Hd0) • • • • • 37: Over-current detection error (Hd1) • • • • • • 38: Over-voltage detection error (Hd2) • • • • • • 39: occ IGBT short circuit detection error (Hd3) • <t< td=""><td>32: Reserved</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | 32: Reserved | | | | | | | |
| 35: W-phase current detection error (cd3) • • • • 36: Clamp current detection error (Hd0) • • • • 37: Over-current detection error (Hd1) • • • • 38: Over-voltage detection error (Hd2) • • • • 39: occ IGBT short circuit detection error (Hd3) • • • • 40: Auto tuning error (AUE) • • • • • 41: PID feedback loss (AFE) • | 33: U-phase current detection error (cd1) | | | | • | | | |
| 36: Clamp current detection error (Hd0)•••37: Over-current detection error (Hd1)•••38: Over-voltage detection error (Hd2)•••39: occ IGBT short circuit detection error (Hd3)•••40: Auto tuning error (AUE)•••41: PID feedback loss (AFE)•••42: PG feedback error (PGF1)•••43: PG feedback loss (PGF2)•••44: PG feedback stall (PGF3)•••45: PG slip error (PGF4)•••46: PG ref loss (PGr1)•••47: PG ref loss (PGr2)•••48: Analog current input loss (ACE)••49: External fault input (EF)••50: Emergency stop (EF1)••51: External Base Block (bb)••52: Password error (PcodE)••53: Reserved• | 34: V-phase current detection error (cd2) | | | | • | | | |
| 37: Over-current detection error (Hd1)••••38: Over-voltage detection error (Hd2)••••39: occ IGBT short circuit detection error (Hd3)••••40: Auto tuning error (AUE)••••41: PID feedback loss (AFE)••••42: PG feedback error (PGF1)••••43: PG feedback loss (PGF2)••••44: PG feedback stall (PGF3)••••45: PG slip error (PGF4)••••46: PG ref loss (PGr1)••••47: PG ref loss (PGr2)••••48: Analog current input loss (ACE)•••49: External fault input (EF)••••50: Emergency stop (EF1)••••51: External Base Block (bb)••••52: Password error (PcodE)••••53: Reserved•••• | 35: W-phase current detection error (cd3) | | | | • | | | |
| 38: Over-voltage detection error (Hd2) • • • 39: occ IGBT short circuit detection error (Hd3) • • • 40: Auto tuning error (AUE) • • • • 41: PID feedback loss (AFE) • • • • • 42: PG feedback loss (AFE) • • • • • • 43: PG feedback kerror (PGF1) • • • • • • • 44: PG feedback stall (PGF3) •< | 36: Clamp current detection error (Hd0) | | | | • | | | |
| 39: occ IGBT short circuit detection error (Hd3) • • • 40: Auto tuning error (AUE) • • • 41: PID feedback loss (AFE) • • • 42: PG feedback error (PGF1) • • • • 43: PG feedback loss (PGF2) • • • • 44: PG feedback stall (PGF3) • • • • 45: PG slip error (PGF4) • • • • 46: PG ref loss (PGr1) • • • • 47: PG ref loss (PGr2) • • • • 48: Analog current input loss (ACE) • • • • 49: External fault input (EF) • • • • 50: Emergency stop (EF1) • • • • 51: External Base Block (bb) • • • • • 52: Password error (PcodE) • • • • • • 53: Reserved • • • • • • • | 37: Over-current detection error (Hd1) | | | | • | | | |
| 40: Auto tuning error (AUE)••41: PID feedback loss (AFE)••42: PG feedback error (PGF1)••43: PG feedback loss (PGF2)••44: PG feedback stall (PGF3)••45: PG slip error (PGF4)••46: PG ref loss (PGr1)••47: PG ref loss (PGr2)••48: Analog current input loss (ACE)••49: External fault input (EF)••50: Emergency stop (EF1)••51: External Base Block (bb)••52: Password error (PcodE)•• | 38: Over-voltage detection error (Hd2) | | | | • | | | |
| 41: PID feedback loss (AFE)•42: PG feedback error (PGF1)•43: PG feedback loss (PGF2)•44: PG feedback stall (PGF3)•45: PG slip error (PGF4)•46: PG ref loss (PGr1)•47: PG ref loss (PGr2)•48: Analog current input loss (ACE)•49: External fault input (EF)•50: Emergency stop (EF1)•51: External Base Block (bb)•52: Password error (PcodE)•53: Reserved | 39: occ IGBT short circuit detection error (Hd3) | | | | • | | | |
| 42: PG feedback error (PGF1)•43: PG feedback loss (PGF2)•44: PG feedback stall (PGF3)•45: PG slip error (PGF4)•46: PG ref loss (PGr1)•47: PG ref loss (PGr2)•48: Analog current input loss (ACE)•49: External fault input (EF)•50: Emergency stop (EF1)•51: External Base Block (bb)•52: Password error (PcodE)•53: Reserved | 40: Auto tuning error (AUE) | | | | • | | | |
| 43: PG feedback loss (PGF2)••44: PG feedback stall (PGF3)••45: PG slip error (PGF4)••46: PG ref loss (PGr1)••47: PG ref loss (PGr2)••48: Analog current input loss (ACE)••49: External fault input (EF)••50: Emergency stop (EF1)••51: External Base Block (bb)••52: Password error (PcodE)••53: Reserved•• | 41: PID feedback loss (AFE) | | | | | • | | |
| 44: PG feedback stall (PGF3)•45: PG slip error (PGF4)•46: PG ref loss (PGr1)•47: PG ref loss (PGr2)•48: Analog current input loss (ACE)•49: External fault input (EF)•50: Emergency stop (EF1)•51: External Base Block (bb)•52: Password error (PcodE)•53: Reserved | 42: PG feedback error (PGF1) | | | | | • | | |
| 45: PG slip error (PGF4)•46: PG ref loss (PGr1)•47: PG ref loss (PGr2)•48: Analog current input loss (ACE)•49: External fault input (EF)•50: Emergency stop (EF1)•51: External Base Block (bb)•52: Password error (PcodE)•53: Reserved | 43: PG feedback loss (PGF2) | | | | | • | | |
| 46: PG ref loss (PGr1)•47: PG ref loss (PGr2)•48: Analog current input loss (ACE)•49: External fault input (EF)•50: Emergency stop (EF1)•51: External Base Block (bb)•52: Password error (PcodE)•53: Reserved | 44: PG feedback stall (PGF3) | | | | | • | | |
| 47: PG ref loss (PGr2) • • • 48: Analog current input loss (ACE) • • • 49: External fault input (EF) • • • 50: Emergency stop (EF1) • • • 51: External Base Block (bb) • • • 52: Password error (PcodE) • • • 53: Reserved • • • | 45: PG slip error (PGF4) | | | | | • | | |
| 47: PG ref loss (PGr2) • • • 48: Analog current input loss (ACE) • • • 49: External fault input (EF) • • • 50: Emergency stop (EF1) • • • 51: External Base Block (bb) • • • 52: Password error (PcodE) • • • 53: Reserved • • • | | | | | | • | | |
| 48: Analog current input loss (ACE) • • 49: External fault input (EF) • • 50: Emergency stop (EF1) • • 51: External Base Block (bb) • • 52: Password error (PcodE) • • 53: Reserved • • | | | | | | • | | |
| 49: External fault input (EF) • 50: Emergency stop (EF1) • 51: External Base Block (bb) • 52: Password error (PcodE) • 53: Reserved • | | | | | | • | | |
| 50: Emergency stop (EF1) • 51: External Base Block (bb) • 52: Password error (PcodE) • 53: Reserved • | | | | | | | • | |
| 51: External Base Block (bb) • 52: Password error (PcodE) • 53: Reserved • | | | | | | | • | |
| 52: Password error (PcodE) • 53: Reserved | | | | | | | • | |
| 53: Reserved | | | | | • | | | |
| | | 1 | | | | l | | |
| | 54: Communication error (CE1) | | | | | | | • |

| Fault Code | Bit0 | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 |
|--|---------|-------|------|------|------|------|------|
| | current | Volt. | OL | SYS | FBK | EXI | CE |
| 55: Communication error (CE2) | | | | | | | • |
| 56: Communication error (CE3) | | | | | | | • |
| 57: Communication error (CE4) | | | | | | | • |
| 58: Communication Time-out (CE10) | | | | | | | • |
| 59: PU Time-out (CP10) | | | | | | | • |
| 60: Brake transistor error (bF) | | | | | | • | |
| 61: Y-connection/ | | | | | | • | |
| (ydc) | | | | | | | |
| 62: Decel. Energy Backup Error (dEb) | | • | | | | | |
| 63: Slip error (oSL) | | | | | | • | |
| 64: Electromagnet switch error (ryF) | | | | | | • | |
| 65 : PG Card Error (PGF5) | | | | | | • | |
| 66-72: Reserved | | | | | | | |
| 73: External safety gate S1 | | | | • | | | |
| 74~78: Reserved | | | | | | | |
| 79: U phase over current (Uocc) | • | | | | | | |
| 80: V phase over current (Vocc) | • | | | | | | |
| 81: W phase over current (Wocc) | • | | | | | | |
| 82: OPHL U phase output phase loss | • | | | | | | |
| 83: OPHL Vphase output phase loss | • | | | | | | |
| 84: OPHL Wphase output phase loss | • | | | | | | |
| 85~100: Reserved | | | | | | | |
| 101: CGdE CANopen software disconnect1 | | | | | | | • |
| 102: CHbE CANopen software disconnect2 | | | | | | | • |
| 103: CSYE CANopen synchronous error | | | | | | | • |
| 104: CbFE CANopen hardware disconnect | | | | | | | • |
| 105: CIdE CANopen index setting error | | | | | | | • |
| 106: CAdE CANopen slave station number setting error | | | | | | | • |
| 107: CFrE CANopen index setting exceed limit | | | | | | | • |
| 108~110: Reserved | | | | | | | |
| 111: InrCOM Internal communication overtime error | | | | | | | ٠ |



Settings 0.00~655.35Amp

When malfunction occurs, user can check the current output current. If it happens again, it will overwrite the previous record.



IGBT Temperature at Malfunction

Factory Setting: Read only

Factory Setting: Read only

Settings 0.0~6553.5℃

When malfunction occurs, user can check the current IGBT temperature. If it happens again, it will overwrite the previous record.

35 - 37 Capacitance Temperature at Malfunction

Settings 0.0~6553.5℃

When malfunction occurs, user can check the current capacitance temperature. If it happens again, it will overwrite the previous record.

35 - 38 Motor Speed in rpm at Malfunction

Factory Setting: Read only

Settings 0.0~6553.5℃

When malfunction occurs, user can check the current motor speed in rpm. If it happens again, it will overwrite the previous record.

36-33 Torque Command at Malfunction

Factory Setting: Read only

Settings 0~65535

When malfunction occurs, user can check the current torque command. If it happens again, it will overwrite the previous record.

115 - 41 Status of Multi-function Input Terminal at Malfunction

Factory Setting: Read only

Settings 0000h~FFFh

35 - 4 Status of Multi-function Output Terminal at Malfunction

Factory Setting: Read only

Settings 0000h~FFFFh

When malfunction occurs, user can check the status of multi-function input/output terminals. If it happens again, it will overwrite the previous record.

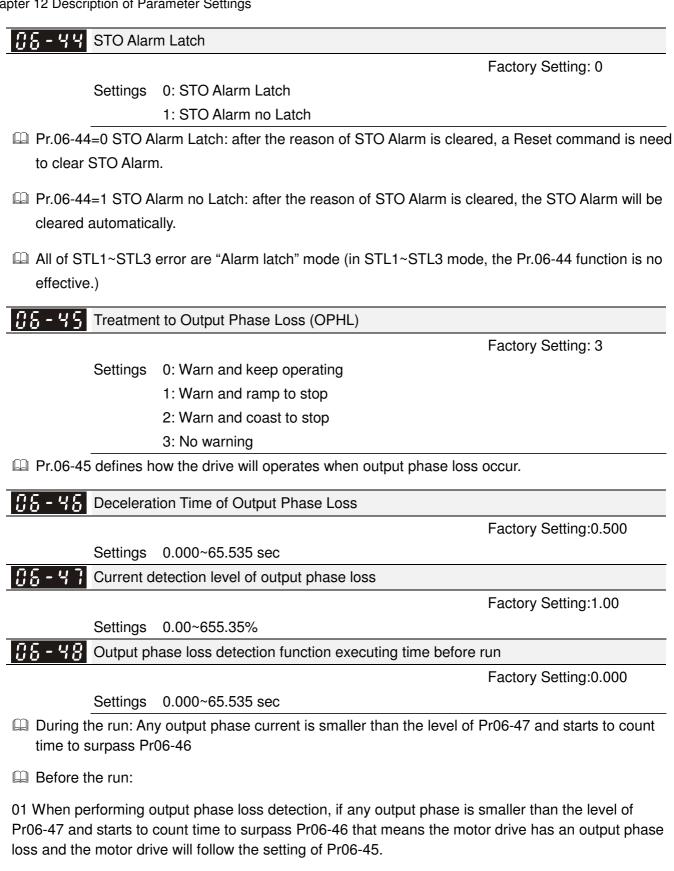
Drive Status at Malfunction

Factory Setting: Read only

Settings 0000H~FFFFh

When malfunction occurs, please check the drive status (communication address 2119H). If malfunction happens again, the previous record will be overwritten by this parameter.

B - **H B Reserved**



02 When Pr06-48 = 0, output phase loss detection before the run is disable.

03 The setting value of Pr06-48 must be larger than the setting of Pr06-46.

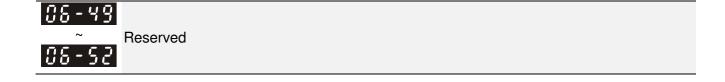


 Image: S - 53
 Treatment for the detected Input Phase Loss (OrP)

 Factory Setting: 0

 Settings
 0: warn, ramp to stop

 1: warn, coast to stop

 Over ripple protection

 When the DC BUS ripple is bigger than protection level, drive will trip up OrP and depending on how the parameter 06-53 is set to stop.

 Image: S - 54

 Reserved

 Image: S - 55

 Derating Protection

 Factory Setting: 0

 Settings
 0: constant rated current and limit carrier wave by load current and

- Settings 0: constant rated current and limit carrier wave by load current and temperature
 - 1: constant carrier frequency and limit load current by setting carrier wave
 - 2: constant rated current(same as setting 0), but close current limit

Setting 0:

When the rated current is constant, carrier frequency (Fc) outputted by PWM will auto decrease according to surrounding temperature, overload output current and time. If overload situation is not frequent and only cares the carrier frequency operated with the rated current for a long time and carrier wave changes during short overload, it is recommended to set to 0.

Refer to the following diagram for the level of carrier frequency. Take VFD007CH43A in super heavy duty as example, surrounding temperature 50°C with independent installation and UL open-type. When the carrier frequency is set to 15kHz, it corresponds to 72% rated output current. When it outputs higher than the value, it will auto decrease the carrier frequency. If the output is 83% rated current and the carrier frequency will decrease to 12kHz. In addition, it will also decrease the carrier frequency is 15kHz and the current is 120%*72%=86% for a minute, the carrier frequency will decrease to the factory setting.

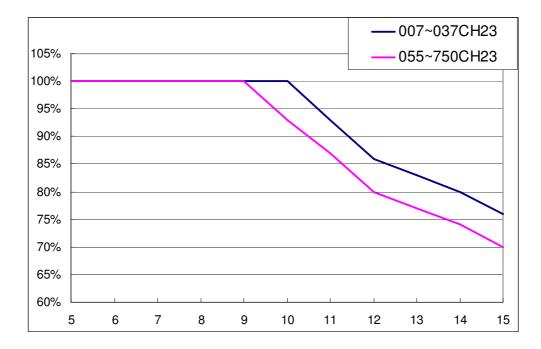
Setting 1:

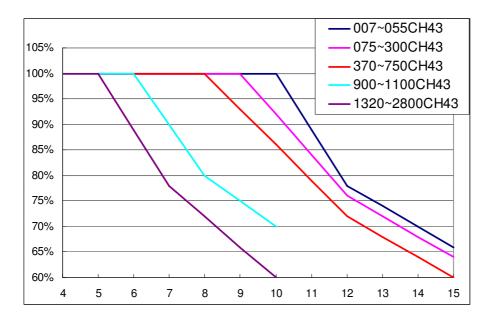
It is used for the fixed carrier frequency and prevents the carrier wave changes and motor noise caused by the surrounding temperature and frequent overload.

Refer to the following for the derating level of rated current. Take VFD007CH43A in super heavy duty as example, when the carrier frequency keeps in 15kHz and the rated current is decreased to 72%, it will have OL protection when the current is 120%*72%=86% for a minute. Therefore, it needs to operate by the curve to keep the carrier frequency.

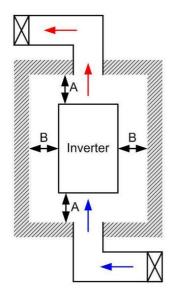
Setting 2:

It sets the protection method and action to 0 and disables the current limit for the Ratio*160% of output current in the normal duty and Ratio*180% of output current in the heavy duty. The advantage is that it can provide higher output current when the setting is higher than the factory setting of carrier frequency. The disadvantage is that it decreases carrier wave easily when overload.





It should be used with Pr. 00-16 and Pr.00-17 for setting.



- ** The mounting clearances stated in the figure is for installing the drive in an open area. To install the drive in a confined space (such as cabinet or electric box), please follow the following three rules: (1) Keep the minimum mounting clearances. (2) Install a ventilation equipment or an air conditioner to keep surrounding temperature lower than operation temperature. (3) Refer to parameter setting and set up Pr. 00-16, Pr.00-17, and Pr. 06-55.
- * The following table shows heat dissipation and the required air volume when installing a single drive in a confined space. When installing multiple drives, the required air volume shall be multiplied by the number the drives.
- * Refer to the chart (Air flow rate for cooling) for ventilation equipment design and selection.

* Refer to the chart (Power dissipation) for air conditioner design and selection. Minimum mounting clearances:

| Frame | A (mm) | B (mm) | C (mm) | D (mm) | | | | | | | | |
|-------|--------|--------|--------|-------------------|--|--|--|--|--|--|--|--|
| A~C | 60 | 30 | 10 | 0 | | | | | | | | |
| D~F | 100 | 50 | - | 0 | | | | | | | | |
| G | 200 | 100 | - | 0 | | | | | | | | |
| Н | 350 | 0 | 0 | 200 (100, Ta=40℃) | | | | | | | | |

| Air fl | Powe | r Dissipat | tion | | | | | | |
|---------------------------------------|----------|------------|-------|----------|----------------------|-------|------------------------------------|----------|-------|
| | Flow | Rate (cf | m) | Flow F | Rate (m ³ | /hr) | Power Di | (watt) | |
| Model No. | External | Internal | Total | External | Internal | Total | Loss External (Heat sink) | Internal | Total |
| VFD007CH23A-21 | - | - | - | - | - | - | 38 | 27 | 65 |
| VFD015CH23A-21 | 14 | - | 14 | 24 | - | 24 | 59 | 31 | 90 |
| VFD022CH23A-21 | 14 | - | 14 | 24 | - | 24 | 80 | 36 | 116 |
| VFD037CH23A-21 | 10 | - | 10 | 17 | - | 17 | 127 | 46 | 173 |
| VFD055CH23A-21 | 40 | 14 | 54 | 68 | 24 | 92 | 223 | 67 | 290 |
| VFD075CH23A-21 | 66 | 14 | 80 | 112 | 24 | 136 | 306 | 86 | 392 |
| VFD110CH23A-21 | 58 | 14 | 72 | 99 | 24 | 136 | 432 | 121 | 553 |
| VFD150CH23A-21 | 166 | 12 | 178 | 282 | 20 | 302 | 499 | 161 | 660 |
| VFD185CH23A-21 | 166 | 12 | 178 | 282 | 20 | 302 | 589 | 184 | 773 |
| VFD220CH23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 737 | 216 | 953 |
| VFD300CH23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1001 | 186 | 1187 |
| VFD370CH23A-00/23A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1064 | 220 | 1284 |
| VFD450CH23A-00/23A-21 | 228 | 73 | 301 | 387 | 124 | 511 | 1238 | 267 | 1505 |
| VFD550CH23A-00/23A-21 | 246 | 73 | 319 | 418 | 124 | 542 | 1505 | 308 | 1813 |
| VFD750CH23A-00/23A-21 | 224 | 112 | 346 | 381 | 190 | 571 | 1758 | 369 | 2127 |
| VFD007CH43A/4EA-21 | - | - | - | - | - | - | 43 | 25 | 68 |
| VFD015CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 59 | 29 | 88 |
| VFD022CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 76 | 33 | 109 |
| VFD037CH43A/4EA-21 | 10 | - | 10 | 17 | - | 17 | 118 | 42 | 160 |
| VFD055CH43A/4EA-21 | 14 | - | 14 | 24 | - | 24 | 152 | 46 | 198 |
| VFD075CH43A/4EA-21 | 40 | 14 | 54 | 68 | 24 | 92 | 260 | 76 | 336 |
| VFD110CH43A/4EA-21 | 58 | 14 | 72 | 99 | 24 | 124 | 348 | 93 | 441 |
| VFD150CH43A/4EA-21 | 58 | 14 | 72 | 99 | 24 | 124 | 469 | 122 | 591 |
| VFD185CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 445 | 138 | 583 |
| VFD220CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 509 | 158 | 667 |
| VFD300CH43A/4EA-21 | 99 | 21 | 120 | 168 | 36 | 204 | 655 | 211 | 866 |
| VFD370CH43A/4EA-21; VFD370CH43S-21 | 147 | 30 | 177 | 248 | 21 | 269 | 863 | 184 | 1047 |
| VFD450CH43A-00/43A-21 | 179 | 30 | 209 | 304 | 51 | 355 | 1162 | 218 | 1380 |
| VFD550CH43A-00/43A-21 | 186 | 30 | 216 | 316 | 51 | 367 | 1384 | 257 | 1641 |
| VFD750CH43A-00/43A-21 | 186 | 30 | 216 | 316 | 51 | 367 | 1878 | 334 | 2212 |
| VFD900CH43A-00/43A-21 | 257 | 73 | 330 | 437 | 124 | 561 | 1878 | 399 | 2277 |
| VFD1100CH43A-00/43A-21 | 223 | 73 | 296 | 379 | 124 | 503 | 2336 | 491 | 2827 |
| VFD1320CH43A-00/43A-21 | 224 | 112 | 336 | 381 | 190 | 571 | 2680 | 579 | 3259 |
| VFD1600CH43A-00/43A-21 | | | 454 | | | 771 | | | 4179 |
| VFD1850CH43A-00/43A-21 | | | 454 | | | 771 | | | 5011 |

| Air flow | Power Dissipation | | tion | | | |
|--|-------------------------------|---------------------|--------|---|------------------------|----------|
| VFD2200CH43A-00/43A-21 | 454 | | 771 | | | 6168 |
| VFD2800CH43A-00/43C-00/43C-21 | 769 | - | 1307 | | | 7059 |
| ※ The required airflow shown in chart is for | or installing one drive in co | onfined space. | | * | The heat dissipation | n shown |
| When installing the multiple drives, the i | • | be the required air | volume | | in the chart is for in | stalling |
| for single drive X the number of the driv | es. | | | | single drive in a co | nfined |
| | | | | | space. | |
| | | | | * | When installing mu | ıltiple |
| | | | | | drives, volume of h | eat |
| | | | | | dissipation should | be the |
| | | | | | heat dissipated for | single |
| | | | | | drive X the number | of the |
| | | | | | drives. | |
| | | | | * | Heat dissipation fo | r each |
| | | | | | model is calculated | l by |
| | | | | | rated voltage, curre | ent and |
| | | | | | default carrier. | |

38-58 PT100 Detection Level 1 Factory Setting: 5.000 Settings 0.000~10.000V Setting: 0.000~10.000V Setting: 0.000~10.000V Setting: 0.000~10.000V Factory Setting: 7.000

Settings 0.000~10.000V

Make sure Pr. 06-57 > Pr.06-56.

35 - 58 PT100 Level 1 Frequency Protection

Factory Setting: 0.00

Settings 0.00~600.00 Hz

PT100 operation

- (1) Use AVI, AUI or ACI(set to 0-10V) for analog voltage input and select PT100 mode.
- (2) Choose one of the analog voltage input type: (a)AVI (Pr.03-00=11), (b) AUI (Pr.03-02=11), or
 (c) ACI (Pr.03-01=11 and Pr.03-29=1).
- (3) When using ACI as analog voltage input, set Pr.03-01=11 and Pr.03-29=1. Then switch SW2 to 0-10V on the I/O control terminal block.
- (4) Set Pr.03-23=23 and AFM2 to constant current output. Switch AFM2 (SW2) to 0-20mA on the I/O control terminal block and set constant current output to 9mA by setting Pr.03-33=45. The AFM2 constant output current is 20mA * 45% = 9mA.
- (5) Pr.03-33 is for adjusting the constant voltage or constant current of AFM2, the setting range is 0~100.00%.
- (6) There are two types of action level for PT100. The diagram of PT protecting action is shown as below:

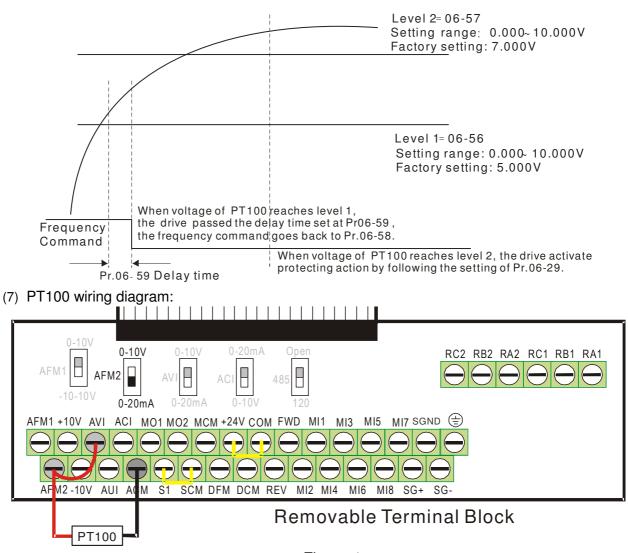


Figure 1

Description When Pr.06-58=0.00Hz, PT100 function is disabled.

Example:

A PT100 is installed to the drive. If motor temperature reaches 135° (275 F) or higher, the drive will decrease motor frequency to the setting of Pr.06-58. Motor will operate at this frequency (Pr.06-58) till the motor temperature decreases to 135° (275 F) or lower. If motor temperature exceeds 150° (302 F), the motor will decelerate to stop and outputs an 'OH3' warning.

Set up process:

- 1. Switch AFM2 (SW2) to 0-20mA on the I/O control terminal block. (Refer to Figure 1, PT100 wiring diagram)
- 2. Wiring (Refer to Figure 1, PT100 wiring diagram):

Connect external terminal AFM2 to (+) Connect external terminal ACM to (-) Connect external terminals AFM2 and AVI to short-circuit

- 3. Set Pr.03-00=11 or Pr.03-23=23 or Pr.03-33=45%(9mA)
- Refer to RTD temperature and resistance comparison table Temperature=135°C, resistance=151.71Ω; Input current: 9mA, Voltage: approximately: 1.37Vdc Temperature=150°C, resistance=157.33Ω; Input current:9mA, Voltage: approximately: 1.42Vdc
- 5. Set Pr.06=56=1.37 and Pr.06-58=10Hz. When RTD temperature increases to 135°C or higher, the drive will decelerate to the selected frequency. When Pr.06-58=0, the drive will not run.

Chapter 12 Description of Parameter Settings

6. Set Pr.06-57=1.42 and Pr.06-29=1 (warning and decelerate to stop). When RTD temperature

| increa | ses to 150 $^\circ\!\!\mathbb{C}$ or higher, the drive will decelerate to stop and outputs an 'OH3' warning. |
|---------|--|
| 88-59 | Reserved |
| 86-68 | Software Detection GFF Current Level |
| | Factory Setting: 60.0 |
| | Settings 0.0~6553.5 % |
| 86-61 | Software Detection GFF Filter Time |
| | Factory Setting: 0.10 |
| | Settings 0.0~6553.5 % |
| | ne motor drive detects the unbalanced three-phase out current is higher than the setting of 0, GFF protection will be activated. Then the motor drive will stop outputting. |
| | -phase current output unbalance value has exceeds Pr06-60 setting, drive will trip up GFF p output immediately. |
| 86-88 | Disable Level of dEb |
| | Factory Setting: 180.0/360.0 |
| | Settings 230V series: 0.0~220.0 Vic |
| | 460V series: 0.0~440.0 Vic |
| 86-63 | Fault Record 1 (day) |
| 08-85 | Fault Record 2 (day) |
| 06-67 | Fault Record 3 (day) |
| 08-69 | Fault Record 4 (day) |
| | Factory Setting: Read only |
| | Settings 0~65535 days |
| | |
| 06-64 | Fault Record 1 (min) |
| 86-66 | Fault Record 2 (min) |
| 86-68 | Fault Record 3 (min) |
| 06 - 70 | Fault Record 4 (min) |

Factory Setting: Read only

Settings 0~1439 min

- Pr.06-63 to Pr.06-68 are used to record the operation time for 6 malfunctions and it can also check if there is any wrong with the drive according to the internal time.
- When the malfunction occurs during operation, it records fault in Pr.06-17~06-22 and operation time is recorded in Pr.06-63~06-68.

For example: When the first fault ovA occurs after operation 3000 min., second fault ovd occurs at 3482 min., third fault ovA occurs at 4051 min., fourth fault ocA at 5003 min., fifth fault ocA at 5824 min., sixth fault ocd occurs at 6402 min. and seven fault ocS at 6951 min..

It'll be recorded as the following table:

It will be recorded as the following table:

| | | - | | | |
|--------------|----------------|-----|----------------|------|---|
| First fault | Pr.06-17 | ovA | Pr.06-63 | 3000 | ovA occurs at the 3000 min after operating. |
| | D 00 (7 | | D 00 00 | | |
| Second fault | Pr.06-17 | ovd | Pr.06-63 | 3482 | 3482-3000=482 min |
| | | | | | ovd occurs at 482 min after |
| | | | | | last fault (ovA) |
| | Pr.06-18 | ovA | Pr.06-64 | 3000 | |
| r | -1 | | r | | |
| Third fault | Pr.06-17 | ovA | Pr.06-63 | 4051 | 4051-3482=569 min |
| | | | | | ovA occurs at 569 min after |
| | | | | | last fault (ovd) |
| | Pr.06-18 | ovd | Pr.06-64 | 3482 | |
| | Pr.06-19 | ovA | Pr.06-65 | 3000 | |
| | 1 | | Γ | | |
| Seven fault | Pr.06-17 | ocS | Pr.06-63 | 12 | (12-5824)+64800=58988 min |
| | | | | | ocS occurs at 58988 min after |
| | | | | | last fault (ocA) |
| | Pr.06-18 | ocA | Pr.06-64 | 5824 | |
| | Pr.06-19 | ocA | Pr.06-65 | 5003 | |
| | Pr.06-20 | ovA | Pr.06-66 | 4051 | |
| | Pr.06-21 | ovd | Pr.06-67 | 3482 | |
| | Pr.06-22 | ovA | Pr.06-68 | 3000 | |

35 - 7 Low Current Setting Level

Factory Setting: 0.0

Settings 0.0 ~ 6553.5 %

B 5 - **7 2** Low Current Detection Time

Factory Setting: 0.00

Settings 0.00 ~ 655.35 sec

36 - 73 Treatment for low current

Factory Setting: 0

- Settings 0: No function
 - 1 : Warn and coast to stop
 - 2 : Warn and ramp to stop by 2nd deceleration time
 - 3 : Warn and operation continue
- The drive will operate as the setting of Pr.06-73 when output current is lower than the setting of Pr.06-71 and when low current continues for a period longer than the setting of Pr.06-72. This parameter can also be used with external multi-function output terminal 44 (MO44) for low current output.
- The low current detection function will not be executed when drive is at sleep or standby status.

07 Special Parameters

✓ This parameter can be set during operation.

✓ C - C C Software Brake Level

Factory Setting: 380.0/760.0

Settings 230V series: 350.0~450.0Vdc 460V series: 700.0~900.0Vdc

- This parameter sets the DC-bus voltage at which the brake chopper is activated. Users can choose the suitable brake resistor to have the best deceleration. Refer to Chapter 7 Accessories for the information of the brake resistor.
- It is only valid for the models below 30kW of 460 series and 22kW of 230 series.

✓ 3 7 - 3 1 DC Brake Current Level

Factory Setting: 0

Settings 0~100%

- This parameter sets the level of DC Brake Current output to the motor during start-up and stopping. When setting DC Brake Current, the Rated Current is regarded as 100%. It is recommended to start with a low DC Brake Current Level and then increase until proper holding torque has been attained.
- When it is in FOCPG control mode, DC brake is zero-speed operation. It can enable DC brake function by setting to any value. The drive will output an appropriate current to meet the actual need.
- C Brake Time at Start-up

Factory Setting: 0.0

Settings 0.00~60.0 sec

The motor may be in the rotation status due to external force or itself inertia. If the drive is used with the motor at this moment, it may cause motor damage or drive protection due to over current. This parameter can be used to output DC current before motor operation to stop the motor and get a stable start. This parameter determines the duration of the DC Brake current after a RUN command. When it is set to 0.0, it is invalid.

✓ []] - []] DC Brake Time at Stop

Factory Setting: 0.00

Settings 0.00~60.00 sec

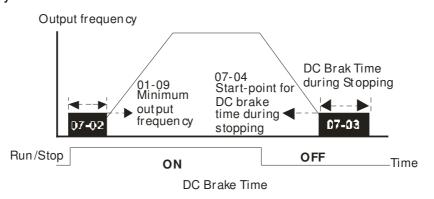
- The motor may be in the rotation status after drive stop outputting due to external force or itself inertia and can't stop accurately. This parameter can output DC current to force the motor drive stop after drive stops to make sure that the motor is stop.
- This parameter determines the duration of the DC Brake current during stopping. To DC brake at stop, this function will be valid when Pr.00-22 is set to 0 or 2. When setting to 0.0, it is invalid.
- Related parameters: Pr.00-22 Stop Method, Pr.07-04 Start-point for DC Brake



Factory Setting: 0.00

Settings 0.00~600.00Hz

This parameter determines the frequency when DC Brake will begin during deceleration. When this setting is less than start frequency (Pr.01-09), the start-point for DC brake will start from the min. frequency.



- DC Brake at Start-up is used for loads that may move before the AC drive starts, such as fans and pumps. Under such circumstances, DC Brake can be used to hold the load in position before setting it in motion.
- DC Brake at stop is used to shorten the stopping time and also to hold a stopped load in position, such as crane or cutting machine.
- DC Brake at Start-up is used for loads that may move before the AC drive starts, such as fans and pumps. Under such circumstances, DC Brake can be used to hold the load in position before setting it in motion.
- DC Brake at stop is used to shorten the stopping time and also to hold a stopped load in position, such as crane or cutting machine.

37-35 Voltage Increasing Gain

Factory Setting: 100

Settings 1~200%

When the user is using speed tracking, adjust Pr07-05 to slow down the increasing of voltage if there are errors such as oL or ocv.

Restart after Momentary Power Loss

Factory Setting: 0

Settings 0: Stop operation

- 1: Speed search for last frequency command
- 2: Speed search for the minimum output frequency
- This parameter determines the operation mode when the AC motor drive restarts from a momentary power loss.
- The power connected to the drive may power off momentarily due to many reasons. This function allows the drive to keep outputting after power is on again after power off and won't cause drive stops.

Chapter 12 Description of Parameter Settings

- Setting 1: Operation continues after momentary power loss, speed search starts with the Master Frequency reference value after drive output frequency and motor rotator speed is synchronous. The motor has the characteristics of big inertia and small obstruction. For example, in the equipment with big inertia wheel, it doesn't need to wait to execute operation command until wheel is complete stop after re-start to save time.
- Setting 2: Operation continues after momentary power loss, speed search starts with the master frequency after drive output frequency and motor rotator speed is synchronous. The motor has the characteristics of small inertia and bigger obstruction.
- In PG control mode, the AC motor drive will execute the speed search function automatically by the PG speed when this setting isn't set to 0.

Maximum Power Loss Duration

Factory Setting: 2.0

Settings 0.1~20.0 sec

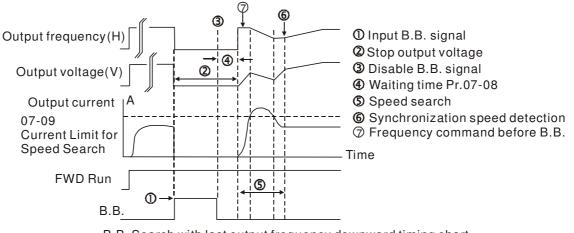
- If the duration of a power loss is less than this parameter setting, the AC motor drive will resume operation. If it exceeds the Maximum Allowable Power Loss Time, the AC motor drive output is then turned off (coast stop).
- □ The selected operation after power loss in Pr.07-06 is only executed when the maximum allowable power loss time is ≤5 seconds and the AC motor drive displays "LU". But if the AC motor drive is powered off due to overload, even if the maximum allowable power loss time is ≤5 seconds, the operation mode as set in Pr.07-06 is not executed. In that case it starts up normally.

Base block Time

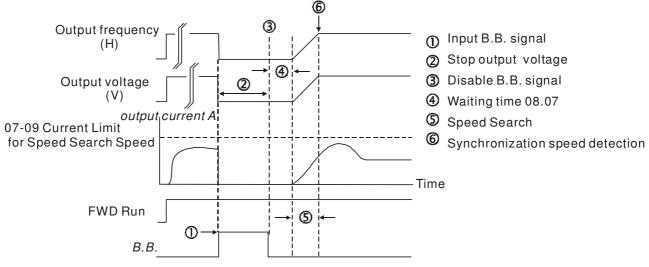
Factory Setting: 0.5

Settings 0.1~5.0 sec

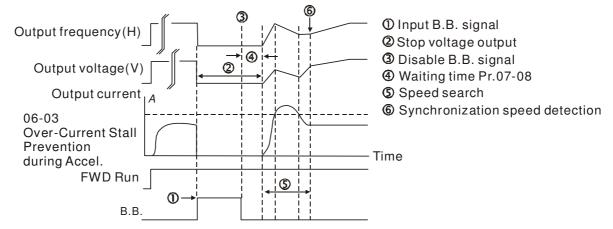
When momentary power loss is detected, the AC drive will block its output and then wait for a specified period of time (determined by Pr.07-08, called Base-Block Time) before resuming operation. This parameter should be set at a value to ensure that any residual regeneration voltage from the motor on the output has disappeared before the drive is activated again.



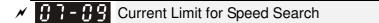
B.B. Search with last output frequency downward timing chart



B.B. Search with minimum output frequency upward timing chart



B.B. Search with minimum output frequency upward timing chart



Factory Setting: 50

Settings 20~200%

- Following a momentary power loss, the AC motor drive will start its speed search operation only if the output current is greater than the value set by Pr.07-09.
- When executing speed search, the V/f curve is operated by group 1 setting. The maximum current for the optimum accel./decel. and start speed search is set by Pr.07-09.
- The speed search level will affect the synchronous time. It will get the synchronization faster when this parameter is set to larger value. But too large value may activate overload protection.

✓ ⑦ · · · / ⑦ · · · / ⑦ Treatment after Fault

Factory Setting: 0

Settings 0: Stop operation

- 1: Speed search starts with current speed
- 2: Speed search starts with minimum output frequency
- In PG control mode, the AC motor drive will execute the speed search function automatically by the PG speed when this setting isn't set to 0.
- Fault includes: bb,oc,ov,occ. To restart after oc, ov, occ, Pr.07-11 can not be set to 0.

× A7-

Auto Restart Time after Fault

Factory Setting: 0

Settings 0~10

- After fault (oc, ov, occ) occurs, the AC motor drive can be reset/restarted automatically up to 10 times.
- Setting this parameter to 0 will disable the reset/restart operation after any fault has occurred. When enabled, the AC motor drive will restart with speed search, which starts at the frequency before the fault.
- If the drive execute reset/restart after fault more than the numbers of time set in Pr.07-11 and the limit is reached within the time period in Pr.07-33, the drive will stop execute reset/restart after fault function. User will be needed to input RESET manually for the drive to continue operation.

Speed Search during Start-up

Factory Setting: 0

Settings 0: Disable

- 1: Speed search from maximum output frequency
- 2: Speed search from start-up motor frequency
- 3: Speed search from minimum output frequency
- This parameter is used for starting and stopping a motor with a high inertia. A motor with high inertia will take 2-5 minutes or longer to stop completely. By setting this parameter, the user does not need to wait for the motor to come to a complete stop before restarting the AC motor drive. If a PG card and encoder is used on the drive and motor, then the speed search will start from the speed that is detected by the encoder and accelerate quickly to the commanded frequency. The output current is set by the Pr.07-09.
- In PG control mode, the AC motor drive will execute the speed search function automatically by the PG speed when this setting isn't set to 0.

✓ B - 13 Decel. Time at Momentary Power Loss (dEb function)

Factory Setting: 0

Settings 0: Disable

1~6: DCBUS control, Auto decel. time

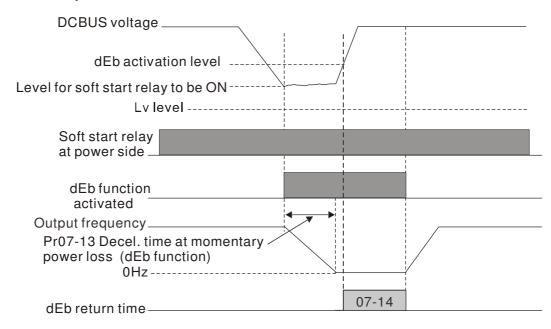
In This parameter is used for the decel. time selection for momentary power loss.

✓ ☐ ☐ - ↓ ↓ dEb Return Time

Factory Setting: 0.0

Settings 0.0~25.0 sec

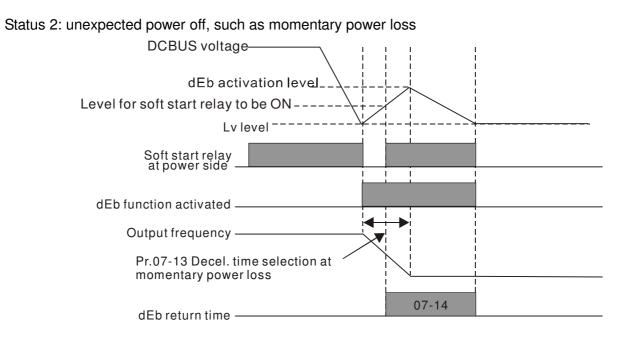
function is the AC motor drive decelerates to stop after momentary power loss. When the momentary power loss occurs, this function can be used for the motor to decelerate to 0 speed with deceleration stop method. When the power is on again, motor will run again after DEB return time. (has applied on high-speed spindle) Status 1: Insufficient power supply due to momentary power-loss/unstable power (due to low voltage)/sudden heavy-load



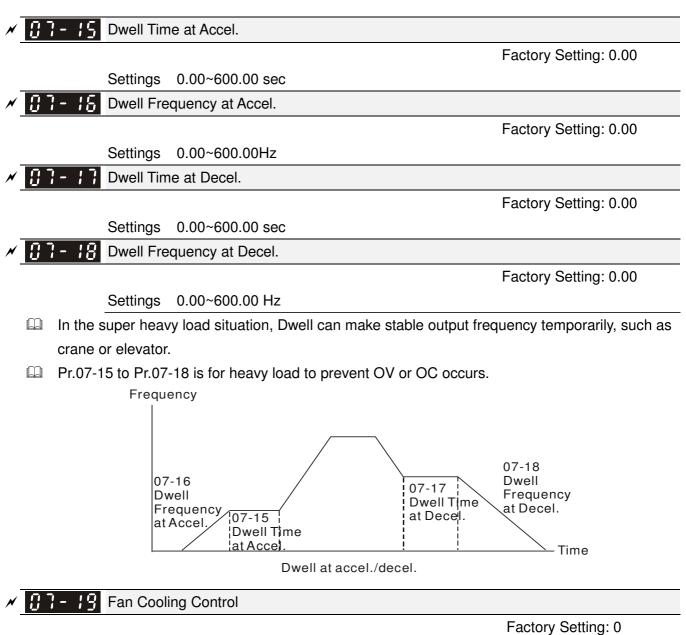
Note (1)When Pr07-14 is set to 0, the motor drive will stop and will not accelerate to the frequency before dEb even the power is on again. But when Pr07-14 is NOT set to 0, then a command of zero speed will be sent to wait for power on.

Note (2) dEb activation level is when DCBUS voltage level is lower than (230V series: Lv level +20Vdc)

(460V series: Lv level +40Vdc)



For example, in textile machinery, you will hope that all the machines can be decelerated to stop to prevent broken stitching when power loss. In this case, the host controller will send a message to the AC motor drive to use dEb function with deceleration time via EF.



Settings 0: Fan always ON

- 1: 1 minute after the AC motor drive stops, fan will be OFF
- 2: When the AC motor drive runs, the fan is ON. When the AC motor drive stops, the fan is OFF
- 3: Fan turns ON when preliminary heat sink temperature (around 60°C) is attained.
- 4: Fan always OFF
- Description: This parameter is used for the fan control.
- Setting 0: Fan will be ON as the drive's power is turned ON.
- Setting 1: 1 minute after AC motor drive stops, fan will be OFF
- Setting 2: AC motor drive runs and fan will be ON. AC motor drive stops and fan will be OFF.
- Setting 3: Fan run according to IGBT and capacitance temperature. Fan will be ON when preliminary capacitance temperature is higher than 60oC. Fan will be OFF, when capacitance temperature is lower than 40oC.
- Setting 4: Fan is always OFF

Emergency Stop (EF) & Force Stop

Factory Setting: 0

- Settings 0: Coast to stop
 - 1: Stop by 1st deceleration time
 - 2: Stop by 2nd deceleration time
 - 3: Stop by 3rd deceleration time
 - 4: Stop by 4th deceleration time
 - 5: System Deceleration (According to original deceleration time)
 - 6: Automatic Deceleration (Pr01-46)
- When the multi-function input terminal is set to 10(EF) or 18(Emergency stop) and is activated, the drive will stop according to the setting in Pr.07-20.

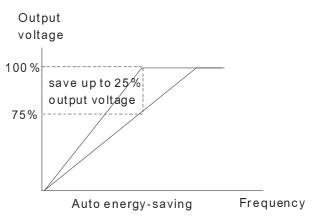
✓ ☐ ☐ - 2 ↓ Auto Energy-saving Operation

Factory Setting: 0

Settings 0: Disable

1: Enable

- When Pr.07-21 is set to 1, the acceleration and deceleration will operate with full voltage. During constant speed operation, it will auto calculate the best voltage value by the load power for the load. This function is not suitable for the ever-changing load or near full-load during operation.
- When the output frequency is constant, i.e. constant operation, the output voltage will auto decrease by the load reduction. Therefore, the drive will operate with min. power, multiplication of voltage and current.



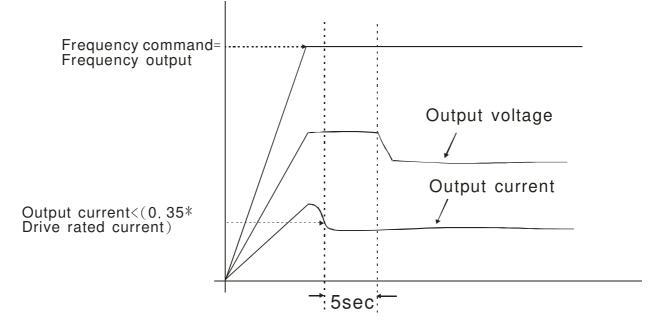
FOCPG(IM) control mode:

When drive is running at constant speed and torque current is lower than 35% of drive rated current, drive will start to count. After 5 seconds, power save function will enable (can max. reduce 30% of output voltage). Return conditions: torque higher than 50% of drive rated current.

UF, VFPG, SVC control mode:

When drive is running at constant speed and the U, V, W output power factor angle cos(phi)>=65.0° (Pr00-04 set 5 for monitor power factor angle cos(phi)), drive will start to do "Power saving enable time counting". After 5 seconds, power save function will enable. Return conditions: (cos(phi)<60.0°) or drive is operating at acceleration or deceleration status.

When drive is at FOCPM or FOC sensor-less control mode, this function will be disable.



✓ ₿ ? - 2 2 Energy-saving Gain

Factory Setting: 100

Settings 10~1000%

- When Pr. 07-21 is set to 1, this parameter can be used to adjust the gain of energy-saving. The factory setting is 100%. If the result is not good, it can adjust by decreasing the setting. If the motor oscillates, it should increase the setting value.
- At some special application such as High speed spindle, the motor temperature rise is been highly concern. Thus, when the motor is not working with load, the motor current will requested to reduce to a lower level. To Lowering this parameter setting can meet this requirement.

✓ ③ 7 - 2 3 Auto Voltage Regulation(AVR) Function

Factory Setting: 0

Settings 0: Enable AVR

- 1: Disable AVR
- 2: Disable AVR during deceleration
- The rated voltage of the motor is usually 220V/200VAC 60Hz/50Hz and the input voltage of the AC motor drive may vary between 180V to 264 VAC 50Hz/60Hz. Therefore, when the AC motor drive is used without AVR function, the output voltage will be the same as the input voltage. When the motor runs at voltages exceeding the rated voltage with 12% 20%, its lifetime will be shorter and it can be damaged due to higher temperature, failing insulation and unstable torque output.
- AVR function automatically regulates the AC motor drive output voltage to the motor rated voltage. For instance, if V/f curve is set at 200 VAC/50Hz and the input voltage is at 200V to 264VAC, then the motor Output Voltage will automatically be reduced to a maximum of 200VAC/50Hz. If the input voltage is at 180V to 200VAC, output voltage to motor and input power will be in direct proportion.

- Setting 0: when AVR function is enabled, the drive will calculate the output voltage by actual DC-bus voltage. The output voltage won't be changed by DC bus voltage.
- Setting 1: when AVR function is disabled, the drive will calculate the output voltage by DC-bus voltage. The output voltage will be changed by DC bus voltage. It may cause insufficient/over current.
- Setting 2: the drive will disable the AVR during deceleration, such as operated from high speed to low speed.
- When the motor ramps to stop, the deceleration time is longer. When setting this parameter to 2 with auto acceleration/deceleration, the deceleration will be quicker.
- When it is in FOCPG or TQCPG, it is recommended to set to 0 (enable AVR).

✓ ③ ? - 2 Ч Filter Time of Torque Command (V/F and SVC control mode)

Factory Setting: 0.020

Settings 0.001~10.000 sec

When the setting is too long, the control will be stable but the control response will be delay. When the setting is too short, the response will be quickly but the control may be unstable. User can adjust the setting by the control and response situation.

 \times \bigcirc \bigcirc \bigcirc Filter Time of Slip Compensation (V/F and SVC control mode)

Factory Setting: 0.100

Settings 0.001~10.000 sec

- It can set Pr.05-22 and 05-23 to change the response time of compensation.
- If Pr.05-22 and 05-23 are set to 10seconds, the response time of compensation is the slowest. But the system may be unstable when the setting is too short.

✓ 37-25 Torque Compensation Gain (V/F and SVC control mode)

Factory Setting: 0

Settings 0~10

- When the motor load is large, a part of drive output voltage is absorbed by the resistor of stator winding and causes insufficient voltage at motor induction and result in over output current and insufficient output torque. It can auto adjust output voltage by the load and keep the air gap magnetic fields stable to get the optimal operation.
- In the V/F control, the voltage will be decreased in direct proportion when the frequency is decreased. It'll cause decrease torque at low speed due to small AC resistor and the same DC resistor. Therefore, Auto torque compensation function will increase the output voltage in the low frequency to get higher start torque.
- When Pr.07-26 is set to large, it may cause motor overflux and result in too large output current, motor overheat or triggers protection function.
- Slip Compensation Gain (V/F and SVC control mode)

Factory Setting: 0.00

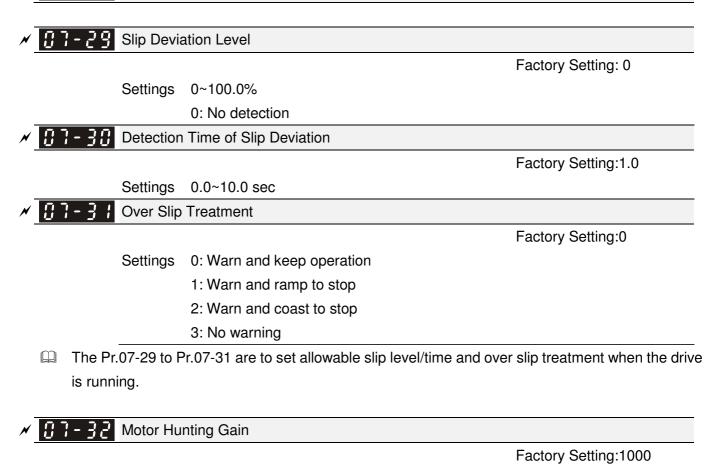
```
Settings 0.00~10.00
```

The induction motor needs the constant slip to produce magnetic torque. It can be ignore in the higher motor speed, such as rated speed or 2-3% slip.

Chapter 12 Description of Parameter Settings

- In the operation with variable frequency, the slip and the synchronous frequency will be in reverse proportion to produce the same magnetic torque. That is the slip will be larger with the reduction of synchronous frequency. The motor may stop when the synchronous frequency is decreased to a specific value. Therefore, the slip serious affects the accuracy of motor speed at low speed.
- In another situation, when the drive uses with induction motor, the slip will be increased by the increasing load. It also affects the accuracy of motor speed.
- This parameter can be used to set compensation frequency and reduce the slip to close the synchronous speed when the motor runs in the rated current to raise the drive accuracy. When the drive output current is larger than Pr.05-05 No-load Current of Induction Motor 1 (A), the drive will compensation the frequency by this parameter.
- When the control method (Pr.00-11) is changed from V/f mode to vector mode, this parameter will auto be set to 1.00. Otherwise, it will be set to 0.00. Please do the compensation of slip after overload and acceleration. The compensation value should be increased from small to large gradually. That is to add the output frequency with motor rated slip X Pr.07-27 Slip Compensation Gain when the motor is rated load. If the actual speed ratio is slow than expectation, please increase the setting. Otherwise, decrease the setting.

87-28 Reserved



Settings 0~10000

0: Disable

The motor will have current wave motion in some specific area. It can improve this situation by setting this parameter. (When it is high frequency or run with PG, it can be set to 0. when the current wave motion happens in the low frequency, please increase Pr.07-32.)



Recovery Time to Pr.07-11 (# of automatic reboots after fault)

Factory Setting:60.0

Settings 00~6000.0 sec

When a reset/restart after fault occurs, the drive will regards Pr.07-33 as a time boundary and begin counting the numbers of faults occur within this time period. Within the period, if numbers of faults occurred did not exceed the setting in Pr.07-11, the counting will be cleared and starts from 0 when next fault occurs. However, if the numbers of faults occurred within this time period have exceed the setting in Pr.07-11, user will need to press RESET key manually for the drive to operate again.

08 High-function PID Parameters

✓ This parameter can be set during operation.

Input Terminal for PID Feedback

Factory Setting: 0

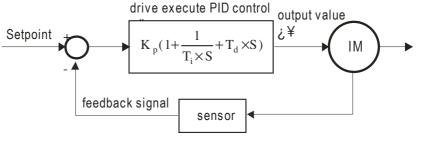
Settings 0: No function

- 1: Negative PID feedback: on analogue input acc. To setting 5 of Pr. 03-00 to Pr.03-02.
- 2: Negative PID feedback from PG card (Pr.10-15, skip direction)
- 3: Negative PID feedback from PG card (Pr.10-15)
- 4: Positive PID feedback from external terminal AVI (Pr.03-00)
- 5: Positive PID feedback from PG card (Pr.10-15, skip direction)
- 6: Positive PID feedback from PG card (Pr.10-15)
- 7: Negative PID feedback from communication protocol
- 8: Positive PID feedback from communication protocol
- Regative feedback means: +target value feedback. It is used for the detection value will be increased by increasing the output frequency.
- When Pr.03-00 to Pr.03-02 have the same setting, then the AVI will be the prioritized selection.
- Positive feedback means: -target value + feedback. It is used for the detection value will be decreased by increasing the output frequency.
- When $Pr08-00 \neq 7$ neither $\neq 8$, input value is disabled. The value of the setting remain the same after the derive is off.

Common applications for PID control

- Flow control: A flow sensor is used to feedback the flow data and performs accurate flow $\mathbf{\nabla}$ control.
- Pressure control: A pressure sensor is used to feedback the pressure data and performs $\mathbf{\nabla}$ precise pressure control.
- Air volume control: An air volume sensor is used to feedback the air volume data to have $\mathbf{\nabla}$ excellent air volume regulation.
- Temperature control: A thermocouple or thermistor is used to feedback temperature data for $\mathbf{\nabla}$ comfortable temperature control.
- Speed control: A speed sensor or encoder is used to feedback motor shaft speed or input $\mathbf{\nabla}$ another machines speed as a target value for closed loop speed control of master-slave operation. Pr.10.00 sets the PID set point source (target value).
- PID control operates with the feedback signal as set by Pr.10.01 either 0~+10V voltage or $\mathbf{\nabla}$ 4-20mA current.

PID control loop:



 $K_{p}: \text{Proportional gain}(\mathsf{P}) \qquad T_{i}: \text{Integral time}(\mathsf{I}) \quad T_{d'} \text{ Derivative control}(\mathsf{D}) \quad S: \text{Operator}$

- Concept of PID control
 - 1. Proportional gain(P):

the output is proportional to input. With only proportional gain control, there will always be a steady-state error.

2. Integral time(I):

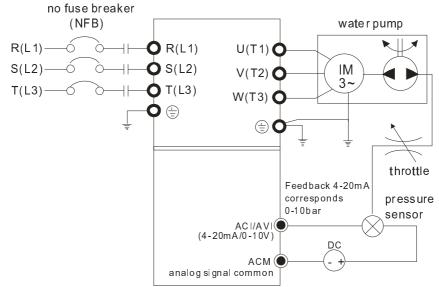
the controller output is proportional to the integral of the controller input. To eliminate the steady-state error, an "integral part" needs to be added to the controller. The integral time decides the relation between integral part and error. The integral part will be increased by time even if the error is small. It gradually increases the controller output to eliminate the error until it is 0. In this way a system can be stable without steady-state error by proportional gain control and integral time control.

3. Differential control(D):

the controller output is proportional to the differential of the controller input. During elimination of the error, oscillation or instability may occur. The differential control can be used to suppress these effects by acting before the error. That is, when the error is near 0, the differential control should be 0. Proportional gain (P) + differential control (D) can be used to improve the system state during PID adjustment.

When PID control is used in a constant pressure pump feedback application: Set the application's constant pressure value (bar) to be the set point of PID control. The pressure sensor will send the actual value as PID feedback value. After comparing the PID set point and PID feedback, there will be an error. Thus, the PID controller needs to calculate the output by using proportional gain (P), integral time (I) and differential time (D) to control the pump. It controls the drive to have different pump speed and achieves constant pressure control by using a 4-20mA signal corresponding to 0-10 bar as feedback to the drive.

Chapter 12 Description of Parameter Settings



- 1. Pr.00-04 is set to 10 (Display PID analog feedback signal value (b) (%))
- 2. Pr.01-12 Acceleration Time will be set as required
- 3. Pr.01-13 Deceleration Time will be set as required
- 4. Pr.00-21=0 to operate from the digital keypad
- 5. Pr.00-20=0, the set point is controlled by the digital keypad
- 6. Pr.08-00=1 (Negative PID feedback from analog input)
- 7. ACI analog input Pr. 03-01 set to 5, PID feedback signal.
- 8. Pr.08-01-08-03 will be set as required
- 8.1 If there is no vibration in the system, increase Pr.08-01(Proportional Gain (P))
- 8.2 If there is no vibration in the system, reduce Pr.08-02(Integral Time (I))
- 8.3 If there is no vibration in the system, increase Pr.08-03(Differential Time (D))
- Refer to Pr.08-00 to 08-21 for PID parameters settings.

✓ 38 - 3 ↓ Proportional Gain (P)

Factory Setting:1.0

Settings 0.0~500.0%

- It is used to eliminate the system error. It is usually used to decrease the error and get the faster response speed. But if setting too large value in Pr.08-01, it may cause the system oscillation and instability.
- If the other two gains (I and D) are set to zero, proportional control is the only one effective.

Integral Time (I)

Factory Setting:1.00

Settings 0.00~100.00 sec

0.00: Disable

- The integral controller is used to eliminate the error during stable system. The integral control doesn't stop working until error is 0. The integral is acted by the integral time. The smaller integral time is set, the stronger integral action will be. It is helpful to reduce overshoot and oscillation to make a stable system. At this moment, the decreasing error will be slow. The integral control is often used with other two controls to become PI controller or PID controller.
- This parameter is used to set the integral time of I controller. When the integral time is long, it will have small gain of I controller, the slower response and bad external control. When the integral time is short, it will have large gain of I controller, the faster response and rapid external control.

- When the integral time is too small, it may cause system oscillation.
- If the integral time is set as 0.00, Pr.08-02 will be disabled.
- **Derivative Control (D)**

Factory Setting:0.00

Settings 0.00~1.00 sec

The differential controller is used to show the change of system error and it is helpful to preview the change of error. So the differential controller can be used to eliminate the error to improve system state. With the suitable differential time, it can reduce overshoot and shorten adjustment time. However, the differential operation will increase the noise interference. Please note that too large differential will cause big noise interference. Besides, the differential shows the change and the output of the differential will be 0 when there is no change. Therefore, the differential control can't be used independently. It needs to be used with other two controllers to make a PD controller or PID controller.

- This parameter can be used to set the gain of D controller to decide the response of error change. The suitable differential time can reduce the overshoot of P and I controller to decrease the oscillation and have a stable system. But too long differential time may cause system oscillation.
- The differential controller acts for the change of error and can't reduce the interference. It is not recommended to use this function in the serious interference.

✓ **38 - 34** Upper limit of Integral Control

Factory Setting:100.0

Settings 0.0~100.0%

- This parameter defines an upper bound or limit for the integral gain (I) and therefore limits the Master Frequency. The formula is: Integral upper bound = Maximum Output Frequency (Pr.01-00) x (Pr.08-04 %).
- Too large integral value will make the slow response due to sudden load change. In this way, it may cause motor stall or machine damage.

✓ 38-35 PID Output Frequency Limit

Factory Setting:100.0

Settings 0.0~110.0%

- This parameter defines the percentage of output frequency limit during the PID control. The formula is Output Frequency Limit = Maximum Output Frequency (Pr.01-00) X Pr.08-05 %.
- ✓ 08 05 PID feedback value by communication protocol

Factory Setting: 0.00

Settings 0.00~200.00%

PID Delay Time

Factory Setting: 0.0

Settings 0.0~35.0 sec

B - 2 **B** PID Mode Selection

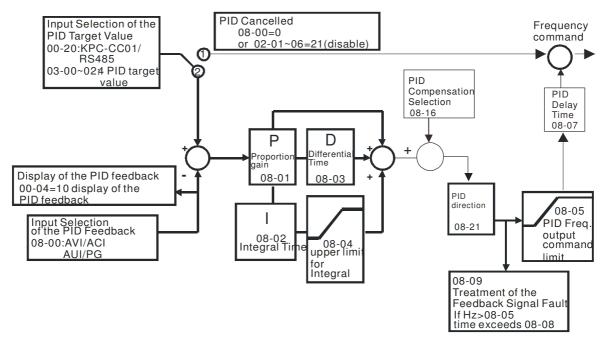
Factory Setting: 0

Settings 0: Serial connection

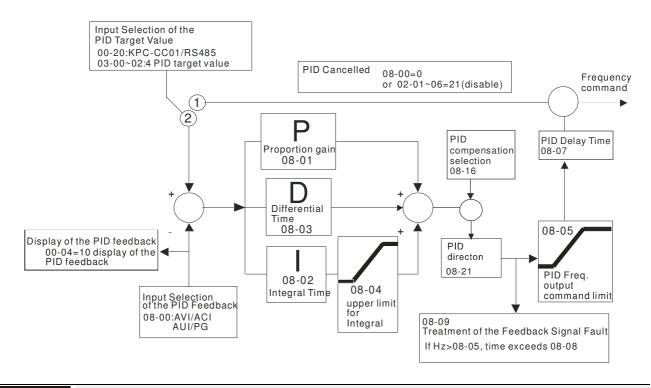
1: Parallel connection

- IP When setting is 0, it uses conventional PID control structure.
- When setting is 1, proportional gain, integral gain and derivative gain are independent. The P, I and D can be customized to fit users' demand.
- Pr.08-07 determines the primary low pass filter time when in PID control. Setting a large time constant may slow down the response rate of drive.
- Output frequency of PID control will filter by primary low pass function. This function could filter a mix frequency. A long primary low pass time means filter degree is high and vice versa.
- Inappropriate setting of delay time may cause system error.
- PI Control: controlled by the P action only, and thus, the deviation cannot be eliminated entirely. To eliminate residual deviations, the P + I control will generally be utilized. And when the PI control is utilized, it could eliminate the deviation incurred by the targeted value changes and the constant external interferences. However, if the I action is excessively powerful, it will delay the responding toward the swift variation. The P action could be used solely on the loading system that possesses the integral components.
- PD Control: when deviation occurred, the system will immediately generate some operation load that is greater than the load generated single handedly by the D action to restrain the increment of the deviation. If the deviation is small, the effectiveness of the P action will be decreasing as well. The control objects include occasions with integral component loads, which are controlled by the P action only, and sometimes, if the integral component is functioning, the whole system will be vibrating. On such occasions, in order to make the P action's vibration subsiding and the system stabilizing, the PD control could be utilized. In other words, this control is good for use with loadings of no brake functions over the processes.
- PID Control: Utilize the I action to eliminate the deviation and the D action to restrain the vibration, thereafter, combine with the P action to construct the PID control. Use of the PID method could obtain a control process with no deviations, high accuracies and a stable system.

Serial connection



Parallel connection



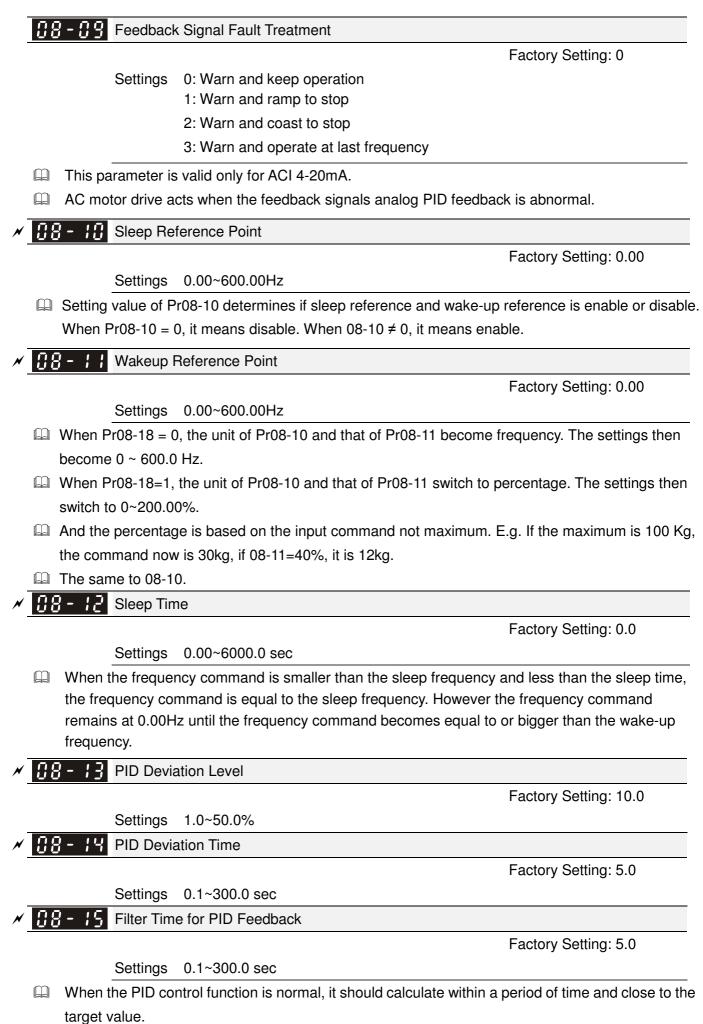
✓ 38-38 Feedback Signal Detection Time

Factory Setting: 0.0

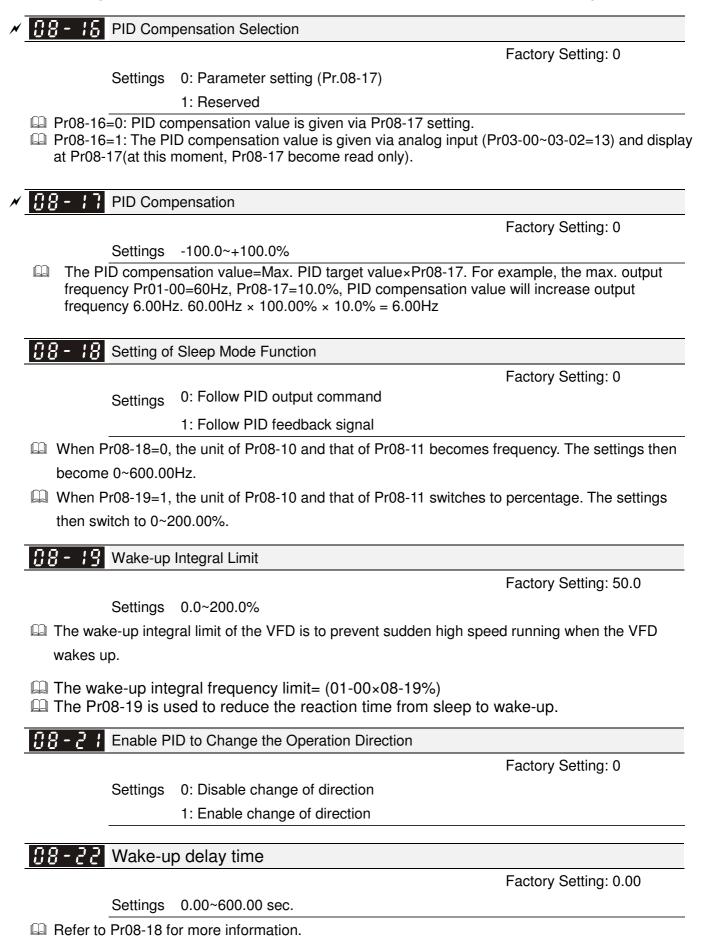
Settings 0.0~3600.0 sec

Pr.08-08 is valid only for ACI 4-20mA.

This parameter sets the detection time of abnormal PID derative. If detection time is set to 0.0, detection function is disabled.



Refer to the PID control diagram for details. When executing PID feedback control, if |PID reference target value – detection value| > Pr.08-13 PID Deviation Level and exceeds Pr.08-14 setting, the PID control fault occurs. The treatment will be done as Pr.08-09 setting.



88-

PID Control Bit



Settings Bit0 =1, PID reverse running must follow the setting of Pr00-23 Bit0 = 0, PID reverse running follows PID's calculated value

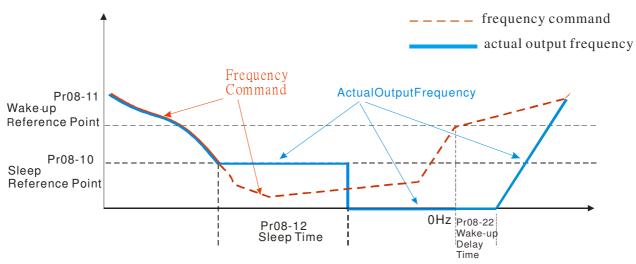
- Bit0, When Pr08-21 = 1, PID reverse running is enable.
- Bit0 = 0, if the PID calculated value is positive, it will be forward running. If the PID calculated value is negative, it will be reverse running.

There are three scenarios for sleep and wake-up frequency.

1) Frequency Command (PID is not in use, Pr08-=00

When the output frequency \leq the sleep frequency and the VFD reaches the preset sleep time, then the VFD will be at the sleep mode.

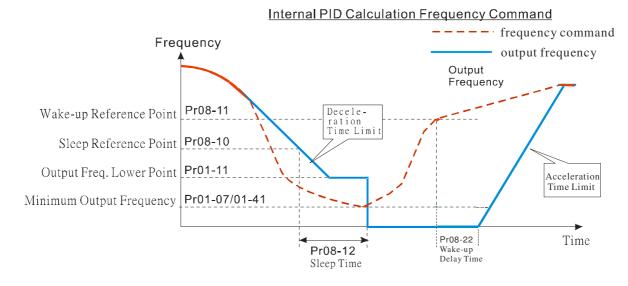
When the frequency command reaches the wake-up frequency, the VFD will start to count the wake-up delay time. Then when the VFD reaches the wake-up delay time, the VFD will begin acceleration time to reach the frequency command.



2) Frequency Command Calculation of the Internal PID

When the PID calculation reaches the sleep frequency, the VFD will start to count the sleep time and the output frequency will start to decrease. If the VFD exceeds the preset sleep time, it will directly go to sleep mode which is 0 Hz. But if the VFD doesn't reach the sleep time, it will remain at the lower limit (if there is a preset of lower limit.). Or it will remain at the lowest output frequency set at Pr01-07 and wait to reach the sleep time then go to sleep mode (0 Hz).

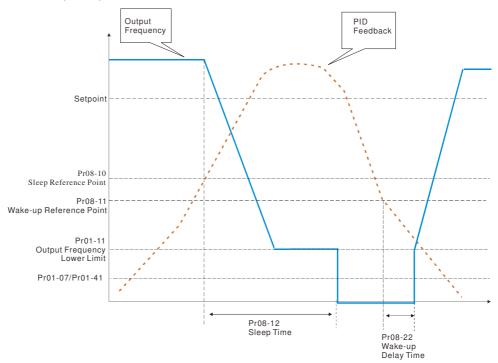
When the calculated frequency command reaches the wake-up frequency, the VFD will start to count the wake-up delay time. Once reaching the wake-up delay time, the VFD will start the acceleration time to reach the PID frequency command.



3) PID Feedback Rate Percentage (Use PID, Pr08-00 ≠ 0 and Pr08-18=1)

When the PID feedback rate reaches the sleep level percentage, the VFD starts to count the sleep time. The output frequency will also decrease. If the VFD exceeds the preset sleep time, it will go to sleep mode which is 0 Hz. But if the VFD doesn't reach the sleep time, it will remain at the lower limit (if there is a preset of lower limit.). Or it will remain at the lowest output frequency set at Pr01-07 and wait to reach the sleep time then go to sleep mode (0 Hz).

When PID feedback value reaches the wake up percentage the motor drive will start to count the wake up delay time. Once reaches the wake up delay time, the motor drives starts the accelerating time to reach PID frequency command



09 Communication Parameters

✓ The parameter can be set during the operation.

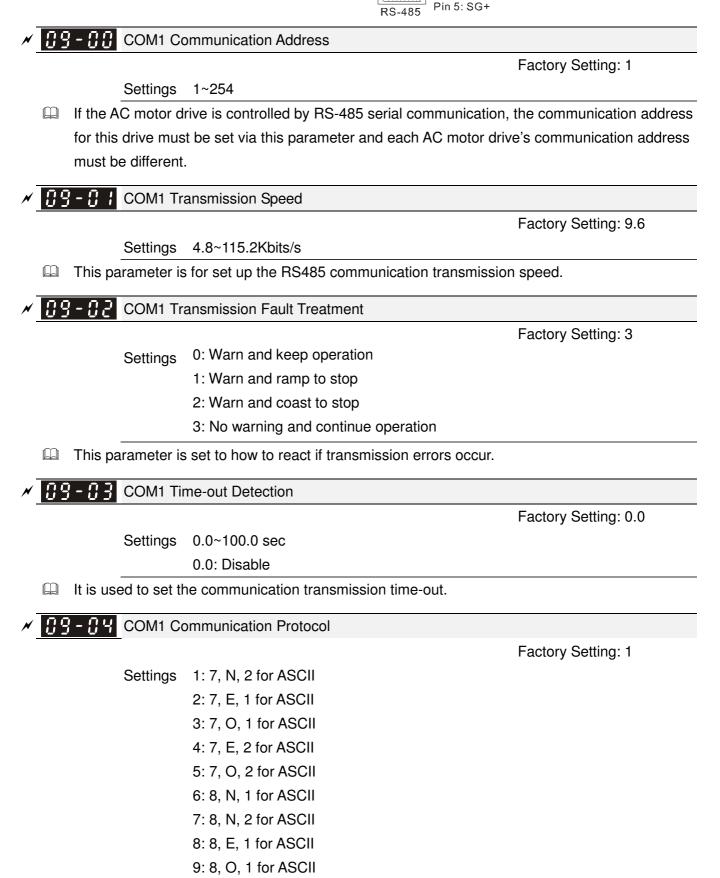
Modbus RS-485

Pin 3, 6: SGND

Pin 4: SG-

Pin 1~2.7.8: Reserved

| connects AC drive with PC by using | Ľ |
|------------------------------------|-----|
| Delta IFD6530 or IFD6500. | Ц((|



10: 8, E, 2 for ASCII
 11: 8, O, 2 for ASCII
 12: 8, N, 1 for RTU
 13: 8, N, 2 for RTU
 14: 8, E, 1 for RTU
 15: 8, O, 1 for RTU
 16: 8, E, 2 for RTU
 17: 8, O, 2 for RTU

Control by PC or PLC (Computer Link)

- A VFD-CH2000 can be set up to communicate on Modbus networks using one of the following modes: ASCII (American Standard Code for Information Interchange) or RTU (Remote Terminal Unit).Users can select the desired mode along with the RS-485 serial port communication protocol in Pr.09-00.
- MODBUS ASCII (American Standard Code for Information Interchange) : Each byte data is the combination of two ASCII characters. For example, a 1-byte data: 64 Hex, shown as '64' in ASCII, consists of '6' (36Hex) and '4' (34Hex).

1. Code Description

Communication protocol is in hexadecimal, ASCII: "0", "9", "A", "F", every 16 hexadecimal represent ASCII code. For example:

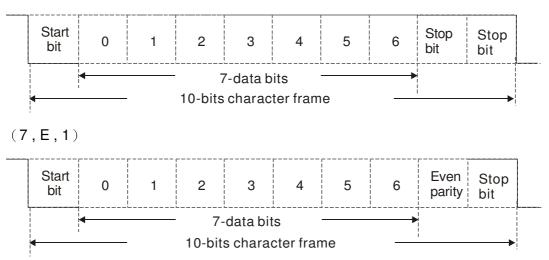
| Character | ·0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| ASCII code | 30H | 31H | 32H | 33H | 34H | 35H | 36H | 37H |

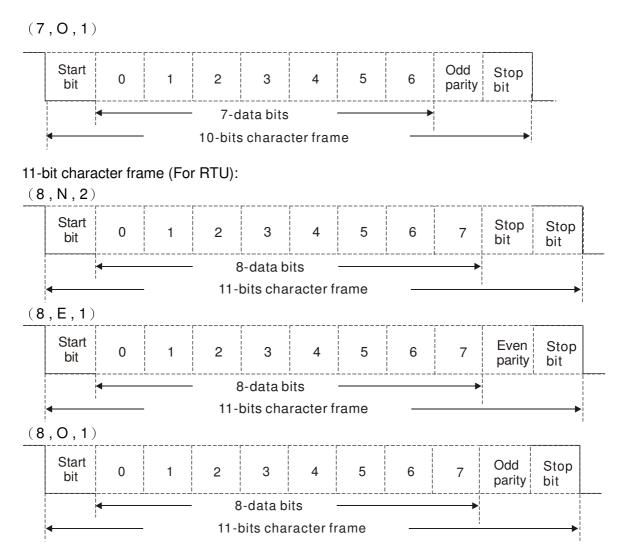
| Character | '8' | ʻ9' | 'A' | 'B' | 'C' | 'D' | 'E' | 'F' |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|
| ASCII code | 38H | 39H | 41H | 42H | 43H | 44H | 45H | 46H |

2. Data Format

10-bit character frame (For ASCII):

(7, N, 2)





3. Communication Protocol

Communication Data Frame: ASCII mode

| STX | Start character = ':' (3AH) |
|-------------|---|
| Address Hi | Communication address: |
| Address Lo | 8-bit address consists of 2 ASCII codes |
| Function Hi | Command code: |
| Function Lo | 8-bit command consists of 2 ASCII codes |
| DATA (n-1) | Contents of data: |
| | Nx8-bit data consist of 2n ASCII codes |
| DATA 0 | |
| LRC CHK Hi | LRC check sum: |
| LRC CHK Lo | 8-bit check sum consists of 2 ASCII codes |
| END Hi | End characters: |
| END Lo | END1 = CR (0DH), END0 = LF(0AH) |

Communication Data Frame: RTU mode

| START | A silent interval of more than 10 ms |
|----------|--------------------------------------|
| Address | Communication address: 8-bit address |
| Function | Command code: 8-bit command |

| DATA (n-1) | Contents of data: |
|--------------|---|
| | n×8-bit data, n<=16 |
| DATA 0 | |
| CRC CHK Low | CRC check sum: |
| CRC CHK High | 16-bit check sum consists of 2 8-bit characters |
| END | A silent interval of more than 10 ms |

Address (Communication Address)

Valid communication addresses are in the range of 0 to 254. A communication address equal to 0, means broadcast to all AC drives (AMD). In this case, the AMD will not reply any message to the master device.

00H: broadcast to all AC drives

01H: AC drive of address 01

0FH: AC drive of address 15

10H: AC drive of address 16

FEH: AC drive of address 254

Function (Function code) and DATA (data characters)

The format of data characters depends on the function code.

03H: read data from register

06H: write single data to register

Example: reading continuous 2 data from register address 2102H, AMD address is 01H. ASCII mode:

| Command Message: | | Response Mes | ssage |
|------------------|------------|--------------------------|-------------|
| STX | (_) _ | STX | · . , |
| Address | ·0' | Address | ʻ0' |
| Address | ·1' | Address | '1' |
| Function | ·0' | Function | ' 0' |
| Function | '3' | FUNCTION | '3' |
| | '2' | Number of data | ' 0' |
| Starting address | '1' | (count by byte) | '4' |
| Starting address | ·0' | Content of starting | '1' |
| | '2' | | '7' |
| | ·0' | address 2102H | '7' |
| Number of data | ·0' | | ' 0' |
| (count by word) | ·0' | | ʻ0' |
| | '2' | Content of address 2103H | ·0' |
| LRC Check | 'D' | Content of address 2103H | ·0' |
| ENC Check | '7' | | ·0' |
| END | CR | LRC Check | '7' |
| | LF | | <u>'1'</u> |
| | | END | CR |
| | | | LF |

RTU mode:

| Command Mes | ssage: | Response Me | ssage |
|-----------------------|-------------------------|-----------------|-------|
| Address | 01H | Address | 01H |
| Function | 03H | Function | 03H |
| Starting data address | arting data address 21H | Number of data | 04H |
| | 02H | (count by byte) | 040 |
| Number of data | 00H | Content of data | 17H |
| (count by world) | 02H | address 2102H | 70H |

Chapter 12 Description of Parameter Settings

| CRC CHK Low | 6FH | Content of data | 00H |
|--------------|-----|-----------------|-----|
| CRC CHK High | F7H | address 2103H | 00H |
| | | CRC CHK Low | FEH |
| | | CRC CHK High | 5CH |

06H: write single data to register.

Example: writing data 6000(1770H) to register 0100H. AMD address is 01H. ASCII mode:

| Command Message: | | Response Mes | ssage |
|------------------|------------|--------------|------------|
| STX | · | STX | ••• • |
| Address | ʻ0' | Address | ʻ0' |
| Address | '1' | Address | '1' |
| Function | ·0' | Function | ʻ0' |
| Function | '6' | Function | '6' |
| | ·0' | | ʻ0' |
| Data address | '1' | Data address | '1' |
| | ·0' | | '0' |
| | ·0' | | '0' |
| | <u>'1'</u> | Data content | '1' |
| Data content | '7' | | '7' |
| Data content | '7' | Data content | '7' |
| | ·0' | | ·0' |
| LRC Check | '7' | LRC Check | '7' |
| EITO OTIECK | '1' | | <u>'1'</u> |
| END | CR | END | CR |
| | LF | LIND | LF |

RTU mode:

| ssage: | Response Me | essage |
|--------|---|--|
| 01H | Address | 01H |
| 06H | Function | 06H |
| 01H | Data address | 01H |
| 00H | Data address | 00H |
| 17H | Dete content | 17H |
| 70H | Data content | 70H |
| 86H | CRC CHK Low | 86H |
| 22H | CRC CHK High | 22H |
| | 01H 06H 01H 00H 17H 70H 86H | 06HFunction01HData address00HData content17HData content70HCRC CHK Low |

10H: write multiple registers (write multiple data to registers) (up to 20 sets of data can be written simultaneously)

Example: Set the multi-step speed,

Pr.04-00=50.00 (1388H), Pr.04-01=40.00 (0FA0H). AC drive address is 01H.

ASCII Mode

| Command Message: | | Response Me | ssage |
|-----------------------|------------------------|-----------------------------------|-------|
| STX | · | STX | ·' |
| ADR 1 | ·0' | ADR 1 | ·0' |
| ADR 0 | '1' | ADR 0 | '1' |
| CMD 1 | '1' | CMD 1 | '1' |
| CMD 0 | ·0' | CMD 0 | ʻ0' |
| | ·0' | Starting data address | ʻ0' |
| Starting data address | '5' | | '5' |
| Starting data address | ʻ0' | | ʻ0' |
| | ʻ0' | | ʻ0' |
| Number of date | Numera en eficiete '0' | Number of date | ʻ0' |
| Number of data | ·0' | Number of data (count by word) | ʻ0' |
| (count by word) | ·0' | | ·0' |

| | '2' | | '2' |
|-------------------------|-------------|-----------|-----|
| Number of data | ʻ0' | LRC Check | 'E' |
| (count by byte) | '4' | LRC Check | '8' |
| | '1' | END | CR |
| The first data contant | '3' | END | LF |
| The first data content | '8' | | |
| - | '8' | | |
| | ' 0' | | |
| The second data content | 'F' | | |
| The second data content | 'A' | | |
| | ' 0' | | |
| LRC Check | ' 9' | | |
| LUC OLIECK | 'A' | | |
| END | CR | | |
| END | LF | | |

RTU mode:

| Command Message: | | Response Message | |
|-------------------------|-------------|-----------------------|-----|
| ADR | 01H ADR | | 01H |
| CMD | 10H | CMD 1 | 10H |
| Starting data address | 05H | Starting data address | 05H |
| Starting data address | 00H | Starting data address | 00H |
| Number of data | 00H | Number of data | 00H |
| (count by word) | 02H | (count by word) | 02H |
| Number of data | 04 | CRC Check Low | 41H |
| (count by byte) | | | |
| The first data content | 13H | CRC Check High | 04H |
| The first data content | 88H | | |
| The second data content | 0FH | | |
| | A0H | | |
| CRC Check Low | ' 9' | | |
| CRC Check High | 'A' | | |

Check sum

ASCII mode:

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, and the values of the bytes from ADR1 to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example,

01H+03H+21H+02H+00H+02H=29H, the 2's-complement negation of 29H is **<u>D7</u>**H.

RTU mode:

CRC (Cyclical Redundancy Check) is calculated by the following steps:

Step 1:

Load a 16-bit register (called CRC register) with FFFFH.

Step 2:

Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.

Step 3:

Examine the LSB of CRC register.

Step 4:

If the LSB of CRC register is 0, shift the CRC register one bit to the right with MSB zero filling, then repeat step 3. If the LSB of CRC register is 1, shift the CRC register one bit to the right with MSB zero filling, Exclusive OR the CRC register with the polynomial value A001H, then repeat step 3.

Step 5:

Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed.

Step 6:

Repeat step 2 to 5 for the next 8-bit byte of the command message. Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value. When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, i.e. the lower order byte will be transmitted first.

The following is an example of CRC generation using C language. The function takes two arguments:

Unsigned char* data \leftarrow a pointer to the message buffer

Unsigned char length \leftarrow the quantity of bytes in the message buffer

The function returns the CRC value as a type of unsigned integer.

Unsigned int crc_chk(unsigned char* data, unsigned char length)

```
{
    int j;
    unsigned int reg_crc=0Xffff;
    while (length--) {
        reg_crc ^= *data++;
        for(j=0;j<8;j++){
        if(reg_crc & 0x01){ /* LSB(b0)=1 */
            reg_crc=(reg_crc>>1) ^ 0Xa001;
        }else{
            reg_crc=reg_crc >>1;
        }
    }
    return reg_crc; // return register CRC
```

4. Address list

| Content | Address | | Function |
|--------------------------|---------|------------|--|
| AC drive parameters | GGnnH | | |
| | | | the address of Pr 4-01 is 0401H. |
| Command write only | 2000H | Bit1~0 | 00B : No function |
| | | | 01B : Stop |
| | | | 10B:Run |
| | | | 11B : JOG+RUN |
| | | Bit3~2 | Reserved |
| | | Bit5~4 | 00B : No function |
| | | | 01B : FWD |
| | | | 10B : REV |
| | | | 11B : Change direction |
| | | Bit7~6 | 00B : 1st accel/decel. |
| | | Βιι/~ο | |
| | | | 01B : 2nd accel/decel |
| | | | 10B : 3rd accel/decel |
| | | | 11B : 4th accel/decel |
| | | Bit11~8 | 000B: master speed |
| | | | 0001B: 1st Step Speed Frequency |
| | | | 0010B: 2nd Step Speed Frequency |
| | | | 0011B: 3rd Step Speed Frequency |
| | | | 0100B: 4th Step Speed Frequency |
| | | | 0101B: 5th Step Speed Frequency |
| | | | 0110B: 6th Step Speed Frequency |
| | | | 0111B: 7th Step Speed Frequency |
| | | | 1000B: 8th Step Speed Frequency |
| | | | 1001B: 9th Step Speed Frequency |
| | | | 1010B: 10th Step Speed Frequency |
| | | | 1011B: 11th Step Speed Frequency |
| | | | 1100B: 12th Step Speed Frequency |
| | | | 1101B: 13th Step Speed Frequency 1110B: 14th Step Speed Frequency |
| | | | 1111B: 15th Step Speed Frequency |
| | | Bit12 | 1: Enable bit06-11 function |
| | | | 00B : No function |
| | | DI(14*13 | |
| | | | 01B : Operated by digital keypad |
| | | | 10B : Operated by Pr.00-21 setting |
| | | | 11B : Change operation source |
| | 000 | Bit15 | Reserved |
| | 2001H | | / command |
| | 2002H | Bit0 | 1 : EF (external fault) on |
| | | Bit1 | 1 : Reset |
| | | Bit2 | 1 : B.B ON |
| | | Bit15~3 | Reserved |
| Status monitor read only | 2100H | Error code | e: refer to Pr.06-17 to Pr.06-22 |
| | 2101H | Bit1~0 | AC Drive Operation Status |
| | | | 00B: Drive stops |
| | | | 01B: Drive decelerating |
| | | | 10B: Drive standby |
| | | | 11B: Drive operating |
| | | Bit2 | 1 : JOG Command |
| | | Bit4~3 | Operation Direction |
| | | | 00B: FWD run |

| Content | Address | | Function |
|---------|----------------|---|--|
| | | | 01B: From REV run to FWD run |
| | | | 10B: REV run |
| | | | 11B: From FWD run to REV run |
| | | Bit8 | 1 : Master frequency controlled by communication |
| | | i | interface |
| | | Bit9 | 1 : Master frequency controlled by analog signal |
| | | Bit10 | 1 : Operation command controlled by |
| | | | communication interface |
| | | Bit11 | 1 : Parameter locked |
| | | Bit12 | 1 : Enable to copy parameters from keypad |
| | | Bit15~13 | Reserved |
| | 2102H | Frequency | command (F) |
| | | Output freq | |
| | | | rent (AXX.X.X) |
| | 2105H | | oltage (UXXX.X) |
| | 2106H | | age (EXXX.X) |
| | 2107H | | p number of Multi-Step Speed Operation |
| | 2108H | Reserved | luo |
| | 2109H 210AH | Counter va | |
| | | | tor Angle (XXX.X) |
| | 210BH | Output Tore | que (%) |
| | 210CH | Actual moto | or speed (rpm) |
| | 210DH | Number of | PG feed back pulses |
| | 210EH | | PG2 pulse commands |
| | 210FH | Power outp | |
| | 2116H | | on display (Pr.00-04) |
| | 211BH | Max. operation frequency (Pr.01-00) or Max. user defined value (Pr.00-26) | |
| | 2200H | | put current (A) |
| | 2201H | Display counter value (c) | |
| | | | but frequency (H) |
| | 2203H | DC-BUS vo | |
| | 2204H | Output volt | |
| | 2205H | Power angl | |
| | 2206H 2207H | | ual motor speed kW of U, V, W (P) tor speed in rpm estimated by the drive or encoder |
| | | feedback | |
| | 2208H | | sitive/negative output torque in %, estimated by the positive torque, -0.0: negative torque) |
| | 2209H | ` | i feedback (as Pr. 00-04 NOTE 1) |
| | 220AH | | ick value after enabling PID function in % (b) |
| | 220BH | Display sig | nal of AVI analog input terminal, 0-10V corresponds (1.) (as Pr. 00-04 NOTE 2) |
| | 220CH | Display sig | nal of ACI analog input terminal, 4-V20mA/0-10V |
| | 2200011 | | ls to 0-100% (2.) (as Pr. 00-04 NOTE 2) |
| | 220DH | correspond | nal of AUI analog input terminal, -10V~10V Is to -100~100% (3.) (as Pr. 00-04 NOTE 2) |
| | 220EH | | erature of drive power module in °C |
| | 220FH | · · · · · · | rature of capacitance in °C |
| | 2210H | The status of digital input (ON/OFF), refer to Pr.02-12 (as Pr 00-04 NOTE 3) | |
| | 2211H | | of digital output (ON/OFF), refer to Pr.02-18 (as Pr. |
| | 2212H | | tep speed that is executing (S) |

| Content | Address | Function |
|---------------------|---------|---|
| | 2213H | The corresponding CPU pin status of digital input (d.) (as Pr. 00-04 NOTE 3) |
| | 2214H | The corresponding CPU pin status of digital output (O.) (as Pr. 00-04 NOTE 4) |
| | 2215H | Number of actual motor revolution (PG1 of PG card) (P.) it will start from 9 when the actual operation direction is changed or keyned diaplay at star is 0. Max, is 65525 |
| | 2216H | keypad display at stop is 0. Max. is 65535 Pulse input frequency (PG2 of PG card) (S.) |
| | 2210H | Pulse input position (PG card PG2), maximum setting is |
| | | 65535. |
| | 2218H | Position command tracing error |
| | 2219H | Display times of counter overload (0.00~100.00%) |
| | 221AH | GFF in % (G.) |
| | 221BH | DCbus voltage ripples (Unit: Vdc) (r.) |
| | 221CH | PLC register D1043 data (C) |
| | 221DH | Pole of Permanent Magnet Motor |
| | 221EH | User page displays the value in physical measure |
| | 221FH | Output Value of Pr.00-05 |
| | 2220H | Number of motor turns when drive operates (keeping when drive stops, and reset to zero when operation) |
| | 2221H | Operation position of motor (keeping when drive stops, and reset to zero when operation) |
| | 2222H | Fan speed of the drive (%) |
| | 2223H | Control mode of the drive 0: speed mode 1: torque mode |
| | 2224H | Carrier frequency of the drive |
| Content | | Function |
| AC drive Parameters | GGnnH | GG means parameter group, nn means parameter number, for example, the address of Pr 4-01 is 0401H. |
| | 2225H | Carrier frequency of the drive |
| | 2226H | Drive status |
| | 2227H | Drive's estimated output torque(positive or negative direction) |
| | 2228H | Torque command |
| | 2229H | KWH display |
| | 222AH | PG2 pulse input in Low Word |
| | 222BH | PG2 pulse input in High Word |
| | 222CH | Motor actual position in Low Word |
| | 222DH | Motor actual position in High Word |
| | 222EH | PID reference |
| | 222FH | PID offset |
| | 2230H | PID output frequency |

5. Exception response:

The AC motor drive is expected to return a normal response after receiving command messages from the master device. The following depicts the conditions when no normal response is replied to the master device.

The AC motor drive does not receive the messages due to a communication error; thus, the AC motor drive has no response. The master device will eventually process a timeout condition. The AC motor drive receives the messages without a communication error, but cannot handle them. An exception response will be returned to the master device and an error message "CExx" will be displayed on the keypad of AC motor drive. The xx of "CExx" is a decimal code equal to the exception code that is described below.

In the exception response, the most significant bit of the original command code is set to 1, and an exception code which explains the condition that caused the exception is returned.

Chapter 12 Description of Parameter Settings

Example:

| ASCII mo | de: | RTU mode: | | |
|----------------|------------|----------------|-----|--|
| STX | (.) - | Address | 01H | |
| Address | ʻ0' | Function | 86H | |
| Address | '1' | Exception code | 02H | |
| Function | '8' | CRC CHK Low | C3H | |
| Function | ·6' | CRC CHK High | A1H | |
| Exception code | ·0' | | | |
| Exception code | '2' | | | |
| LRC CHK | '7' | | | |
| | '7' | | | |
| END | CR | | | |
| END | LF | | | |

The explanation of exception codes:

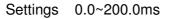
| Exception | Evelopetion | | |
|-----------|---|--|--|
| code | Explanation | | |
| 4 | Illegal data value: | | |
| | The data value received in the command message is not available for the AC drive. | | |
| | Illegal data address: | | |
| 2 | The data address received in the command message is not available for the AC | | |
| | motor drive. | | |
| 3 | Parameters are locked: parameters can't be changed | | |
| 4 | Parameters can't be changed during operation | | |
| 10 | Communication time-out. | | |

× 89-85

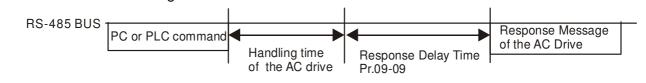
Reserved

Response Delay Time

Factory Setting: 2.0



This parameter is the response delay time after AC drive receives communication command as shown in the following.



✓ 39 - 18 Main Frequency of the Communication

Factory Setting: 60.00

Settings 0.00~600.00Hz

When Pr.00-20 is set to 1 (RS485 communication). The AC motor drive will save the last frequency command into Pr.09-10 when abnormal turn-off or momentary power loss. After reboots the power, it will regards the frequency set in Pr.09-10 if no new frequency command is inputted.

| N | 89-11 | Block Transfer 1 |
|---|-------|------------------|
| N | 09-12 | Block Transfer 2 |

| 89-13 | Block Transfer 3 |
|---------|---|
| 89-14 | Block Transfer 4 |
| 89-45 | Block Transfer 5 |
| 09-16 | Block Transfer 6 |
| 89-17 | Block Transfer 7 |
| 89 - 18 | Block Transfer 8 |
| 89-19 | Block Transfer 9 |
| 09-20 | Block Transfer 10 |
| 09-21 | Block Transfer 11 |
| 88-88 | Block Transfer 12 |
| 88-83 | Block Transfer 13 |
| 89-24 | Block Transfer 14 |
| 89-25 | Block Transfer 15 |
| 88-88 | Block Transfer 16 |
| | 09-14 09-15 09-16 09-18 09-18 09-18 09-19 09-21 09-21 |

Factory Setting: 0

Settings 0~65535

There is a group of block transfer parameter available in the AC motor drive (Pr.09-11 to Pr.09-26). Through communication code 03H, user can use them (Pr.09-11 to Pr.09-26) to save those parameters that you want to read.

09-27

ק - ף

Reserved

39-30 Communication Decoding Method

Factory Setting: 1

Settings 0: Decoding Method 1

1: Decoding Method 2

| | | Decoding Method 1 | Decoding Method 2 | | |
|--|-----------------------|---|--|--|--|
| Source of Digital Keypad Digital keypad controls the drive action regardless dec | | gardless decoding method 1 or 2. | | | |
| Operation | External Terminal | External terminal controls the drive acti | ion regardless decoding method 1 or 2. | | |
| Control | RS-485 | Refer to address: 2000h~20FFh | Refer to address: 6000h ~ 60FFh | | |
| | CANopen | Refer to index: 2020-01h~2020-FFh | Refer to index:2060-01h ~ 2060-FFh | | |
| | Communication Card | Refer to address: 2000h ~ 20FFh | Refer to address: 6000h ~ 60FFh | | |
| | PLC | PLC commands the drive action r | PLC commands the drive action regardless decoding method 1 or 2. | | |

89-3

Internal Communication Protocol

Settings 0: Modbus 485

-1: Internal Communication Slave 1

- -2: Internal Communication Slave 2
- -3: Internal Communication Slave 3
- -4: Internal Communication Slave 4
- -5: Internal Communication Slave 5
- -6: Internal Communication Slave 6
- -7: Internal Communication Slave 7
- -8: Internal Communication Slave 8
- -9: Reserve
- -10: Internal Communication Master
- -11: Reserve
- -12: Internal PLC Control
- When it is defined as internal communication, see CH16-10 for information on Main Control Terminal of Internal Communication.
- When it is defined as internal PLC control, see CH16-12 for Remote IO control application (by using MODRW)

39-32 Reserved

39-33 PLC command force to 0

Factory Setting: 0

Factory Setting: 0

Settings 0~65535

| bit | Explanation | |
|------|--|--|
| bit0 | Before PLC scan, set up PLC target frequency=0 | |
| bit1 | Before PLC scan, set up the PLC target torque=0 | |
| bit2 | Before PLC scan, set up the speed limit of torque control mode=0 | |

89-34 Reserved

BB-35 PLC Address

Factory Setting: 2

Factory Setting: 0

Settings 1~254

CANopen Slave Address

Settings 0: Disable 1~127

| 89-37 | CANoper | Speed | |
|--------------|----------|--|----------------------------|
| | | | Factory Setting: 0 |
| | Settings | 0: 1M | |
| | | 1: 500k | |
| | | 2: 250k | |
| | | 3: 125k | |
| | | 4: 100k (Delta only) | |
| | | 5: 50k | |
| 09-38 | Reserved | | |
| <u></u> | CANapar | Warning Decord | |
| <u>89-39</u> | CANoper | Warning Record | E I O III O |
| | O | | Factory Setting: 0 |
| | Settings | bit 0: CANopen Guarding Time out | |
| | | bit 1: CANopen Heartbeat Time out | |
| | | bit 2: CANopen SYNC Time out | |
| | | bit 3: CANopen SDO Time out | |
| | | bit 4: CANopen SDO buffer overflow | |
| | | bit 5: Can Bus Off | |
| | | bit 6: Error protocol of CANOPEN | |
| | | bit 8: The setting values of CANopen indexes a | re fail |
| | | bit 9: The setting value of CANopen address is | fail |
| | | bit10: The checksum value of CANopen indexe | s is fail |
| 09-40 | CANoper | Decoding Method | |
| | | | Factory Setting: 1 |
| | Settings | 0: Delta defined decoding method | |
| | | 1: CANopen Standard DS402 protocol | |
| 09-4; | CANoper | Status | |
| | | | Factory Setting: 0 |
| | Settings | 0: Node Reset State | |
| | | 1: Com Reset State | |
| | | 2: Boot up State | |
| | | 3: Pre Operation State | |
| | | 4: Operation State | |
| | | 5: Stop State | |
| 69-42 | CANoper | Control Status | |
| | | | Factory Setting: Read Only |
| | Settings | 0: Not ready for use state | , , , |
| | | 1: Inhibit start state | |
| | | 2: Ready to switch on state | |
| | | 3: Switched on state | |
| | | | |
| | | | |

| | 4: Enable operation state | |
|--------------------|-----------------------------------|-----------------------|
| | 7: Quick stop active state | |
| | 13: Err reaction activation state | |
| | 14: Error state | |
| H Reset C | ANopen Index | |
| | | Factory Setting: 6553 |
| Settings | bit0: reset address 20XX to 0 | |
| - | bit1: reset address 264X to 0 | |
| | bit2: reset address 26AX to 0 | |
| | bit3: reset address 60XX to 0 | |
| 44 Reserve | d | |
| | | |
| 45 CANope | n Master Function | |
| | | Factory Setting: 0 |
| Settings | 0: Disable | |
| | 1: Enable | |
| 45 CANope | n Master Address | |
| | | Factory Setting: 100 |
| Settings | 1~127 | |
| 47 | | |
| Reserve | d | |
| 53 | | |
| b 🖁 Identifica | ations for Communication Card | |
| | | Factory Setting: ## |
| Settings | 0: No communication card | |
| | 1: DeviceNet Slave | |
| | 2: Profibus-DP Slave | |
| | 3: CANopen Slave/Master | |
| | 4: Modbus-TCP Slave | |
| | 5: EtherNet/IP Slave | |
| | 6~8: Reserved | |
| 5 ; Firmwar | e Version of Communication Card | |
| | | Factory Setting: ## |
| Settings | · · | |
| 62 Product | Code | |
| | | Factory Setting: ## |
| Settings | Read only | |

DeviceNet: As it connects to different kind of motor drive, it will have different product code.

Profibus: ID number of a communication card. Each Profibus selling in the market must apply for an ID number at the Profibus International to be a unique product.

| 89-63 | Fault Coo | le | |
|---------------|--------------|---|---------------------|
| | | | Factory Setting: ## |
| | Settings | Read only | |
| 🕮 For me | ore informa | tion about Fault codes, refer to Pr. 06-17~06-22 at | nd Chapter 14. |
| 89-64 | | | |
| ~ | Reserved | l | |
| 89-69 | | | |
| 00 20 | | | |
| 09-70 | Address | of Communication Card | F i o i i |
| | | | Factory Setting: 1 |
| | Settings | DeviceNet: 0-63 | |
| | | Profibus-DP: 1-125 | |
| 89-71 | Setting of | DeviceNet Speed (according to Pr.09-72) | |
| | | | Factory Setting: 2 |
| | Settings | Standard DeviceNet: | |
| | | 0: 125Kbps | |
| | | 1: 250Kbps | |
| | | 2: 500Kbps | |
| | | Non standard DeviceNet: (Delta only) | |
| | | 0: 10Kbps | |
| | | 1: 20Kbps | |
| | | 2: 50Kbps | |
| | | 3: 100Kbps | |
| | | 4: 125Kbps | |
| | | 5: 250Kbps | |
| | | 6: 500Kbps | |
| | | 7: 800Kbps | |
| | | 8: 1Mbps | |
| 88 - 75 | Other Set | tting of DeviceNet Speed | |
| | | | Factory Setting: 0 |
| | Settings | 0: Disable | |
| | | 1: Enable | |
| 🕮 It need | ds to use w | ith Pr.09-71. | |
| 🛄 Setting | g 0: the bai | ud rate can only be set to 0, 1, 2 or 3. | |
| | | of DeviceNet baud rate can be the same as CANo | open (setting 0-8). |
| <u>89-</u> 73 | Reserved | | |
| 09-74 | Reserved | 1 | |

19 - 15 IP Configuration of the Communication Card Factory Setting: 0 Settings 0: Static IP 1: DynamicIP (DHCP) Setting 0: it needs to set IP address manually. Setting 1: IP address will be auto set by host controller. 20 - IF Address 1 of the Communication Card 20 IP Address 2 of the Communication Card IP Address 3 of the Communication Card 89-IP Address 4 of the Communication Card Factory Setting: 0 Settings 0~255 Pr.09-76~09-79 needs to use with communication card. Address Mask 1 of the Communication Card Address Mask 2 of the Communication Card Address Mask 3 of the Communication Card Address Mask 4 of the Communication Card Factory Setting: 0 Settings 0~255 **Getway Address 1 of the Communication Card** Getway Address 2 of the Communication Card Getway Address 3 of the Communication Card Getway Address 4 of the Communication Card Factory Setting: 0 Settings 0~255 Password for Communication Card (Low word) Password for Communication Card (High word) Factory Setting: 0 Settings 0~255 89-98 **Reset Communication Card**

Settings 0: Disable

1: Reset, return to factory setting

Factory Setting: 0

| 89-9; | Additiona | I Setting for Communication Card |
|-------|-----------|---|
| | | Factory Setting: 1 |
| | Settings | Bit 0: Enable IP Filter |
| | | Bit 1: Internet parameters enable(1bit) |
| | | When IP address is set up, this bit need to be enabled to write down the |
| | | parameters. This bit will change to disable when it finishes saving the |
| | | update of internet parameters. |
| | | Bit 2: Login password enable(1bit) |
| | | Enable login password (1bit). This bit will be changed to disable when it |
| | | finishes saving the update of internet parameters. |
| 88-85 | Status of | Communication Card |
| | | Factory Setting: 0 |
| | Settings | Bit 0: password enable |
| | | When the communication card is set with password, this bit is enabled. |
| | | When the password is clear, this bit is disabled. |
| | | |

10 PID Control

✓ This parameter can be set during operation.

In this parameter group, ASR is the abbreviation for Adjust Speed Regulator and PG is the abbreviation for Pulse Generator.

| I [] - [] [] Encoder Type Selection | |
|--|--------------------|
| | Factory Setting: 0 |

Settings 0: Disable

1: ABZ

2: ABZ (Delta encoder for Delta Servo motor)

- 3: Resolver
- 4: ABZ/UVW
- 5. MI8 single phase pulse input
- For PG extension card EMC-PG01L and EMC-PG01O, set Pr.10-00=1. These extension cards are for IM motor only.
- For EMC-PG01U, when setting Pr.10-00=2 (Delta encoder) make sure SW1 is switched to D (Delta type). If the setting for Pr.10-00, 10-01 and 10-02 has changed, please turn off the drive's power and reboots to prevent PM motor stall. This mode is suggested for PM motor.
- For EMC-PG01R, when setting Pr.10-00=3 please also input 1024 ppr.
- For EMC-PG01U, when setting Pr.10-00=4 (Standard ABZ/UVW Encoder) make sure SW1 is switched to S (Standard Type). This mode is applicable for both IM and PM motor.
- When using MI8 single phase pulse input as frequency command, the Pr10-02 must set "5: Single-phase input". This only can be use with VF, VFPG, SVC, IM FOC Sensor-less, IM TQC Sensor-less control mode.
- When using MI8 single phase pulse as speed feedback, the drive must at VFPG control mode only.

H - **H** Encoder Pulse

Factory Setting: 600

Settings 1~20000

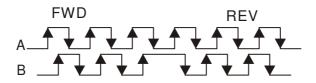
- A Pulse Generator (PG) or encoder is used as a sensor that provides a feedback signal of the motor speed. This parameter defines the number of pulses for each cycle of the PG control, i.e. the number of pulses for a cycle of A phase/B phase.
- This setting is also the encoder resolution. With the higher resolution, the speed control will be more accurate.
- An incorrect input to Pr.10-00 may result drive over current, motor stall, PM motor magnetic pole origin detection error. If Pr.10-00 setting has changed, please trace the magnetic pole again, set Pr.05-00=4 (static test for PM motor magnetic pole and PG origin again).



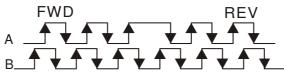
Factory Setting: 0

Settings 0: Disable

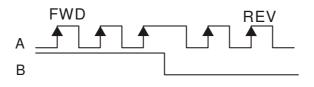
1: Phase A leads in a forward run command and phase B leads in a reverse run command



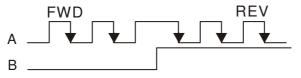
2: Phase B leads in a forward run command and phase A leads in a reverse run command



3: Phase A is a pulse input and phase B is a direction input. (L =reverse direction, H=forward direction)



4: Phase A is a pulse input and phase B is a direction input. (L=forward direction, H=reverse direction)



5: Single-phase input



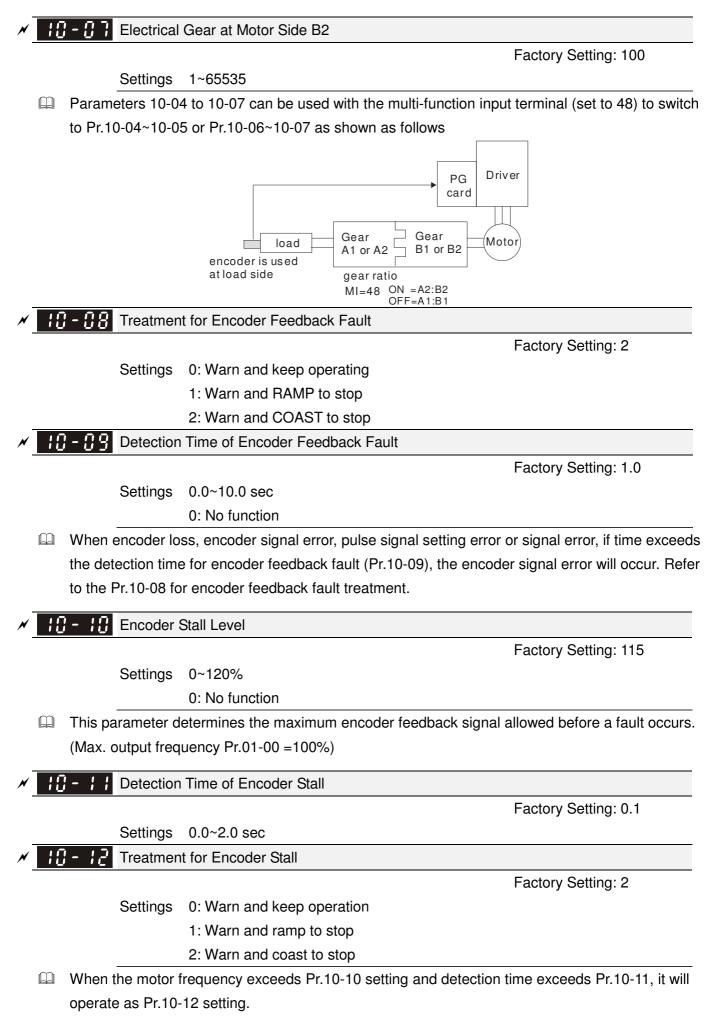
III - II 3 Output Setting for Frequency Division (denominator)

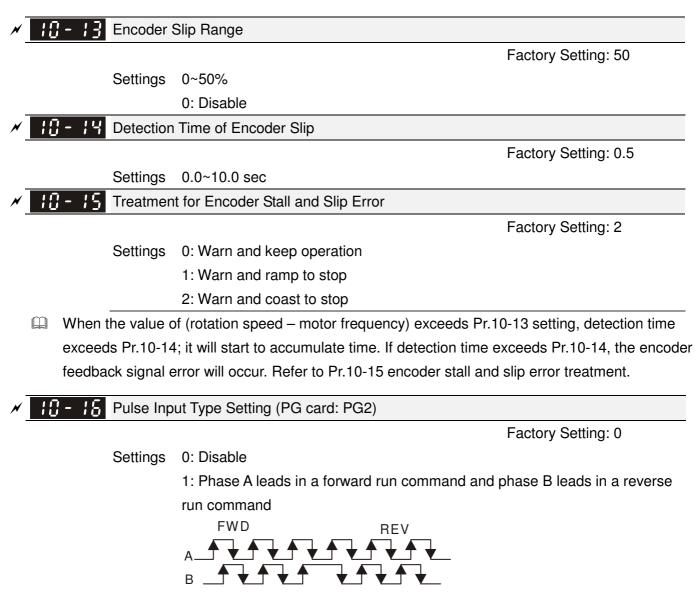
Factory Setting: 1

Settings 1~255

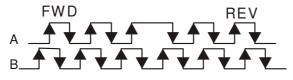
This parameter is used to set the denominator for frequency division (for PG card EMC-PG01L or EMC-PG01O). For example, when it is set to 2 with feedback 1024ppr, PG output will be 1024/2=512ppr.

| * | Image: Control of the sector o |
|---|--|
| | 10 - 05 Electrical Gear at Motor Side B1 |
| * | IC - C S Electrical Gear at Load Side A2 |

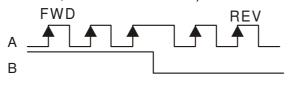




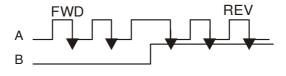
2: Phase B leads in a forward run command and phase A leads in a reverse run command



3: Phase A is a pulse input and phase B is a direction input. (L=reverse direction, H=forward direction)



4: Phase A is a pulse input and phase B is a direction input. (L=forward direction, H=reverse direction)



Chapter 12 Description of Parameter Settings

- When this setting is different from Pr.10-02 setting and the source of the frequency command is pulse input (Pr.00-20 is set to 4 or 5), it may have 4 times frequency problem.
 Example: Assume that Pr.10-01=1024, Pr.10-02=1, Pr.10-16=3, Pr.00-20=5, MI=37 and ON, it needs 4096 pulses to rotate the motor a revolution.
- Assume that Pr.10-01=1024, Pr.10-02=1, Pr.10-16=1, Pr.00-20=5, MI=37 and ON, it needs 1024 pulses to rotate the motor a revolution.
- Desition control diagram

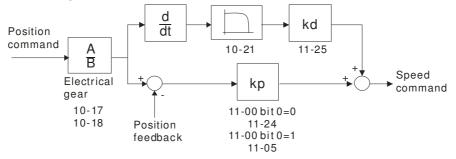


 Image: Constraint of the sector of the se

Settings

Factory Setting: 100

Rotation speed = pulse frequency/encoder pulse (Pr.10-01) * PG Electrical Gear A / PG Electrical Gear B.

✓ IB - IB Positioning for Encoder Position

Factory Setting: 0

Settings 0~65535 pulse

1~65535

Description of the internal position in the position mode.

It needs to be used with multi-function input terminal setting =35 (enable position control).

When it is set to 0, it is the Z-phase position of encoder.

Range for Encoder Position Attained

Factory Setting: 10

Settings 0~65535 pulse

In This parameter determines the range for internal positioning position attained.

For example:

When the position is set by Pr.10-19 Positioning for Encoder Position and Pr.10-20 is set to 1000, it reaches the position if the position is within 990-1010 after finishing the positioning.



Factory Setting: 0.100

Settings 0.000~65.535 sec

When Pr.00-20 is set to 5 and multi-function input terminal is set to 37 (OFF), the pulse command will be regarded as frequency command. This parameter can be used to suppress the jump of speed command.

10-22 Sp

Speed Mode (PG2)

Factory Setting: 0

Settings 0: Electronic Frequency

1: Mechanical Frequency (base on pole pair)

Reserved

FOC&TQC Function Control

Factory Setting: 0

Settings 0~65535

| Bit# | Description | |
|------|--|--|
| 0 | ASR control at sensorless torque 0:use PI as ASR; 1:use P as ASR | |
| 1~10 | NA | |
| 11 | Activate DC braking when executing zero torque command 0:ON, 1:OFF | |
| 12 | FOC Sensorless mode, cross zero means speed goes from negative to positive or positive to negative (forward to reverse direction or reverse to forward direction). 0: determine by stator frequency, 1: determine by speed command | |
| 13 | NA | |
| 14 | NA | |
| 15 | Direction control at open loop status 0: Switch ON direction control 1: Switch OFF direction control | |

Except Bit=0 set to be used in closed loop, other Bit settings are for open loop.

FOC Bandwidth of Speed Observer

Factory Setting:40.0

Settings 20.0~100.0Hz

Setting speed observer to higher bandwidth could shorten the speed response time but will create greater noise interference during the speed observation.

10 - 26 FOC Minimum Stator Frequency

Factory Setting:2.0

Settings 0.0~10.0%fN

This parameter is used to set the minimum level of stator frequency at operation status. This setting ensures the stability and accuracy of observer and avoid interferences from voltage, current and motor parameter.

III - 2 1 FOC Low-pass Filter Time Constant

Factory Setting:50

Settings 1~1000ms

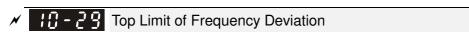
This parameter sets the low-pass filter time constant of a flux observer at start up. If the motor can not be activated during the high-speed operation, please lower the setting in this parameter.

G-28 FOC Gain of Excitation Current Rise Time

Factory Setting:100

Settings 33~100% Tr (Tr: rotor time constant)

This parameter sets the drive's excitation current rise time when activates at senslorless torque mode. When the drive's activation time is too long at torque mode, please adjust this parameter to a shorter time constant.



Factory Setting: 20.00

Settings 0.00~100.00Hz

Pr.10-29 is for setting the maximum of frequency deviation.

- When this parameter is set too large, resulting in abnormal PG feedback malfunction.
- If customer application require a large Pr10-29 value, resulting in larger output slip, then it is tends to be PG Error (PGF3, PGF4) in such a case. To prevent PGF3 and PGF4 error, set Pr10-10 Encoder Stall Level and to 10-13 Encoder Slip Range to be 0 "No function" (means removing PGF3 and PGF4 detection). But this must only when the PG card connection and application are correct, or prompt PG protection function will be disable. Too large Pr10-29 setting is not a common set.

Resolver Pole Pair

Factory Setting: 1

Settings 1~50

To use Pr.10-30 function, user must set Pr.10-00=3(Resolver Encoder) first.

| 10-33 Reserved | |
|------------------|--------------------|
| 10 - 35 ARM (Kp) | |
| | Factory Setting: 1 |

Settings 0~3

- 35 ARM (Ki)

Factory Setting: 1

Settings 0~3

| 10-38 Reserved | |
|---|-----------------------|
| I/F Mode, current command | |
| | Factory Setting: 40 |
| Settings 0~150%Irated (Rated current % of the drive) | |
| 10 - 32 PM Sensorless Observer Bandwidth for High Speed Zone | |
| | Factory Setting: 5.00 |

Settings 0.00~600.00Hz

H Sensorless Observer Low-pass Filter Gain

Factory Setting: 1.00

Settings 0.00~655.35Hz

PM Sensorless Control Word

Factory Setting: 0000

| Bit No. | Function | Description |
|---------|---------------------------------|---|
| 0 | Reserved | |
| 1 | Reserved | |
| 2 | Choose a control mode to start. | 0 :Start by IF mode 1: Start by VF mode |
| 3 | Choose a mode to stop. | 0 :Stop by IF mode 1 :Stop by VF mode |
| 4 | Reserved | |
| 5 | | 0 : When lower than Pr10-40, coast to stop If lower than Pr10-40, decelerate to stop by VF mode. |
| 6 | Reserved | |
| 7 | Reserved | |

II - 3 Frequency Point when switch from I/F mode to PM Sensorless mode

Factory Setting: 20.00

Settings 0.00~600.00Hz

II - YI Frequency Point when switch from PM Sensorless Observation mode to I/F mode

Factory Setting: 20.00

Settings 0.00~600.00Hz

4 | I/F mode, low pass-filter time

Factory Setting: 0.2

Settings 0.0~6.0 sec

1 - 4 2 Initial Angle Detection Time

Factory Setting: 5

Settings 0~20 ms

PM Sensorless Adjustment Procedure

1. When using high frequency standstill VFD parameter tuning, use VFD software to monitor adjustment procedure. To download VFD Software go to:

http://www.delta.com.tw/product/em/download/download_main.asp?act=3&pid=1&cid=1&tpid=3

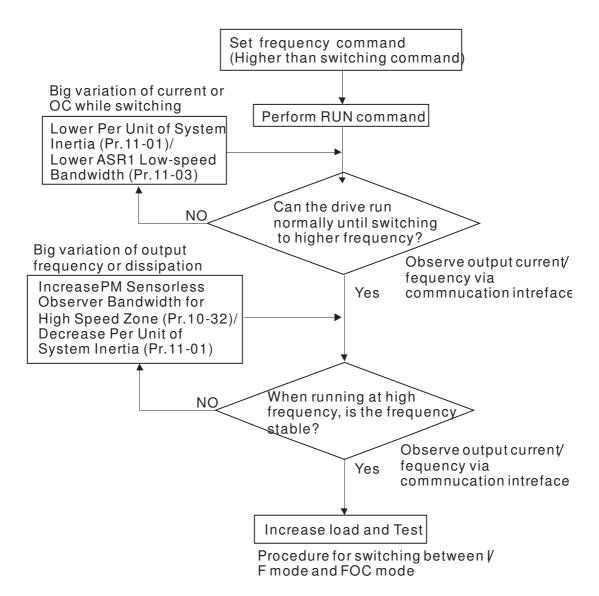
2. Testing PM High Frequency Standstill VFD (calculation of Rs, Ld, Lg)

Procedures:

- A. Set control mode as VF mode (Pr00-10=0, Pr00-11=0
- B. Output Frequency of Motor 1 (Pr01-01)
- C. Output Voltage of Motor 1 (Pr01-02)
- D. Induction Motor and Permanent Magnet Motor Selection (Pr05-33=1)
- E. Full-load current of Permanent Magnet Motor(Pr05-34
- F. Set Moto Auto Tuning Pr 05-00 =13; High frequency and blocked rotor test for PM motor. Then run the drive.

3. Set control mode as PM sensorless Mode (Parameters 00-10=0, 00-11=6)

- 4. Set VFD Parameters
 - Pr05-35 Rated Power of Permanent Magnet Motor
 - Pr05-36 Rated speed of Permanent Magnet Motor
 - Pr05-37 Pole number of Permanent Magnet Motor
 - Pr05-38 Inertia of Permanent Magnet Motor
- 5. Set ASR Parameters
 - Pr11-00 bit0=1: Auto tuning for ASR and APR
 - ✓ Pr11-02 : ASR1/ASR2 Switch Frequency, it is recommended to set Pr10-39 higher than 10Hz.
 - ✓ Pr11-03: ASR1 Low-speed Bandwidth and Pr11-03, ASR2 High-speed Bandwidth. Do not set Low-speed Bandwidth too high to avoid dissipation of the estimator.
- 6. Set speed estimator and speed control's parameter.
 - Pr10-39 Frequency when switch from I/F Mode to PM sensorless mode.
 - Pr10-32 PM Sensorless Observer Bandwidth for High Speed Zone
- 7. Zero-load test
 - \square Refer to switch point procedure of I/F and FOC as shown in the image below.



H - H - PG Card Version

Factory Setting:0

Settings 0~655.35

Reserved

10 - 49 Zero Voltage Time while Start up

Factory Setting: 0.2 sec.

Settings 0~65.535 sec.

- When the motor is in static status at the startup, the accuracy to estimate angles will be increased. Inorder to make the motor in "static status", the drive 3 phase U, V, W output 0V to motor to reach this goal. The Pr.10-49 setting time is the length of time when 3-phase output 0V.
- It is possible that even when this parameter is being applied but the motor at the installation site cannot go in to the "static status" caused by the inertia or by any external force. So, if the motor doesn't go into a completer "static status" in 0.2 sec., increase appropriately this setting value.
- III This parameter is functional only when the setting of Pr.07-12 Speed Search during Startup \neq 0.

11 - 51 Reverse Angle Limit (Electrical angle)

Factory Setting: 10.00

Settings 0~30.00 degree

- While forward run is staring, if there is sudden reverse run and the reverse angle is bigger than the Pr.10-50 setting, then, drive will has a ScRv error.
- Description: This parameter is valid only when Pr.07-28 Enable textile machines's function.

Factory Setting: 500Hz

Settings 0~2000Hz

I This parameter is a High Frequency Injection Command when the motor drive is under IPM HFI sersor-less control mode and it doesn't often need to be adjusted. But, if a motor's rated frequency (i.e. 400Hz)

19 - 52 Injection Magnitude

Factory Setting: 15/30V

Settings 0.0~200.0V

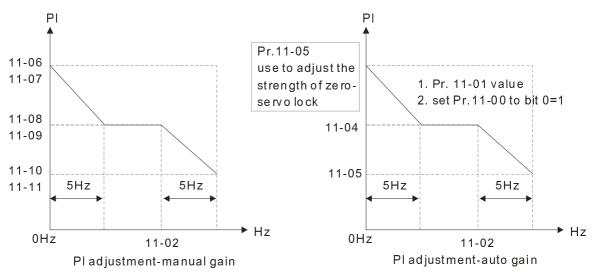
- I This parameter is the High Frequency Injection Command's amplitude when the motor drive is under IPM HFI sensor-less control mode.
- By increase the setting value of this parameter, the accuracy of angles detected will also be increased. However, if the setting value is too big, it will cause a louder electromagnetic noise.

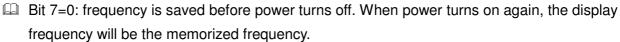
11 Advanced Parameters

✓ This parameter can be set during operation.

In this parameter group, ASR is the abbreviation for Adjust Speed Regulator

| · - · · · | | | | | | |
|-------------------------------------|--|---|---------------|--|--|--|
| II-III System Control | | | | | | |
| | | Factory Setting | j: O | | | |
| Settings 0: Auto t | is 0: Auto tuning for ASR and APR | | | | | |
| 1: Inertia | 1: Inertia estimate (only in FOCPG mode) | | | | | |
| 2: Zero s | 2: Zero servo | | | | | |
| 3: Dead | 3: Dead time compensation closed | | | | | |
| 7: Selec | tion to save or not sa | ve the frequency | | | | |
| 8: Maxin | num speed of point to | point position control | | | | |
| Bit 0=0: Pr.11-06 to 11-11 v | vill be valid and Pr.11 | -03~11-05 are invalid. | | | | |
| Bit 0=1: system will genera | te an ASR setting. At | t this moment, Pr.11-06~11-11 will b | e invalid and | | | |
| Pr.11-03~11-05 are valid. | | | | | | |
| Bit 1=0: no function. | | | | | | |
| Bit 1=1: Inertia estimate fu | nction is enabled. (Bi | t 1 setting would not activate the es | timation | | | |
| process, please set Pr.05-0 | 00=12 to begin FOC/ | TQC Sensorless inertia estimating) | | | | |
| Bit 2=0: no function. | | | | | | |
| Bit 2=1: when frequency co | ommand is less than | Fmin (Pr.01-07), it will use zero serv | vo function. | | | |
| | NO | | | | | |
| Estimateine | rtia value ——— | | | | | |
| | | | | | | |
| | YES | | | | | |
| | , | | | | | |
| Setting auto gai | n adjustment | | | | | |
| Pr.11-00=1 | | Adjust gain value by manual Pr.11-00=0 (factory setting) | | | | |
| | 11-04 and 11-05 | | | | | |
| separately by sp | beed response | Adjust Pr.11-06, 11-07, 11-08, 11-09, 11-10 and 11-11 | | | | |
| Adjust by requir | | separately by speed response | | | | |
| Pr.11-13 (PDFF | function) | Adjust by requirement | | | | |
| | | Pr.11-14 (for general, no need to adjust) | | | | |
| | | | | | | |
| Adjust by requi | rement | | 1 | | | |
| Pr.11-02 | witch frequency) | | | | | |
| Adjust by requi Pr. 11-17~20 (to | | | | | | |
| | | | | | | |





Bit 7=1: frequency is not saved before power turns off. When power turns ON again, the display frequency will be 0.00Hz.

Bit 8=0: maximum speed for point-to-point position control is control by the setting of Pr.11-43. Bit 8=1: maximum speed for point-to-point position control is control by the multi-step speed setting of the external terminal device. When multi-step speed of the external device is set to 0, the maximum operation speed will bet the setting of Pr.11-43.

Factory Setting: 400

Settings 1~65535 (256=1PU)

To get the system inertia from Pr.11-01, user needs to set Pr.11-00 to bit1=1 and execute continuous forward/reverse running.

Unit of induction motor system inertia is 0.001kg-m^2:

| Power | Setting | Power | Setting | Power | Setting |
|-------|---------|-------|---------|-------|---------|
| 1HP | 2.3 | 20HP | 95.3 | 100HP | 1056.5 |
| 2HP | 4.3 | 25HP | 142.8 | 125HP | 1275.3 |
| 3HP | 8.3 | 30HP | 176.5 | 150HP | 1900.0 |
| 5HP | 14.8 | 40HP | 202.5 | 175HP | 2150.0 |
| 7.5HP | 26.0 | 50HP | 355.5 | 215HP | 2800.0 |
| 10HP | 35.8 | 60HP | 410.8 | 300HP | 3550.0 |
| 15HP | 74.3 | 75HP | 494.8 | | |

The base value for induction motor system inertia is set by Pr.05-38 and the unit is in 0.001kg-m^2.

ASR1/ASR2 Switch Frequency

Factory Setting: 7.00

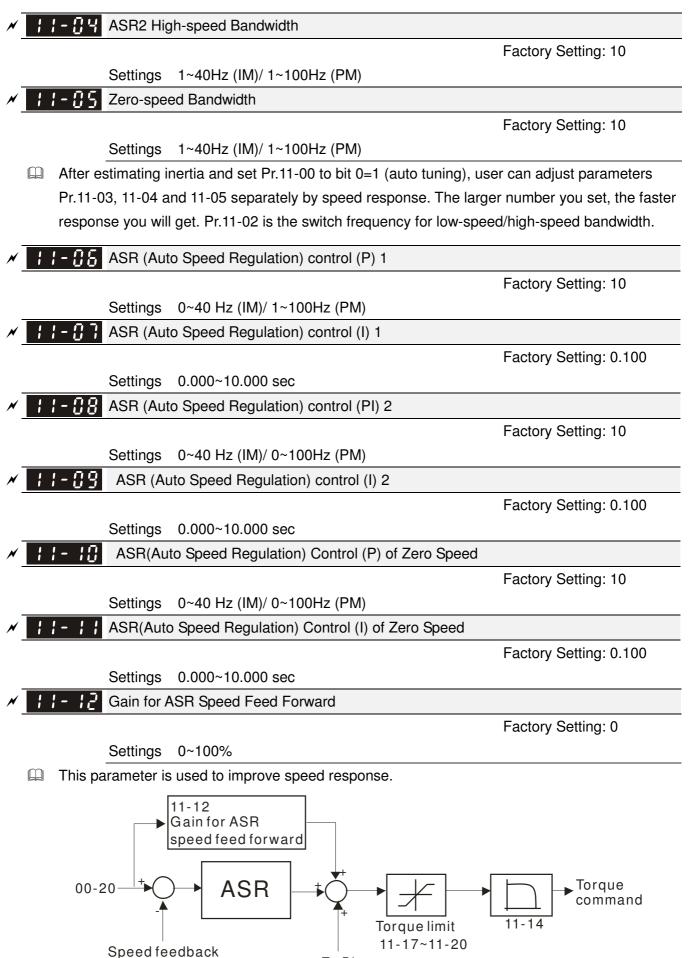
Settings 5.00~600.00Hz

I I - **I A**SR1 Low-speed Bandwidth

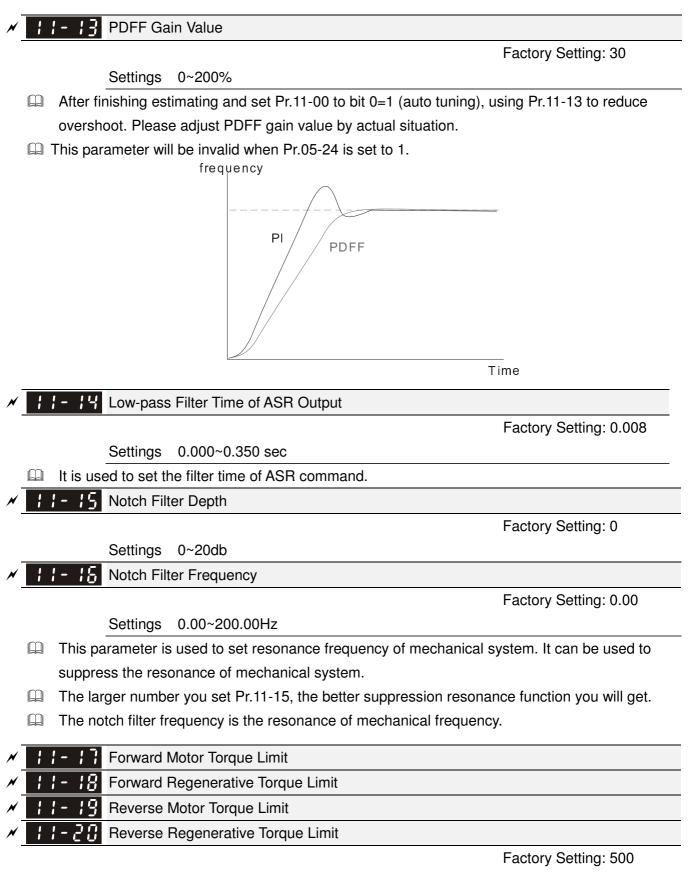
Factory Setting: 10

Settings 1~40Hz (IM)/ 1~100Hz (PM)

Chapter 12 Description of Parameter Settings







Settings 0~500%

- The motor drive rated current is 100%. The settings for Pr.11-17 to Pr.11-20 will compare with Pr.03-00=7, 8, 9, 10. The minimum of the comparison result will be torque limit. Please refer the chart as below.
- Calculation equation for motor rated torque:

$$= \frac{T(N.M) = \frac{P(W)}{\omega(rad/s)}}{\omega(rad/s)}; P(W) \text{ value} = Pr.05-02;$$

$$\frac{RPM \times 2\pi}{60} = rad/s$$

Motor rated torque=

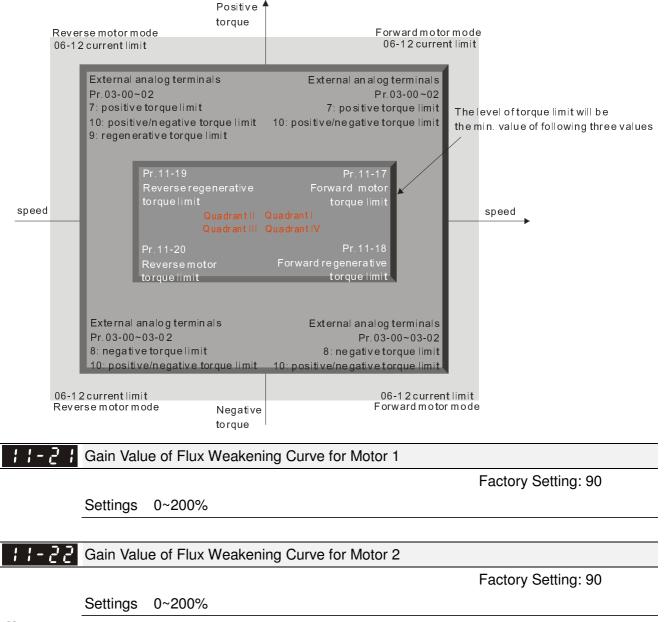
 ω (rad/s) value= Pr.05-03 \circ

$$\hfill \square$$
 . FOCPG and FOC sensor-less control mode

The drive rated current=100%. The setting value of parameters Pr11-17~Pr11-20 will compare to Pr03-00=7, 8, 9 and 10. The smallest value will become the torque limit value. Please refer to the torque limit diagram.

- □ TQCPG and TQC Sensor-less control mode The drive rated current=100%. The setting value of parameters Pr11-17~Pr11-20 will compare to Pr06-12. The smallest value will become the torque limit value.
- III VF, VFPG and SVC control mode

The Pr11-17~Pr11-20 are output current limit and its 100%=drive rated current. The smallest value between the Pr11-17~Pr11-20 and Pr06-12 will become output current limit. If the output current has reached this limit during acceleration or normal running, drive will enable "Over current Stall" function. Until the output current drops to limit value, drive can run normally.



Pr.11-21 and 11-22 are used to adjust the output voltage of flux weakening curve.

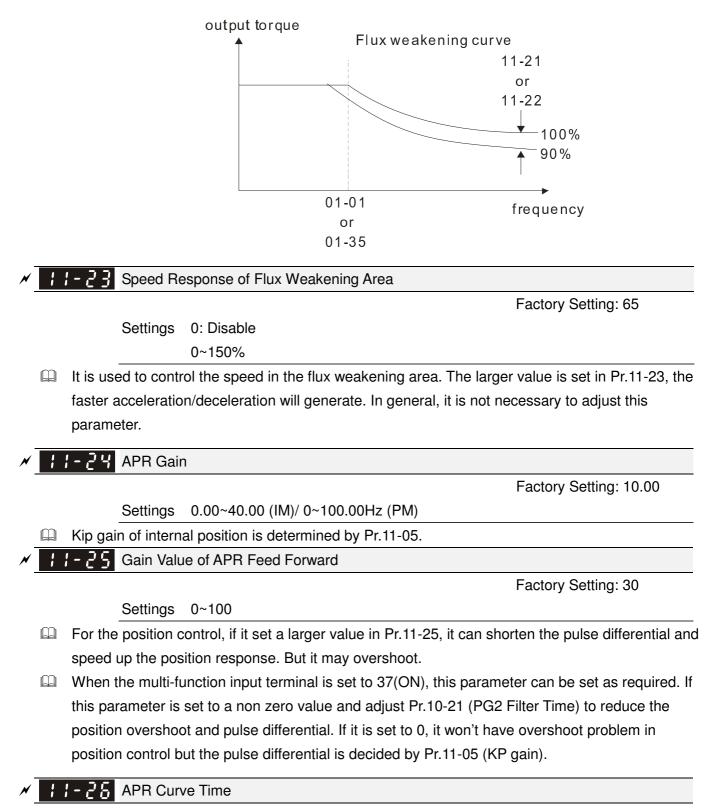
Given For the spindle application, the adjustment method is

1. It is used to adjust the output voltage when exceeding rated frequency.

2. Monitor the output voltage

3. Adjust Pr.11-21 (motor 1) or Pr.11-22 (motor 2) setting to make the output voltage reach motor rated voltage.

4. The larger number it is set, the larger output voltage you will get.

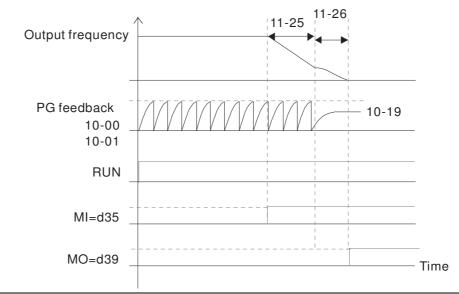


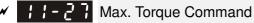
Settings 0.00~655.35 sec

Factory Setting: 3.00

Chapter 12 Description of Parameter Settings

It is valid when the multi-function input terminal is set to 35(ON). The larger it is set, the longer the position time will be.





Factory Setting: 100

Settings 0~500%

Description: The upper limit of torque command is 100%.

Calculation equation for motor rated torque:

motor rated torque: $T(N.M) = \frac{P(W)}{\omega(rad/s)}$; P(W) value= Pr.05-02;

$$\omega$$
(rad/s) value= Pr.05-03 $\circ \frac{RPM \times 2\pi}{60} = rad / s$

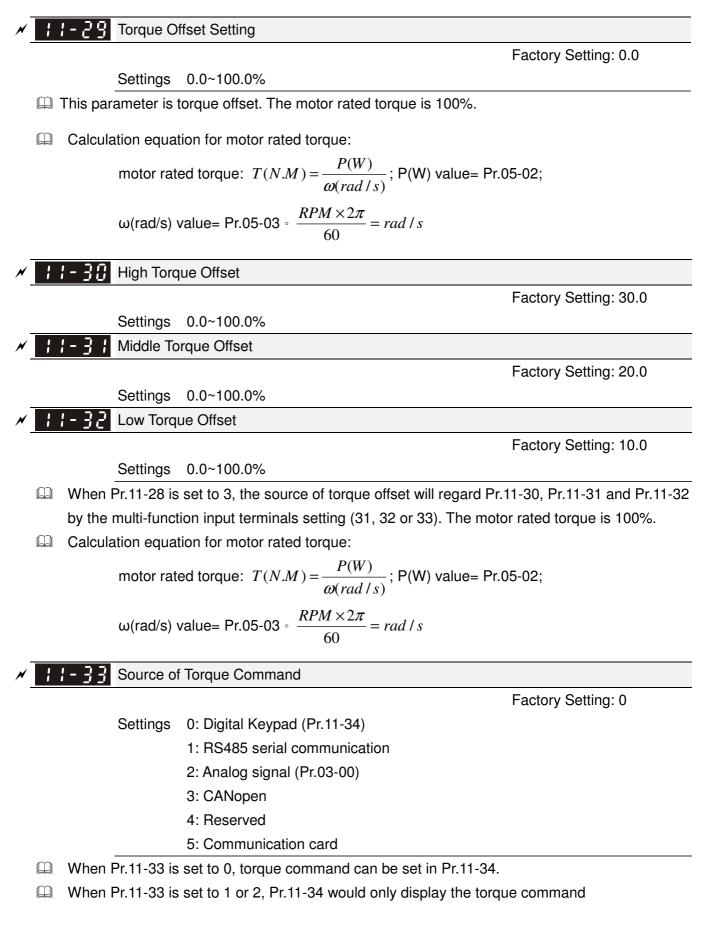
; ; - ? 8 Source of Torque Offset

Factory Setting: 0

- Settings 0: Disable
 - 1: Analog input (Pr.03-00)
 - 2: Torque offset setting (Pr.11-29)
 - 3: Control by external terminal (by Pr.11-30 to Pr.11-32)
- Description: This parameter is the source of torque offset.
- When it is set to 3, source of torque offset would determine Pr.11-30 to Pr.11-32 by
- When it is set to 3, the source of torque offset will regard Pr.11-30~11-32 by the multi-function input terminals (MI) setting (31, 32 or 33).

N.O. switch status: ON= contact closed, OFF= contact open

| Pr. 11-32 | Pr. 11-31 | Pr. 11-30 | |
|-------------|------------|------------|-------------------|
| MI=33(High) | MI=32(Mid) | MI=31(Low) | Torque Offset |
| OFF | OFF | OFF | None |
| OFF | OFF | ON | 11-30 |
| OFF | ON | OFF | 11-31 |
| OFF | ON | ON | 11-30+11-31 |
| ON | OFF | OFF | 11-32 |
| ON | OFF | ON | 11-30+11-32 |
| ON | ON | OFF | 11-31+11-32 |
| ON | ON | ON | 11-30+11-31+11-32 |





Settings -100.0~100.0% (Pr.11-27=100%)

- This parameter is for the torque command. When Pr.11-27 is set to 250% and Pr.11-34 is set to 100%, actual torque command=250X100%=250% motor rated torque.
- The drive will save the setting to the record before power turns off.

I I - *3* **S** Low-pass Filter Time of Torque Command

Factory Setting: 0.000

Settings 0.000~1.000 sec

When the setting is too long, the control will be stable but the control response will be delay. When the setting is too short, the response will be quickly but the control maybe unstable. User can adjust the setting by the control and response situation.

1 - 3 Speed Limit Selection

Factory Setting: 0

Settings 0: Set by Pr.11-37 (Forward speed limit) and Pr.11-38 (Reverse speed limit) 1: Set by Pr.11-37,11-38 and Pr.00-20 (Source of Master Frequency Command)

2: Set by Pr.00-20 (Source of Master Frequency Command).

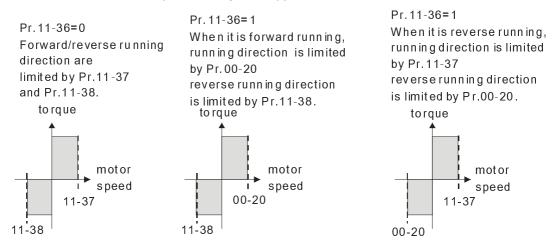
Speed limit function: in TQCPG, when the motor speed is accelerated to speed limit value (Pr.11-36, 11-37 and 11-38), it will switch to speed control mode to stop acceleration.

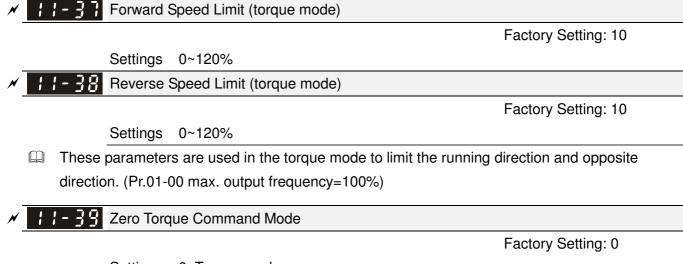
Pr11-36=1:

When the torque command is positive, the forward speed limit is Pr00-20 and reverse speed limit is Pr11-38.

When the torque command is negative, the forward speed limit is Pr11-37 and reverse speed limit is Pr00-20.

Unwind application, Torque command direction is different to motor operating direction, this indicates that the motor is being load dragging. At this moment, the speed limit must be Pr11-37 or Pr11-38. When the torque command direction and speed limit have same direction, the speed limit will refer to the setting of Pr00-20. About the keypad display, please refer to the "LED function Descriptions" in User manual chapter10 "Digital Keypad".





Settings 0: Torque mode 1: Speed mode

The drive is running at Torque control mode, Pr11-39 defines the operation mode when torque command=0%.

When Pr.11-39 is set as 0 (the torque mode), if torque command is 0%, the motor will produce excitation current but no torque current.

When Pr.11-39 is set as 1 (the speed mode), if torque command is 0% and speed limit is 0Hz, the AC motor drive can still produce torque current through speed controller(at this moment, the torque limit is Pr06-12) and the control mode will changed from TQCPG to become FOCPG mode. The motor will have a holding torque.

| : - : - : Command Source of Point-to-Point Position Control | |
|--|---------------------|
| | Factory Settings: 0 |

Settings 0: External terminal

- 1: Reserved
 - 2: RS485
 - 3: CAN
 - 4: PLC
 - 5: Communication card

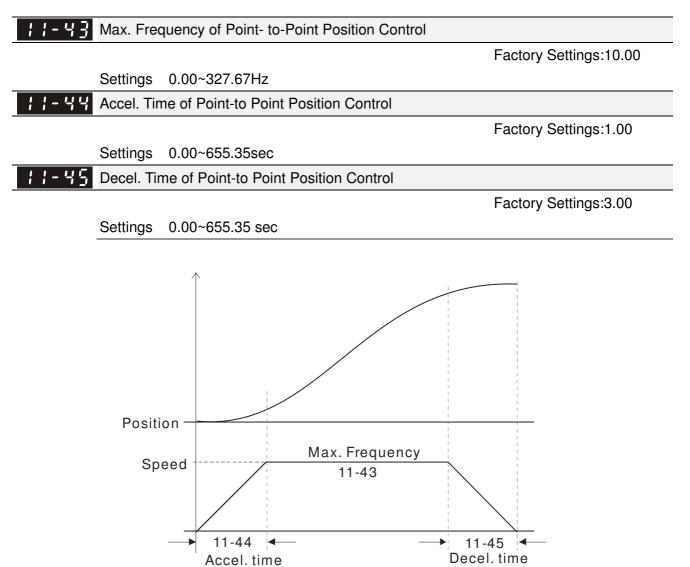
; ; - + ; Reserved

II-H2 System control flag

Factory Settings: 0000

Settings 0000~FFFFh

Function Bit No. Description 0: Speed control at torque mode, the largest current 0 At torque mode, selection between speed control and current control. limit is the torque command. 1: Speed control at torque mode, P06-12 the largest current limit is Pr06-12 1 FWD/REV direction control 0: FWD/REV cannot be controlled by 02-12 bit 0 & 1 1: FWD/REV can be controlled by 02-12 bit 0&1 2~15 Reserved



Chapter 13 Warning Codes

| HAND Warning CE01 Comm. Error 1 Display error signal Display error code The code is displayed as shown on KPC-CE01. Display error description | | | |
|---|------------------------------------|--|--|
| ID No. | Display on LCM Keypad | Descriptions | |
| 1 | Warning CE01 Comm. Error 1 | Modbus function code error | |
| 2 | Warning CE02 Comm. Error 2 | Address of Modbus data is error | |
| 3 | Warning CE03 Comm. Error 3 | Modbus data error | |
| 4 | Warning CE04 Comm. Error 4 | Modbus communication error | |
| 5 | Warning CE10 Comm. Error 10 | Modbus transmission time-out | |
| 6 | Warning CP10 Keypad time out | Keypad transmission time-out | |
| 7 | Warning SE1 Save Error 1 | Keypad COPY error 1 Keypad simulation error, including communication delays, communication error (keypad recived error FF86) and parameter value error. | |
| 8 | Warning SE2 Save Error 2 | Keypad COPY error 2 Keypad simulation done, parameter write error | |
| 9 | Warning 0H1 Over heat 1 warn | IGBT over-heating warning | |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|------------------------------------|---|
| 10 | Warning 0H2 Over heat 2 warn | Capacity over-heating warning |
| 11 | Warning PID PID FBK Error | PID feedback error |
| 12 | Warning ANL Analog loss | ACI signal error When Pr03-19 is set to 1 and 2. |
| 13 | Warning UC Under Current | Low current |
| 14 | Warning AUE Auto-tune error | Auto tuning error |
| 15 | Warning PGFB PG FBK Warn | PG feedback error |
| 16 | Warning PGL PG Loss Warn | PG feedback loss |
| 17 | Warning OSPD Over Speed Warn | Over-speed warning |
| 18 | Warning DAvE Deviation Warn | Over speed deviation warning |
| 19 | Warning PHL Phase Loss | Phase loss |
| 20 | Warning ot1 Over Torque 1 | Over torque 1 |
| 21 | Warning ot2 Over Torque 2 | Over torque 2 |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|-------------------------------------|--|
| 22 | Warning oH3 Motor Over Heat | Motor over-heating |
| 24 | Warning oSL Over Slip Warn | Over slip |
| 25 | Warning tUn Auto tuning | Auto tuning processing |
| 28 | Warning OPHL Output PHL Warn | Output phase loss |
| 30 | Warning SE3 Copy Model Err 3 | Keypad COPY error 3 Keypad copy between different power range drive |
| 36 | Warning CGdn Guarding T-out | CAN guarding time-out 1 |
| 37 | Warning CHbn Heartbeat T-out | CAN heartbeat time-out 2 |
| 38 | Warning CSYn SYNC T-out | CAN synchrony time-out |
| 39 | Warning CbFn Can Bus Off | CAN bus off |
| 40 | Warning Cldn CAN/S ldx exceed | CAN index error |
| 41 | Warning CAdn CAN/S Addres set | CAN station address error |
| 42 | Warning CFrn CAN/S FRAM fail | CAN memory error |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|------------------------------------|--------------------------------------|
| 43 | Warning CSdn SDO T-out | CAN SDO transmission time-out |
| 44 | Warning CSbn Buf Overflow | CAN SDO received register overflow |
| 45 | Warning Cbtn Boot up fault | CAN boot up error |
| 46 | Warning CPtn Error Protocol | CAN format error |
| 47 | Warning PIra RTC Adjust | Adjust RTC |
| 50 | Warning PLod Opposite Defect | PLC download error |
| 51 | Warning PLSv Save mem defect | Save error of PLC download |
| 52 | Warning PLdA Data defect | Data error during PLC operation |
| 53 | Warning PLFn Function defect | Function code of PLC download error |
| 54 | Warning PLor Buf overflow | PLC register overflow |
| 55 | Warning PLFF Function defect | Function code of PLC operation error |
| 56 | Warning PLSn Check sum error | PLC checksum error |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|---|---|
| 57 | Warning PLEd No end command | PLC end command is missing |
| 58 | Warning PLCr PLC MCR error | PLC MCR command error |
| 59 | Warning PLdF Download fail | PLC download fail |
| 60 | HAND Warning PLSF Scane time fail | PLC scan time exceed |
| 61 | Warning PCGd CAN/M Guard err | CAN Master guarding error |
| 62 | HAND Warning PCbF CAN/M bus off | CAN Master bus off |
| 63 | Warning PCnL CAN/M Node Lack | CAN Master node error |
| 64 | HAND Warning PCCt CAN/M Cycle Time | CAN/M cycle time-out |
| 65 | HAND Warning PCSF CAN/M SDO over | CAN/M SDOover |
| 66 | HAND Warning PCSd CAN/M Sdo Tout | CAN/M SDO time-out |
| 67 | HAND Warning PCAd CAN/M Addres set | CAN/M station address error |
| 68 | Warning PCTo CAN/MT-Out | PLC/CAN Master Slave communication time out |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|------------------------------------|---|
| 70 | Warning ECid ExCom ID failed | Duplicate MAC ID error Node address setting error |
| 71 | Warning ECLv ExCom pwr loss | Low voltage of communication card |
| 72 | Warning ECtt ExCom Test Mode | Communication card in test mode |
| 73 | Warning ECbF ExCom Bus off | DeviceNet bus-off |
| 74 | Warning ECnP ExCom No power | DeviceNet no power |
| 75 | Warning ECFF ExCom Facty def | Factory default setting error |
| 76 | Warning ECiF ExCom Inner err | Serious internal error |
| 77 | Warning ECio ExCom IONet brk | IO connection break off |
| 78 | Warning ECPP ExCom Pr data | Profibus parameter data error |
| 79 | Warning ECPi ExCom Conf data | Profibus configuration data error |
| 80 | Warning ECEF ExCom Link fail | Ethernet Link fail |
| 81 | Warning ECto ExCom Inr T-out | Communication time-out for communication card and drive |

| ID No. | Display on LCM Keypad | Descriptions |
|--------|-------------------------------------|--|
| 82 | Warning ECCS ExCom Inr CRC | Check sum error for Communication card and drive |
| 83 | Warning ECrF ExCom Rtn def | Communication card returns to default setting |
| 84 | Warning ECo0 ExCom MTCP over | Modbus TCP exceed maximum communication value |
| 85 | Warning ECo1 ExCom EIP over | EtherNet/IP exceed maximum communication value |
| 86 | Warning ECiP ExCom IP fail | IP fail |
| 87 | Warning EC3F ExCom Mail fail | Mail fail |
| 88 | Warning Ecby ExCom Busy | Communication card busy |
| 90 | Warning CPLP CopyPLCP ass W d | Copy PLC password error |
| 91 | Warning CPL0 CopyPLCModeRd | Copy PLC Read mode error |
| 92 | Warning CPL1 CopyPLCModeWt | Copy PLC Write mode error |
| 93 | Warning CPLv CopyPLCVersion | Copy PLC Version error |
| 94 | Warning CPLS CopyPLCSize | Copy PLC Capacity size error |

Chapter 13 Warning Codes

| ID No. | Display on LCM Keypad | Descriptions |
|--------|------------------------------------|-------------------------------|
| 96 | Warning CPLt CopyPLCTimeOut | Copy PLC time out |
| 101 | Warning ictn InrCOM Time Out | Internal communication is off |

| | НА |
|---|---------------|
| 1 | Warning |
| 2 | CE01 |
| 3 | Comm. Error 1 |

Display error signal

Abbreviate error code

The code is displayed as shown on KPC-CE01.

3 Display error description

* Refer to setting of Pr06-17~Pr06~22.

| ID* | Fault Name | Fault Descriptions | Corrective Actions |
|-----|----------------------------------|---|---|
| 1 | Fault ocA Oc at accel | Over-current during acceleration (Output current exceeds triple rated current during acceleration.) | Short-circuit at motor output: Check for possible poor insulation at the output. Acceleration Time too short: Increase the Acceleration Time. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model. |
| 2 | Fault ocd Oc at decel | Over-current during deceleration (Output current exceeds triple rated current during deceleration.) | Short-circuit at motor output: Check for possible poor insulation at the output. Deceleration Time too short: Increase the Deceleration Time. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model. |
| 3 | Fault ocn Oc at normal SPD | Over-current during steady state operation (Output current exceeds triple rated current during constant speed.) | Short-circuit at motor output: Check for possible poor insulation at the output. Sudden increase in motor loading: Check for possible motor stall. AC motor drive output power is too small: Replace the AC motor drive with the next higher power model. |
| 4 | Fault GFF Ground fault | Ground fault | When (one of) the output terminal(s) is grounded, short circuit current is more than 50% of AC motor drive rated current, the AC motor drive power module may be damaged. NOTE: The short circuit protection is provided for AC motor drive protection, not for protecting the user. Check the wiring connections between the AC motor drive and motor for possible short circuits, also to ground. Check whether the IGBT power module is damaged. Check for possible poor insulation at the output. |
| 5 | Fault occ Short Circuit | Short-circuit is detected between upper bridge and lower bridge of the IGBT module | Return to the factory |

| ID* | Fault Name | Fault Descriptions | Corrective Actions |
|-----|----------------------------------|---|---|
| 6 | Fault ocS Oc at stop | Hardware failure in current detection | Return to the factory |
| 7 | Fault ovA Ov at accel | DC BUS over-voltage during acceleration (230V: DC 450V; 460V: DC 900V) | Check if the input voltage falls within the rated AC motor drive input voltage range. Check for possible voltage transients. If DC BUS over-voltage due to regenerative voltage, please increase the acceleration time or add an optional brake resistor. |
| 8 | Fault ovd Ov at decel | DC BUS over-voltage during deceleration (230V: DC 450V; 460V: DC 900V) | Check if the input voltage falls within the rated AC motor drive input voltage range. Check for possible voltage transients. If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an optional brake resistor. |
| 9 | Fault ovn Ov at normal SPD | DC BUS over-voltage at constant speed (230V: DC 450V; 460V: DC 900V) | Check if the input voltage falls within the rated AC motor drive input voltage range. Check for possible voltage transients. If DC BUS over-voltage due to regenerative voltage, please increase the Deceleration Time or add an optional brake resistor. |
| 10 | Fault ovS Ov at stop | Hardware failure in voltage detection | Check if the input voltage falls within the rated AC motor drive input voltage range. Check for possible voltage transients. |
| 11 | Fault LvA Lv at accel | DC BUS voltage is less than Pr.06-00 during acceleration | Check if the input voltage is normal Check for possible sudden load |
| 12 | Fault Lvd Lv at decel | DC BUS voltage is less than Pr.06-00 during deceleration | Check if the input voltage is normal Check for possible sudden load |
| 13 | Fault Lvn Lv at normal SPD | DC BUS voltage is less than Pr.06-00 in constant speed | Check if the input voltage is normal Check for possible sudden load |
| 14 | Fault LvS Lv at stop | DC BUS voltage is less than Pr.06-00 at stop | Check if the input voltage is normal Check for possible sudden load |

| ID* | Fault Name | Fault Descriptions | Corrective Actions |
|-----|----------------------------------|---|--|
| 15 | Fault OrP Phase lacked | Phase Loss | Check Power Source Input if all 3 input phases are connected without loose contacts. For models 40hp and above, please check if the fuse for the AC input circuit is blown. |
| 16 | Fault oH1 IGBT over heat | IGBT overheating IGBT temperature exceeds protection level | Ensure that the ambient temperature falls within the specified temperature range. Make sure that the ventilation holes are not obstructed. Remove any foreign objects from the heatsinks and check for possible dirty heat sink fins. Check the fan and clean it. Provide enough spacing for adequate ventilation. |
| 17 | Fault oH2 Heat Sink oH | Heatsink overheating Capacitance temperature exceeds cause heatsink overheating. | Ensure that the ambient temperature falls within the specified temperature range. Make sure heat sink is not obstructed. Check if the fan is operating Check if there is enough ventilation clearance for AC motor drive. |
| 18 | Fault tH1o Thermo1open | IGBT Hardware Error | Return to the factory |
| 19 | Fault tH2o Thermo 2 open | Capacitor Hardware Error | Return to the factory |
| 21 | Fault oL Over load | Overload The AC motor drive detects excessive drive output current. | Check if the motor is overloaded. Take the next higher power AC motor drive model. |
| 22 | Fault EoL1 Thermal relay 1 | Electronics thermal relay 1 protection | Check the setting of electronics thermal relay (Pr.06-14) Take the next higher power AC motor drive model |
| 23 | Fault EoL2 Thermal relay 2 | Electronics thermal relay 2 protection | Check the setting of electronics thermal relay (Pr.06-28) Take the next higher power AC motor drive model |

| ID* | Fault Name | Fault Descriptions | Corrective Actions | | | | |
|-----|----------------------------------|--|---|--|--|--|--|
| 24 | Fault oH3 Motor over heat | Motor overheating The AC motor drive detecting internal temperature exceeds the setting of Pr.06-30 (PTC level) or Pr.06-57 (PT100 level 2). | Make sure that the motor is not obstructed. Ensure that the ambient temperature falls within the specified temperature range. Change to a higher power motor. | | | | |
| 26 | Fault ot1 Over torque 1 | These two fault codes will be displayed when output current exceeds the over-torque detection level (Pr.06-07 or Pr.06-10) and exceeds | Check whether the motor is overloaded. Check whether motor rated current setting (Pr.05-01) is suitable | | | | |
| 27 | Fault ot2 Over torque 2 | over-torque detection (Pr.06-08 or Pr.06-11) and it is set to 2 or 4 in Pr.06-06 or Pr.06-09. | Take the next higher power AC motor drive model. | | | | |
| 28 | Fault uC Under torque | Low current detection | Check Pr.06-71, Pr.06-72, Pr.06-73. | | | | |
| 29 | Fault LMIT Limit Error | Limit error | | | | | |
| 30 | Fault cF1 EEPROM write err | Internal EEPROM can not be programmed. | Press "RESET" key to the factory setting Return to the factory. | | | | |
| 31 | Fault cF2 EEPROM read err | Internal EEPROM can not be read. | Press "RESET" key to the factory setting Return to the factory. | | | | |
| 33 | Fault cd1 las sensor err | U-phase error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | |
| 34 | Fault cd2 Ibs sensor err | V-phase error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | |
| 35 | Fault cd3 lcs sensor err | W-phase error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | |

| ID* | Fault Name | Fault Descriptions | Corrective Actions | | | | | |
|-----|----------------------------------|--------------------|--|--|--|--|--|--|
| 36 | Fault Hd0 cc HW error | CC (current clamp) | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | | |
| 37 | Fault Hd1 Oc HW error | OC hardware error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | | |
| 38 | Fault Hd2 Ov HW error | OV hardware error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | | |
| 39 | Fault Hd3 occ HW error | Occ hardware error | Reboots the power. If fault code is still displayed on the keypad please return to the factory | | | | | |
| 40 | Fault AUE Auto tuning err | Auto tuning error | Check cabling between drive and motor Try again. | | | | | |
| 41 | Fault AFE PID Fbk error | PID loss (ACI) | Check the wiring of the PID feedback Check the PID parameters settings | | | | | |
| 42 | Fault PGF1 PG Fbk error | PG feedback error | Check if encoder parameter setting is accurate when it is PG feedback control. | | | | | |
| 43 | Fault PGF2 PG Fbk loss | PG feedback loss | Check the wiring of the PG feedback | | | | | |
| 44 | Fault PGF3 PG Fbk over SPD | PG feedback stall | Check the wiring of the PG feedback Check if the setting of PI gain and deceleration is suitable Return to the factory | | | | | |
| 45 | Fault PGF4 PG Fbk deviate | PG slip error | Check the wiring of the PG feedback Check if the setting of PI gain and deceleration is suitable Return to the factory | | | | | |

| ID* | Fault Name | Fault Descriptions | Corrective Actions |
|-----|---|---------------------------------------|--|
| 46 | HAND Fault PGReferror | Pulse input error | Check the pulse wiring Return to the factory |
| 47 | Fault PGr2 PG Ref loss | Pulse input loss | Check the pulse wiring Return to the factory |
| 48 | Fault ACE ACI loss | ACI loss | Check the ACI wiring Check if the ACI signal is less than 4mA |
| 49 | Fault EF External fault | External Fault | Input EF (N.O.) on external terminal is closed to GND. Output U, V, W will be turned off. Give RESET command after fault has been cleared. |
| 50 | Fault EF1 Emergency stop | Emergency stop | When the multi-function input terminals MI1 to MI6 are set to emergency stop, the AC motor drive stops output U, V, W and the motor coasts to stop. Press RESET after fault has been cleared. |
| 51 | Fault bb Base block | External Base Block | When the external input terminal (B.B) is active, the AC motor drive output will be turned off. Deactivate the external input terminal (B.B) to operate the AC motor drive again. |
| 52 | Hand Fault Pcod Password error | Password is locked. | Keypad will be locked. Turn the power ON after power OFF to re-enter the correct password. See Pr.00-07 and 00-08. |
| 54 | HAND Fault CE1 PC err command | Illegal function code | Check if the function code is correct (function code must be 03, 06, 10, 63) |
| 55 | Fault CE2 PC err address | Illegal data address (00H to 254H) | Check if the communication address is correct |
| 56 | Fault CE3 PC err data | Illegal data value | Check if the data value exceeds max./min. value |

| ID* | Fault Name | Fault Descriptions | Corrective Actions | | | | |
|-----|--|---|--|--|--|--|--|
| 57 | Fault CE4 PC slave fault | Data is written to read-only address | Check if the communication address is correct | | | | |
| 58 | Fault CE10 PC time out | Modbus transmission time- | out | | | | |
| 59 | Fault CP10 PU time out | Keypad transmission time-o | out | | | | |
| 60 | Fault bF Braking fault | Brake resistor fault | If the fault code is still displayed on the keypad after pressing "RESET" key, please return to the factory. | | | | |
| 61 | Fault ydc Y-delta connect | Y-connection/Δ-connectio n switch error | Check the wiring of the Y-connection/Δ-connection Check the parameters settings | | | | |
| 62 | Hand Fault dEb Dec. Energy back | When Pr.07-13 is not set to 0 and momentary power off or power cut, it will display dEb during accel./decel. stop. | Set Pr.07-13 to 0 Check if input power is stable | | | | |
| 63 | HAND Fault OVer slip error | It will be displayed when slip exceeds Pr.05-26 setting and time exceeds Pr.05-27 setting. | Check if motor parameter is correct (please decrease the load if overload Check the settings of Pr.05-26 and Pr.05-27 | | | | |
| 64 | Fault ry F MC Fault | Electric valve switch error when executing Soft Start. (This warning is for frame E and higher frame of AC drives) Do not disconnect RST when drive is still operating. | | | | | |
| 65 | Fault PGF5 PG HW Error | Hardware error of PG Card Check if PG Card is insert to the right slot and parameter settings for encoder are accurate. | | | | | |
| 68 | Fault SdRv SpdFbk Dir Rev | sensorless. Solution Verify if the parameter settin | Solution /erify if the parameter setting of the motor drive is correct ncrease the estimator's bandwidth and verify if parameters relating to the sensorless | | | | |

| ID* | Fault Name | Fault Descriptions Corrective Actions |
|-----|----------------------------------|--|
| 69 | Fault SdOr SpdFbk over SPD | Overspeed rotation detected by the sensorless Solution Verify if the parameter setting of the motor drive is correct Increase the estimator's bandwidth and verify if parameters relating to the sensorless are correct. Verify if the gains of the speed circuit is reasonable. |
| 70 | Fault SdDe SpdFbk deviate | Big difference between the rotating speed and the command deteced by the sensorless Solution Verify if the parameter setting of the motor drive is correct Increase the estimator's bandwidth and verify if parameters relating to the sensorless are correct. Verify if the gains of the speed circuit is reasonable. |
| 72 | Fault STOL STO Loss 1 | STO1~SCM1 internal hardware detect error |
| 73 | Fault S1 S1-emergy stop | Emergency stop for external safety |
| 76 | Fault STO STO | Safety Torque Off function active |
| 77 | Fault STOL STO Loss 2 | STO2~SCM2 internal hardware detect error |
| 78 | Fault STOL STO Loss 3 | STO1~SCM1 and STO2~SCM2 internal hardware detect error |
| 79 | Fault Uoc U phase oc | Phase U short circuit |
| 80 | Fault Voc V phase oc | Phase V short circuit |

| ID* | Fault Name | Fault Descriptions Corrective Actions |
|-----|--|--|
| 81 | Fault Woc W phase oc | W phase short circuit |
| 82 | HAND Fault OPHL U phase lacked | Output phase loss (Phase U) |
| 83 | Fault OPHL V phase lacked | Output phase loss (Phase V) |
| 84 | Fault OPHL W phase lacked | Output phase loss (Phase W) |
| 85 | Fault AboF PGABZ Line off | PG card ABZ signal loss Solution Verify if the parameter setting of PG card and PG card cable is correct. |
| 86 | HAND Fault UvoF PG UVW Line off | PG card UVW signal loss Solution Verify if the parameter setting of PG card and PG card cable is correct. |
| 89 | Fault RoPd Rotor Pos. Error | Rotor position detection error Solution Verify if the UVW output cable are loss. Verify if the motor internal coil is broken. Verify if the drive UVW output are normal. |
| 90 | Fault Fstp For ce Stop | Internal PLC forced to stop Verify the setting of Pr.00-32 |
| 101 | Fault CGdE Guarding T-out | CANopen guarding error |
| 102 | Fault CHbE Heartbeat T-out | CANopen heartbeat error |

| ID* | Fault Name | Fault Descriptions | Corrective Actions |
|-----|------------------------------------|--|---|
| 103 | Fault CSYE SYNCT-out | CANopen synchronous er | ror |
| 104 | Fault CbFE Can bus off | CANopen bus off error | |
| 105 | Fault CIdE Can bus Index Err | CANopen index error | |
| 106 | Fault CAdE Can bus Add. Err | CANopen station address | error |
| 107 | Fault CFrE Can bus off | CANopen memory error | |
| 111 | Fault ictE InrCom Time Out | Internal communication tir | ne-out |
| 112 | Fault SfLK PMLess ShaftLock | Motor Shaft lock error(N zero) Solution Verify if the motor parar | Notor does not turn but the output frequency is not neter setting is correct. |
| 113 | Fault SwOc Software OC | Software OC protection | |

Chapter 15 CANopen Overview

Newest version is available at http://www.delta.com.tw/industrialautomation/

- 15.1 CANopen Overview
- 15.2 Wiring for CANopen
- 15.3 CANopen Communication Interface Description

15.3.1 CANopen Control Mode Selection

15.3.2 DS402 Standard Control Mode

- 15.3.3 By using Delta Standard (Old definition, only support speed mode)
- 15.3.4 By using Delta Standard (New definition)
- 15.3.5 DI/DO AI AO are controlled via CANopen
- 15.4 CANopen Supporting Index

15.5 CANopen Fault Code

15.6 CANopen LED Function

Built-in EMC-COP01 card is included in VFDXXXC23E/VFDXXXC43E models.

The built-in CANopen function is a kind of remote control. Master can control the AC motor drive by using CANopen protocol. CANopen is a CAN-based higher layer protocol. It provides standardized communication objects, including real-time data (Process Data Objects, PDO), configuration data (Service Data Objects, SDO), and special functions (Time Stamp, Sync message, and Emergency message). And it also has network management data, including Boot-up message, NMT message, and Error Control message. Refer to CiA website http://www.can-cia.org/ for details. The content of this instruction sheet may be revised without prior notice. Please consult our distributors or download the most updated version at http://www.delta.com.tw/industrialautomation

Delta CANopen supporting functions:

- Support CAN2.0A Protocol;
- Support CANopen DS301 V4.02;
- Support DSP-402 V2.0.

Delta CANopen supporting services:

- PDO (Process Data Objects): PDO1~ PDO4
- SDO (Service Data Object):

Initiate SDO Download; Initiate SDO Upload; Abort SDO; SDO message can be use

SDO message can be used to configure the slave node and access the Object Dictionary in every node.

■ SOP (Special Object Protocol):

Support default COB-ID in Predefined Master/Slave Connection Set in DS301 V4.02; Support SYNC service; Support Emergency service.

■ NMT (Network Management):

Support NMT module control; Support NMT Error control; Support Boot-up.

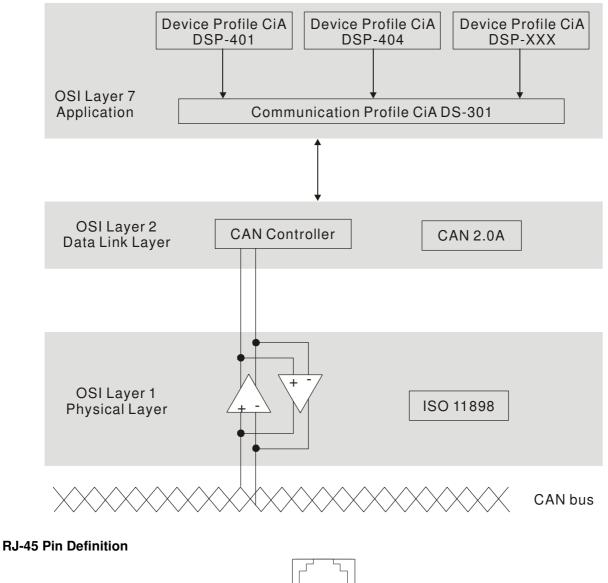
Delta CANopen not supporting service:

■ Time Stamp service

15.1 CANopen Overview

CANopen Protocol

CANopen is a CAN-based higher layer protocol, and was designed for motion-oriented machine control networks, such as handling systems. Version 4.02 of CANopen (CiA DS301) is standardized as EN50325-4. The CANopen specifications cover application layer and communication profile (CiA DS301), as well as a framework for programmable devices (CiA 302), recommendations for cables and connectors (CiA 303-1) and SI units and prefix representations (CiA 303-2).





| PIN | Signal | Description |
|-----|---------|--------------------------------|
| 1 | CAN_H | CAN_H bus line (dominant high) |
| 2 | CAN_L | CAN_L bus line (dominant low) |
| 3 | CAN_GND | Ground / 0V /V- |
| 6 | CAN_GND | Ground / 0V /V- |

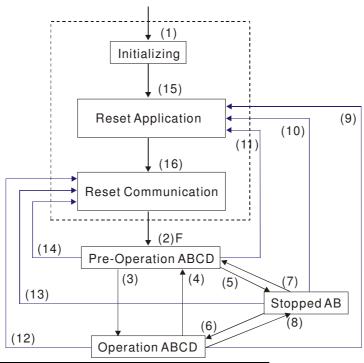
CANopen Communication Protocol

It has services as follows:

- NMT (Network Management Object)
- SDO (Service Data Objects)
- PDO (Process Data Object)
- EMCY (Emergency Object)

NMT (Network Management Object)

The Network Management (NMT) follows a Master/Slave structure for executing NMT service. Only one NMT master is in a network, and other nodes are regarded as slaves. All CANopen nodes have a present NMT state, and NMT master can control the state of the slave nodes. The state diagram of a node is shown as follows:



(1) After power is applied, it is auto in initialization state

- (2) Enter pre-operational state automatically
- (3) (6) Start remote node

(4) (7) Enter pre-operational state

(5) (8) Stop remote node

(9) (10) (11) Reset node

(12) (13) (14) Reset communication

- (15) Enter reset application state automatically
- (16) Enter reset communication state automatically

| | Initializing | Pre-Operational | Operational | Stopped |
|------------|--------------|-----------------|-------------|---------|
| PDO | | | 0 | |
| SDO | | 0 | 0 | |
| SYNC | | 0 | 0 | |
| Time Stamp | | 0 | 0 | |
| EMCY | | 0 | 0 | |
| Boot-up | 0 | | | |
| NMT | | 0 | 0 | 0 |

- A: NMT
- B: Node Guard
- C: SDO
- D: Emergency
- E: PDO
- F: Boot-up

SDO (Service Data Objects)

SDO is used to access the Object Dictionary in every CANopen node by Client/Server model. One SDO has two COB-ID (request SDO and response SDO) to upload or download data between two nodes. No data limit for SDOs to transfer data. But it needs to transfer by segment when data exceeds 4 bytes with an end signal in the last segment.

The Object Dictionary (OD) is a group of objects in CANopen node. Every node has an OD in the system, and OD contains all parameters describing the device and its network behavior. The access path of OD is the index and sub-index, each object has a unique index in OD, and has sub-index if necessary. The request and response frame structure of SDO communication is shown as follows:

PDO (Process Data Object)

PDO communication can be described by the producer/consumer model. Each node of the network will listen to the messages of the transmission node and distinguish if the message has to be processed or not after receiving the message. PDO can be transmitted from one device to one another device or to many other devices. Every PDO has two PDO services: a TxPDO and a RxPDO. PDOs are transmitted in a non-confirmed mode.

PDO Transmission type is defined in the PDO communication parameter index (1400h for the 1st RxPDO or 1800h for the 1st TxPDO), and all transmission types are listed in the following table:

| Type Number | PDO | | | | | | |
|-------------|--------|---------|-------------|--------------|----------|--|--|
| | Cyclic | Acyclic | Synchronous | Asynchronous | RTR only | | |
| 0 | | 0 0 | | | | | |
| 1-240 | 0 | | 0 | | | | |
| 241-251 | | | Reserved | | | | |
| 252 | | | 0 | | 0 | | |
| 253 | | | | 0 | 0 | | |
| 254 | | | | 0 | | | |
| 255 | | | | 0 | | | |

Type number 1-240 indicates the number of SYNC message between two PDO transmissions.

Type number 252 indicates the data is updated (but not sent) immediately after receiving SYNC.

Type number 253 indicates the data is updated immediately after receiving RTR.

Type number 254: Delta CANopen doesn't support this transmission format.

Type number 255 indicates the data is asynchronous transmission.

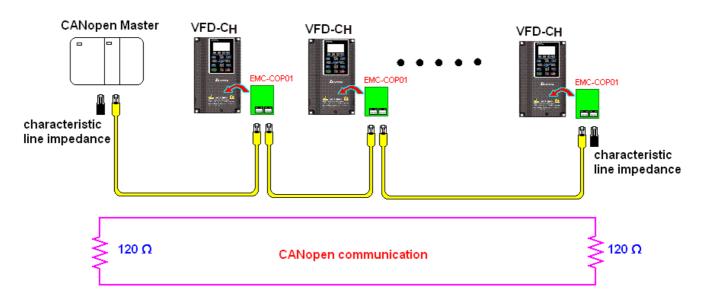
All PDO transmission data must be mapped to index via Object Dictionary.

EMCY (Emergency Object)

When errors occurred inside the hardware, an emergency object will be triggered an emergency object will only be sent when an error is occurred. As long as there is nothing wrong with the hardware, there will be no emergency object to be served as a warning of an error message.

15.2 Wiring for CANopen

An external adapter card: EMC-COP01 is used for CANopen wiring to connect CANopen to VFD CH2000. The link is enabled by using RJ45 cable. The two farthest ends must be terminated with 120Ω terminating resistors.



15.3 CANopen Communication Interface Description

15.3.1 CANopen Control Mode Selection

There are two control modes for CANopen; Pr.09-40 set to 1 is the factory setting mode DS402 standard and Pr.09-40 set to 0 is Delta's standard setting mode.

Actually, there are two control modes according to Delta's standard, one is the old control mode (Pr09-30=0).

This control mode can only control the motor drive under frequency control. Another mode is a new standard (Pr09-30=1)

This new control mode allows the motor drive to be controlled under all sorts of mode. Currently, CH2000 support speed, torque, position and home mode.

The definition of relating control mode are:

| CANopen | Control Mode | | | | | | | |
|---|--------------|--------------------------------------|---------|-------------------------|----------|--------------------|-------|-------------|
| Control | Speed | | Torque | | Position | | Home | |
| Mode Selection | Index | Description | Index | Description | Index | Description | Index | Description |
| DS402 standard Pr. 09-40=1 | 6042-00 | Target rotating speed (RPM) | 6071-00 | Target Torque (%) | 607A-00 | Target Position | | |
| | | | 6072-00 | Max. Torque Limit(%) | | | | |
| Delta Standard (Old definition) P09-40=1, P09-30=0 | 2020-02 | Target rotating speed (Hz) | | | | | | |
| Delta Standard (New definition) | 2060-03 | Target rotating speed (Hz) | 2060-07 | Target Torque (%) | 2060-05 | Target Position | | |
| P09-40=0, P09-30=1 | 2060-04 | Torque Limit (%) | 2060-08 | Speed Limit (Hz) | | | | |

| CANopen Control Mode | Operation Control | | | | |
|---|-------------------|-------------------|--|--|--|
| Selection | Index | Description | | | |
| DS402 standard | 6040-00 | Operation Command | | | |
| Pr. 09-40=1 | | | | | |
| Delta Standard (Old definition) P09-40=1, P09-30=0 | 2020-01 | Operation Command | | | |
| Delta Standard (New definition) | 2060-01 | Operation Command | | | |
| P09-40=0, P09-30=1 | | | | | |

| CANopen Control Mode | | Other | | | | |
|---------------------------------|---------|-----------------------------------|--|--|--|--|
| Selection | Index | Description | | | | |
| DS402 standard | 605A-00 | Quick stop processing mode | | | | |
| Pr. 09-40=1 | 605C-00 | Disable operation processing mode | | | | |
| Delta Standard (Old definition) | | | | | | |
| P09-40=1, P09-30=0 | | | | | | |
| Delta Standard (New | | | | | | |
| definition) | | | | | | |
| P09-40=0, P09-30=1 | | | | | | |

However, you can use some index regardless DS402 or Delta's standard.

For example:

- 1. Index which are defined as RO attributes.
- 2. Index correspond to parameters such as (2000 ~200B-XX)
- 3. Accelerating/Decelerating Index: 604F 6050

15.3.2 DS402 Standard Control Mode

15.3.2.1 Related set up of ac motor drive (by following DS402 standard)

If you want to use DS402 standard to control the motor drive, please follow the steps below:

- 1. Wiring for hardware (refer to chapter 15-2 Wiring for CANopen)
- 2. Operation source setting: set Pr.00-21 to 3 for CANopen communication card control.
- 3. Frequency source setting: set Pr.00.20 to 6. (Choose source of frequency commend from CANopen setting.)
- 4. Source of torque setting is set by Pr.11-33. (Choose source of torque commend from CANopen setting.)
- 5. CANopen station setting: set Pr.09-36 (Choose source of position commend from CANopen setting.)
- 6. Set DS402 as control mode: Pr09-40=1
- CANopen station setting: set Pr.09-36 (Range of setting is 1~127. When Pr.09-36=0, CANopen slave function is disabled.) (Note: If error arise (CAdE or CANopen memory error) as station setting is completed, press Pr.00-02=7 for reset.)
- CANopen baud rate setting: set Pr.09.37 (CANBUS Baud Rate: 1M(0), 500K(1), 250K(2), 125K(3), 100K(4) and50K(5))
- Set multiple input functions to Quick Stop (it can also be enable or disable, default setting is disable). If it is necessary to enable the function, set MI terminal to 53 in one of the following parameter: Pr.02.01 ~Pr.02.08 or Pr.02.26 ~ Pr.02.31. (Note: This function is available in DS402 only.)

15.3.2.1 The status of the motor drive (by following DS402 standard)

According to the DS402 definition, the motor drive is divided into 3 blocks and 9 status as described below.

3 blocks

Power Disable: That means without PWM output Power Enable: That means with PWM output Fault: One or more than one error has occurred.

9 status

Start: Power On

Not ready to switch on: The motor drive is initiating.

Switch On Disable: When the motor drive finishes the initiation, it will be at this mode.

Ready to switch on: Warming up before running.

Switch On: The motor derive has the PWM output now, but the reference commend is not effective.

Operate Enable: Able to control normally.

Quick Stop Active: When there is a Quick Stop request, you have to stop running the motor drive.

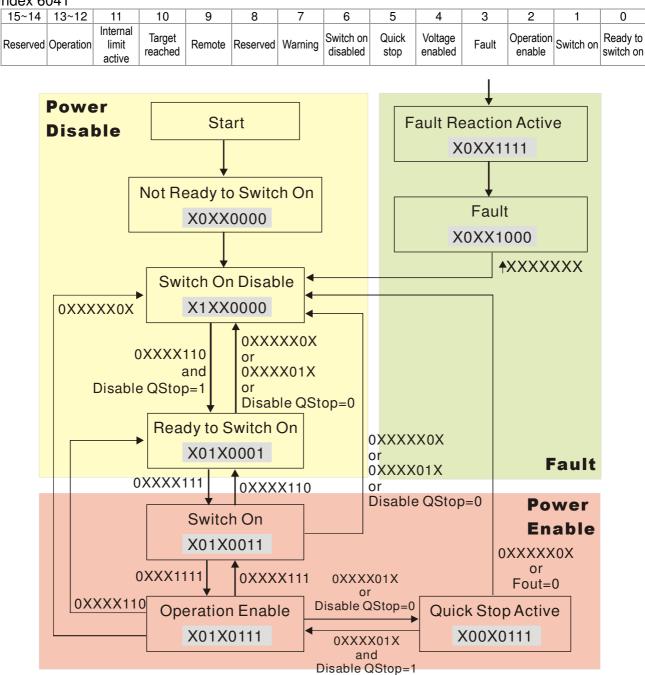
Fault Reaction Active: The motor drive detects conditions which might trigger error(s). Fault: One or more than errors has occurred to the motor drive.

Therefore, when the motor drive is turned on and finishes the initiation, it will remain at Ready to Switch on status. To control the operation of the motor drive, you need to change this status to Operate Enable status. The way to change it is to commend the control word's bit0 ~ bit3 and bit7 of the Index 6040H and to pair with Index Status Word (Status Word 0X6041). The control steps and index definition are described as below:

Index 6040

| 15~9 | 8 | 7 | 6~4 | 3 | 2 | 1 | 0 |
|----------|------|-------------|-----------|------------------|------------|-------------------|-----------|
| Reserved | Halt | Fault Reset | Operation | Enable operation | Quick Stop | Enable Voltage | Switch On |

Index 6041



Set command 6040 = 0xE, then set another command 6040 = 0xF. Then the motor drive can be switched to Operation Enable. The Index 605A decides the dashed line of Operation Enable when

the control mode changes from Quick Stop Active. (When the setting value is 1~3, this dashed line is active. But when the setting value of 605A is not 1~3, once he motor derive is switched to Quick Stop Active, it will not be able to switch back to Operation Enable.)

| Index | Sub | Definition | Factory Setting | R/W | Size | Unit | PDO Map | Mode | note |
|-------|-----|------------------------|-----------------|-----|------|------|------------|------|---|
| 605Ah | 0 | Quick stop option code | 2 | RW | S16 | | No | | 0 : disable drive function 1 :slow down on slow down ramp 2: slow down on quick stop ramp 5 slow down on slow down ramp and stay in QUICK STOP 6 slow down on quick stop ramp and stay in QUICK STOP 7 slow down on the current limit and stay in Quick stop |

Besides, when the control section switches from Power Enable to Power Disable, use 605C to define parking method.

| Index | Sub | Definition | Factory Setting | R/W | Size | Unit | PDO Map | Mode | note |
|-------|-----|-------------------------------|-----------------|-----|------|------|------------|------|---|
| 605Ch | 0 | Disable operation option code | 1 | RW | S16 | | No | | 0: Disable drive function 1: Slow down with slow down ramp; disable of the drive function |

15-3-2-3 Various mode control method (by following DS402 standard)

Control mode of CH2000, supporting speed, torque, position and home control are described as below:

Speed mode

- 1. Let Ac Motor Drive be at the speed control mode: Set Index6060 to 2.
- 2. Switch to Operation Enable mode: Set 6040=0xE, then set 6040=0xF.
- 3. To set target frequency: Set target frequency of 6042, since the operation unit of 6042 is rpm, there is a transformation:

 $n = f \times \frac{120}{p}$ n: rotation speed (rpm) (rounds/minute) P: motor's pole number (Pole)

f: rotation frequency (Hz)

For example:

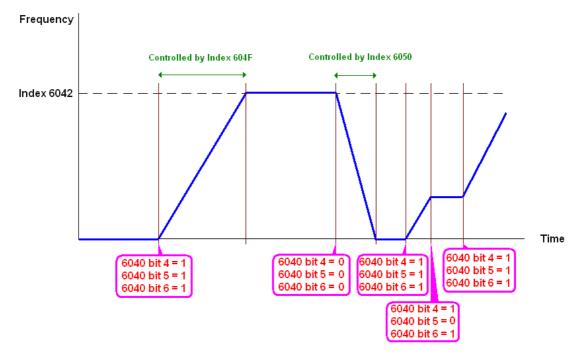
Set 6042H = 1500 (rpm), if the motor drive's pole number is 4 (Pr05-04 or Pr05-16), then the motor drive's operation frequency is 1500(120/4)=50Hz.

Besides, the 6042 is defined as a signed operation. The plus or minus sign means to rotate clockwise or counter clockwise

4. To set acceleration and deceleration: Use 604F(Acceleration) and 6050(Deceleration).

5. Trigger an ACK signal: In the speed control mode, the bit 6~4 of Index 6040 needs to be controlled. It is defined as below:

| | | Index 6040 | <u>CLIM</u> | |
|------------------------------|-------|------------|-------------|--------------------------------|
| Crassed mode | Bit 6 | Bit 5 | Bit 4 | - SUM |
| Speed mode (Index 6060=2) | 1 | 0 | 1 | Locked at the current signal. |
| (IIIdex 6060=2) | 1 | 1 | 1 | Run to reach targeting signal. |
| | | Other | | Decelerate to 0Hz. |



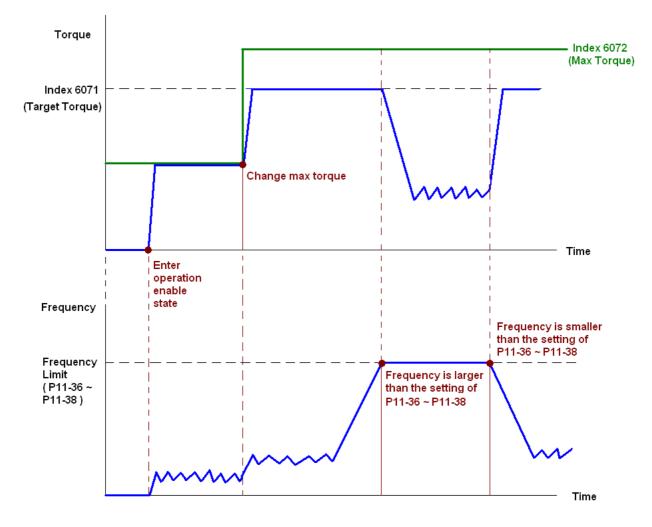
NOTE 01: To know the current rotation speed, read 6043. (unit: rpm)

NOTE 02: To know if the rotation speed can reach the targeting value; read bit 10 of 6041. (0: Not reached; 1: Reached)

Torque mode

- 1. Let Ac Motor Drive be at the torque control mode: Set Index6060 = 4.
- 2. Switch the current mode to Operation Enable, set 6040 = 0xE, then set 6040 = 0xF.
- 3. To set targeting torque: Set 6071 as targeting torque and 6072 as the largest output torque.

| Torquo modo | | Index 6040 | | SUM | | |
|-------------------------------|-------|------------|-------|------------------------------------|--|--|
| Iorque mode (Index 6060=4) | Bit 6 | Bit 5 | Bit 4 | SUM | | |
| (Index 0000=4) | Х | Х | Х | RUN to reach the targeting torque. | | |



NOTE: The standard DS402 doesn't regulate the highest speed limit. Therefore if the motor drive defines the control mode of DS402, the highest speed will go with the setting of Pr11-36 to Pr11-38.

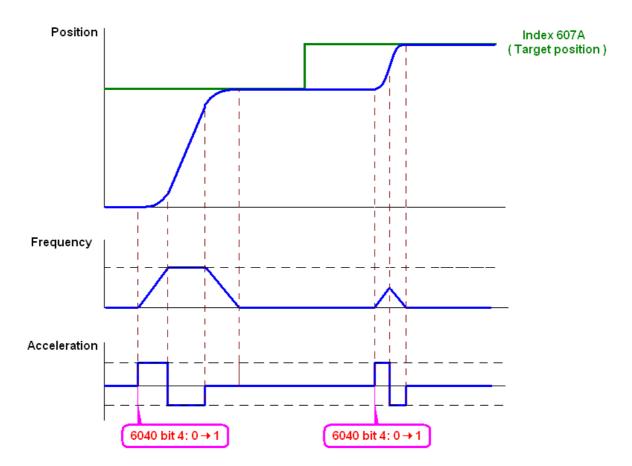
NOTE 01: To know the current torque, read 6077 (unit: 0.1%).

NOTE02: To know if reaching the targeting torque, read bit 10 of 6041. (0: Not reached; 1: Reached)

Position mode

1. Set the parameter of a trapezium curve to define position control (Pr11-43 Max. Frequency of Point- to-Point Position Control, Pr11-44 Accel. Time of Point-to Point Position Control and Pr11-45 Decel. Time of Point-to Point Position Control)

- 2. Let Ac Motor Drive be at the position control mode: Then set Index 6060 = 1.
- 3. Switch the current mode to Operation Enable, set 6040 = 0xE and then set 6040 = 0xF.
- 4. To set targeting position: set 607A as the targeting position.
- 5. Trigger an ACK signal: Set 6040 = 0x0F then set 6040 = 0x1F. (Bit4 changes from 0 to 1).



NOTE 01: To know the current position, read 6064.

- NOTE 02: To know if the position reaches the targeting position, read bit 10 of 6041. (0: reached, 1: Not reached)
- NOTE 03: To know if the position is over the limited area, read bit 11 of 6041 (0: in the limit, 1: over the limit)

Home mode

- 1. Set Pr00-12 to choose a home method.
- 2. Set the left and right limits correspond to the position of MI terminal.
- 3. To switch Ac Motor Drive control mode to Home mode: Set Index 6060 = 6.
- 4. To switch from current mode to Operation Enable: Set 6040 = 0xE, then set 6040 = 0xF.
- 5. To trigger an ACK signal: Set 6040 = 0x0F, then set 6040 = 0x1F (Bit4 changes from 0 to 1 and the motor drive will be back to home.)

Note 01: To know if the home mode is completed, read bit 12 of 6041. (0: reached, 1: Not reached)

15.3.3 By using Delta Standard (Old definition, only support speed mode)

15-3.3.1 Various mode control method (by following DS402 standard)

If you want to use DS402 standard to control the motor drive, please follow the steps below:

- 1. Wiring for hardware (Refer to chapter 15.2 Wiring for CANopen)
- 2. Operation source setting: set Pr.00-21 to 3 for CANopen communication card control.
- 3. Frequency source setting: set Pr.00.20 to 6. (Choose source of frequency commend from CANopen setting.)

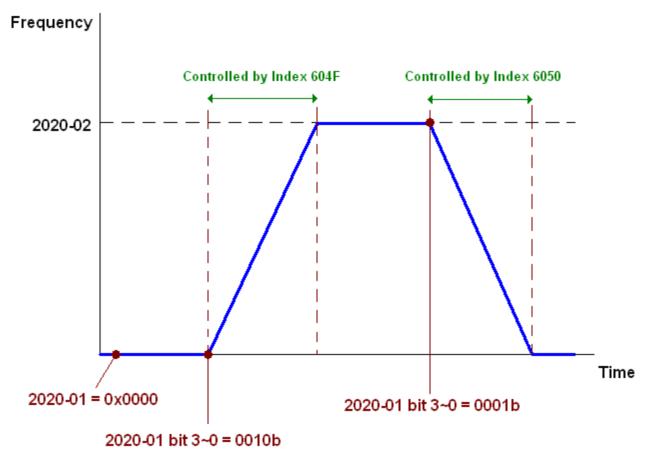
4. Set Delta Standard (Old definition, only support speed mode) as control mode: Pr. 09-40 = 0 and 09-30 = 0.

CANopen station setting: set Pr.09-36 (Range of setting is 1~127. When Pr.09-36=0, CANopen slave function is disabled.) (Note: If error arised (CAdE or CANopen memory error) as station setting is completed, press Pr.00-02=7 for reset.)

5. CANopen baud rate setting: set Pr.09.37 (CANBUS Baud Rate: 1M(0), 500K(1), 250K(2), 125K(3), 100K(4) and50K(5))

15-3-3-2 By speed mode

- 1. Set the target frequency: Set 2020-02, the unit is Hz, with a number of 2 decimal places. For example 1000 is 10.00.
- 2. Operation control: Set 2020-01 = 0002H for Running, and set 2020-01 = 0001H for Stopping.



15.3.4 By using Delta Standard (New definition)

15-3-4-1 Related set up of ac motor drive (Delta New Standard)

If you want to use DS402 standard to control the motor drive, please follow the steps below:

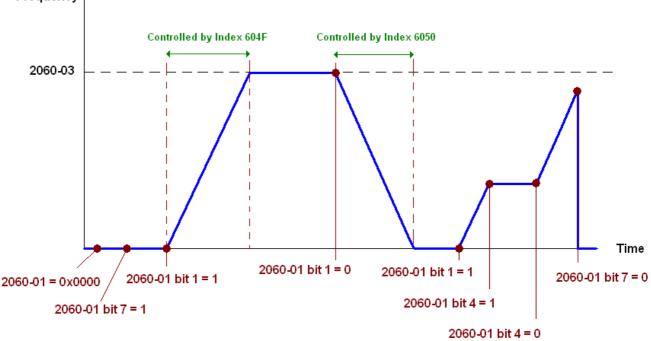
- 1. Wiring for hardware (Refer to chapter 15.2 Wiring for CANopen)
- 2. Operation source setting: set Pr.00-21 to 3 for CANopen communication card control.
- 3. Frequency source setting: set Pr.00.20 to 6. (Choose source of frequency commend from CANopen setting.)
- 4. Source of torque setting is set by Pr.11-33. (Choose source of torque commend from CANopen setting.)

- 5. CANopen station setting: set Pr.09-36 (Choose source of position commend from CANopen setting.)
- 6. Set Delta Standard (Old definition, only support speed mode) as control mode: Pr. 09-40 = 0 and 09-30 = 0.
- CANopen station setting: set Pr.09-36 (Range of setting is 1~127. When Pr.09-36=0, CANopen slave function is disabled.) (Note: If error arised (CAdE or CANopen memory error) as station setting is completed, press Pr.00-02=7 for reset.)
- 8. CANopen baud rate setting: set Pr.09.37 (CANBUS Baud Rate: 1M(0), 500K(1), 250K(2), 125K(3), 100K(4) and50K(5))

15-3-4-2 Various mode control method (Delta New Standard)

Speed Mode

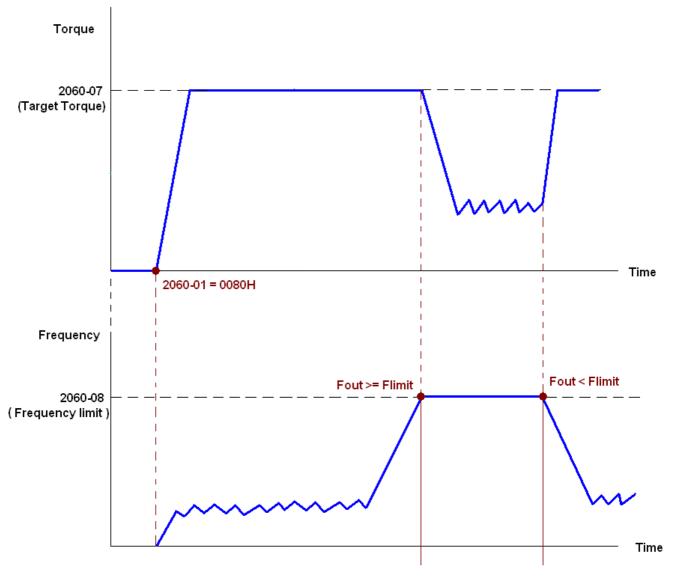
- 1. Let Ac Motor Drive be at the speed control mode: Set Index6060 = 2.
- 2. Set the target frequency: set 2060-03, unit is Hz, with a number of 2 decimal places. For example 1000 is 10.00Hz.
- 3. Operation control: set 2060-01 = 008H for Server on, and set 2060-01 = 0081H for Running.



Frequency

Torque Mode

- 1. Let Ac Motor Drive be at torque control mode: set Index 6060 = 4.
- 2. Set target torque: set 2060-07, unit is %, a number of 1 decimal place. For example 100 is 10.0%.
- 3. Operation control: Set 2060-01 = 0080H for Server on, then the motor drive will start to run to reach target torque.



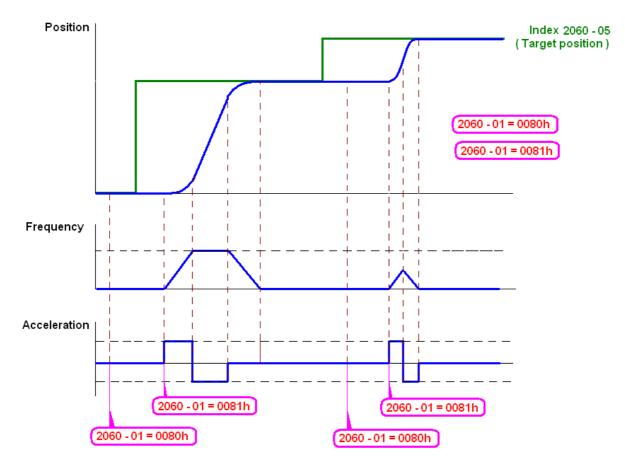
Note01 To know what the current torque is, read 2061-07 (unit is 0.1%).

Note02 To know if the torque can reach the setting value, read the bit 0 of 2061-01 (0: Not reached, 1: Reached).

Note 03: When doing torque output and if the motor drive's speed reaches the speed limit, the output torque will decrease to ensure the speed is under the limit.

Position Mode

- 1. Set the parameter of a trapezium curve to define position control (Pr11-43 Max. Position Control Frequency), Pr11-44 Accel. Time of Position Control, Pr11-45 Decel. Time of Position Control)
- 2. Let Ac motor drive be at the position control mode, set Index 6060 = 1.
- 3. Set 2060-01 = 0080h, then motor drive will have server on.
- 4. Set target position: set 2060-05 = target position.
- 5. Set 2060-01 =0081h to trigger the motor drive to run to the target position.
- 6. To move to another position, simply repeat step 3 to 5.



NOTE01: To know the current position, read 2061-05.

NOTE02: To know if reaching the target position, read bit 0 of 2061 (0: Not reached, 1: Reached).

Home Mode

- 1. Set Pr00-12 to choose how to return home.
- 2. Set the left and right limits correspond to the position of MI terminal.
- 3. To switch CH2000 control mode to Home mode: Set Index 6060 = 6.
- 4. Set 2060-01 = 0080h, then motor drive will have server on.
- 5. Set the ACK signal: set 2060-01 = 0081h, then the motor drive will start to go back home.

NOTE 01: To know if returning home is completed, read bit12 of 6041 (0: Not reached, 1: Reached).

15-3-5 DI/DO AI AO are controlled via CANopen

To control the DO AO of the motor drive through CANopen, follow the steps below:

- 1. To set the DO to be controlled, define this DO to be controlled by CANopen. For example, set Pr02-14 to control RY2.
- 2. To set the DO to be controlled, define this AO to be controlled by CANopen. For example, set Pr03-23 to control AFM2.
- 3. To control the mapping index of CANopen. If you want to control DO, then you will need to control Index2026-41. If you want to control AO, then you will need to control 2026-AX. If you want to set RY2 as ON, set the bit 1 of Index 2026-41 =1, then RY2 will output 1. If you want to control AFM2 output = 50.00%, then you will need to set Index 2026-A2 =5000, then AFM2 will output 50%.

Mapping table of CANopen DI DO AI AO:

| Terminal | Related Parameters | R/W | Mapping Index | | |
|----------|---------------------------|-----|----------------|--|--|
| FWD | == | RO | 2026-01 bit 0 | | |
| REV | REV == | | 2026-01 bit 1 | | |
| MI 1 | == | RO | 2026-01 bit 2 | | |
| MI 2 | == | RO | 2026-01 bit 3 | | |
| MI 3 | == | RO | 2026-01 bit 4 | | |
| MI 4 | == | RO | 2026-01 bit 5 | | |
| MI 5 | == | RO | 2026-01 bit 6 | | |
| MI 6 | == | RO | 2026-01 bit 7 | | |
| MI 7 | == | RO | 2026-01 bit 8 | | |
| MI 8 | == | RO | 2026-01 bit 9 | | |
| MI 10 | == | RO | 2026-01 bit 10 | | |
| MI 11 | == | RO | 2026-01 bit 11 | | |
| MI 12 | == | RO | 2026-01 bit 12 | | |
| MI 13 | == | RO | 2026-01 bit 13 | | |
| MI 14 | == | RO | 2026-01 bit 14 | | |
| MI 15 | == | RO | 2026-01 bit 15 | | |
| DO : | | | | | |
| Terminal | Related Parameters | R/W | Mapping Index | | |
| RY1 | P2-13 = 50 | RW | 2026-41 bit 0 | | |
| RY2 | P2-14 = 50 | RW | 2026-41 bit 1 | | |
| | P2-15 = 50 | RW | 2026-41 bit 2 | | |

DI:

MO1

MO2

MO3

MO4

2026-41 bit 3

2026-41 bit 4

2026-41 bit 5

2026-41 bit 6

RW

RW

RW

RW

P2-16 = 50

P2-17 = 50

P2-18 = 50

P2-19 = 50

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| MO5 | P2-20 = 50 | RW | 2026-41 bit 7 |
|-----|------------|----|----------------|
| MO6 | P2-21 = 50 | RW | 2026-41 bit 8 |
| MO7 | P2-22 = 50 | RW | 2026-41 bit 9 |
| MO8 | P2-23 = 50 | RW | 2026-41 bit 10 |

AI :

| Terminal | Related Parameters | R/W | Mapping Index | | | |
|----------|---------------------------|-----|------------------|--|--|--|
| AVI | == | RO | Value of 2026-61 | | | |
| ACI | == | RO | Value of 2026-62 | | | |
| AUI | == | RO | Value of 2026-63 | | | |

AO :

| [| Terminal | Related Parameters | R/W | Mapping Index | | |
|---|----------|---------------------------|-----|------------------|--|--|
| | AFM1 | P3-20 = 20 | RW | Value of 2026-A1 | | |
| | AFM2 | P3-23 = 20 | RW | Value of 2026-A2 | | |

15.4 CANopen Supporting Index

CH2000 Index:

Parameter index corresponds to each other as following:

| Index s | sub-Ind |
|---------|---------|
|---------|---------|

2000H + Group

sub-Index member+1

For example:

Pr.10.15 (Encoder Slip Error Treatment)

| Grou | р | l | member |
|------|-------------------|---|---------|
| 10(0 | \overline{A} H) | - | 15(0FH) |
| | | | |

Index = 2000H + 0AH = 200ASub Index = 0FH + 1H = 10H

CH2000 Control Index:

Delta Standard Mode (Old definition)

| Index | Sub | Definition | Factory Setting | R/W | Size | Note | | | |
|-------|-----|--------------|--------------------|-----|------|---|---|--|--|
| | 0 | Number | 3 | R | U8 | | | | |
| 2020H | | | 3 | | | 01 10 11 Bit3~2 Rd Bit5~4 00 11 11 Bit7~6 00 01 11 Bit11~8 00 00 00 | DB:disable 1B:stop DB:disable 1B: JOG Enable eserved DB:disable 1B: Direction forward DB: Reverse 1B: Switch Direction DB: 1 st step Accel. /Decel. 1B: 2 nd step Accel. /Decel. 1B: 4 th step Accel. /Decel. 1B: 4 th step Accel. /Decel. 000B: Master speed 001B: 1 st step speed 010B: 2 nd step speed | | |
| 2020H | 1 | Control word | 0 | RW | U16 | 01 01 01 01 01 01 01 10 10 10 11 11 11 1 | 011B: 3 rd step speed 100B: 4 th step speed 101B: 5 th step speed 110B: 6 th step speed 111B: 7 th step speed 000B: 8 th step speed 000B: 8 th step speed 001B: 9 th step speed 010B: 10 th step speed 011B: 11 th step speed 100B: 12 th step speed 101B: 13 th step speed 111B: 15 th step speed | | |

| Index | Sub | Definition | Factory Setting | R/W | Size | | Note | | | |
|--------|--------|--|--------------------|--------|------------|-----------|---|--|--|--|
| | | | | | | | 10B: Operation command by Pr. 00-21 setting | | | |
| | | | | | | | 11B: Switch the source of | | | |
| | | | | | | Bit 15 | operation command Reserved | | | |
| | | Freq. command | | | | Dit 10 | | | | |
| | 2 | (XXX.XXHz) | 0 | RW | U16 | | 1 | | | |
| | | | - | | | Bit0 | 1: E.F. ON | | | |
| | 3 | Other trigger | 0 | RW | U16 | Bit1 | 1: Reset | | | |
| 2021H | 0 | Number | DH | R | U8 | Bit15~2 | Reserved | | | |
| 202111 | 1 | Error code | 0 | R | U16 | | | | | |
| | 2 | AC motor drive status | 0 | R | U16 | Bit 1~0 | 00B: stop | | | |
| | | | | | 0.0 | | 01B: decelerate to stop | | | |
| | | | | | | | 10B: waiting for operation | | | |
| | | | | | | | command | | | |
| | | | | | | | 11B: in operation | | | |
| | | | | | | Bit 2 | 1: JOG command | | | |
| | | | | | | Bit 4~3 | 00B: forward running | | | |
| | | | | | | | 01B: switch from reverse running to forward running | | | |
| | | | | | | | 10B: switch from forward | | | |
| | | | | | | | running to reverse running | | | |
| | | | | | | | 11B: reverse running | | | |
| | | | | | | Bit 7~5 | Reserved | | | |
| | | | | | | Bit 8 | 1: master frequency command controlled by communication interface | | | |
| | | | | | | Bit 9 | 1: master frequency command controlled by analog signal input | | | |
| | | | | | | Bit 10 | 1: operation command controlled by communication interface | | | |
| | | | | | | Bit 15~11 | Reserved | | | |
| | 3 | Freq. command (XXX.XXHz) | 0 | R | U16 | | | | | |
| | 4 | Output freq. (XXX.XXHz) | 0 | R | U16 | | | | | |
| | 5 | Output current (XX.XA) | 0 | R | U16 | | | | | |
| | 6 7 | DC bus voltage (XXX.XV) Output voltage (XXX.XV) | 0 | R R | U16 U16 | | | | | |
| | | the current segment run by | 0 | n | 010 | | | | | |
| | 8 | the multi-segment speed commend | 0 | R | U16 | | | | | |
| | 9 | Reserved | 0 | R | U16 | | | | | |
| | Α | Display counter value (c) | 0 | R | U16 | | | | | |
| | В | Display output power angle (XX.X °) | 0 | R | U16 | | | | | |
| | С | Display output torque (XXX.X%) | 0 | R | U16 | | | | | |
| | D | Display actual motor speed (rpm) | 0 | R | U16 | | | | | |
| | Е | Number of PG feed back pulses (0~65535) | 0 | R | U16 | | | | | |
| | F | Number of PG2 pulse commands (0~65535) | 0 | R | U16 | | | | | |
| | | power output (X.XXXKWH) | 0 | R | U16 | | | | | |
| 2022H | 0 | Reserved | 0 | R | U16 | | | | | |
| | 1 | Display output current | 0 | R | U16 | | | | | |

| Index | Sub | | Factory Setting | R/W | Size | Note |
|-------|-----|---|--------------------|-----|------|------|
| | 2 | Display counter value | 0 | R | U16 | |
| | 3 | Display actual output frequency (XXX.XXHz) | 0 | R | U16 | |
| | 4 | Display DC-BUS voltage (XXX.XV) | 0 | R | U16 | |
| | 5 | Display output voltage (XXX.XV) | 0 | R | U16 | |
| | 6 | Display output power angle (XX.X°) | 0 | R | U16 | |
| | 7 | Display output power in kW | 0 | R | U16 | |
| | 8 | Display actual motor speed (rpm) | 0 | R | U16 | |
| | 9 | Display estimate output torque (XXX.X%) | 0 | R | U16 | |
| | A | Display PG feedback | 0 | R | U16 | |
| | В | Display PID feedback value after enabling PID function in % (To 2 decimal places) | 0 | R | U16 | |
| | с | Display signal of AVI analog input terminal, 0-10V corresponds to 0-100% (To 2 decimal places) | 0 | R | U16 | |
| | D | Display signal of ACI analog input terminal, 4-V20mA/0-10V corresponds to 0-100% (To 2 decimal places) | 0 | R | U16 | |
| | E | Display signal of AUI analog input terminal, -10V~10V corresponds to -100~100% (To 2 decimal places) | 0 | R | U16 | |
| | F | Display the IGBT temperature of drive power module in °C | 0 | R | U16 | |
| | 10 | Display the temperature of capacitance in °C | 0 | R | U16 | |
| | 11 | The status of digital input (ON/OFF), refer to Pr.02-12 | 0 | R | U16 | |
| | 12 | The status of digital output (ON/OFF), refer to Pr.02-18 | 0 | R | U16 | |
| | 13 | Display the multi-step speed that is executing | 0 | R | U16 | |
| | 14 | The corresponding CPU pin status of digital input | 0 | R | U16 | |
| | 15 | The corresponding CPU pin status of digital output | 0 | R | U16 | |
| | 16 | Number of actual motor revolution (PG1 of PG card). it will start from 9 when the actual operation direction is changed or keypad display at stop is 0. Max. is 65535 | 0 | R | U16 | |
| | 17 | Pulse input frequency (PG2 of PG card) | 0 | R | U16 | |
| | 18 | Pulse input position (PG card PG2), maximum setting is 65535. | 0 | R | U16 | |
| | 19 | Position command tracing error | 0 | R | U16 | |
| | 1A | Display times of counter overload (0.00~100.00%) | 0 | R | U16 | |

| Index | Sub | Definition | Factory Setting | R/W | Size | Note |
|-------|-----|--|--------------------|-----|------|------|
| | 1B | Display GFF in % | 0 | R | U16 | |
| | 1C | Display DCbus voltage ripples (Unit: Vdc) | 0 | R | U16 | |
| | 1D | Display PLC register D1043 data | 0 | R | U16 | |
| | 1E | Display Pole of Permanent Magnet Motor | 0 | R | U16 | |
| | 1F | User page displays the value in physical measure | 0 | R | U16 | |
| | 20 | Output Value of Pr.00-05 | 0 | R | U16 | |
| | 21 | Number of motor turns when drive operates | 0 | R | U16 | |
| | 22 | Operation position of motor | 0 | R | U16 | |
| | 23 | Fan speed of the drive | 0 | R | U16 | |
| | 24 | Control mode of the drive 0: speed mode 1: torque mode | 0 | R | U16 | |
| | 25 | Carrier frequency of the drive | 0 | | | |

CANopen Remote IO mapping

| • | | | |
|-------|---------|-----|--|
| Index | Sub | R/W | Definition |
| 2026H | 01h | R | Each bit corresponds to the different input terminals |
| | 02h | R | Each bit corresponds to the different input terminals |
| | 03h~40h | R | Reserved |
| | 41h | RW | Each bit corresponds to the different output terminals |
| | 42h~60h | R | Reserved |
| | 61h | R | AVI (%) |
| | 62h | R | ACI (%) |
| | 63h | R | AUI (%) |
| | 64h~A0h | R | Reserved |
| | A1h | RW | AFM1 (%) |
| | A2h | RW | AFM2 (%) |

Delta Standard Mode (New definition)

| Index | cub | DVV | Sizo | [| Description | າຣ | Speed Mode | Position Mode | Home Mode | Torque Mode |
|--------|-----|-----|------|-----|-------------|----------|---|------------------------------|----------------------------|-------------|
| IIIUEX | Sub | | | bit | Definition | Priority | | | | |
| | 00h | R | U8 | | | | | | | |
| | | | | 0 | Ack | 4 | | Pulse 1: Position control | Pulse 1: Return to home | |
| | | | | 1 | Dir | 4 | 0: FWD run command 1: REV run command | | | |
| | | | | 2 | | | | | | |
| 2060h | 01h | RW | U16 | 3 | Halt | | 0: drive run till target speed is attained 1: drive stop by declaration setting | | | |
| | | | | 4 | Hold | | 0: drive run till target speed is attained 1: frequency stop at current frequency | | | |
| | | | | 5 | JOG | | 0:JOG OFF Pulse 1:JOG RUN | | | |
| | | | | 6 | QStop | | Quick Stop | | | |

| Indox | dex sub R/W Siz | | Sizo | C | Descriptions | Speed Mode | Position Mode | Home Mode | Torque Mode |
|-------|-----------------|----|------|------|--------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| muex | | | Size | bit | DefinitionPriority | / Speed Mode | Position Mode | | Torque Mode |
| | | | | 7 | Power | 0:Power OFF 1:Power ON | 0:Power OFF 1:Power ON | 0:Power OFF 1:Power ON | 0:Power OFF 1:Power ON |
| | | | | 14~8 | Cmd SW | Multi-step frequency switching | Multi-step position switching | | |
| | | | | 15 | | Pulse 1: Fault code cleared | Pulse 1: Fault code cleared | Pulse 1: Fault code cleared | Pulse 1: Fault code cleared |
| | 02h | RW | U16 | | | | | | |
| | | | U16 | | | Speed command (unsigned decimal) | | | |
| | | | U16 | | | | | | |
| | | RW | S32 | | | | Position command | | |
| | 06h | RW | | | | | | | |
| | 07h | RW | U16 | | | | | | Torque command (signed decimal) |
| | 08h | RW | U16 | | | | | | Speed limit (unsigned decimal) |
| | | | | 0 | Arrive | Frequency attained | Position attained | Homing complete | Torque attained |
| | | | | 1 | Dir | 0: Motor FWD run 1: Motor REV run |
| | | | | 2 | Warn | Warning | Warning | Warning | Warning |
| | 01h | R | U16 | 3 | Error | Error detected | Error detected | Error detected | Error detected |
| | | | | 4 | | | | | |
| | | | | 5 | JOG | JOG | JOG | JOG | JOG |
| | | | | 6 | QStop | Quick stop | Quick stop | Quick stop | Quick stop |
| 2061h | | | | 7 | Power On | Switch ON | Switch ON | Switch ON | Switch ON |
| | | | | 15~8 | | | | | |
| | 02h | R | | | | | | | |
| | 03h | R | U16 | | | Actual output frequency | Actual output frequency | Actual output frequency | Actual output frequency |
| | 04h | R | | | | | | | |
| | 05h | | S32 | | | Actual position (absolute) | Actual position (absolute) | Actual position (absolute) | Actual position (absolute) |
| | 06h | R | | | | | | | |
| | 07h | | S16 | | | Actual torque | Actual torque | Actual torque | Actual torque |

DS402 Standard

| Index | Sub | Definition | Factory Setting | R/W | Size | | PDO Map | Mode | Note |
|-------|-----|------------------------------|--------------------|-----|------|-----|------------|------|---|
| 6007h | 0 | Abort connection option code | 2 | RW | S16 | | Yes | | 0: No action 2: Disable Voltage, 3: quick stop |
| 603Fh | 0 | Error code | 0 | R0 | U16 | | Yes | | |
| 6040h | 0 | Control word | 0 | RW | U16 | | Yes | | |
| 6041h | 0 | Status word | 0 | R0 | U16 | | Yes | | |
| 6042h | 0 | vl target velocity | 0 | RW | S16 | rpm | Yes | vl | |
| 6043h | 0 | vl velocity demand | 0 | RO | S16 | rpm | Yes | vl | |
| 6044h | 0 | vl control effort | 0 | RO | S16 | rpm | Yes | vl | |
| 604Fh | 0 | vl ramp function time | 10000 | RW | U32 | 1ms | Yes | vl | Unit must be: 100ms, and |
| 6050h | 0 | vl slow down time | 10000 | RW | U32 | 1ms | Yes | vl | check if the setting is set to |
| 6051h | 0 | vl quick stop time | 1000 | RW | U32 | 1ms | Yes | vl | 0. |
| 605Ah | 0 | Quick stop option code | 2 | RW | S16 | | No | | 0 : disable drive function 1 :slow down on slow down ramp 2: slow down on quick stop ramp |

| Index | Sub | Definition | Factory Setting | R/W | Size | Unit | PDO Map | Mode | Note |
|-------|-----|-------------------------------|--------------------|-----|------|------|------------|------|--|
| | | | | | | | | | 5 slow down on slow down ramp and stay in QUICK STOP |
| | | | | | | | | | 6 slow down on quick stop ramp and stay in QUICK STOP |
| 605Ch | 0 | Disable operation option code | 1 | RW | S16 | | No | | 0: Disable drive function 1: Slow down with slow down ramp; disable of the drive function |
| 6060h | 0 | Mode of operation | 2 | RW | S8 | | Yes | | 1: Profile Position Mode 2: Velocity Mode 4: Torque Profile Mode 6: Homing Mode |
| 6061h | 0 | Mode of operation display | 2 | RO | S8 | | Yes | | Same as above |
| 6064h | 0 | pp Position actual value | 0 | RO | S32 | | Yes | рр | |
| 6071h | 0 | tq Target torque | 0 | RW | S16 | 0.1% | Yes | tq | Valid unit: 1% |
| 6072h | 0 | tq Max torque | 150 | RW | U16 | 0.1% | No | tq | Valid unit: 1% |
| 6075h | 0 | tq Motor rated current | 0 | RO | U32 | mA | No | tq | |
| 6077h | 0 | tq torque actual value | 0 | RO | S16 | 0.1% | Yes | tq | |
| 6078h | 0 | tq current actual value | 0 | RO | S16 | 0.1% | Yes | tq | |
| 6079h | 0 | tq DC link circuit voltage | 0 | RO | U32 | mV | Yes | tq | |
| 607Ah | 0 | pp Target position | 0 | RW | S32 | 1 | Yes | рр | |

15.5 CANopen Fault Code

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|---------------------------------------|------------|---|-----------------------|---|
| Fault ocA Oc at accel | 0001H | Over-current during acceleration | 2213 H | 1 |
| Fault ocd Oc at decel | 0002H | Over-current during deceleration | 2213 H | 1 |
| Fault Ocn Oc at normal SPD | 0003H | Over-current during steady status operation | 2214H | 1 |
| Fault GFF Ground fault | 0004H | Ground fault. When (one of) the output terminal(s) is grounded, short circuit current is more than 50% of AC motor drive rated current. NOTE: The short circuit protection is provided for AC motor drive protection, not for protection of the user. | 2240H | 1 |
| HAND Fault OCC Short Circuit | 0005H | Short-circuit is detected between upper bridge and lower bridge of the IGBT module. | 2250H | 1 |
| Fault ocS Oc at stop | 0006H | Over-current at stop. Hardware failure in current detection | 2314H | 1 |
| Fault ovA Ov at accel | 0007H | Over-current during acceleration. Hardware failure in current detection | 3210H | 2 |
| Fault ovd Ov at decel | 0008H | Over-current during deceleration. Hardware failure in current detection. | 3210H | 2 |
| Fault ovn Ov at normal SPD | 0009H | Over-current during steady speed. Hardware failure in current detection. | 3210H | 2 |
| HAND Fault ovS Ov at stop | 000AH | Over-voltage at stop. Hardware failure in current detection | 3210H | 2 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|--|------------|---|-----------------------|---|
| Fault LvA Lv at accel | 000BH | DC BUS voltage is less than Pr.06.00 during acceleration. | 3220H | 2 |
| Fault Lvd Lv at decel | 000CH | DC BUS voltage is less than Pr.06.00 during deceleration. | 3220H | 2 |
| Fault Lvn Lv at normal SPD | 000DH | DC BUS voltage is less than Pr.06.00 in constant speed. | 3220H | 2 |
| Fault LvS Lv at stop | 000EH | DC BUS voltage is less than Pr.06-00 at stop | 3220H | 2 |
| Fault OrP Phase Lacked | 000FH | Phase Loss Protection | 3130H | 2 |
| HAND Fault oH1 IGBT over heat | 0010H | IGBT overheat IGBT temperature exceeds protection level. 1~15HP: 90°C 20~100HP: 100°C | 4310H | 3 |
| Fault oH2 Hear Sink oH | 0011H | Heat sink overheat Heat sink temperature exceeds 90oC | 4310H | 3 |
| HAND Fault tH1o Thermo 1 open | 0012H | Temperature detection circuit error (IGBT) IGBT NTC | FF00H | 3 |
| Fault tH2o Thermo 2 open | 0013H | Temperature detection circuit error (capacity module) CAP NTC | FF01H | 3 |
| Fault PWR Power RST OFF | 0014H | Power RST off | FF02H | 2 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|----------------------------------|------------|--|-----------------------|---|
| Fault oL Inverter oL | 0015H | Overload. The AC motor drive detects excessive drive output current. NOTE: The AC motor drive can withstand up to 150% of the rated current for a maximum of 60 seconds. | 2310H | 1 |
| Fault EoL1 Thermal relay 1 | 0016H | Electronics thermal relay 1 protection | 2310H | 1 |
| Fault EoL2 Thermal relay 2 | 0017H | Electronics thermal relay 2 protection | 2310H | 1 |
| Fault ot1 Over torque 1 | 001AH | These two fault codes will be displayed when output current exceeds the over-torque detection level (Pr.06.07 or | 8311H | 3 |
| Fault ot2 Over torque 2 | 001BH | Pr.06.10) and exceeds over-torque detection (Pr.06.08 or Pr.06.11) and it is set 2 or 4 in Pr.06-06 or Pr.06-09. | 8311H | З |
| Fault uC Under torque 1 | 001CH | Low current | 8321H | 1 |
| Fault cF1 EEPROM write Err | 001EH | Internal EEPROM can not be programmed. | 5530H | 5 |
| Fault cF2 EEPROM read Err | 001FH | Internal EEPROM can not be read. | 5530H | 5 |
| Fault cd1 las sensor Err | 0021H | U-phase error | FF04H | 1 |
| Fault cd2 Ibs sensor Err | 0022H | V-phase error | FF05H | 1 |
| Fault cd3 Ics sensor Err | 0023H | W-phase error | FF06H | 1 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|--------------------------------------|------------|-----------------------------------|-----------------------|---|
| HAND Fault Hd0 cc HW Error | 0024H | cc (current clamp) hardware error | FF07H | 5 |
| HAND Fault Hd1 oc HW Error | 0025H | oc hardware error | FF08H | 5 |
| Fault Hd2 ov HW Error | 0026H | ov hardware error | FF09H | 5 |
| HAND Fault Hd3 GFF HW Error | 0027H | GFF hardware error | FF0AH | 5 |
| Fault AUE Auto tuning Err | 0028H | Auto tuning error | FF21H | 1 |
| Fault AFE PID Fbk Error | 0029H | PID loss (ACI) | FF22H | 7 |
| Fault PGF1 PG Fbk Error | 002AH | PG feedback error | 7301H | 7 |
| Fault PGF2 PG Fbk Loss | 002BH | PG feedback loss | 7301H | 7 |
| Fault PGF3 PG Fbk Over SPD | 002BH | PG feedback stall | 7301H | 7 |
| Fault PGF4 PG Fbk deviate | 002CH | PG slip error | 7301H | 7 |
| Fault ACE ACI loss | 0030H | ACI loss | FF25H | 1 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|----------------------------------|------------|--|--------------------|---|
| Fault EF External Fault | 0031H | External Fault When input EF (N.O.) on external terminal is closed to GND, AC motor drive stops output U, V, and W. | 9000H | 5 |
| Fault EF1 Emergency stop | 0032H | Emergency stop When the multi-function input terminals MI1 to MI6 are set to emergency stop, the AC motor drive stops output U, V, W and the motor coasts to stop. | 9000H | 5 |
| Fault bb Base block | 0033H | External Base Block When the external input terminals MI1 to MI16 are set as bb and active, the AC motor drive output will be turned off | 9000H | 5 |
| Fault Pcod Password Error | 0034H | Password will be locked if three fault passwords are entered | FF26H | 5 |
| Fault ccod SW code Error | 0035H | Software error | 6100H | 5 |
| Fault cE1 Modbus CMD err | 0036H | Illegal function code | 7500H | 4 |
| Fault cE2 Modbus ADDR err | 0037H | Illegal data address (00H to 254H) | 7500H | 4 |
| Fault cE3 Modbus DATA err | 0038H | Illegal data value | 7500H | 4 |
| Fault cE4 Modbus slave FLT | 0039H | Data is written to read-only address | 7500H | 4 |
| Fault cE10 Modbus time out | 003AH | Modbus transmission timeout. | 7500H | 5 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|---|------------|--|-----------------------|---|
| Fault cP10 Keypad time out | 003BH | Keypad transmission timeout. | 7500H | 4 |
| Fault bF Braking fault | 003CH | Brake resistor fault | 7110H | 4 |
| Fault ydc Y-delta connect | 003DH | Motor Y-Δ switch error | 3330H | 2 |
| Fault dEb Dec. Energy back | 003EH | Energy regeneration when decelerating | FF27H | 2 |
| HAND Fault oSL Over slip Error | 003FH | Over slip error. Slip exceeds Pr.05.26 limit and slip duration exceeds Pr.05.27 setting. | FF28H | 7 |
| Fault PGF5 PG HW Error | 0041H | PG Card Error | FF29H | 5 |
| Fault ocU Unknow Over Apm | 0042H | over current caused by unknown reason | 2310H | 1 |
| Fault ovU Unknow Over volt. | 0043H | over voltage caused by unknown reason | 3210H | 2 |
| Fault S1 S1-Emergy stop | 0049H | external safety emergency stop | FF2AH | 5 |
| Fault OPHL U phase lacked | 0052H | U phase output phase loss | 2331H | 2 |
| Fault OPHL U phase lacked | 0053H | V phase output phase loss | 2332H | 2 |

| Display | Fault code | Description | CANopen fault code | CANopen fault register (bit 0~7) |
|-----------------------------------|------------|---------------------------|-----------------------|---|
| Fault OPHL U phase lacked | 0054H | W phase output phase loss | 2333H | 2 |
| Fault aocc A phase short | 004FH | A phase short | FF2BH | 1 |
| Fault bocc B phase short | 0050H | B phase short | FF2CH | 1 |
| Fault cocc C phase short | 0051H | C phase short | FF2DH | 1 |
| Fault CGdE Guarding T-out | 0065H | Guarding time-out 1 | 8130H | 4 |
| Fault CHbE Heartbeat T-out | 0066H | Heartbeat time-out | 8130H | 4 |
| Fault CSyE SYNC T-out | 0067H | CAN synchrony error | 8700H | 4 |
| Fault CbFE CAN/S bus off | 0068H | CAN bus off | 8140H | 4 |
| Fault CIdE CAN/S Idx exceed | 0069H | Can index exceed | 8110H | 4 |
| Fault CAdE CAN/S add. set | 006AH | CAN address error | 0x8100 | 4 |
| Fault CFdE CAN/S FRAM fail | 006BH | CAN frame fail | 0x8100 | 4 |

15.6 CANopen LED Function

There are two CANopen flash signs: RUN and ERR.

RUN LED:

| LED status | Condition | CANopen State |
|--------------|------------------------------------|---------------|
| OFF | | Initial |
| Blinking | ON-200 200 ms ms ms | Pre-Operation |
| Single flash | ON - 200 200 100 ms ms ms ms ms | Stopped |
| ON | | Operation |

ERR LED:

| LED status | Condition/ State |
|--------------|--|
| OFF | No Error |
| Single | One Message fail |
| flash | ON - 200 200 100 ms ms ms ms to ms |
| Double | Guarding fail or heartbeat fail |
| flash | ON 200 200 100 ms ms ms ms ms |
| Triple flash | SYNC fail |
| | ON 200 200 200 200 100 ms ms m |
| ON | Bus off |

16 PLC Function Applications

PLC Summary 16-1 Notes before PLC use 16-2 16-3 Turn on 16-3-1 Connect to PC 16-3-2 I/O device explanation 16-3-3 Installation WPLSoft 16-3-4 Program writing 16-3-5 Program download 16-3-6 Program monitoring 16-4 Basic principles of PLC ladder diagrams 16-4-1 Schematic diagram of PLC ladder diagram program scanning 16-4-2 Introduction to ladder diagrams 16-4-3 Overview of PLC ladder diagram editing 16-4-4 Commonly-used basic program design examples 16-5 Various PLC device functions 16-5-1 Introduction to device functions 16-5-2 Introduction to special relay functions (special M) 16-5-3 Introduction to special register functions (special D) 16-5-4 PLC Communication address 16-6 Introduction to the Command Window 16-6-1 Overview of basic commands 16-6-2 Detailed explanation of basic commands 16-6-3 Overview of application commands Detailed explanation of applications commands 16-6-4 Detailed explanation of driver special applications 16-6-5 commands 16-7 Error display and handling 16-8 CANopen Master control applications 16-9 Explanation of various PLC mode controls (speed, torque, homing, and position) 16-10 Internal communications main node control 16-11 Count function using MI8 16-11-1 High-speed count function 16-11-2 Frequency calculation function 16-12 Modbus remote IO control applications (use MODRW) 16-13 Calendar

16-1 PLC Summary

16-1-1 Introduction

The commands provided by the CH2000's built-in PLC functions, including the ladder diagram editing tool WPLSoft, as well as the usage of basic commands and applications commands, chiefly retain the operating methods of Delta's PLC DVP series.

16-1-2 WPLSoft ladder diagram editing tool

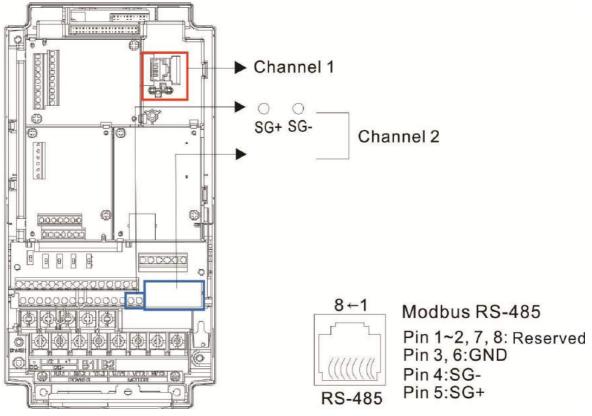
WPLSoft is Delta's program editing software for the DVP and CH2000 programmable controllers in the Windows operating system environment. Apart from general PLC program design general Windows editing functions (such as cut, paste, copy, multiple windows, etc.), WPLSoft also provides many Chinese/English annotation editing and other convenience functions (such as registry editing, settings, file reading, saving, and contact graphic monitoring and settings, etc.).

| Item | System requirements |
|------------------|--|
| Operating system | Windows 95/98/2000/NT/ME/XP |
| CPU | At least Pentium 90 |
| Memory | At least 16MB (we recommend at least 32MB) |
| Hard drive | Hard drive capacity: at least 100MB free space |
| Hald unve | One optical drive (for use in installing this software) |
| Dicplay | Resolution: 640×480, at least 16 colors; it is recommended that the screen |
| Display | area be set at 800×600 pixels |
| Mouse | Ordinary mouse or Windows-compatible device |
| Printer | Printer with a Windows driver program |
| RS-485 port | Must have at least an RS-485 port to link to the PLC |
| Suitable PLC | Delta's full DVP-PLC series, VFD-CH2000 series |
| models | Delta S Iuli DVF-FLO Selles, VFD-OFI2000 Selles |

The following basic requirements that need to install WPLSoft editing software:

16-2 Notes before PLC use

- 1. The PLC has a preset communications format of 7,N,2,9600, with node 2; the PLC node can be changed in parameter 09-35, but this address may not be the same as the converter's address setting of 09-00.
- 2. The CH2000 provides 2 communications serial ports that can be used to download PLC programs (see figure below). Channel 1 has a fixed communications format of 19200,8,N,2 RTU.



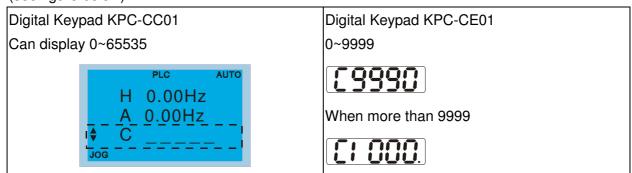
3. The client can simultaneously access data from the converter and internal PLC, which is performed through identification of the node. For instance, if the converter node is 1 and the internal PLC node is 2, then the client command will be

01 (node) 03 (read) 0400 (address) 0001 (1 data item), indicating that it must read the data in converter parameter 04-00

02 (node) 03 (read) 0400 (address) 0001 (1 data item), indicating that it must read the data in internal PLC X0

- 4. The PLC program will be disabled when uploading/downloading programs.
- 5. Please note when using WPR commands to write in parameters, values may be modified up to a maximum of 10⁹ times, otherwise a memory write error will occur. The calculation of modifications is based on whether the entered value has been changed. If the entered value is left unchanged, the modifications will not increase afterwards. But if the entered value is different from before, the number of modifications will increase by one.

6. When parameter 00-04 is set as 28, the displayed value will be the value of PLC register D1043 (see figure below):



- 7. In the PLC Run and PLC Stop mode, the content 9 and 10 of parameter 00-02 cannot be set and cannot be reset to the default value.
- 8. The PLC can be reset to the default value when parameter 00-02 is set as 6.
- 9. The corresponding MI function will be disabled when the PLC writes to input contact X.
- 10. When the PLC controls converter operation, control commands will be entirely controlled by the PLC and will not be affected by the setting of parameter 00-21.
- 11. When the PLC controls converter frequency commands (FREQ commands), frequency commands will be entirely controlled by the PLC, and will not be affected by the setting of parameter 00-20 or the Hand ON/OFF configuration.
- 12. When the PLC controls converter frequency (TORQ commands), torque commands will be entirely controlled by the PLC, and will not be affected by the setting of parameter 11-33 or the Hand ON/OFF configuration.
- 13. When the PLC controls converter frequency (POS commands), position commands will be entirely controlled by the PLC, and will not be affected by the setting of parameter 11-40 or the Hand ON/OFF configuration.
- 14. When the PLC controls converter operation, if the keypad Stop setting is valid, this will trigger an FStP error and cause stoppage.

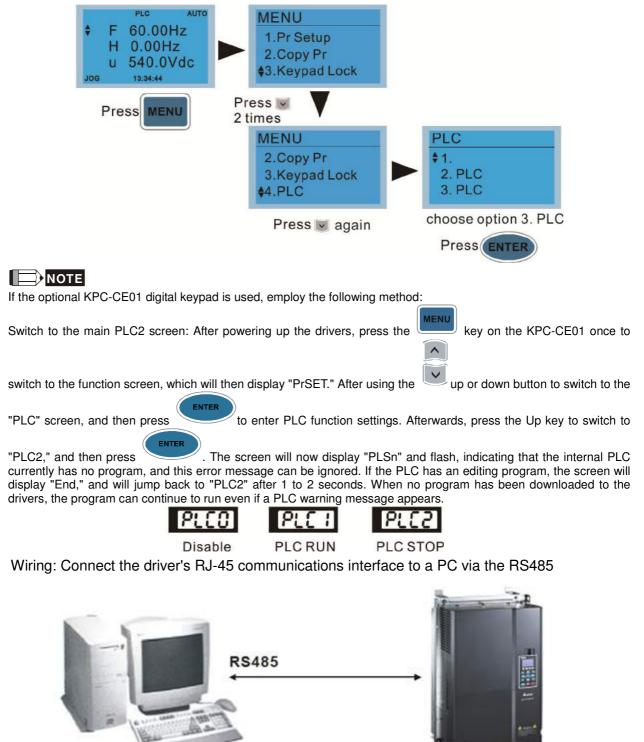
16-3 Turn on

2.

16-3-1 Connect to PC

Start operation of PLC functions in accordance with the following four steps

1. After pressing the Menu key and selecting 4: PLC on the KPC-CC01 digital keypad, press the Enter key (see figure below).



16-5

CH2000

3. PLC function usage

| DLO | PLC func | tions are as shown in the figure on the left; select |
|-------------------------|-----------------|--|
| PLC | item 2 an | d implement PLC functions. |
| 1.Disable 2.PLC Run | 1: No function | (Disable) |
| 3.PLC Stop | 2: Enable PLC | ; (PLC Run) |
| · · · · · | 3: Stop PLC fu | Inctions (PLC Stop) |
| | | |
| Optional product: PLC f | unction display | PLC 0 : Do not implement PLC functions |
| method on KPC-CE01 of | digital keypad | PLC 1 : Initiate PLC Run |

When the external multifunctional input terminals (MI1 to MI8) are in PLC Mode select bit0 (51) or PLC Mode select bit1 (52), and the terminal contact is closed or open, it will compulsorily switch to the PLC mode, and keypad switching will be ineffective. Corresponding actions are as follows:

PLC 2 : Initiate PLC Stop

| PLC | mode | PLC Made calest bit1(52) | PLC Made calest hit0 (E1) |
|-------------------|-------------------|--------------------------|---------------------------|
| Using KPC-CC01 | Using KPC-CE01 | PLC Mode select bit1(52) | PLC Mode select bit0 (51) |
| Disable | PLC 0 | OFF | OFF |
| PLC Run | PLC 1 | OFF | ON |
| PLC Stop | PLC 2 | ON | OFF |
| Maintain previous | Maintain previous | ON | ON |
| state | state | ON | ON |

Use of KPC-CE01 digital keypad to implement PLC functions

- ☑ When the PLC screen switches to the PLC1 screen, this will trigger one PLC action, and the PLC program start/stop can be controlled by communications via the WPL.
- ☑ When the PLC screen switches to the PLC2 screen, this will trigger one PLC stop, and the PLC program start/stop can be controlled by communications via the WPL.
- \square The external terminal control method is the same as shown in the table above.

- When input/output terminals (FWD REV MI1 to MI8 MI10 to 15, Relay1, Relay2 RY10 to RY15, MO1 to MO2 MO10 to MO11,) are included in the PLC program, these input/output terminals will only be used by the PLC. As an example, when the PLC program controls Y0 during PLC operation (PLC1 or PLC2), the corresponding output terminal relay(RA/RB/RC) will operate in accordance with the program. At this time, the multifunctional input/output terminal setting will be ineffective. Because these terminal functions are already being used by the PLC, the DI DO AO in use by the PLC can be determined by looking at parameter 02-52, 02-53, and 03-30.
- When the PLC's procedures use special register D1040, the corresponding AO contact AFM1 will be occupied, and AFM2 corresponding to special register D1045 will have the same situation.
- Parameter 03-30 monitors the state of action of the PLC function analog output terminal; Bit0 corresponds to the AFM1 action state, and Bit1 corresponds to the AFM2 action state.

16-3-2 I/O device explanation

Input devices:

| Serial No. | X0 | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X10 | X11 | X12 | X13 | X14 | X15 | X16 | X17 |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| 1 | FWD | REV | MI1 | MI2 | MI3 | MI4 | MI5 | MI6 | MI7 | MI8 | | | | | | |
| 2 | | | | | | | | | | | MI10 | MI11 | MI12 | MI13 | MI14 | MI15 |
| 3 | | | | | | | | | | | MI10 | MI11 | MI12 | MI13 | | |

1: Control I/O |

2: Expansion card EMC-D611A (D1022=4)

3: Expansion card EMC-D42A (D1022=5)

Output devices:

| 0 | Serial No. | Y0 | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | Y10 | Y11 | Y12 | Y13 | Y14 | Y15 | Y16 | Y17 |
|---|---------------|-----|-----|----|-----|-----|------|------|------|------|------|------|-----|-----|-----|-----|-----|
| | 1 | RY1 | RY2 | | MO1 | MO2 | | | | | | | | | | | |
| | 2 | | | | | | MO10 | MO11 | | | | | | | | | |
| | 3 | | | | | | RY10 | RY11 | RY12 | RY13 | RY14 | RY15 | | | | | |

1: Control I/O |

2: Expansion card EMC-D42A (D1022=5)

3: Expansion card EMC-R6AA (D1022=6)

16-3-3 Installation WPLSoft

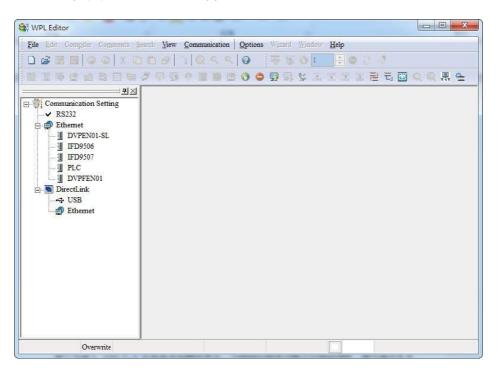
See Delta's website for WPLSoft editing software: <u>http://www.delta.com.tw/industrialautomation/</u>download.

16-3-4 Program writing

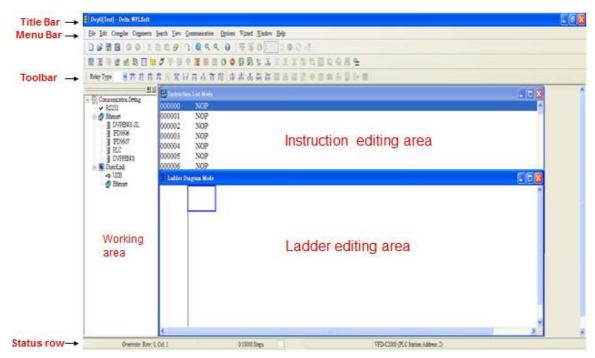
After completing installation, the WPLSoft program will be installed in the designated subfolder "C:\Program Files\Delta Industrial Automation\WPLSoft x.xx." The editing software can now be run by clicking on the WPL icon using the mouse.



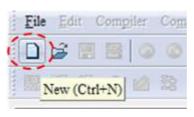
The WPL editing window will appear after 3 seconds (see figure below). When running WPLSoft for the first time, before "New file" has been used, only the "File (F)," "Communications (C)," View (V)," "Options (O)," and "Help (H)" columns will appear on the function toolbar.



After running WPLSoft for the second time, the last file edited will open and be displayed in the editing window. The following figure provides an explanation of the WPLSoft editing software window:



Click on the Click on the toolbar in the upper left part of the screen: opens new file (Ctrl+N)



You can also use "File (F)"=> New file (N) (Ctrl+N)

| Eile Edit (| Compiler Comm |
|--------------|---------------|
| New | Ctrl+N |
| 🚰 Open | Ctrl+O |
| <u>S</u> ave | Ctrl+S |
| Save As | Ctrl+Alt+S |

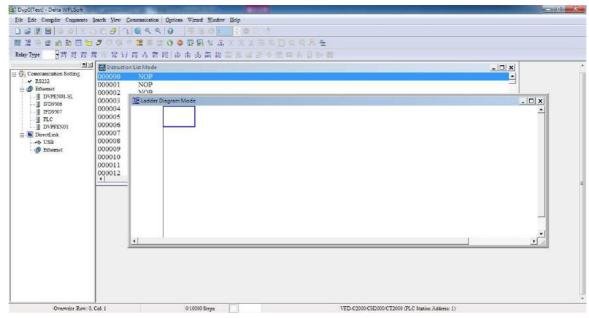
The "Device settings" window will appear after clicking. You can now enter the project title and filename, and select the device and communication settings to be used

| Program Title | |
|---------------|-------------------------------------|
| Test | |
| Select | VFD-C2000/CH2000/C' - |
| Communicatio | SE |
| RS232 (COM | VFD E Type VFD-C2000/CH2000/CT20 |
| File Name | VFD-C200 VFD-CP2000 |
| Dvp0 | TP04P TP70P/TP70G |
| OK | Cancel |

Communications settings: Perform settings in accordance with the desired communications method

| Type | RS232 | • |
|--------------------|------------------|---------------|
| ommunication Sett | ing | |
| COM Port | COM3 | • ASCII |
| Data Length | 7 | C RTU (8 bits |
| Parity | Even 💌 |] |
| Stop Bits | 1 - | Auto-detect |
| Baud Rate | 9600 💌 |] |
| Station Address | 1 | Default |
| Ethemet Setting | | - |
| 🗖 Assign IP | 2/12 - 2/ | 111 |
| Port | 12346 | |
| Baud Rate Decide | d by | |
| PLC Setting | | |
| C WPL Setting | | |
| Setup Responding | g Time | |
| Times of Auto-ret | ry | 3 |
| Time Interval of A | uto-retry (sec.) | 3 + |
| | | |

Press Confirm after completing settings and begin program editing. There are two program editing methods; you can choose whether to perform editing in the command mode or the ladder diagram mode.



In ladder diagram mode, you can perform program editing using the buttons on the function icon row

| Dvp0[Test] - Del | ta WPLSoft |
|--|--|
| Eile Edit Compil | er Comments Search View Communication Options Wizard Window Help |
| | ◎ ◎ X 0 10 🔗 3 Q < < 0 🐺 13 0 💶 🗧 ● 0 🦪 |
| R I 🕫 🔮 🛛 | ● 8 回 9 2 7 1 2 4 4 4 7 0 0 0 0 0 1 1 7 7 7 8 8 6 6 6 8 8 9 1 |
| Relay Type | ···································· |
| Dvp0(Test) - Delta WPLSoft | |
| | earch Yew Communication Options Wigard Window Help |
| | |
| | 2799282000000000000000000000000000000000 |
| Relay Type ++ 377 PT FT F | |
| · 월고 · 합 Communication Setting | 😢 Ladder Diagram Mode |
| E OF Ethernet DVFENULSI UPDF06 UPDF07 UPFC01 DVFFC01 | |
| Ocerventa Rave: 0, | Colt 1 010000 Stops VED-C2000 CH2000 CT2006 (PLC Statise, Address: 1) |

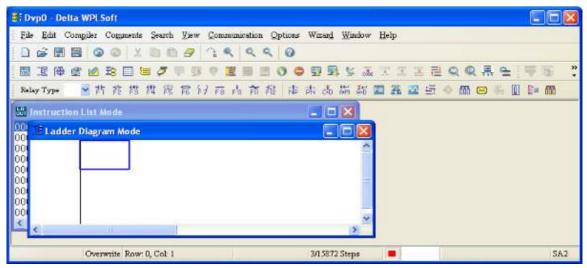
Basic Operation

Example: Input the ladder diagram in the following figure

| Γ | MID | -(YD | |
|---|-----|-------|---|
| | | (10 | 1 |
| | | END | ٦ |
| L | | 640 | |

Mouse operation and keyboard function key (F1 to F12) operation

1. The following screen will appear after a new file has been established:



2. Use the mouse to click on the always-open switch icon the function key F1:

| Dvp0 - Delta | WPLSof | it - [Ladde | r Diagr | am Mo | de] | | | | | | | | | | | |
|--------------------|---------|--------------|-----------------|-------|-------|-----------|---------|-----------|----------------|----------------|------|------|-----|-----|-------|-----|
| Eile Edit C | omgiler | Comments | Search | Dew | Comm | unication | Options | Wizard | <u>W</u> indov | ⊬ <u>H</u> elp | | | | | 10 | 7 : |
| 0 🖌 🗐 🗃 | 9 | DXE | 0.00 4 | 2 9 | | 9,9 | 0 | | | | | | | | | |
| 111 11 11 11 11 11 | 1 1 I | B 🗐 🗐 | 5 1 | 28 9 | 12 | 10 CT | 00 | 99 S) | St ats | X 75 | 11 元 | | . 県 | 9 | 10 | |
| telay Type | - 11 | 救 背 背 | 背雨 | 1 17 | FE PS | के म | No p | i do A | 5 # B | - 26 | - | 0 00 | | H 🔟 | B= 60 | |
| | 40 | ormally Ope | . e . | | | | | | | | | | | | | |
| 1 | Ť | ormany ope | n, contac | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | 1 | | | | 1 | > |
| | Overwri | | Contract in the | | | | | 3/15872 S | 61 C | | | | | | St | |

3. After the name of the input device and the comment dialog box have appeared, the device name (such as "M"), device number (such as "10"), and input comments (such as "auxiliary contact") can be selected; press the Confirm button when finished.

| Constantly | y opened contact | |
|----------------|------------------|-----------|
| Device Name | M • | <u>ок</u> |
| Device Number | 10 | Cancel |
| Internal Relay | | |
| Range | M0M4095 | |
| Comment | Internal Relay | |

| 😫 Dvp0 - Delta WPLSoft - [Ladder Diagram Mode] | |
|--|---------------------------------|
| 📲 File Edit Compiler Comments Search Yiew Communication Options Wizard Window Help | _ @ X |
| | |
| | Q.Q.Q. 🗠 🐺 🗟 🔅 |
| RelayType 📑 許將背間留局好商店前服 市南島縣 話 🖬 🏯 🖾 🗐 🧇 | the second of the second second |
| M0 Input Device Instruction () Output coil Device Name Y OK Device Number 0 Cancel Output Relay Range Y0-Y377 Comment Output Coil | |
| | * |
| C Overwrite Row 0, Col: 2 3/15872 Steps | SA2 |

5. Click on application command icon 🛱 or press function key F6. Click on "All application

commands" in the function classification field, and click on the End command in the application command pull-down menu, or use the keyboard to key in "End" in that field, and press the confirm button.

| Dvp0 - Delta WPLSc | oft - [Ladder Diagram | 1 Mode] | | | - • × |
|---|--------------------------------|---|--|--|-------|
| and the second se | | Dew Communication Options Wizard | Window Help | | _ @ X |
| | | | 1. 法 文 文 本 理 | QQRA | |
| Relay Type MO | F2 Application Inst | And a state of the second s | | | m |
| | Instruction Type API Number | All Application Instructions Application Instruction | END | OK ✓ Cancel | |
| | Explanation | Program end | END FAND< FAND FAND FAND FAND FAND FAND FAND | | |
| € Overw | nite forw 1, cor 1 | JU1-1672 JU | efa | | SA2 |

6. Click on the 📠 icon, which will compile the edited ladder diagram as a command program.

After compiling, the number of steps will appear on the left side of the busbar.

| 🛱 Dvp0 - D | elta WPLSoft - [Ladder Diag | am Mode] | | | 1 | × |
|------------|------------------------------|-----------------------|-----------------------------|-----------|----------|--------|
| 📜 Eile Ed | lit Compiler Comments Search | Liew Communication Op | tions Wizar <u>d W</u> indo | w Help | | _ # X |
| 0 🖌 🖩 | 1 2 0 0 X 1 1 | 334 44 0 |) | | | |
| 國運降 |) 🔮 🙆 😫 🛅 🐸 🍠 🛡 | | 🗢 🗊 🛒 🛸 🚠 | 文言王書の | Q R & T | 1 18 2 |
| Relay Type | ≥ 許 推 楷 霄 電 1 | 17月前内市限 # | 同時品編超し | - 22 25 4 | aa 🖂 🗎 🛙 | a 🕅 |
| 0 | | Delta WPI.Soft | | | | |
| < | Overwrite Row 0 | | 3/15872 Steps | | | SA2 |

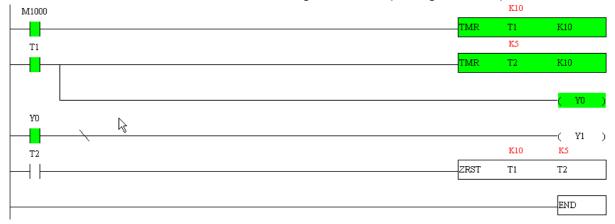
16-3-5 Program download

After inputting a program using WPLSoft, select compile . After completing compilation, select

the sto download a program. WPLSoft will perform program download with the online PLC in the communications format specified in communications settings.

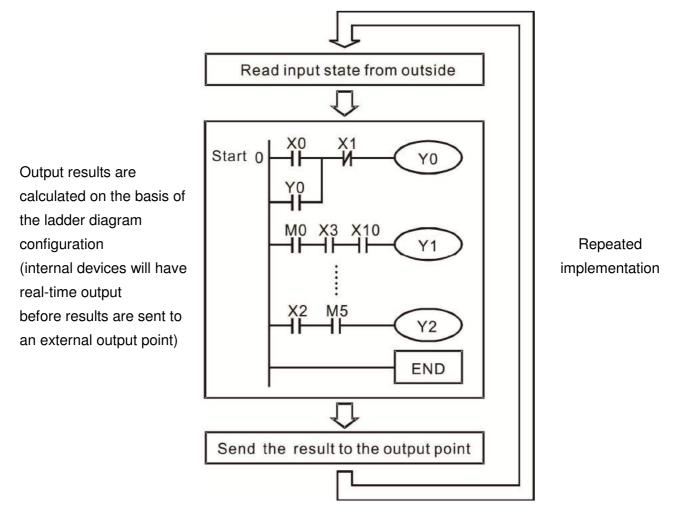
16-3-6 Program monitoring

While confirming that the PLC is in the Run mode, after downloading a program, click on *sin the communications menu and select start ladder diagram control (see figure below)*



16-4 Basic principles of PLC ladder diagrams

16-4-1 Schematic diagram of PLC ladder diagram program scanning



16-4-2 Introduction to ladder diagrams

Ladder diagrams comprise a graphic language widely applied in automatic control, and employs common electrical control circuit symbols. After a ladder diagram editor has been used to create a ladder pattern, PLC program designed is completed. The use of a graphic format to control processes is very intuitive, and is readily accepted by personnel who are familiar with electrical control circuit technology. Many of the basic symbols and actions in a ladder diagram comprise commonly-seen electrical devices in conventional automatic control power distribution panels, such as buttons, switches, relays, timers, and counters.

Internal PLC devices: The types and quantities of internal PLC devices vary in different brands of products. Although these internal devices use the same names as conventional electrical control circuit elements such as relays, coils, and contacts, a PLC does not actually contain these physical devices, and they instead correspond to basic elements in the PLC's internal memory (bits). For instance, if a bit is 1, this may indicate that a coil is electrified, and if that bit is 0, it will indicate that the coil is not electrified. An NO contact (Normal Open, or contact a) can be used to directly read the value of the corresponding bit, and an NC contact (Normal Close, or contact b) can be used to obtain the inverse of the bit's value. Multiple relays occupy multiple bits, and 8 bits comprise one byte; two

bytes comprise one word, and two words comprise a double word. When multiple relays are processing at the same time (such as addition/subtraction or displacement, etc.), a byte, word, or double word can be used. Furthermore, a PLC contains two types of internal devices: a timer and a counter. It not only has a coil, but can count time and numerical values. Because of this, when it is necessary to process some numerical values, these values are usually in the form of bytes, words, or double words.

The various internal devices in a PLC all account for a certain quantity of storage units in the PLC's storage area. When these devices are used, the content of the corresponding storage area is red in the form of bits, bytes, or words.

| Device type | Description of Function |
|----------------|---|
| Input Relay | An input relay constitutes the basic unit of storage in a PLC's internal memory corresponding to an external input point (which serves as a terminal connecting with an external input switch and receiving external input signals). It is driven by external input signals, to which it assigns values of 0 or 1. A program design method cannot change the input relay status, and therefore cannot rewrite the corresponding basic units of an input relay, and WPLSoft cannot be used to perform compulsory On/Off actions. A relay's contacts (contacts a and b) can be used an unlimited number of times. An input relay with no input signal must be left idle and cannot be used for some other purpose. ✓ Device indicated as: X0, X1, X7, X10, X11, etc. This device is expressed with the symbol "X," and a device's order is indicated with an octal number. Input point numbers are indicated in the main computer and in expansion |
| | devices. An output relay constitutes the basic unit of storage in a PLC's internal memory |
| Output Relay | An output relay constitutes the basic unit of storage in a PLC's internal memory corresponding to an external output point (which connects with an external load). It may be driven by an input relay contact, a contact on another internal device, or its own contacts. It uses one NO contact to connect with external loads or other contacts, and, like input contacts, can use the contact an unlimited number of times. An output relay with no input signal will be idle, but may be used an internal relay if needed. Device indicated as: Y0, Y1, Y7, Y10, Y11, etc. This device is expressed with the symbol "Y," and a device's order is indicated with an octal number. Output point numbers are indicated in the main computer and in expansion |
| | devices. |
| Internal Relay | Internal relays have no direct connection with the outside. These relays are auxiliary relays inside a PLC. Their function is the same as that of an auxiliary (central) relay in an electrical control circuit: Each auxiliary relay corresponding to a basic unit of internal storage; they can be driven by input relay contacts, output relay contacts, and the contacts of other internal devices. An internal auxiliary relay's contact can also be used an unlimited number of times. Internal relays have no outputs to outside, and must output via an output point. |
| | Device indicated as: M0, M1 to M799, etc. This device is expressed as the symbol "M," expressed, and its order is expressed as a decimal number. |
| Counter | A counter is used to perform counting operations. A count setting value (such as the number of pulses to be counted) must be assigned when a counter is used. A counter contains a coil, contact, and a counting storage device. When the coil goes from Off →to On, this indicates that the counter has an input pulse, and one is added to its count. There are 16 bits that can be employed by the user. ✓ Device indicated as: C0, C1 to C79, etc. This device is expressed as the symbol "C," expressed, and its order is expressed as a decimal number. |

Introduction to the basic internal devices in a PLC

| Device type | Description of Function |
|---------------|---|
| Timer | A timer is used to complete control of timing. The timer contains a coil, contact, and a time value register. When the coil is electrified, if the preset time is reached, the contact will be actuated (contact a will close, contact b will open), and the timer's fixed value be given by the set value. Timer has a regulated clock cycle (timing units: 100 ms). As soon as power to the coil is cut off, the contact will no longer be actuated (contact a will open, contact b will close), and the original timing value will return to zero. |
| | Device indicated as: T0, T1 to T159, etc. The device is expressed as the symbol "T," and its order is expressed as a decimal number. |
| Data register | When a PLC is used to perform various types of sequence control and set time value and count value control, it most commonly perform data processing and numerical operations, and data registers are used exclusively for storage of data and various parameters. Each data register contains 16 bits of binary data, which means that it can store one word. Two data registers with adjacent numbers can be used to process double words. |
| | Device indicated as: D0, D1 to D399, etc. The device is expressed as the symbol "D," and its order is expressed as a decimal number. |

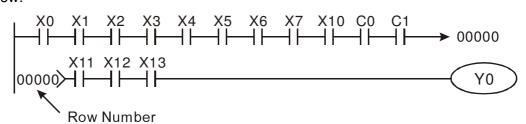
Ladder diagram images and their explanation

| Ladder diagram structures | Explanation of commands | Command | Using Device |
|------------------------------|----------------------------------|---------|---|
| | NO switch, contact a | LD | $X \mathrel{\scriptstyle{\vee}} Y \mathrel{\scriptstyle{\vee}} M \mathrel{\scriptstyle{\vee}} T \mathrel{\scriptstyle{\vee}} C$ |
| | NC switch, contact b | LDI | $X \mathrel{\scriptstyle{\vee}} Y \mathrel{\scriptstyle{\vee}} M \mathrel{\scriptstyle{\vee}} T \mathrel{\scriptstyle{\vee}} C$ |
| | Series NO | AND | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Series NC | ANI | $X \mathrel{\scriptstyle{\vee}} Y \mathrel{\scriptstyle{\vee}} M \mathrel{\scriptstyle{\vee}} T \mathrel{\scriptstyle{\vee}} C$ |
| | Parallel NO | OR | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Parallel NC | ORI | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Positive edge-triggered switch | LDP | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Negative edge-triggered switch | LDF | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Positive edge-triggered series | ANDP | Χ、Υ、Μ、Τ、Ϲ |
| | Negative edge-triggered series | ANDF | Χ、Υ、Μ、Τ、Ϲ |
| | Positive edge-triggered parallel | ORP | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Negative edge-triggered parallel | ORF | $X \mathrel{\scriptstyle{\scriptstyle\vee}} Y \mathrel{\scriptstyle{\scriptstyle\vee}} M \mathrel{\scriptstyle{\scriptstyle\vee}} T \mathrel{\scriptstyle{\scriptstyle\vee}} C$ |
| | Block series | ANB | N/A |

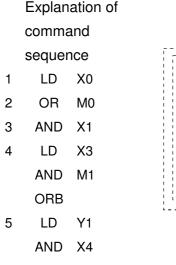
| Ladder diagram structures | Explanation of commands | Command | Using Device |
|------------------------------|--|--|--------------|
| | Block parallel | ORB | N/A |
| | Multiple outputs | MPS MRD MPP | N/A |
| O | Coil driven output commands | OUT | Υ、M |
| | Some basic commands, applications commands | Some basic commands Applications commands | |
| | Inverted logic | INV | N/A |

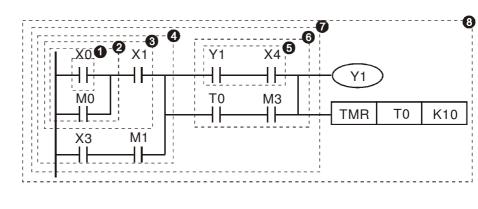
16-4-3 Overview of PLC ladder diagram editing

The program editing method begins from the left busbar and proceeds to the right busbar (the right busbar is omitted when editing using WPLSoft). Continue to the next row after completing each row; there is a maximum of 11 contacts on each row. If this is not sufficient, a continuous line will be will be generated to indicate the continued connection and more devices can be added. A continuous series of numbers will be generated automatically and identical input points can be used repeatedly. See figure below:



The ladder diagram programming method involves scanning from the upper left corner to the lower right corner. The coils and applications command computing box are handled in the output, and the ladder diagram is placed on the farthest right. Taking the figure below as an example, we can gradually analyze the procedural sequence of the ladder diagram. The number in the upper right corner gives the sequential order.



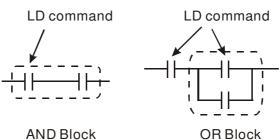


Chapter 16 PLC Function Applications

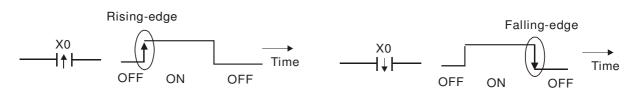
- 6 LD T0 AND M3 ORB 7 ANB
- 8 OUT Y1
 - TMR T0 K10

Explanation of basic structure of ladder diagrams

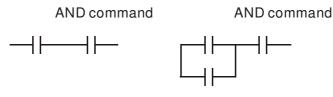
LD (LDI) command: An LD or LDI command is given at the start of a block.



LDP and LDF have this command structure, but there are differences in their action state. LDP, LDF only act at the rising or falling edge of a conducting contact. (see figure below):

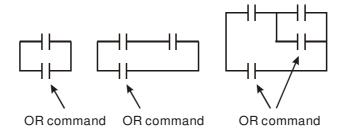


AND (ANI) command: A series configuration in which a single device is connected with one device or a block.



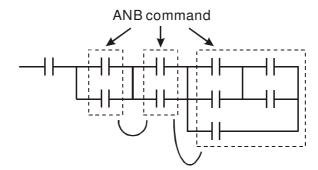
ANDP, ANDF also have structures like this, but their action occurs at the rising and falling edge.

OR (ORI) command: A single device is connected with one device or a block.

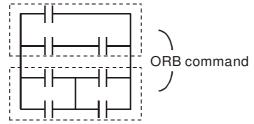


ORP, ORF also have identical structures, but their action occurs at the rising and falling edge.

ANB command: A configuration in which one block is in series with one device or block.



ORB command: A configuration in which one block is in parallel with one device or block.



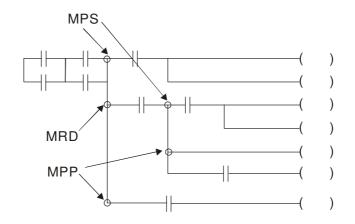
In the case of ANB and ORB operations, if a number of blocks are connected, they should be combined to form a block or network from the top down or from left to right.

MPS, MRD, MPP commands: Branching point memory for multiple outputs, enabling multiple, different outputs. The MPS command begins at a branching point, where the so-called branching point refers to the intersection of horizontal and vertical lines. We have to rely on the contact status along a single vertical line to determine whether the next contact can give a memory command. While each contact is basically able to give memory commands, in view of convenience and the PLC's capacity restrictions, this can be omitted from some places when converting a ladder diagram. The structure of the ladder diagram can be used to judge what kinds of contact memory commands are used.

MPS can be distinguished by use of the " $_{T}$ " symbol; this command can be used consecutively for up to 8 times. The MRD command is read from branching point memory; because logic states along any one vertical line must be the same, in order to continue analysis of other ladder diagrams, the original contact status must be read.

MRD can be distinguished by use of the " -" symbol. The MPP command is read from the starting state of the uppermost branching point, and it is read from the stack (pop); because it is the final command along a vertical line, it indicates that the state of the vertical line can be concluded.

MPP can be distinguished by use of the "L" symbol. Although there should basically be no errors when using the foregoing analytical approach, the compiling program may sometimes omit identical state output, as shown in the following figure:



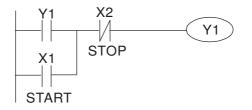
16-4-4 Commonly-used basic program design examples

Start, stop, and protection

Some applications may require a brief close or brief break using the buttons to start and stop equipment. A protective circuit must therefore be designed to maintain continued operation in these situations; this protective circuit may employ one of the following methods:

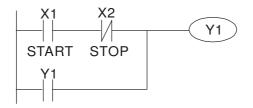
Example 1: Priority stop protective circuit

When the start NO contact X1=On, and the stop NC contact X2=Off, Y1=On; if X2=On at this time, coil Y1 will no longer be electrified, and this is therefore referred to as priority stop.



Example 2: Priority start protective circuit

When start NO contact X1=On, and the stop NC contact X2=Off, Y1=On, and coil Y1 will be electrified and protected. At this time, if X2=On, coil Y1 will still protect the contact and continue to be electrified, and this is therefore priority start.

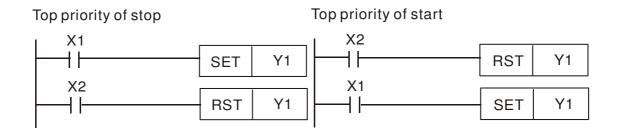


Example 3: Setting (SET) and reset (RST) command protective circuit

The following figure shows a protective circuit composed of RST and SET commands.

Priority stop occurs when the RST command is placed after the SET command. Because the PLC executes programs from the top down, at the end of the program, the state of Y1 will indicate whether coil Y1 is electrified. When X1 and X2 are both actuated, Y1 will lose power, and this is therefore priority stop.

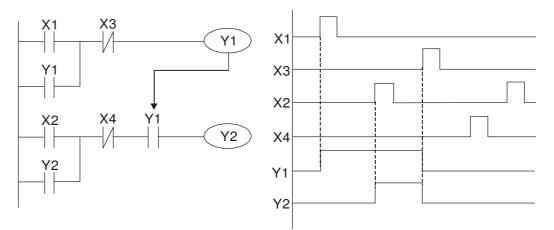
Priority start occurs when the SET command is placed after the RST command. When X1 and X2 are both actuated, Y1 will be electrified, and this is therefore priority start.



Commonly-used control circuits

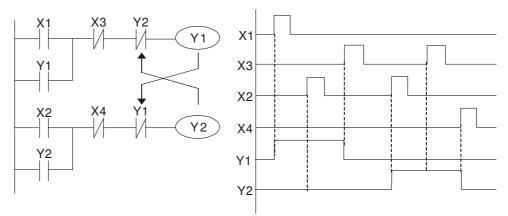
Example 4: Conditional control

X1, X3 are respectively start/stop Y1, and X2, X4 are respectively start/stop Y2; all have protective circuits. Because Y1's NO contact is in series with Y2's circuit, it becomes an AND condition for the actuation of Y2. The action of Y1 is therefore a condition for the action of Y2, and Y1 must be actuated before Y2 can be actuated.



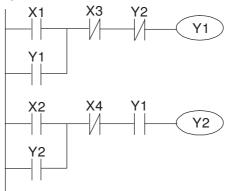
Example 5: Interlocking control

The figure below shows an interlocking control circuit. Depending on which of the start contacts X1, X2 is valid first, the corresponding output Y1 or Y2 will be actuated, and when one is actuated, the other will not be actuated. This implies that Y1 and Y2 cannot be actuated at the same time (interlocking effect). Even if both X1 and X2 are valid at the same time, because the ladder diagram program is scanned from the top down, it is impossible for Y1 and Y2 to be actuated at same time. This ladder diagram assigns priority only to Y1.



Example 6: Sequence control

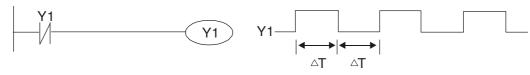
If the NC contact of Y2 in the interlocking control configuration of example 5 is put in series with the Y1 circuit, so that it is an AND condition for actuation of Y1 (see figure below), not only is Y1 a condition for the actuation of Y2 in this circuit, the actuation of Y2 will also stop the actuation of Y1. This configuration confirms the actuation order of Y1 and Y2.



Example 7: Oscillating circuit

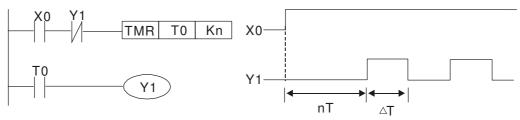
Oscillating circuit with a period of $\Delta T + \Delta T$

The figure below shows a very simple ladder diagram. When starting to scan the Y1 NC contact, because the Y1 coil has lost power, the Y1 NC contact will be closed. When the Y1 coil is then scanned, it will be electrified, and the output will be 1. When the Y1 NC contact is scanned in the scanning cycle, because Y1 coil is electrified, the Y1 NC contact will be open, the Y1 coil will then lose power, and the output will be 0. Following repeated scanning, the output of Y1 coil will have an oscillating waveform with a period of $\Delta T(On) + \Delta T(Off)$.



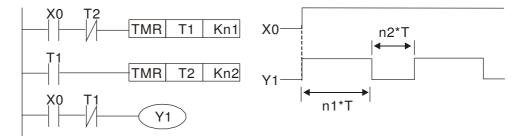
Oscillating circuit with a period of $nT+\Delta T$

The program of the ladder diagram shown below uses timer T0 to control coil Y1's electrified time. After Y1 is electrified, it causes timer T0 to close during the next scanning cycle, which will cause the output from Y1 to have the oscillating waveform shown in the figure below. Here n is the timer's decimal setting value, and T is the clock cycle of the timer.



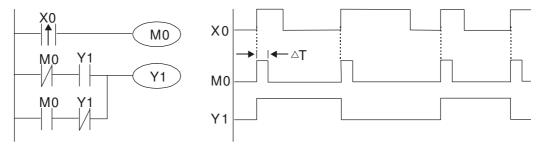
Example 8: Flashing circuit

The following figure shows an oscillating circuit of a type commonly used to cause an indicator light to flash or a buzzers to buzz. It uses two timers to control the On and Off time of Y1 coil. Here n1, n2 are the timing set values of T1 and T2, and T is the clock cycle of the timer.



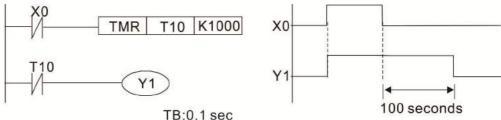
Example 9: Triggering circuit

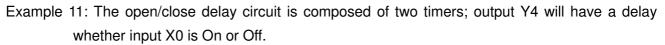
In the figure below, a command consisting of the differential of the rising edge of X0 causes coil M0 to generate a single pulse for ΔT (length of one scanning cycle), and coil Y1 is electrified during this scanning cycle. Coil M0 loses power during the next scanning cycle, and NC contact M0 and NC contact Y1 are both closed. This causes coil Y1 to stay in an electrified state until there is another rising edge in input X0, which again causes the electrification of coil M0 and the start of another scanning cycle, while also causing coil Y1 to lose power, etc. The sequence of these actions can be seen in the figure below. This type of circuit is commonly used to enable one input to perform two actions in alternation. It can be seen from the time sequence in the figure below that when input X0 is a square wave signal with a period of T, the output of coil Y1 will be a square wave signal with a period of 2T.



Example 10: Delay circuit

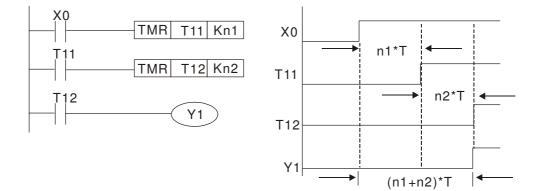
When input X0 is On, because the corresponding NC contact will be Off, the timer T10 will be in no power status, and output coil Y1 will be electrified. T10 will receive power and begin timing only after input X0 is Off, and output coil Y1 will be delayed for 100 sec. (K1000*0.1 sec. =100 sec.) before losing power; please refer to the sequence of actions in the figure below.





Example 12: Extended timing circuit

In the circuit in the figure on the left, the total delay time from the moment input X0 closes to the time output Y1 is electrified is $(n1+n2)^{*}T$, where T is the clock cycle. Timers: T11, T12; clock cycle: T.



16-5 Various PLC device functions

| Item | Specifications | Notes |
|---------------------------------|--|--|
| Algorithmic control method | Program stored internally, alternating back-and-forth scanning method | |
| Input/output control method | When it starts again after ending (after execution to the END command), the input/output has an immediate refresh command | |
| Algorithmic processing speed | Basic commands (several us); | Applications command (1-several tens of us) |
| Programming language | Command + ladder diagram | |
| Program capacity | 10000 steps | |
| Input/output terminal | Input (X): 10, output (Y): 4 | This number of contacts constitutes CH2000 input/output contacts; other devices have different correspondences |

| Туре | Device | Iter | n | | Range | | Function | |
|--------------------|-------------------------|---------------|-------------------------------------|---|--|------------------------|---|----------------------|
| | Х | External inpu | ıt relay | number | | Total | Corresponds to external input point | |
| | Y | | xternal output relay | | 16 points, octa | points | Corresponds to external output point | |
| | М | Auxiliary l | General Jse | M0~M799 | , 800 points | Total 880 | Contact can switch On/Off within the | |
| Rel | | | Special ourpose | M1000~M | 1079, 80 points | | program | |
| Relay bit form | т | l limor l | 100ms imer | T0~T159, | 160 points | Total 160 points | Timers referred to by the TMR command; contact of the T with the same number will go On when the time is reached | |
| | С | Counter o | 16-bit counter, general use | C0~C79, 8 | 30 points | Total 80 points | Counter referred to by the CNT command; contact of the C with the same number will go On when the count is reached | |
| | Т | Current time | r value | T0~T159, 160 points | | | The contact will be On when the time is reached | |
| Regist | C Current counter value | | C0~C79, 16-bit counter 80 points | | The counter contact will come On when the count is reached | | | |
| Register word data | D | | Data | Used maintain power Off | | 99, 400 points | Total | Used as data storage |
| lata | | D Register | Special purpose | D1000~ points D2000~ points | · |) 1400 points) | memory area | |
| | К | Decimal | Single-byt | <u>v</u> | Range: K-32,76 | | | |
| Constant | r\ | Decimal | | | | | 8~K2,147,483,647 | |
| Considii | Н | Hexadecima | | Single-byte Setting Range:H0000 ~ HFFFF | | | | |
| | • • | | Double-by | oyte Setting Range: H00000000 ~ HFFFFFFFF | | | | |

| Serial communications port (program write/read) | | RS-485/keypad port |
|---|-------------------------|---|
| Input/output | | Built-in three analog inputs and two analog outputs |
| Function expansion module | Optional Accessories | EMC-D42A; EMC-R6AA; EMCD611A |
| Communication Expansion Module | Optional Accessories | EMC-COP01,(CANopen) |

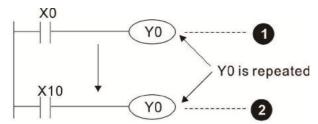
16-5-1 Introduction to device functions

Input/output contact functions

Input contact X functions: Input contact X is connected with an input device, and reads input signals entering the PLC. The number of times that contact a or b of input contact X is used in the program is not subject to restrictions. The On/Off state of input contact X will change as the input device switches On and Off; a peripheral device (WPLSoft) cannot be used to force contact X On or Off.

Output contact Y functions

The job of output contact Y is to send an On/Off signal to drive the load connected with output contact Y. Output contacts consist of two types: relays and transistors. While number of times that contact a or b of each output contact Y is used in the program is not subject to restrictions, it is recommended that the number of output coil Y be used only once in a program, otherwise the right to determine the output state when the PLC performs program scanning will be assigned to the program's final output Y circuit.



The output of Y0 will be decided by circuit **2**, i.e. decided by On/Off of X10.

Numerical value, constant [K]/[H]

| Constant | Single-byte | ĸ | Llecimal | K-32,768 ~ K32,767 |
|----------|-------------|-----|-------------|--------------------------------|
| | Double-byte | IX. | | K-2,147,483,648~K2,147,483,647 |
| | Single-byte | Ц | Hovadooimal | H0000 ~ HFFFF |
| | Double-byte | П | Hexadecimal | H0000000 ~ HFFFFFF |

The PLC can use five types of numerical values to implement calculations based on its control tasks; the following is an explanation of the missions and functions of different numerical values.

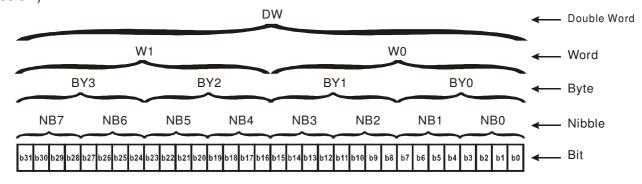
Binary Number, BIN

The PLC's numerical operations and memory employ binary numbers. Binary nibbles and relevant terms are explained as follows:

| Bit | Bits are the fundamental units of binary values, and have a state of either 1 or 0 |
|--------|--|
| Nibble | Comprised of a series of 4 bits (such as b3-b0); can be used to express a |
| | one-nibble decimal number 0-9 or hexadecimal number: 0-F. |
| Puto | Comprised of a series of two nibbles (i.e. 8 bits, b7-b0); can express a |
| Byte | hexadecimal number: 00-FF. |
| Word | Comprised of a series of two bytes (i.e. 16 bits, b15-b0); can express a |
| voia | hexadecimal number with four nibbles: 0000-FFFF. |

| Double Word | Comprised of a series of two words (i.e. 32 bits, b31-b0); can express a |
|-------------|--|
| | hexadecimal number with eight nibbles: 00000000-FFFFFFFF |

Relationship between bits, digits, nibbles, words, and double words in a binary system (see figure below):



Octal Number, OCT

The external input and output terminals of a DVP-PLC are numbered using octal numbers Example: External input: X0~X7 , X10~X17...(Device number table); External output: Y0~Y7 , Y10~Y17...(Device number table)

Decimal Number, DEC

Decimal numbers are used for the following purposes in a PLC system:

The setting values of timer T or counter C, such as TMR C0 K50. (K constant)

The numbers of devices including M, T, C, or D, such as M10 or T30. (device number)

Used as a operand in an application command, such as MOV K123 D0. (K constant)

Binary Code Decimal, BCD

Uses one nibble or 4 bits to express the data in a decimal number; a series of 16 bits can therefore express a decimal number with 4 nibbles. Chiefly used to read the input value of a fingerwheel numerical switch input or output a numerical value to a seven-segment display driver.

Hexadecimal Number, HEX

Applications of hexadecimal numbers in a PLC system: Used as operands in application commands, such as MOV H1A2B D0. (H constant)

Constant K

Decimal numbers are usually prefixed with a "K" in a PLC system, such as K100. This indicates that it is a decimal number with a numerical value of 100.

Exceptions: K can be combined with bit device X, Y, M, or S to produce data in the form of a nibble, byte, word, or double word, such as in the case of K2Y10 or K4M100. Here K1 represents a 4-bit combination, and K2-K4 variously represent 8-, 12-, and 16-bit combinations.

Constant H

Hexadecimal numbers are usually prefixed with the letter "H" in a PLC system, such as in the case of H100, which indicates a hexadecimal number with a numerical value of 100.

Functions of auxiliary relays

Like an output relay Y, an auxiliary relay M has an output coil and contacts a and b, and the number

of times they can be used in a program is unrestricted. Users can use an auxiliary relay M to configure the control circuit, but cannot use it to directly drive an external load. Auxiliary relays have the following two types of characteristics:

Ordinary auxiliary relays: Ordinary auxiliary relays will all revert to the Off state if a power outage occurs while the PLC is running, and will remain in the Off state if power is again turned down.

Special purpose auxiliary relays: Each special purpose auxiliary relay has its own specific use. Do not use any undefined special purpose auxiliary relays.

Timer functions

Timers take 100 ms as their timing units. When the timing method is an upper time limit, when the current timer value = set value, power will be sent to the output coil. Timer setting values consist of decimal K values, and the data register D can also serve as a setting value.

Actual timer setting time = timing units * set value

Counter features

| Item | 16-bit counter |
|-------------------|---|
| Туре | General Type |
| CT Direction: | Score: |
| Setting | 0~32,767 |
| Designation of | Constant K or data register D |
| set value | |
| Change in current | When the count reaches the set value, there is no |
| value | longer a count |
| Output contact | When the count reaches the set value, the contact |
| | comes On and stays On |
| Reset | The current value reverts to 0 when an RST |
| | command is executed, and the contact reverts to Off |
| Contact actuation | All are actuated after the end of scanning |

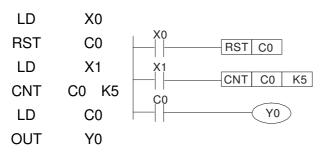
Counter functions

When a counter's counting pulse input signal goes $Off \rightarrow On$, if the counter's current value is equal to the set value, the output coil will come On. The setting value will be a decimal K values, and the data register D can also serve as a setting value.

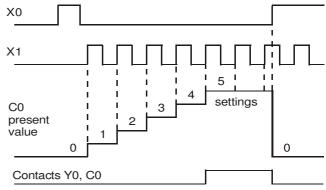
16-bit counter C0-C79:

- ☑ 16-bit counter setting range: K0-K32,767. (when K0 and K1 are identical, the output contact will immediately be On during the first count.)
- ☑ The current counter value will be cleared from an ordinary counter when power is shut off to the PLC.
- ☑ If the MOV command or WPLSoft is used to transmit a value greater than the set value to the C0 current value register, when the next X1 goes from Off→On, the C0 counter contact will change to On, and the current value will change to the set value.
- ☑ A counter's setting value may be directly set using a constant K or indirectly set using the value in register D (not including special data registers D1000- D1199 或 D2000 ~ D2799).
- ☑ If the set value employs a constant K, it may only be a positive number; the set value may be either a positive or negative number if the value in data register D is used. The current counter value will change from 32,767 to -32,768 as the count continues to accumulate.

Example



- When X0=On and the RST command is executed, the current value of C0 will revert to 0, and the output contact will revert to Off.
- When X1 changes from Off→On, the current value of the counter will execute an increase (add one).
- When the count of counter C0 reaches the set value K5, the contact C0 will come On, and the current value of C0= set value =K5. Afterwards, signal C0 triggered by X1 cannot be received, and the current value of C0 will remain K5.



16-5-2 Introduction to special relay functions (special M)

| Special M | Description of Function | R/W * |
|---------------------|--|-------|
| M1000 | Operates monitor NO contact (contact a). NO while RUN, contact a. This contact is On while in the RUN state. | RO |
| M1001 | Operates monitor NC contact (contact b). NC while RUN, contact b. This contact is Off while in the RUN state. | RO |
| M1002 | Initiates a forward (the instant RUN is On) pulse. Initial pulse, contact a. Produces a forward pulse the moment RUN begins; its width = scan cycle | RO |
| M1003 | Initiates a reverse (the instant RUN is Off) pulse. Initial pulse, contact a. Produces a reverse pulse the moment RUN ends; the pulse width = scan cycle | RO |
| M1004 | Reserved | RO |
| M1005 | Driver malfunction instructions | RO |
| M1006 | Converter has no output | RO |
| M1007 | Driver direction FWD(0)/REV(1) | RO |
| M1008 ~ M1010 | | |
| M1011 | 10 ms clock pulse , 5ms On/5ms Off | RO |
| M1012 | 100 ms clock pulse 50ms On / 50ms Off | RO |
| M1013 | 1 sec. clock pulse , 0.5s On / 0.5s Off | RO |
| M1014 | 1 min. clock pulse , 30s On / 30s Off | RO |
| M1015 | Frequency attained (when used together with M1025) | RO |

R/W items: RO: read only function; RW: read and write function

| Special M | Description of Function | R/W * |
|--|---|--|
| | Parameter read/write error | RO |
| M1017 | Parameter write successful | RO |
| M1018 | | |
| M1019 | | |
| M1020 | Zero flag | RO |
| M1020 | Borrow flag | RO |
| M1022 | Carry flag | RO |
| M1022 | Divisor is 0 | RO |
| M1023 | | |
| M1024 | Driver frequency = set frequency (ON) Driver frequency =0(OFF) | RW |
| M1026 | Driver operating direction FWD(OFF)/REV(ON) | RW |
| M1020 | Driver Reset | RW |
| M1027 | | |
| | | |
| M1029 | | |
| M1030 | | |
| M1031 | Compulsory setting of the current PID integral value equal to D1019 (0 change, 1 valid) | RW |
| M1032 | Compulsory definition of FREQ command after PID control | RW |
| M1033 | | |
| M1034 | Initiates CANopen real-time control | RW |
| M1035 | Initiates internal communications control | RW |
| M1036 | Ignore calendar error | RW |
| M1037 | | |
| M1038 | MI8 count begins | RW |
| M1039 | Reset MI8 count value | RW |
| M1040 | Hardware power (Servo On) | RW |
| M1041 | | |
| M1041 | Quick stop | RW |
| M1042 | | |
| M1043 | Pause | RW |
| M1044 | | |
| M1045 | | |
| M1047 | Move to new position | RW |
| M1048 | | 1100 |
| | | |
| M1050 | Absolute position/relative position (0: relative/1: absolute) | RW |
| M1051 M1052 | Lock frequency (lock, frequency locked at the current operating frequency) | RW |
| M1052 | | 1100 |
| M1053 | Compulsory reset of absolute position | RW |
| | | |
| M1055 | Search Origin | RW |
| | | RO |
| M1056 | Hardware already has power (Servo On Ready) | |
| M1056 M1057 | | |
| M1056 M1057 M1058 | On Quick Stopping | RO |
| M1056 M1057 M1058 M1059 | On Quick Stopping CANopen Master setting complete | RO RO |
| M1056 M1057 M1058 M1059 M1060 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station | RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 | On Quick Stopping CANopen Master setting complete | RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure | RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 M1063 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure Torque attained | RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 M1063 M1064 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure Torque attained Target reached | RO RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 M1063 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure Torque attained | RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 M1063 M1064 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure Torque attained Target reached | RO RO RO RO RO |
| M1056 M1057 M1058 M1059 M1060 M1061 M1062 M1063 M1064 M1065 | On Quick Stopping CANopen Master setting complete CANopen Currently initializing slave station CANopen Slave station initialization failure Torque attained Target reached Read/write CANOpen data time out | RO RO RO RO RO RO |

| Special M | Description of Function | R/W * |
|--------------|---|-------|
| M1069 | | |
| M1070 | Return home complete | RO |
| M1071 | Homing error | RO |
| M1072 | | |
| ~ | | |
| M1075 | | |
| M1076 | Calendar time error or refresh time out | RO |
| M1077 | 485 Read/write complete | RO |
| M1078 | 485 Read-write error | RO |
| M1079 | 485 Communications time out | RO |

16-5-3 Introduction to special register functions (special D)

| Special D | Description of Function | R/W * |
|----------------|---|----------|
| D1000 | | |
| D1001 | Device system program version | RO |
| D1002 | Program capacity | RO |
| D1003 | Total program memory content | RO |
| D1004 | | |
| ~ | | |
| D1009 | | |
| | Current scan time (units: 0.1 ms) | RO |
| D1011 | Minimum scan time (units: 0.1 ms) | RO |
| | Maximum scan time (units: 0.1 ms) | RO |
| D1013 | | |
| | | |
| D1017 | | |
| | Current integral value | RO |
| D1019 D1020 | Compulsory setting of PID I integral | RW RO |
| D1020 | Output frequency (0.000~600.00Hz) Output current (####.#A) | RO |
| D1021 | AI AO DI DO Expansion card number | ΠŪ |
| | 0 : No expansion card | |
| D1000 | 4 : AC input card (6 in) (EMC-D611A) | |
| D1022 | | RO |
| | 5 : I/O Card (4 in 2 out) (EMC-D42A) | |
| | 6 : Relay card(6 out) (EMC-R6AA) | |
| | Communication expansion card number | |
| | 0 · No expansion card | |
| | 1 : DeviceNet Slave | |
| D1023 | 2 : Profibus-DP Slave | RO |
| | 3 : CANopen Slave | |
| | 4 : Modbus-TCP Slave | |
| | 5 : EtherNet/IP Slave | |
| D1024 | | |
| ~ | | |
| D1026 | | |
| D1027 | PID calculation frequency command (frequency command after PID calculation) | RO |
| D1028 | AVI value (0.00~100.00%) | RO |
| D1029 | ACI value (0.0~100.00%) | RO |
| D1030 | AUI value (-100.0~100.00%) | RO |
| D1031 | | |

| Special D | Description of Function | R/W * |
|--------------|---|-------|
| ~ | | |
| D1035 | | |
| D1036 | Servo error bit | RO |
| D1037 | Driver output frequency | RO |
| D1038 | DC BUS voltage | RO |
| D1039 | Output voltage | RO |
| D1040 | Analog output value AFM1(-100.00~100.00%) | RW |
| D1041 | (| |
| ~ | | |
| D1042 | | |
| D1043 | Can be user-defined (will be displayed on panel when parameter 00-04 is set as 28; display method is C xxx) | RW |
| D1044 | | - |
| D1045 | Analog output value AFM2(-100.00~100.00%) | RW |
| D1046 | (| |
| ~ | | |
| D1049 | | |
| | Actual Operation Mode | |
| | 0 : Speed | |
| D1050 | 1 : Position | RO |
| | 2 : Torque | |
| | 3 : Homing Origin | |
| D1051 | Actual position (Low word) | RO |
| | Actual position (High word) | RO |
| D1053 | Actual torque | RO |
| D1054 | MI8 current calculated count value (L Word) | RO |
| D1055 | MI8 current calculated count value (H Word) | RO |
| D1056 | Rotational speed corresponding to MI8 | RO |
| | MI8's rotational speed ratio | RW |
| D1058 | MI8 refresh rate (ms) corresponding to rotational speed | RW |
| D1059 | Number of nibbles of rotational speed corresponding to MI8 (0-3) | RW |
| | Operation Mode setting | |
| | 0 · Speed | |
| D1060 | 1 Position | RW |
| | 2 : Torque | |
| | 3 : Homing Origin | |
| D1061 | 485 COM1 communications time out time (ms) | RW |
| D1062 | Torque command (torque limit in speed mode) | RW |
| | Year (Western calendar) (display range 2000-2099) (must use | RO |
| D1063 | KPC-CC01) | |
| D1064 | Week (display range 1-7) (must use KPC-CC01) | RO |
| D1065 | Month (display range 1-12) (must use KPC-CC01) | RO |
| D1066 | Day (display range 1-31) (must use KPC-CC01) | RO |
| D1067 | Hour (display range 0-23) (must use KPC-CC01) | RO |
| D1068 | Minute (display range 0-59) (must use KPC-CC01) | RO |
| D1069 | Second (display range 0-59) (must use KPC-CC01) | RO |
| D1100 | Target frequency | RO |
| D1101 | Target frequency (must be operating) | RO |
| D1102 | Reference frequency | RO |
| D1103 | Target L | RO |
| D1104 | Target H | RO |
| D1105 | Target torque | RO |
| D1106 | | |
| D1107 | π(Pi) Low word | RO |
| D1108 | π(Pi) High word | RO |

| Special D | Description of Function | R/W * |
|--------------|---|-------|
| D1109 | Random number | RO |
| D1110 | Internal node communications number (set number of slave stations to be controlled) | RW |
| D1111 | Encoder Pulses L | RO |
| D1112 | Encoder Pulses H | RO |
| D1113 | | RO |
| D1114 | | |
| D1115 | Internal node synchronizing cycle (ms) | RO |
| D1116 | Internal node error (bit0 = Node 0, bit1 = Node 1,bit7 = Node 7) | RO |
| D1117 | Internal node online correspondence (bit0 = Node 0, bit1 = Node 1,bit7 = Node 7) | RO |
| D1118 | | |
| D1119 | | |
| D1120 | Internal node 0 control command | RW |
| D1121 | Internal node 0 mode | RW |
| D1122 | Internal node 0 reference command L | RW |
| D1123 | Internal node 0 reference command H | RW |
| D1124 | | |
| D1125 | | |
| D1126 | Internal node 0 status | RO |
| D1127 | Internal node 0 reference status L | RO |
| D1128 | Internal node 0 reference status H | RO |
| D1129 | | |
| D1130 | Internal node 1 control command | RW |
| D1131 | Internal node 1 mode | RW |
| D1132 | Internal node 1 reference command L | RW |
| D1133 | Internal node 1 reference command H | RW |
| D1134 | | |
| D1135 | | |
| D1136 | Internal node 1 status | RO |
| | Internal node 1 reference status L | RO |
| D1138 | Internal node 1 reference status H | RO |
| D1139 | | |
| D1140 | Internal node 2 control command | RW |
| D1141 | Internal node 2 mode | RW |
| D1142 | Internal node 2 reference command L | RW |
| D1143 | Internal node 2 reference command H | RW |
| D1144 | | |
| D1145 | | |
| D1146 | Internal node 2 status | RO |
| D1147 | Internal node 2 reference status L | RO |
| D1148 | Internal node 2 reference status H | RO |
| D1149 | | |
| D1150 | Internal node 3 control command | RW |
| D1151 | Internal node 3 mode | RW |
| D1152 | Internal node 3 reference command L | RW |
| D1153 | Internal node 3 reference command H | RW |
| D1154 | | |
| D1155 | | |
| D1156 | Internal node 3 status | RO |
| D1157 | Internal node 3 reference status L | RO |
| D1158 | Internal node 3 reference status H | RO |
| D1159 | utawa al wards. A sa white Las wards of t | |
| D1160 | Internal node 4 control command | RW |

| Special D | Description of Function | R/W * |
|--------------|-------------------------------------|-------|
| D1161 | Internal node 4 mode | RW |
| D1162 | Internal node 4 reference command L | RW |
| D1163 | Internal node 4 reference command H | RW |
| D1164 | | |
| D1165 | | |
| D1166 | Internal node 4 status | RO |
| D1167 | Internal node 4 reference status L | RO |
| D1168 | Internal node 4 reference status H | RO |
| D1169 | | |
| D1170 | Internal node 5 control command | RW |
| D1171 | Internal node 5 mode | RW |
| D1172 | Internal node 5 reference command L | RW |
| D1173 | Internal node 5 reference command H | RW |
| D1174 | | RW |
| D1175 | | |
| D1176 | Internal node 5 status | |
| D1177 | Internal node 5 reference status L | RO |
| D1178 | Internal node 5 reference status H | RO |
| D1179 | | |
| D1180 | Internal node 6 control command | RW |
| D1181 | Internal node 6 mode | RW |
| D1182 | Internal node 6 reference command L | RW |
| D1183 | Internal node 6 reference command H | RW |
| D1184 | | |
| D1185 | | |
| D1186 | Internal node 6 status | RO |
| D1187 | Internal node 6 reference status L | RO |
| D1188 | Internal node 6 reference status H | RO |
| D1189 | | |
| D1190 | Internal node 7 control command | RW |
| D1191 | Internal node 7 mode | RW |
| D1192 | Internal node 7 reference command L | RW |
| D1193 | Internal node 7 reference command H | RW |
| D1194 | | |
| D1195 | | |
| D1196 | Internal node 7 status | RO |
| D1197 | Internal node 7 reference status L | RO |
| D1198 | Internal node 7 reference status H | RO |
| D1199 | | |

The following is CANopen Master's special D (can be written in only

with PLC in Stop state)

n = 0 ~ 7

| Special D | Description of Function | PDO Map | Power off Memory | Default: | R/W |
|-----------|--|------------|------------------------|----------|-----|
| D1070 | Channel opened by CANopen initialization (bit0=Machine code0) | NO | NO | 0 | R |
| D1071 | Error channel occurring in CANopen initialization process (bit0=Machine code0) | NO | NO | 0 | R |
| D1072 | Reserved | - | - | | - |
| D1073 | CANopen break channel (bit0=Machine code0) | NO | NO | | R |

| Special D | Description of Function | PDO Map | Power off Memory | Default: | R/W |
|---------------------|---|------------|------------------------|----------|-----|
| D1074 | Error code of master error 0: No error 1: Slave station setting error 2: Synchronizing cycle setting error (too small) | NO | NO | 0 | R |
| D1075 | Reserved | - | - | | - |
| D1076 | SDO error message (main index value) | NO | NO | | R |
| D1077 | SDO error message (secondary index value) | NO | NO | | R |
| D1078 | SDO error message (error code) | NO | NO | | R |
| D1079 | SDO error message (error code) | NO | NO | | R |
| D1080 | Reserved | - | - | | - |
| D1081 | | | | | - |
| ~ | Reserved | - | - | | |
| D1086 | | | | | |
| D1087 | | | | | |
| ~ | Reserved | - | - | | - |
| D1089 | | | | | |
| D1090 | Synchronizing cycle setting | NO | YES | 4 | RW |
| D1091 | Sets slave station On or Off (bit 0-bit 7 correspond to slave stations number 0-7) | NO | YES | FFFFH | RW |
| D1092 | Delay before start of initialization | NO | YES | 0 | RW |
| D1093 | Break time detection | NO | YES | 1000ms | RW |
| D1094 | Break number detection | NO | YES | 3 | RW |
| D1095 ~ D1096 | Reserved | - | - | | - |
| D1097 | Corresponding real-time transmission type (PDO) Setting range: 1~240 | NO | YES | 1 | RW |
| D1098 | Corresponding real-time receiving type (PDO) Setting range: 1~240 | NO | YES | 1 | RW |
| D1099 | Initialization completion delay time Setting range: 1 to 60000 sec | NO | YES | 15 sec. | RW |
| D2000+100*n | Station number n of slave station Setting range: 0~127 0: No CANopen function | NO | YES | 0 | RW |

The CH2000 supports 8 slave stations under the CANopen protocol; each slave station

occupies 100 special D locations; stations are numbered 1-8, total of 8 stations.

| Explanation of slave station number and | Slave station no. 1 | D2000 D2001 ~ D2099 | Node ID Slave station no. 1 torque restrictions ~ Address 4(H) corresponding to receiving channel 4 |
|---|------------------------|------------------------------|---|
| | Slave station no. 2 | D2100 D2101 ~ | Node ID Slave station no. 2 torque restrictions |
| | | D2199 | Address 4(H) corresponding to receiving channel 4 |
| | Slave station no. 3 | D2200 D2201 ~ | Node ID Slave station no. 3 torque restrictions |
| | | D2299 | Address 4(H) corresponding to receiving channel 4 |
| | | Û | _ |
| | Slave station no. 8 | D2700 D2701 ~ | Node ID Slave station no. 8 torque restrictions |
| | | D2799 | Address 4(H) corresponding to receiving channel 4 |

1. The range of n is 0-7

2. ●Indicates PDOTX, ▲Indicates PDORX; unmarked special D can be refreshed using the CANFLS command

| Special D | Description of Function | Default: | R/W |
|-------------|---|----------|-----|
| D2000+100*n | Station number n of slave station Setting range: 0~127 0: No CANopen function | 0 | RW |
| D2002+100*n | Manufacturer code of slave station number n (L) | 0 | R |
| D2003+100*n | Manufacturer code of slave station number n (H) | 0 | R |
| D2004+100*n | Manufacturer's product code of slave station number n (L) | 0 | R |
| D2005+100*n | Manufacturer's product code of slave station number n (H) | 0 | R |

Basic definitions

| Special D | Description of Function | Default: | CAN Index | PD 1 | 2 | | ault: 4 | R/W |
|-------------|--|----------|--------------|---------|---|---|------------|-----|
| D2006+100*n | Communications break handling method of slave station number n | 0 | 6007H-0010H | | | | | RW |
| D2007+100*n | Error code of slave station number n error | 0 | 603FH-0010H | | | | | R |
| D2008+100*n | Control word of slave station number n | 0 | 6040H-0010H | • | | • | • | RW |
| D2009+100*n | Status word of slave station number n | 0 | 6041H-0010H | | | | | R |
| D2010+100*n | Control mode of slave station number n | 2 | 6060H-0008H | | | | | RW |
| D2011+100*n | Actual mode of slave station number n | 2 | 6061H-0008H | | | | | R |

Velocity Control

Slave station number n=0-7

| Special D | Description of Function | Default: | CAN | PD | 00 | Def | ault: | R/W |
|-------------|--|----------|-------------|----|----|-----|-------|-----|
| Special D | Description of Function | Delault. | Index | 1 | 2 | 3 | 4 | |
| D2001+100*n | Torque restriction on slave station number n | 0 | 6072H-0010H | | | | | RW |
| D2012+100*n | Target speed of slave station number n | 0 | 6042H-0010H | • | | | | RW |
| D2013+100*n | Actual speed of slave station number n | 0 | 6043H-0010H | | | | | R |
| D2014+100*n | Error speed of slave station number n | 0 | 6044H-0010H | | | | | R |
| D2015+100*n | Acceleration time of slave station number n | 1000 | 604FH-0020H | | | | | R |
| D2016+100*n | Deceleration time of slave station number n | 1000 | 6050H-0020H | | | | | RW |

Torque control

Slave station number n=0-7

| Special D | ial D Description of Function Default: | | CAN | PD | 00 | Def | ault: | R/W |
|-------------|--|----------|-------------|----|----|-----|-------|-------|
| Special D | Description of Function | Delault. | Index | 1 | 2 | 3 | 4 | n/ VV |
| D2017+100*n | Target torque of slave station number n | 0 | 6071H-0010H | | | | • | RW |
| D2018+100*n | Actual torque of slave station number n | 0 | 6077H-0010H | | | | | R |
| D2019+100*n | Actual current of slave station number n | 0 | 6078H-0010H | | | | | R |

Position control

Slave station number n=0-7

| Special D | Description of Function | Default: | CAN | PD | 00 | Def | ault: | R/W |
|--------------|---|---------------------------------|-------------|----|----|-----|-------|-----|
| Special D | | Delault. | Index | 1 | 2 | 3 | 4 | |
| D2020+100*n | Target of slave station number n (L) | 0 | | | | | | RW |
| D2021+100*n | Target of slave station number n (H) | 0 | 607AH-0020H | | | | | RW |
| D2022+100*n | Actual position of slave station number n | 0 | | | | | | R |
| D2022+100 11 | (L) | 0 | 6064H-0020H | | | | | 11 |
| D2023+100*n | Actual position of slave station number n | 0 | 00041-00201 | | | | | R |
| | (H) | | | | | | | |
| D2024+100*n | Speed chart of slave station number n (L) | 10000 | 6081H-0020H | | | | | RW |
| D2025+100*n | Speed chart of slave station number n (H) | of slave station number n (H) 0 | | | | | | RW |

20XXH correspondences: MI MO AI AO

Slave station number n=0-7

| Special D | Description of Function | Default: | CAN | P | 00 | Def | ault: | R/W |
|-------------|--------------------------------------|----------|-------------|---|----|-----|-------|-----|
| Special D | Description of Function | Delault. | Index | 1 | 2 | 3 | 4 | |
| D2026+100*n | MI status of slave station number n | 0 | 2026H-0110H | | | | | RW |
| D2027+100*n | MO setting of slave station number n | 0 | 2026H-4110H | | • | | | RW |
| D2028+100*n | Al1 status of slave station number n | 0 | 2026H-6110H | | | | | RW |
| D2029+100*n | AI2 status of slave station number n | 0 | 2026H-6210H | | | | | RW |
| D2030+100*n | AI3 status of slave station number n | 0 | 2026H-6310H | | | | | RW |
| D2031+100*n | AO1 status of slave station number n | 0 | 2026H-A110H | | • | | | RW |
| D2032+100*n | AO2 status of slave station number n | 0 | 2026H-A210H | | • | | | RW |
| D2033+100*n | AO3 status of slave station number n | 0 | 2026H-A310H | | • | | | RW |

PDO reflection length setting:

| Special D | Description of Function | Default: | R/W |
|-------------|--|----------|-----|
| D2034+100*n | Real-time transmission setting of slave station number n | 000AH | RW |
| D2067+100*n | Real-time reception setting of slave station number n | 0000H | RW |

16-5-4 PLC Communication address

| Device | Range | Туре | Address (Hex) |
|--------|---------------|----------|---------------|
| X | 00~37 (Octal) | bit | 0400~041F |
| Y | 00~37 (Octal) | bit | 0500~051F |
| Т | 00~159 | bit/word | 0600~069F |
| M | 000~799 | bit | 0800~0B1F |
| M | 1000~1079 | bit | 0BE8~0C37 |
| С | 0~79 | bit/word | 0E00~0E47 |
| D | 00~399 | word | 1000~118F |
| D | 1000~1099 | word | 13E8~144B |
| D | 2000~2799 | word | 17D0~1AEF |

Command code that can be used

| Function Code | Description of Function | Function target |
|---------------|--|-----------------|
| 01 | Coil status read | Y,M,T,C |
| 02 | Input status read | X,Y,M,T,C |
| 03 | Read single unit of data | T,C,D |
| 05 | Compulsory single coil status change | Y,M,T,C |
| 06 | Write single unit of data | T,C,D |
| 0F | Compulsory multiple coil status change | Y,M,T,C |
| 10 | Write multiple units of data | T,C,D |

When PLC functions have been activated, the CH2000 can match PLC and driver parameters; this method employs different addresses, drivers (default station number is 1, PLC sets station number as 2)

16-6 Introduction to the Command Window

16-6-1 Overview of basic commands

Ordinary commands

| Command code | Function | OPERAND | Execution speed (us) |
|-----------------|--------------------------------------|-----------|----------------------|
| LD | Load contact a | Χ、Υ、Μ、Τ、Ο | 0.8 |
| LDI | Load contact b | Χ、Υ、Μ、Τ、Ο | 0.8 |
| AND | Connect contact a in series | Χ、Υ、Μ、Τ、Ο | 0.8 |
| ANI | Connect contact b in series | Χ、Υ、Μ、Τ、Ο | 0.8 |
| OR | Connect contact a in parallel | Χ、Υ、Μ、Τ、Ο | 0.8 |
| ORI | Connect contact b in parallel | Χ、Υ、Μ、Τ、Ο | 0.8 |
| ANB | Series circuit block | N/A | 0.3 |
| ORB | Parallel circuit block | N/A | 0.3 |
| MPS | Save to stack | N/A | 0.3 |
| MRD | Stack read (pointer does not change) | N/A | 0.3 |
| MPP | Read stack | N/A | 0.3 |

Output command

| Command code | Function | OPERAND | Execution speed (us) |
|-----------------|---------------------------|-----------|----------------------|
| OUT | Drive coil | Y ∘ M | 1 |
| SET | Action continues (ON) | Y ∘ M | 1 |
| RST | Clear contact or register | Y、M、T、C、D | 1.2 |

Timer, counter

| Command | Function | OPERAND | Execution |
|---------|----------------|---------------------|------------|
| code | | | speed (us) |
| TMR | 16-bit timer | T-K or T-D commands | 1.1 |
| CNT | 16-bit counter | C-K or C-D (16-bit) | 0.5 |

Main control command

| Command | Function | OPERAND | Execution |
|---------|----------------------------------|---------|------------|
| code | | | speed (us) |
| MC | Common series contact connection | N0~N7 | 0.4 |
| MCR | Common series contact release | N0~N7 | 0.4 |

Contact rising edge/falling edge detection command

| Command | Function | OPERAND | Execution |
|---------|--|---|------------|
| code | | | speed (us) |
| LDP | Start of forward edge detection action | $X \mathrel{\scriptstyle{\vee}} Y \mathrel{\scriptstyle{\vee}} M \mathrel{\scriptstyle{\vee}} T \mathrel{\scriptstyle{\vee}} C$ | 1.1 |
| LDF | Start of reverse edge detection action | Χ、Υ、Μ、Τ、Ο | 1.1 |
| ANDP | Forward edge detection series connection | Χ、Υ、Μ、Τ、Ο | 1.1 |
| ANDF | Reverse edge detection series connection | $X \mathrel{\scriptstyle{\vee}} Y \mathrel{\scriptstyle{\vee}} M \mathrel{\scriptstyle{\vee}} T \mathrel{\scriptstyle{\vee}} C$ | 1.1 |
| ORP | Forward edge detection parallel connection | Χ、Υ、Μ、Τ、Ο | 1.1 |
| ORF | Reverse edge detection parallel connection | Χ、Υ、Μ、Τ、Ο | 1.1 |

Upper/lower differential output commands

| Command code | Function | OPERAND | Execution speed (us) |
|-----------------|---------------------------|---------|----------------------|
| PLS | Upper differential output | Y ∘ M | 1.2 |
| PLF | Lower differential output | Y × M | 1.2 |

Stop command

| Command | Function | OPERAND | Execution |
|---------|--------------------|---------|------------|
| code | | | speed (us) |
| END | Program conclusion | N/A | 0.2 |

Other commands

| Command | Function | OPERAND | Execution |
|---------|------------------------------|---------|------------|
| code | | | speed (us) |
| NOP | No action | N/A | 0.2 |
| INV | Inverse of operation results | N/A | 0.2 |
| Р | Index | Р | 0.3 |

16-6-2 Detailed explanation of basic commands

| Command | Function | | | | | | |
|--------------|---|--------------|---------|--------------|---------|------------------------------|---------------------------|
| LD | Load contact a | a | | | | | |
| Ora a waxa d | X0~X17 | Y0~Y17 | M0~M799 | T0~159 |) (| C0~C79 | D0~D399 |
| Operand | ✓ | \checkmark | ✓ | \checkmark | | \checkmark | _ |
| Explanation | The LD command is used for contact a starting at the left busbar or contact a starting at a contact circuit block; its function is to save current content and save the acquired contact status in the cumulative register. | | | | | | |
| Example | Ladder diagra | | | Comman | d code: | Des | scription: |
| | X0 X1 Y1 LD X0 Load Contact a of X0 | | | | | | |
| | | | | AND | X1 | Create connectic of X1 | series on to contact a |
| | | | | OUT | Y1 | Drive Y1 | coil |

| Command | Function | | | | | | | |
|-------------|--|--------------|---------|--------------|----|------------------------------|---------------------------|--|
| LDI | Load contact b | | | | | | | |
| Onerand | X0~X17 | Y0~Y17 | M0~M799 | T0~159 |) | C0~C79 | D0~D399 | |
| Operand | ✓ | \checkmark | ✓ | \checkmark | | \checkmark | — | |
| Explanation | contact status in the cumulative register. | | | | | | | |
| | X0 X | 1 | Y1 | LDI | X0 | Load Cor | ntact b of X0 | |
| | | | | AND | X1 | Create connectic of X1 | series on to contact a | |
| | | | | OUT | Y1 | Drive Y1 | coil | |

| 0 | | | | | | | | |
|-------------|--|-----------------------------------|----------------|---------------|-----------------|--------------------------------|-----------------------------|--|
| Command | Connact courts | at a in carias | Fund | ction | | | | |
| AND | Connect conta | | | | 0 | 00.070 | | |
| Operand | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | | C0~C79 | D0~D399 | |
| - | ✓ | ✓ | ✓ | ✓ | | √ | | |
| Explanation | The AND con current status contact in orde | of the design | ated series co | ontact and | logi | cal operation | results before | |
| Example | Ladder diagram | | | Comman LDI | nd co X | | scription: ntact b of X1 | |
| | | | Y1) | LDI | ~ | Create | series | |
| | | AND | X | | on to contact a | | | |
| | | | | OUT | Y | 1 Drive Y1 | coil | |
| Command | Function | | | | | | | |
| ANI | Connect conta | | | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0~M799 | T0~15 | 9 | C0~C79 | D0~D399 | |
| Operanu | ✓ | \checkmark | \checkmark | ✓ | | \checkmark | _ | |
| Explanation | The ANI comm first read curre before contac register. Ladder diagram | ent status of th t in order to | e designated : | series con | tact a on; s | and logical op aves results | eration results | |
| Example | X1 X | | | Comman | | | • | |
| | | ľ(| Y1 | LD | X | 1 Load Cor | ntact a of X1 | |
| | | | | ANI | X | Create connection of X0 | series on to contact b | |
| | | | | OUT | Y | 1 Drive Y1 | coil | |
| Command | | | Fund | ction | | | | |
| OR | Connect conta | ct a in parallel | | | | | | |
| | X0~X17 | Y0~Y17 | M0~M799 | T0~15 | 9 | C0~C79 | D0~D399 | |
| Operand | ✓ | ✓ | ✓ | ✓ | | ✓ | _ | |
| Explanation | The OR comm to first read c | urrent status | | ated serie | es co | ntact and log | jical operatior | |

| Operand | | 10 117 | | 10 100 | _ | 00 010 | 80 8000 |
|-------------|---|---------------|----------------|--------------|--------|------------------------------|--------------------------|
| oporaria | \checkmark | \checkmark | ✓ | \checkmark | | \checkmark | — |
| Explanation | The OR comm to first read or results before register. | urrent status | of the design | ated series | conta | act and log | |
| Example | Ladder diagram | m: | | Command | code: | Des | cription: |
| Example | | (| Y1 | LD | X0 | Load Con | tact a of X0 |
| | X1 | | | OR | X1 | Create connectio of X1 | series n to contact a |
| | | | | OUT | Y1 | Drive Y1 | coil |
| Command | | | | ction | | | |
| ORI | Connect conta | • | | | | | |
| Operand | X0~X17 ✓ | Y0~Y17 ✓ | M0∼M799 ✓ | T0~159 ✓ | | C0~C79 ✓ | D0~D399 |
| Explanation | The ORI comr is to first read results before register. | current statu | s of the desig | nated series | s cont | act and log | ical operation |
| Example | Ladder diagra | m: | | Command | code: | Des | cription: |
| | | | | LD | X0 | Load Con | tact a of X0 |



| Command | | Function | | | | | |
|-------------|-----------------------------|--------------|---|--------|------------|--|-------------------------------|
| ANB | Series circuit bl | ock | | | | | |
| Operand | | | | N// | A | | |
| Explanation | ANB performs current cumula | | • | on the | e previous | sly save | ed logic results and the |
| Example | Ladder diagram | 1: | | | Command | d code: | Description: |
| Example | | <u>(Y1</u>) | | LD | X0 | Load Contact a of X0 Establish parallel | |
| | X2 | X3 | | | ORI | X2 | connection to contact b of X2 |
| | | | | LDI | X1 | Load Contact b of X1 Establish parallel | |
| | | | | | OR | Х3 | connection to contact a of X3 |
| | | | | | ANB | | Series circuit block |
| | | | | | OUT | Y1 | Drive Y1 coil |

| Command | | Function | | | | | |
|---------------|---|------------------|----------|--|--|--|--|
| ORB | Parallel circuit block | | | | | | |
| Operand | | N/A | | | | | |
| Explanation | ORB performs an "OR" operation on the cumulative register content. | ne previously sa | wed logi | c results and the current | | | |
| Evenue | Ladder diagram: | Comman | d code: | Description: | | | |
| Example | X0 X1 Block A | LD | X0 | Load Contact a of X0 | | | |
| | (Y1) | | | Establish parallel | | | |
| | $\begin{array}{c c} & & & \\ &$ | ANI | X1 | connection to contact b of X1 | | | |
| | Block B | LDI | X2 | Load Contact b of X2 Establish parallel | | | |
| | | AND | Х3 | connection to contact a of X3 | | | |
| | | ORB | | Parallel circuit block | | | |
| | | OUT | Y1 | Drive Y1 coil | | | |
| Command | | Function | | | | | |

| Command | Function | |
|---------|---------------|---|
| MPS | Save to stack |] |
| Operand | N/A |] |
| | | |

Explanation Save current content of cumulative register to the stack. (Add one to stack pointer)

| Command | Function | | | | |
|-------------|---|--|--|--|--|
| MRD | ead stack (pointer does not change) | | | | |
| Operand | N/A | | | | |
| Explanation | Reads stack content and saves to cumulative register. (Stack pointer does not change) | | | | |

| Command | | | | Fund | ction | | | |
|-------------|---------------------------------------|----------------------|-----------------|--------------|---------------|-------------|-----------------------|---|
| MPP | Read stack | | | 1 0110 | | | | |
| Operand | | | | N/ | Ά | | | |
| Explanation | Retrieves resu cumulative reg | | | ve logica | l operation | from | the stack, | and saves to |
| Example | Ladder diagrar | <u>n:</u> | | | Command LD | code: X0 | Load Con | scription: tact a of X0 |
| | , X0 🖌 | X 1 | \frown | | MPS | | Save to st | |
| | | — — X2 | <u>Y1</u> | > | AND | X1 | to contact | |
| | MRD - | | M0 | \mathbf{i} | OUT | Y1 | Drive Y1 c | |
| | | | \geq | | MRD | | not chang | |
| | | | <u>Y2</u> | \sum | AND | X2 | to contact | |
| | MPP | | END | | OUT MPP | M0 | Drive M0 Read stac | |
| | I | | | | OUT | Y2 | Drive Y2 c | |
| | | | | | END | 12 | | conclusion |
| | | | | | LIND | | riogramie | |
| Command | | | | Fund | ction | | | |
| OUT | Drive coil | | | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0 ² | ~M799 | T0~159 | (| C0~C79 | D0~D399 |
| Operand | _ | \checkmark | | ✓ | — | | — | _ |
| Explanation | Outputs result o Coil contact acti | f logical ope on: | ration bef | ore OUT o | command to | the des | signated ele | ment. |
| | | | Out | commar | nd | | | |
| | Result: | Coil | | Access | s Point: | | | |
| | | COII | Contact | a (NO) | Contact b | (NC) | | |
| | FALSE | Off | | ducting | Conduct | | | |
| | TRUE | On | Cond | ucting | Not condu | icting | | |
| | | | | | | | | |
| Example | Ladder diagram | | -(Y1) | | Command LD | code: X0 | | scription: ntact b of X0 parallel |
| | | 1 | | | AND | X1 | | on to contact a |
| | | | | | OUT | Y1 | Drive Y1 | coil |
| | | | | | | | | |

| Command | Function | | | | | | | |
|-------------|--|---------|---------|---------|-------|----------------------------------|-----------------------------|--|
| SET | Action continu | es (ON) | | | | | | |
| Onerend | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | (| C0~C79 | D0~D399 | |
| Operand | _ | ✓ | ✓ | _ | | _ | — | |
| Explanation | When the SET command is driven, the designated element will be set as On, and will Explanation be maintained in an On state, regardless of whether the SET command is still driven. | | | | | | | |
| | The RST command can be used to set the element as Off. | | | | | | | |
| Example | Ladder diagra | m: | | Command | code: | Des | scription: | |
| Example | X0 Y | γ́ο | | LD | X0 | Load Cor | ntact a of X0 | |
| | SET Y1 | | Y1 | AN | Y0 | Establish connection of Y0 | parallel on to contact b | |
| | | | | SET | Y1 | Action co | ntinues (ON) | |

| Command | Function | | | | | | |
|---------|---------------|--------------------------|---------|--------|--------|---------|--|
| RST | Clear contact | lear contact or register | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | C0~C79 | D0~D399 | |
| Operand | | \checkmark | ✓ | ✓ | ✓ | ✓ | |

| | | | | | Chapter | 16 PLC Function Applications | |
|-------------|----------------------|--|-------------------------|-------------|----------------|-----------------------------------|--|
| Explanation | When the RS follows: | When the RST command is driven, the action of the designated element will be as follows: | | | | | |
| | Element | | M | ode | | | |
| | | th coil and contact w | /ill be set a | s Off. | | | |
| | I, C and | e current timing or co d contact ill be set a | as Off. | | et as 0, a | nd both the coil | |
| | | e content value will k | | | | | |
| | remain uncha | | en executed | d, the sta | itus of the | e designated element will | |
| | Ladder diagra | 0 | | Comma | nd code: | Description: | |
| Example | ι χο σ | | | LD | X0 | Load Contact a of X0 | |
| | | RST Y5 | | RST | Y5 | Clear contact or register | |
| Command | | | Func | tion | | | |
| TMR | 16-bit timer | | | | | | |
| Operand | T-K | T0~T159 , K0~K3 | | | | | |
| | T-D | T0~T159 , D0~D3 | | locianato | od timor o | oil will be electrified, and | |
| Explanation | | | | | | follows when the timing | |
| | | es the designated set | | | | | |
| | | nally Open) contact | Closed | | | , | |
| | | ally Close) contact | Open | d the ste | tue of the | designated alamant will | |
| | remain uncha | | en executed | u, the sta | lius of the | e designated element will | |
| Example | Ladder diagra | am: | | Comma LD | nd code: X0 | Load Contact a of X0 | |
| | | TMR T5 K10 | 00 | TMR | T5 K1000 |) T5 timer Set value as K1000 | |
| Command | | | Func | tion | | | |
| CNT | 16-bit counte | r | | | | | |
| a 1 | C-K | C0~C79,K0~K3 | 2,767 | | | | |
| Operand | C-D | C0~C79 , D0~D3 | 399 | | | | |
| Explanation | When the CN | VT command is exec | uted from | Off→On, | this indic | cates that the designated | |
| Laplanation | counter coil g | goes from no power | $r \rightarrow electri$ | fied, and | l 1 will be | e added to the counter's | |
| | count value; | when the count read | ches the d | esignate | d value (d | count value = set value), | |
| | the contact w | vill have the following | g action: | | | | |
| | NO (Norma | ally Open) contact | Closed | | | | |
| | NC (Norma | ally Close) contact | Open | | | | |
| | After the cou | nt value has been re | eached, the | e contact | and cour | nt value will both remain | |
| | unchanged e | even if there is contin | nued count | pulse in | put. Pleas | se use the RST | |
| | command if y | you wish to restart or | r clear the | count. | | | |
| Example | Ladder diagr | am: | | | nd code: | Description: | |
| | X0 | CNT C2 K10 | 0 | LD | X0 | Load Contact a of X0 C2counter | |
| | | CNT C2 K10 | | CNT | C2 K100 | Set value as K100 | |

| Command | Function | | | |
|-------------|--|--|--|--|
| MC/MCR | Connect/release a common series contact | | | |
| Operand | N0~N7 | | | |
| Explanation | MC is the main control initiation command, and any commands between MC and MCR will be executed normally. When the MC command is Off, any commands | | | |

| between MC and MCR will act as follows: | | | | | | |
|---|---|--|--|--|--|--|
| Determination of commands | Description | | | | | |
| Ordinary timer | The timing value will revert to 0, the coil will lose power, and the contact will not operate | | | | | |
| Counter | The coil will lose power, and the count value and contact will stay in their current state | | | | | |
| Coil driven by OUT command | None receive power | | | | | |
| Elements driven by SET, RST commands | Will remain in their current state | | | | | |
| Applications commands | None are actuated | | | | | |

MCR is the main control stop command, and is placed at the end of the main control program. There may not be any contact commands before the MCR command. The MC-MCR main control program commands support a nested program structure with a maximum only 8 levels; use in the order N0-N7, please refer to the following program:

| | program | | |
|---------|----------------|-----|----|
| Example | Ladder diagram | : | |
| | X0 | MC | N0 |
| | | YO | |
| | | MC | N1 |
| | | Y1 | |
| | ↓ | MCR | N1 |
| | X10 | MCR | N0 |
| | | MC | N0 |
| | | Y10 | |
| | ↓ | MCR | N0 |
| | 1 | | |

| Comr coc | | Description: | | | |
|----------------|------------|---|--|--|--|
| LD | X0 | Load Contact a of X0 | | | |
| МС | N0 | Connection of N0 common series contact | | | |
| LD OUT : | X1 Y0 | Load Contact a of X1 Drive Y0 coil | | | |
| LD | X2 | Load Contact a of X2 | | | |
| МС | N1 | Connection of N1 common series contact | | | |
| LD OUT : | X3 Y1 | Load Contact a of X3 Drive Y1 coil | | | |
| MCR | N1 | Release N1 common series contact | | | |
| : | | | | | |
| MCR | N0 | Release N0 common series contact | | | |
| : LD | X10 | Load Contact a of X10 | | | |
| MC | N0 | Connection of N0 common series contact | | | |
| LD OUT : | X11 Y10 | Load Contact a of X11 Drive Y10 coil | | | |
| MCR | N0 | Release N0 common series contact | | | |

| Command | Function | | | | | | | | | |
|--|--|--------|---------|------|-----------|------------------|--------------------------------|-----------|-----------|--|
| LDP | Start of forward edge detection action | | | | | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0~I | M799 | T0~ | ·159 | C0~C79 | | | |
| Operand | ✓ | ✓ | v | / | | / | \checkmark | | _ | |
| Explanation The LDP command has the same usage as LD, but its action is different; its function is to save current content, while also saving the detected state of the rising edge of the contact to the cumulative register. | | | | | | | | | | |
| | Command Description: | | | | | | | | | |
| Example | Ladder diagra | | 9.01011 | | | | Descri | iption: | | |
| Example | | | | | | Start of action | Descri X0 forwar | · | detection | |
| Example | Ladder diagra | m: | <i></i> | cod | le: | | X0 forwar series | · | | |
| Example | Ladder diagra | m: | | cod | le: X0 | action Create | X0 forwar series a of X1 | rd edge o | | |

Remark

Please refer to the function specifications table for each device in series for the scope of usage of each operand.

A rising edge contact will be TRUE after power is turned on if the rising edge contact is On before power is turned on to the PLC.

| Command | Function | | | | | | | |
|-------------|--|---------------------------------|---|--------|---------|-------------------|--------------|---------------------|
| LDF | Start of reverse edge detection action | | | | | | | |
| Onerered | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | | C0~C79 | D0 | ~D399 |
| Operand | ✓ | ✓ | ✓ | ~ | | \checkmark | | _ |
| Explanation | to save curren contact to the | t content whil cumulative re | same usage as e also saving t gister. | | d state | of the falli | | ge of the |
| Example | Ladder diagram | — Y1 | | LDF | X0 | Start of edge det | X0 ection | reverse action |
| | | | | AND | X1 | Create | | series contact a |
| | | | | OUT | Y1 | Drive Y1 | coil | |

| Command | Function | | | | | | | | |
|-----------------|-----------------|--|------------------|------------|-----------|-----------|---------------|--|--|
| ANDP | Forward edge | Forward edge detection series connection | | | | | | | |
| Operand | X0~X17 | X0~X17 Y0~Y17 M0~M799 T0~159 C0~C79 | | | | | | | |
| Operand | ✓ | \checkmark | ✓ | ✓ | | ✓ | _ | | |
| Explanation | The ANDP cor | nmand used f | or a contact ris | ing edge c | detection | series co | nnection. | | |
| E vample | Ladder diagra | m: | | Commar | nd code: | Des | scription: | | |
| Example | X0 X1 | | | LD | X0 | Load Cor | ntact a of X0 | | |
| | X1 Forward edge | | | | | | | | |
| | | | | ANDP | X1 | detection | series | | |

| Command | | Function | | | | | | |
|-------------|--------------|----------------|---------------|-----------------|-----------------|-------------|--|--|
| ANDF | Reverse edge | detection seri | es connection | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | C0~C79 | D0~D399 | | |
| Operand | ✓ | \checkmark | \checkmark | \checkmark | ✓ | _ | | |
| Explanation | The ANDF cor | mmand is used | for a contact | falling edge de | etection series | connection. | | |

OUT

Y1

Example Ladder diagram:

| Commai | nd code: | Description: |
|--------|----------|----------------------|
| LD | X0 | Load Contact a of X0 |
| | | X1 Reverse edge |
| ANDF | X1 | detection series |
| | | connection |
| OUT | Y1 | Drive Y1 coil |

connection

Drive Y1 coil

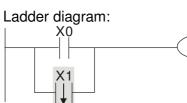
Example

| Command | Function | | | | | | | | |
|-------------|--|--|-----------|-------|-----|---|---------------|--|--|
| ORP | Forward edge | Forward edge detection parallel connection | | | | | | | |
| Operand | X0~X17 | Y0~Y17 | M0~M799 | T0~15 | 9 0 | C0~C79 | D0~D399 | | |
| Operand | \checkmark | \checkmark | ✓ | ✓ | | \checkmark | _ | | |
| Explanation | Ladder diagram: Command code: Description: | | | | | | | | |
| Example | | (| <u>Y1</u> | LD | X0 | Load Co | ntact a of X0 | | |
| | X1 ↑ | | | ORP | X1 | X1 Forward edge detection parallel connection | | | |
| | | | | OUT | Y1 | Drive Y1 | coil | | |

| Command | Function | | | | | | | |
|---------|--------------|---|--|--|--|--|--|--|
| ORF | Reverse edge | everse edge detection parallel connection | | | | | | |
| Operand | X0~X17 | X0~X17 Y0~Y17 M0~M799 T0~159 C0~C79 D0~D399 | | | | | | |
| Operand | ✓ | $\checkmark \qquad \checkmark \qquad$ | | | | | | |

Explanation The ORF command is used for contact falling edge detection parallel connection.

Y1



| ng cuyc c | ig eage detection paraller connection. | | | | | | | |
|-----------|--|---|--|--|--|--|--|--|
| Commar | nd code: | Description: | | | | | | |
| LD | X0 | Load Contact a of X0 | | | | | | |
| ORF | X1 | X1 Reverse edge detection parallel connection | | | | | | |
| OUT | Y1 | Drive Y1 coil | | | | | | |

| Command | Function | | | | | | | | |
|-------------|---------------------------|-----------------|--|--------|---------|-------------------|----------------|--|--|
| PLS | Jpper differential output | | | | | | | | |
| Orearrand | X0~X17 | Y0~Y17 | M0~M799 | T0~159 | 9 (| C0~C79 | D0~D399 | | |
| Operand | — | ✓ | ✓ | _ | | _ | _ | | |
| Explanation | | d will be exec | nmands. When cuted, and M0 period. | | | Ų | 00 /· | | |
| Example | Ladder diagra | 01 | | Comman | d code: | Des | scription: | | |
| | ×0 ├──│ | PLS M0 | | LD | X0 | Load Cor | ntact a of X0 | | |
| | MO | SET Y0 | | PLS | MO | M0 Uppe output | r differential | | |
| | Time sequenc | e diagram: | | LD | M0 | Load Cor | ntact a of M0 | | |
| | X0 | | | SET | Y0 | Y0 Action (ON) | continues | | |
| | M0Time | for one scan cy | /cle | | | () | | | |
| | Y0 | | | | | | | | |

| Command | Function | | | | | | |
|---------|----------------------------|---------------------------------|---|------------|--------|-------------------|----------------|
| PLF | Lower differential output | | | | | | |
| Onerend | X0~X17 | Y0~Y17 | M0~M799 | T0~15 | 9 | C0~C79 | D0~D399 |
| Operand | | \checkmark | ✓ | _ | | _ | — |
| | PLF comman consisting of c | d will be exe one scanning p | nmand. When 2 cuted, and Mo period. | 0 will sen | d one | e pulse, with | pulse length |
| | Ladder diagra | m: | | Commar | nd coc | de: Des | scription: |
| Example | X0 | PLF M0 | | LD | XO | Load Cor | ntact a of X0 |
| | M0 | SET Y0 | | PLF | МС | M0 Lowe | r differential |
| | Time sequenc | e diagram: | | LD | MC |) Load Cor | ntact a of M0 |
| | X0 | 5 | | SET | Y0 | Y0 Actior (ON) | n continues |
| | M0Time | for one scan cy | rcle | | | () | |
| | Y0 | | | | | | |

| Command | Function |
|-------------|--|
| END | Program conclusion |
| Operand | N/A |
| Explanation | An END command must be added to the end of a ladder diagram program or command program. The PLC will scan from address 0 to the END command, and will return to address 0 and begins scanning again after execution. |

| Command | Function | | | | | | |
|-------------|---|--------|----------|----------------------|--|--|--|
| NOP | No action | | | | | | |
| Operand | N | /A | | | | | |
| Explanation | The command NOP does not perform any operation in the program. Because execution of this command will retain the original logical operation results, it can be used in the following situation: the NOP command can be used instead of a command that is deleted without changing the program length. | | | | | | |
| Example | Ladder diagram: | Commar | nd code: | Description: | | | |
| Lxample | NOP command will be simplified and not displayed when the ladder diagram is | LD | X0 | Load Contact b of X0 | | | |
| | displayed. | NOP | | No action | | | |
| | | OUT | Y1 | Drive Y1 coil | | | |

| Command | Function | | | | | | |
|-------------|--|-------------|-------------|------------------------------|--|--|--|
| INV | Inverse of operation results | | | | | | |
| Operand | | N/A | | | | | |
| Explanation | Saves the result of the logic inversion cumulative register. | operation p | orior to th | e INV command in the | | | |
| Example | Ladder diagram: Command code: Des | | | | | | |
| | X0 Y1 | LD | X0 | Load Contact a of X0 | | | |
| | | INV | | Inverse of operation results | | | |
| | | OUT | Y1 | Drive Y1 coil | | | |

| Command | Function | | | | | | | | |
|-------------|--|---|-----|---|--------------------------|-----------------------|---|--|--|
| Р | Index | | | | | | | | |
| Operand | P0~P255 | | | | | | | | |
| Explanation | starting from zero, | Pointer P is used to subprogram call command API 01 CALL. Use does not require starting from zero, but the number cannot be used repeatedly, otherwise an unpredictable error will occur. | | | | | | | |
| Example | Ladder diagram: X0 X1 X1 P10 | CALL | P10 |] | Comma LD CALL : | nd code: X0 P10 | Description: Load Contact a of X0 Call command CALL to P10 | | |
| | I | \smile | | | P10 | | Pointer P10 | | |
| | | | | | LD | X1 | Load Contact a of X1 | | |
| | | | | | OUT | Y1 | Drive Y1 coil | | |

16-6-3 Overview of application commands

| Classification | API | Command code | | P. | Function | STE | |
|--------------------------|-----|--------------|--------|-----------------------|--|-------|-------|
| Classification | | 16 bit | 32 bit | command | | 16bit | 32bit |
| | 01 | CALL | - | ✓ | Call subprogram | 3 | - |
| Circuit control | 2 | SRET | - | - | Conclusion of subprogram | 1 | - |
| | 06 | FEND | - | - | Conclusion a main program | 1 | - |
| | 10 | CMP | DCMP | ✓ | Compares set output | 7 | 13 |
| Send | 11 | ZCP | DZCP | ✓ | Range comparison | 9 | 17 |
| comparison | 12 | MOV | DMOV | ✓ | Data movement | 5 | 9 |
| | 15 | BMOV | _ | ✓ | Send all | 7 | _ |
| | 20 | ADD | DADD | ✓ | BIN addition | 7 | 13 |
| | 21 | SUB | DSUB | ✓ | BIN subtraction | 7 | 13 |
| Four logical | 22 | MUL | DMUL | ✓ | BIN multiplication | 7 | 13 |
| operations | 23 | DIV | DDIV | ✓ | BIN division | 7 | 13 |
| _ | 24 | INC | DINC | ✓ | BIN add one | 3 | 5 |
| | 25 | DEC | DDEC | ✓ | BIN subtract one | 3 | 5 |
| Rotational | 30 | ROR | DROR | ✓ | Right rotation | 5 | |
| displacement | 31 | ROL | DROL | ✓ | Left rotation | 5 | _ |
| Data Process | 40 | ZRST | _ | ✓ | Clear range | 5 | - |
| _ | 49 | _ | DFLT | ~ | BIN whole number \rightarrow binary floating point number transformation | - | 9 |
| communication | 150 | MODRW | _ | √ | MODBUS read/write | 7 | _ |
| | 110 | - | DECMP | ✓ | Comparison of binary floating point numbers | _ | 13 |
| - | 111 | - | DEZCP | ~ | Comparison of binary floating point number range | - | 17 |
| | 116 | - | DRAD | ✓ | Angle \rightarrow Diameter | - | 9 |
| | 117 | - | DDEG | ✓ | Diameter \rightarrow angle | - | 9 |
| | 120 | - | DEADD | ~ | Binary floating point number addition | - | 13 |
| | 121 | - | DESUB | ✓ | Binary floating point number subtraction | - | 13 |
| | 122 | - | DEMUL | ✓ | Binary floating point number multiplication | - | 13 |
| Floating point operation | 123 | - | DEDIV | ✓ | Binary floating point number division | - | 13 |
| ng po | 124 | - | DEXP | ✓ | Binary floating point number obtain exponent | - | 9 |
| oint op | 125 | - | DLN | √ | Binary floating point number obtain logarithm | _ | 9 |
| oerati | 127 | - | DESQR | ✓ | Binary floating point number find square root | - | 9 |
| n | 129 | _ | DINT | √ | Binary floating point number \rightarrow BIN whole number transformation | | 9 |
| | 130 | - | DSIN | ✓ | Binary floating point number SIN operation | _ | 9 |
| | 131 | - | DCOS | √ | Binary floating point number COS operation | _ | 9 |
| | 132 | - | DTAN | ✓ | Binary floating point number TAN operation | - | 9 |
| | 133 | - | DASIN | ✓ | Binary floating point number ASIN operation | _ | 9 |
| - | 134 | - | DACOS | ✓ | Binary floating point number ACOS operation | - | 9 |

| Classification | API | Command code | | P | Function | STE | |
|--------------------------------|------------|--------------|---------------|---------|--|--------|--------|
| Classification | ALI | 16 bit | 32 bit | command | | 16bit | 32bit |
| | 135 | _ | DATAN | ✓ | Binary floating point number ATAN operation | _ | 9 |
| 8 <u>n</u> | 136 | - | DSINH | ✓ | Binary floating point number SINH operation | _ | 9 |
| Floating point operation | 137 | _ | DCOSH | ✓ | Binary floating point number COSH operation | _ | 9 |
| D Q | 138 | _ | DTANH | ✓ | Binary floating point number TANH operation | _ | 9 |
| | 160 | TCMP | _ | ✓ | Compare calendar data | 11 | - |
| | 161 | TZCP | | ✓ | Compare calendar data range | 9 | - |
| Calendar | 162 | TADD | _ | ✓ | Calendar data addition | 7 | - |
| - | 163 | TSUB | - | ✓ ✓ | Calendar data subtraction | 7 | - |
| | 166 | TRD | | ✓ ✓ | Calendar data read | 3 5 | - |
| GRAY code | 170 171 | GRY GBIN | DGRY DGBIN | ✓ ✓ | BIN→GRY code transformation GRY code →BIN transformation | 5 5 | 9 9 |
| | 215 | LD& | DLD& | - | Contact form logical operation | 5 | 9 |
| 0 | 216 | LD | DLD | - | Contact form logical operation | 5 | 9 |
| Contact form logical operation | 217 | LD^ | DLD^ | - | Contact form logical operation LD# | 5 | 9 |
| ot forn | 218 | AND& | DAND& | - | Contact form logical operation AND# | 5 | 9 |
| n logic | 219 | ANDI | DANDI | - | Contact form logical operation AND# | 5 | 9 |
| | 220 | AND^ | DAND^ | - | Contact form logical operation AND# | 5 | 9 |
| eratio | 221 | OR& | DOR& | - | Contact form logical operation OR# | 5 | 9 |
| – | 222 | OR | DOR | - | Contact form logical operation OR# | 5 | 9 |
| | 223 | OR^ | DOR^ | - | Contact form logical operation OR# | 5 | 9 |
| | 224 | LD= | DLD= | - | Contact form compare LD* | 5 | 9 |
| | 225 | LD> | DLD> | - | Contact form compare LD* | 5 | 9 |
| | 226 | LD< | DLD< | - | Contact form compare LD* | 5 | 9 |
| 0 | 228 | LD<> | DLD<> | - | Contact form compare LD* | 5 | 9 |
| Contact form compare command | 229 | LD<= | DLD<= | - | Contact form compare LD* | 5 | 9 |
| lac | 230 | LD>= | DLD>= | - | Contact form compare LD* | 5 | 9 |
| t fo | 232 | AND= | DAND= | - | Contact form compare AND* | 5 | 9 |
| rm | 233 | AND> | DAND> | - | Contact form compare AND* | 5 | 9 |
| <u>co</u> | 234 | AND< | DAND< | - | Contact form compare AND* | 5 | 9 |
| gu | 236 | AND<> | DAND<> | - | Contact form compare AND* | 5 | 9 |
| are | 237 | AND<= | DAND<= | - | Contact form compare AND* | 5 | 9 |
| ÷ cc | 238 | AND>= | DAND>= | - | Contact form compare AND* | 5 | 9 |
| mr | 240 | OR= | DOR= | - | Contact form compare OR* | 5 | 9 |
| nar | 241 | OR> | DOR> | - | Contact form compare OR* | 5 | 9 |
| ъ – | 242 | OR< | DOR< | - | Contact form compare OR* | 5 | 9 |
| ŀ | 244 | OR<> | DOR<> | _ | Contact form compare OR* | 5 | 9 |
| - | 245 | OR<= | DOR<= | - | Contact form compare OR* | 5 | 9 |
| | 245 | OR>= | DOR<= | - | Contact form compare OR* | 5 | 9 |

| | | Command code | | Р | F unction | STE | EPS |
|---------------------------------------|-----|--------------|--------|----------|--|-------|-------|
| Classification | API | 16 bit | 32 bit | command | Function | 16bit | 32bit |
| рој F | 275 | - | FLD= | - | Floating point number contact form compare LD* | - | 9 |
| Floating point contact form | 276 | - | FLD> | - | Floating point number contact form compare LD* | - | 9 |
| ig itact | 277 | - | FLD< | - | Floating point number contact form compare LD* | - | 9 |
| | 278 | - | FLD<> | - | Floating point number contact form compare LD* | - | 9 |
| | 279 | - | FLD<= | - | Floating point number contact form compare LD* | - | 9 |
| | 280 | - | FLD>= | - | Floating point number contact form compare LD* | - | 9 |
| | 281 | - | FAND= | - | Floating point number contact form compare AND* | - | 9 |
| | 282 | - | FAND> | - | Floating point number contact form compare AND* | - | 9 |
| C . | 283 | - | FAND< | - | Floating point number contact form compare AND* | - | 9 |
| Compare command | 284 | - | FAND<> | - | Floating point number contact form compare AND* | - | 9 |
| e cor | 285 | - | FAND<= | - | Floating point number contact form compare AND* | - | 9 |
| nman | 286 | - | FAND>= | - | Floating point number contact form compare AND* | - | 9 |
| đ | 287 | - | FOR= | - | Floating point number contact form compare OR* | - | 9 |
| | 288 | - | FOR> | - | Floating point number contact form compare OR* | - | 9 |
| | 289 | - | FOR< | - | Floating point number contact form compare OR* | - | 9 |
| | 290 | - | FOR<> | - | Floating point number contact form compare OR* | - | 9 |
| | 291 | - | FOR<= | - | Floating point number contact form compare OR* | - | 9 |
| | 292 | - | FOR>= | - | Floating point number contact form compare OR* | - | 9 |
| | 139 | RPR | _ | ✓ | Read servo parameter | 5 | _ |
| | 140 | WPR | | ✓ | Write servo parameter | 5 | _ |
| | 141 | FPID | _ | ✓ | Driver PID control mode | 9 | _ |
| rive | 142 | FREQ | | ✓ | Driver torque control mode | 7 | |
| P C | 262 | | DPOS | ✓ | Set target | - | 5 |
| j pe | 263 | TORQ | - | ✓ | Set target torque | 5 | - |
| Driver special command | 261 | CANRX | - | √ | Read CANopen slave station data | 9 | - |
| i i i i i i i i i i i i i i i i i i i | 264 | CANTX | _ | ✓ | Write CANopen slave station data | 9 | - |
| and | 265 | CANFLS | - | ✓ | Refresh special D corresponding to CANopen | 3 | - |
| | 320 | ICOMR | DICOMR | ✓ | Internal communications read | 9 | 17 |
| | 321 | ICOMW | DICOMW | ✓ | Internal communications write | 9 | 17 |

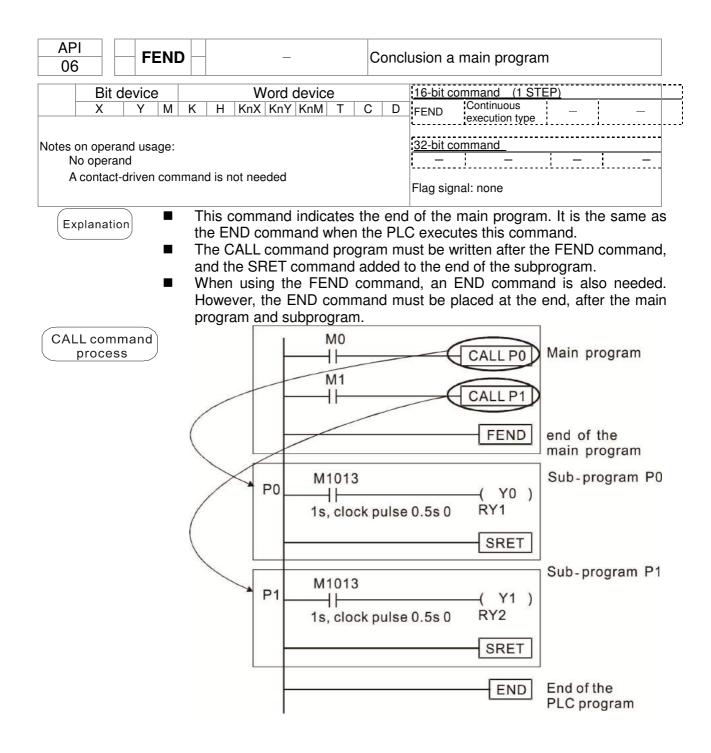
16-6-4 Detailed explanation of applications commands

| API 01 CALL | P S | Call su | ıbprogram |
|---|---|-----------|---|
| Bit device X Y M | Word device K H KnX KnY KnM T | C D | 16-bit command (3 STEP) CALL Continuous CALLP execution type execution type |
| Notes on operand usag The S operand ca CH2000 series de | | te P0-P63 | <u>32-bit command</u> — — — — — — — — Flag signal: none |
| Explanation | S : Call subprogram poin Write the subprogram af | | ND command. |

- The subprogram must end after the SRET command.
- Refer to the FEND command explanation and sample content for detailed command functions.

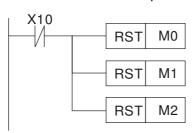
| API 02 SRET | P – Conclusion of subprogram |
|--|---|
| Bit device X Y M Notes on operand usage No operand A contact-driven co | Word device 16-bit command (1 STEP) K H KnX KnM T C D FEND Continuous : |
| Explanation | A contact-driven command is not needed. Automatically returns next |

- command after CALL command
- Indicates end of subprogram. After end of subprogram, SRET returns to main program, and executes next command after the original call subprogram CALL command.
- Refer to the FEND command explanation and sample content for detailed command functions.



| AF 1(| | b C | MP | Ρ | | <u>(S1</u>) | (S2 | | \mathbf{D} | C | ompa | ares set output | | |
|---|-----|------------|------------------|--------|---|--------------|------|--------|--------------|---|------|-------------------------------|--|--|
| | Bit | devi | ce | | | V | Vord | devic | е | | | 16-bit command (7 STEP) | | |
| | X | Y | M | K | Н | | | KnM | T | С | D | CMP Continuous CMPP Pulse | | |
| S1 | | | | * | * | * | * | * | * | * | * | execution type execution type | | |
| S2 | | | | * | * | * | * | * | * | * | * | 32-bit command (13 STEP) | | |
| D | | * | * | | | | | | | | | DCMP Continuous DCMPP Pulse | | |
| | | | and us) occu | pies t | | | | points | | Flag signal: none are value 2. D: Results of comparison. | | | | |
| Compares the size of the content of operand (S1) and (S2); the results comparison are expressed in D. Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, th indicates a negative number. | | | | | | | | | | | | | | |
| Example When the designated device is Y0, it automatically occupies Y0, Y1 and Y2. When X10=On, the CMP command executes, and Y0, Y1 or Y2 will be On. When X10=Off, the CMP command will not execute, and the state of Y0, Y1 and Y2 will remain in the state prior to X10=Off. If ≥, ≤, or ≠ results are needed, they can be obtained via series/paralle connections of Y0-Y2. | | | | | | | | | | | | | | |
| connections of Y0-Y2. $ \begin{array}{c c} X10 \\ \hline \\ \hline \\ Y0 \\ \hline \\ Y1 \end{array} $ If K10>D10 Y0 | | | | | | | | | | | | | | |

- Y_1 If K10=D10, Y1 = On Y2 If K10<D10, Y2= On
- To clear results of comparison, use the RST or ZRST command.



| X10 | ZRST | M0 | M2 |
|-----|------|----|----|
| | L | | |
| | | | |

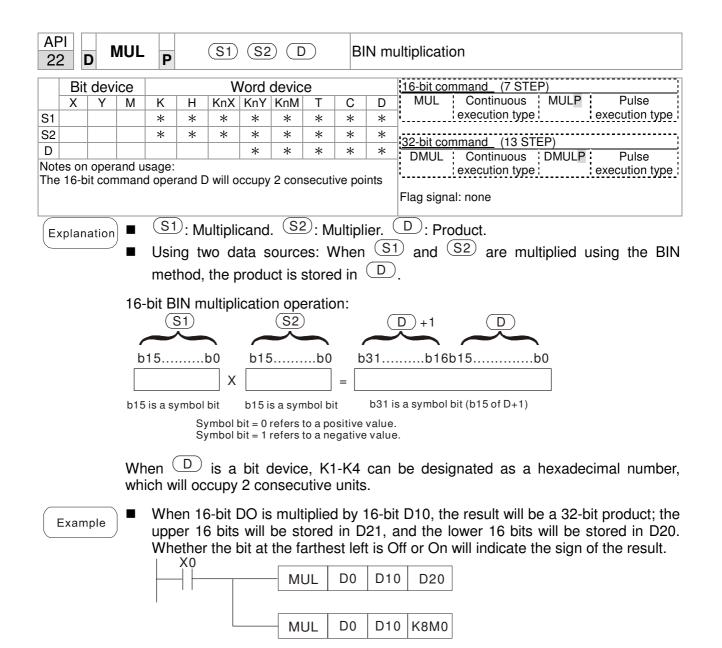
| Bit device Word device 16-bit command (9 STEP) X Y M K H KnY KnM T C D X Y M K H KnY KnM T C D X Y M K H KnX KnY KnM T C D X Y M K H KnX KnY KnM T C D X Y M K H KnX KnY KnM T C D Z I * * * * * * * * * * Y M K H KnY KnM T C D ZCP Continuous ZCPP Pulse Y M * | API 11 [| | ZCP | Ρ | S | 1) (5 | 32) (| S | | R | ange | comparison |
|---|--------------------|-------------|------------|-------------------|--------------------------|------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------------|---|
| X Y M K H KnY KnM T C D 2CPP Continuous 2CPP iexecution type iexecution type iexecution iixecution | | | ico | 1- 1 | | M | lord | dovic | <u>م</u> | | | 16-bit command (9 STEP) |
| 2 * * * * * * * * * * * * * * * * * * * | | | | К | Н | | | | | С | D | ZCP Continuous ZCPP Pulse |
| * * * * * * * * * * * * * * * * * * * | 1 | | | * | * | * | * | * | * | * | * | execution type : : execution type |
| * | 2 | | | | | | | | | | | 32-bit command (17 STEP) |
| e content value of operand S1 is less than the content value of Flag signal: none (operand) (operand) D occupies three consecutive points (S1): Lower limit of range comparison. (S2): Upper limit of range comparison (S): Comparative value. (D): Results of comparison. (When the comparative value (S) is compared with the lower limit (S1) at upper limit (S2), the results of comparison are expressed in (D). (When lower limit (S1) > upper limit (S2), the command will use the lower limit (S1) to perform comparison with the upper and lower limit. Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, the indicates a negative number. (When the designated device is M0, it automatically occupies M0, M1 and M2. (When X0=Onft, the ZCP command executes, and M0, M1 or M2 will be On. When X0=Offt, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Offt, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Offt, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Offt, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Offther is a reneeded, they can be obtained via series/paral connections of M0-M2. (X0) (X0 | | - | | | | * | * | * | * | * | * | |
| S : Comparative value. D : Results of comparison. When the comparative value S is compared with the lower limit S1 at upper limit S2, the results of comparison are expressed in D. When lower limit S1 > upper limit S2, the command will use the lower lim S1 to perform comparison with the upper and lower limit. Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, the indicates a negative number. When the designated device is M0, it automatically occupies M0, M1 and M2. When X0=On, the ZCP command executes, and M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 v remain in the state prior to X0=Off. If ≥, ≤, or ≠ results are needed, they can be obtained via series/paral connections of M0-M2. X0 <li< td=""><td>ne cont 2 opera</td><td>ent v nd</td><td>alue o</td><td>f ope</td><td>rand S</td><td></td><td></td><td></td><td></td><td>ent va</td><td>lue of</td><td>Flag signal: none</td></li<> | ne cont 2 opera | ent v nd | alue o | f ope | rand S | | | | | ent va | lue of | Flag signal: none |
| upper limit S2, the results of comparison are expressed in D. When lower limit S1 > upper limit S2, the command will use the lower limit. Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, the indicates a negative number. When the designated device is M0, it automatically occupies M0, M1 and M2. When X0=On, the ZCP command executes, and M0, M1 or M2 will be On. What X0=Off, the ZCP command execute, and the state of M0, M1 or M2 will be On. What X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. What X0=Off. If ≥, ≤, or ≠ results are needed, they can be obtained via series/paral connections of M0-M2. X0 X1 X0 X1 X1 X1 X0 X1 X2 X1 X2 X1 X2 X1 X2 X2 X2 X2 X2 X2 X2 X3 X4 X4<td>Explan</td><td>ation</td><td>)</td><td>S</td><td>) : C</td><td>Comp</td><td>arativ</td><td>/e va</td><td>lue.</td><td></td><td>: Res</td><td>sults of comparison.</td> | Explan | ation |) | S |) : C | Comp | arativ | /e va | lue. | | : Res | sults of comparison. |
| When lower limit S1 > upper limit S2, the command will use the lower limit. Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, the indicates a negative number. When the designated device is M0, it automatically occupies M0, M1 and M2. When X0=On, the ZCP command executes, and M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off. If ≥, ≤, or ≠ results are needed, they can be obtained via series/paral connections of M0-M2. X0 X0< | | | • | | | _ | | | | | | |
| Size comparison is performed algebraically. All data is compared in the form numerical binary values. Because this is a 16-bit command, when b15 is 1, the indicates a negative number. When the designated device is M0, it automatically occupies M0, M1 and M2. When X0=On, the ZCP command executes, and M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 will be On. When X0=Off, the ZCP command will not execute a series/paral connections of M0-M2. If 2, <, or \$\neq\$ results of comparison, use the RST or ZRST command. X0 X0 | | | • | Whe | en lo | wer I | imit | S1 | > up | oper | limit | (S2), the command will use the lower lim |
| When the designated device is M0, it automatically occupies M0, M1 and M2. When X0=On, the ZCP command executes, and M0, M1 or M2 will be On. Whe X0=Off, the ZCP command will not execute, and the state of M0, M1 or M2 w remain in the state prior to X0=Off. If ≥, ≤, or ≠ results are needed, they can be obtained via series/paral connections of M0-M2. X0 If C10 < K10, M0 = On M1 M1 M1 M2 M1 M2 M2 M3 M4 M4 | | | | Size num | e cor nerica | npari: al bin | son i ary v | s pei value: | rform s. Be | ed a caus | lgebr | aically. All data is compared in the form |
| connections of M0-M2. $X0$ $ZCP K10 K100 C10 M0$ $M0$ $H C10 < K10, M0 = On$ $M1$ $H C10 \le C10 \le K100, M1 = On$ $M2$ $H C10 > K100, M2 = On$ To clear results of comparison, use the RST or ZRST command. X0 $RST M0$ $M2$ $TRST M1$ | Exam | ple |) _ | Whe X0= rem | en X(⊡Off, ain iı | 0=On the Z n the | , the CP of state | ZCP comn prio | com nand r to X | man will (0=0 | d exe not e ff. | ecutes, and M0, M1 or M2 will be On. Whe xecute, and the state of M0, M1 or M2 w |
| M0 $HC = 0n$ $M1$ $HC = 0n$ $M1$ $HC = 0n$ $M2$ $HC = 0n$ $HC =$ | | | | | | | of M0 | | Г | | | · · · · · · · · · · · · · · · · · · · |
| If C10 < K10, M0 = On M1 If K10 \leq C10 \leq K100, M1 = On M2 If C10 > K100, M2 = On To clear results of comparison, use the RST or ZRST command. X0 RST M0 X0 RST M1 | | | | | | | | | | ZCI | P | <10 K100 C10 M0 |
| ■ To clear results of comparison, use the RST or ZRST command. X0 RST M0 RST M1 RST M1 RST M1 | | | | | | | | | | — If | C10 | < K10, M0 = On |
| ■ To clear results of comparison, use the RST or ZRST command. X0 RST M0 RST M1 RST M1 K10 > K100, M2 = On X0 ZRST M0 M2 | | | | | | | | | M1 - | — f | K10 | ≦ C10 ≦ K100, M1 = On |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | | | | | | | | M2 | — If | C10 | > K100, M2 = On |
| RST M0 ZRST M0 M2 | | | | | | resul | ts of | comp | pariso | on, u | | e RST or ZRST command. |
| | | | | | | | R | ST | M0 | | | ZRST M0 M2 |
| | | | | | | | | | | | | |
| | | | | | | | - R | ST | M2 | | | |
| | | | | | | | | | | | | |

| AF 12 | | | ۸OV | Ρ | | | S) (| D | | Da | ata n | novement |
|----------|-------|-------|-------|------------|----------------|--------|-----------------|---------------|--|--------------|-------|---|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit command (5 STEP) |
| | Х | Y | Μ | K | Н | KnX | | | Т | С | D | MOV Continuous MOVP Pulse |
| S | | | | * | * | * | * | * | * | * | * | execution type execution type |
| D | | | | | | | * | * | * | * | * | 32-bit command (9 STEP) |
| Not | es on | oper | and u | sage: | none | | | | DMOV Continuous DMOVP Pulse execution type execution type | | | |
| | | | | | | | | | | Flag signal: | | |
| E> | (plan | ation | | Whe mov | en th | nis co | omma | and i | of data movement. The content of \bigcirc content will be directly is not executed, the content of \bigcirc will not | | | |
| E | Exam | ple | | sen Whe | t to d en X | lata r | egist f, the | er D1 cont | 0. ent c | f D1 | 0 wil | not change; if X0=On, the value K10 will be I not change; if X1=On, the current value of <u>MOV K10 D0</u> <u>MOV T0 D10</u> |

| API 15 BMO | P S D n Send all |
|----------------------|--|
| Bit device | Word device 16-bit command (7 STEP) |
| X Y M | K H KnX KnY KnM T C D BMOV Continuous BMOVP Pulse |
| S D | * * * * * execution type execution type * * * * * * |
| n | * * |
| Notes on operand u | |
| n operand scope n | = 1 to 512 Flag signal: none |
| Explanation | S: Initiate source device. D: Initiate destination device. n: Send block |
| | length. The content of n registers starting from the initial number of the device designated |
| | by S will be sent to the n registers starting from the initial number of the |
| | device designated by <u>n</u> ; if the number of points referred to by n exceeds the range used by that device, only points within the valid range will be sent. |
| Example 1 | When X10=On, the content of registers D0-D3 will be sent to the four registers D20 to D23. |
| | $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ |
| | $D3 \longrightarrow D23 $ |
| Example 2 | If the designated bit devices KnX, KnY, and KnM are sent, (S) and (D) must have the same number of nibbles, which implies that n must be identical. 1 M1000 |
| | $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ |
| | $ \begin{array}{c} M4 \\ M5 \\ M6 \\ M7 \\ \hline Y6 \\ Y7 \\ \hline Y7 \end{array} $ $ \begin{array}{c} Y4 \\ Y5 \\ Y6 \\ Y7 \end{array} $ $ \begin{array}{c} n=3 \\ r=3 \\ \hline r=3 \\ \hline r=3 \\ r=$ |
| | $M8 \longrightarrow Y10$ |
| | $ \begin{array}{c} M \\ M 9 \\ M 10 \\ M 10 \\ M 11 \\ \end{array} \begin{array}{c} Y 11 \\ Y 12 \\ Y 13 \end{array} \right) $ |
| Example 3 | In order to prevent overlap between the transmission addresses of two operands, which would cause confusion, make sure that the addresses designated by the two operands have different sizes, as shown below: When $(S) > (D)$, send in the order $(D \rightarrow (2) \rightarrow (3)$. |
| | X10 \square \square \square \square \square \square \square \square \square \square |
| | When $(S) < (D)$, send in the order $(3 \rightarrow (2) \rightarrow (1))$. |
| | $\begin{array}{c c c c c c c c c c c c c c c c c c c $ |

| AF 20 | | , | ٩DD | Ρ | | (S1) | (S2 | | \mathbf{D} | BI | N ac | dition | | | | |
|-----------|-------|----------|-------|------------|------------|----------------|---------------|-----------------|-------------------------------------|------------------------|------------|---|--------------------------------|-----------|-------|---------------------|
| | Bit | dev | ice | | | ٧ | Vord | devic | е | | | 16-bit command | (7 STE | P) | | |
| | X | Y | M | К | Н | KnX | | | T | С | D | ADD Contin | uous | ADDP | | Pulse |
| S1 | | | | * | * | * | * | * | * | * | * | executio | on type | <u>.</u> | execi | ution type |
| S2 | | | | * | * | * | * | * | * | * | * | 32-bit command | (13 ST | EP) | | |
| D Note | es on | oper | and u | sage: | none | | * | * | * | * | * | DADD Contin executio | | DADDP | | Pulse ution type |
| | | | | | | | | | | | | | Borrow Carry fl refer to | flag | | |
| Ex | plan | ation | | (S1 |): Al | igenc | <u>1</u> . (S | <u>2</u> : A | dder | nd. 🤇 | <u>D</u> : | Sum. | | | | |
| | | |) | | | | | ource red ir | | | esult | of adding S1 | and | (S2) เ | using | the BIN |
| | | | • | The (ne | high | est b e), e | oit of | any c | lata i | s syr | | ed as bit 0 indie ebraic addition | 0 | | , | |
| | | | | Flag | g cha | nges | con | necte | d wit | h the | add | ion. | | | | |
| | | | | 2. (| Whe Dn. | n ca | culat | less | e zero flag M102 han –32,768, th | e bor | row flag | | | | | |
| | | | | | Whe Dn. | n ca | culat | ion re | esulte | s are | grea | er than 32,767, | the ca | arry flag | M102 | 22 will be |
| E | Exam | ple |) | | | | | | | | | result of the co content of D20 | | of adder | nd D0 | plus the |
| | | | | | | | | - A[| DD | D0 | D1 | D20 | | | | |
| | Rema | ark |) | | | | | | | | | negative/positiv | | | | |
| | | | | -2, ▼ | -1, 0 | -3 | 2,768 | 3 🔶 | | 1, | | 1 32 | ,767 | | • | |
| | | | | | Borro | ∖ ow fla | ıg | of th | e dat | est bi ta ttive) | (| / he highest bit f the data 0 (positive) | С | arry flag | | |
| | | | | 32 | 2 bit: | Zero | flag | | | Ze | ero fla | g | Zei | ro flag | | |
| | | | | -2, · | 1,0 | -2,147 / | 7,483, | | • | 1, | 0 | 1 2,147 | ,483,64 | | 2 | |
| | | | | B | orrow | / flag | | of th | highe e dat nega | | | he highest bit f the data 0 (positive) | | Carry fl | ag | |

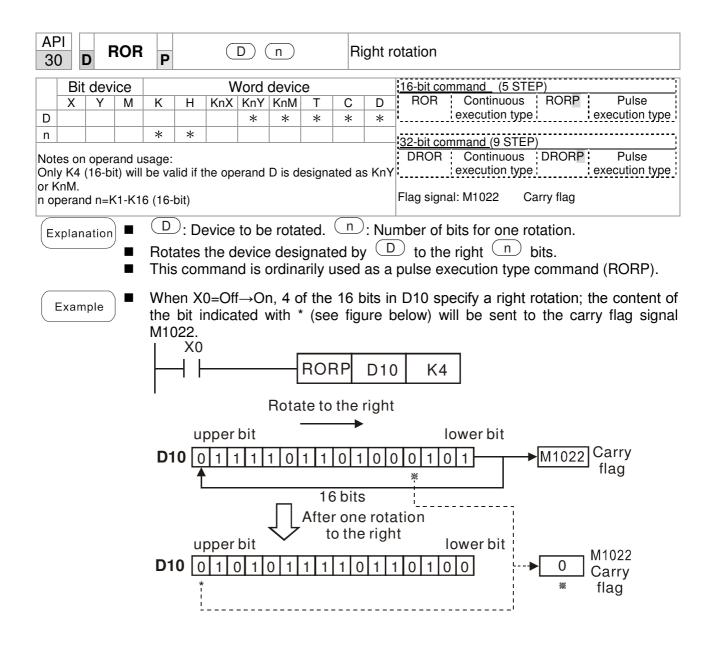
| AF 21 | | 5 | SUB | Ρ | | (S1) | (S2 | | D | BI | IN su | btraction | | | |
|----------|--|------|-------|---------------|------------|--------|-------|--------|---------|---|--------------------------|---|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | е | | | 16-bit command (7 STEP) | | | |
| | X | Y | M | K | Н | | | KnM | T | С | D | SUB Continuous SUBP Pulse | | | |
| S1 | | | | * | * | * | * | * | * | * | * | execution type execution type | | | |
| S2 | | | | * | * | * | * | * | * | * | 32-bit command (13 STEP) | | | | |
| D | | | | | | | | | | | | | | | |
| Note | es on | oper | and u | sage: | none | | | | | DSUB Continuous DSUBP Pulse execution type | | | | | |
| | Notes on operand usage: none DSUB DSUB execution type DSUB execution type Flag signal: M1020 Zero flag M1021 Borrow flag M1022 Carry flag Please refer to the following supplementary explanation | | | | | | | | | | | | | | |
| | Explanation S1: Minuend. S2: Subtrahend. D: Difference. Using two data sources: The result of subtraction of S1 and S2 using th BIN method is stored in D. The highest bit of any data is symbolized as bit 0 indicating (positive) 1 indicatin (negative), enabling the use of algebraic subtraction operations. Flag changes connected with subtraction. | | | | | | | | | | | | | | |
| | | | | 2. C 3. | Whe Dn. | en cal | culat | ion re | esults | are | less | e zero flag M1020 will be On. than –32,768, the borrow flag M1021 will be ter than 32,767, the carry flag M1022 will be | | | |
| E | Exam | ple |) = | | | | | | differe | | | , the content of D10 is subtracted from the ored in D20. | | | |

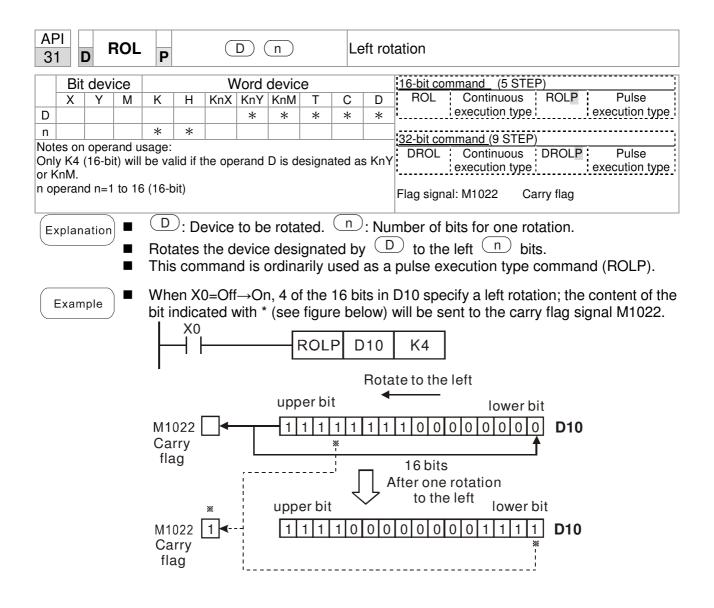


| AF 23 | | כ | DIV | Ρ | | (S1) | (S2 | | D | В | IN di | vision | | | |
|----------|--|-----|-----|-------------|-------------|-------|----------|-------|--------------------------|-------|-------|--|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | е | | | 16-bit command (7 STEP) | | | |
| | Х | Y | М | Κ | Н | KnX | KnY | KnM | Т | С | D | DIV Continuous DIVP Pulse | | | |
| S1 | | | | * | * | * | * | * | * | * | * | execution type execution type | | | |
| S2 | | | | * | * | * | * | * | * | * | * | <u>32-bit command</u> (13 STEP) | | | |
| Not | D * * * * * * * * * * * DDIV Continuous DDIVP Pulse Iotes on operand usage: execution type execution type execution type execution type he 16-bit command operand D will occupy 2 consecutive points Flag signal: none Flag signal: none S1): Dividend S2): Diviser D): Ouctions and remainder | | | | | | | | | | | | | | |
| | S1: Dividend. S2: Divisor. D: Quotient and remainder. Using two data sources: The quotient and remainder will be stored in D when S1 and S2 are subjected to division using the BIN method. The sign bit for S1, S2 and D must be kept in mind when performing a 16-bit operation. | | | | | | | | | | | | | | |
| | 16-bit BIN division: Quotient Remainder | | | | | | | | | | | | | | |
| | | | | C | <u>S1</u>) | | | I | $\widehat{S_2}$ |) | | \bigcirc \bigcirc \bigcirc +1 | | | |
| | | | b1 | 5 | | b00 | í / [| o15 | | b | | b15b00 b15b00 | | | |
| | | | | D) Iseci | | | | | | | | designated 16 bits, which will occupy 2 d remainder. | | | |
| E | Exam | ple |) ■ | will | be p | laced | in [| D20, | and † /ill inc / [| the i | rema | Tom division of dividend D0 by divisor D10 inder will be placed in D21. Whether the sign of the result. D20 K4Y0 | | | |

| AF 24 | | D | INC | Ρ | | | D |) | | | BIN ad | dd one | | |
|--|-------------------|-------------------------------|-------|-------------|---------|--------|-------|--------|-------|-------|--------------------------------|--|--|--|
| | Bi | it dev | ice | | | V | Vord | devic | е | | | 16-bit command (3 STEP) | | |
| | Х | Y | Μ | K | Н | KnX | | | Т | С | D * | INC Continuous INCP Pulse | | |
| D | | | | Isage: none | | | | | | | | execution type execution type | | |
| NOT | es o | n oper | and u | sage: | none | | | | | | <u>32-bit command</u> (5 STEP) | | | |
| DINC Continuous DINCP Pulse execution type execution type | | | | | | | | | | | | | | |
| | Flag signal: none | | | | | | | | | | | | | |
| E | ola | anation I Destination device. | | | | | | | | | | | | |
| \subset | | | | | | | | | | exe | ecutio | n type, when the command is executed, the | | |
| | | | | prod | aram | will a | dd 1 | to the | e con | itent | t of de | vice D for each scanning cycle. | | |
| | | | | | | | | | | | | oulse execution type command (INCP). | | |
| | | | | Dur | ing 1 | 6-bit | opera | ation, | 32,7 | 67 - | +1 will | change the value to -32,768. During 32 bit | | |
| | | | | ope | ratior | ı, 2,1 | 47,48 | 33,64 | 7 +1 | will | chang | ge the value to -2,147,483,648. | | |
| | Exar | nple | | Whe | |)=Off | →On | , 1 is | auto | mat | ically a | added to the content of D0. | | |
| | | · |) | | X0 - | [| INCF | D0 |) | | | | | |

| AF 25 | |) | DEC | Ρ | | | D |) | | BI | N su | btract one | | | |
|----------|--|-------|--------|-------|-----------------|-------|------------|-------|------|--------------------------------|-------|--|--|--|--|
| | Bit | devi | ice | | | V | Vord | devic | e | | | 16-bit command (3 STEP) | | | |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | DEC Continuous DECP Pulse | | | |
| D | | | | * | * | * | * | * | | | | execution type execution type | | | |
| Note | es on | opera | and us | sage: | none | | | | | <u>32-bit command</u> (5 STEP) | | | | | |
| | <u>32-bit command</u> (5 STEP) DDEC Continuous DDECP execution type execution type | | | | | | | | | | | | | | |
| | Flag signal: none | | | | | | | | | | | | | | |
| Ex | Explanation D: Destination device. If a command is not the pulse execution type, when the command is executed, the program will add 1 to the content of device D for each scanning cycle. This command is ordinarily used as a pulse execution type command (DECP). | | | | | | | | | | | | | | |
| | | | | | | | | | | | | ill change the value to 32,767. During 32 bit age the value to -2,147,483,647. | | | |
| E | Exam | ple |) | Whe | en X(X0 |)=Off | →Or DEC | - | auto | omati | cally | subtracted from the content of D0. | | | |





| AP 40 | | – Z | RST | Ρ | | | D1)(| D2) | | | Cle | ear r | ange |) | | | | | | |
|---|--|------------|--------|-----|---------|---|---------|--------|-----|-----|------|-------|---------------------|-----------------|---------|----------------|-----------|------|---------|---------|
| | Bit | dev | ice | | | V | Vord | devic | е | | | | 16-h | it com | mand | (5 STE | :P) | | | ! |
| | X | Y | M | K | Н | | | KnM | T | 0 | ; | D | | ST | | tinuous | | 2 | Pul | se |
| D1 | | * | * | | | | | | * | × | < | * | | | | ution type | | | xecutio | on type |
| D2 | | * | * | | | | | | * | × | < | * | | | | | | | | ; |
| | | | and us | | | | | | | | | | <u>32-b</u> | it com | mand | | <u>.</u> | | | |
| | | | | | | | | f oper | | | | | · | ł | | - - | ÷ | | | |
| Plea | erands D_1 , D_2 must designate the same type of device ease refer to the function specifications table for each | | | | | | | | | | | | Flag | signal | : none | Э | | | | |
| serie | ries for the scope of device usage | | | | | | | | | | | | | • | | | | | | |
| Ex | Explanation D ₁ : Clear range's initial device. | | | | | | | | | | | | ear | range | e's fir | nal devi | ce. | | | |
| ■ When the number of operand D ₁ > number of operand D ₂ , designated by D ₂ will be cleared. | | | | | | | | | | | | | D ₂ , on | ly t | he o | perand | | | | |
| Example When X0 is On, auxiliary relays M300 - M399 will be cleared and changed When X1 is On, 16-bit counters C0 - C127 will all be cleared. (Writes 0, and and changes contact and coil to Off). When X10 is On, timer T0 - T127 will all be cleared. (Writes 0, and cleared) | | | | | | | | | | | | |), and | clears | | | | | | |
| | | | - | | | | | nd co | | | | / // | ii aii | | lear | | 1105 0, 6 | anu | | |
| | | | - | | | | | | | | | anie | ers | ו - חח | |) will be | cleared | d ar | nd se | t as 0 |
| | | | _ | ••• | 511 7 (| | /II, UI | X0 | ann | uui | .u i | gio | | | | | | uu | | 1 40 0. |
| | | | | | | | | ίľ— | | | | ZF | RST | мз | 300 | M399 | 9 | | | |
| | | | | | | | | V 4 | | | L | | _ | | | | | | | |
| | | | | | | | | X1 | | | | 70 | от | | 20 | 0107 | , | | | |
| | | | | | | | | | | | | | RST | | 0 | C127 | | | | |
| | | | | | | | | X10 | | | ſ | | | | | | | | | |
| | | | | | | | | | | | _ | ZF | RST | т | 0 | T127 | , | | | |
| | | | | | | | | X3 | | | | | | | | | _ | | | |
| | | | | | | | | - | | | | ZF | RST | C | 00 | D100 |) | | | |
| F | Rema | ark |) | | | | | , C, E | | use | e th | e cle | ear c | omm | and | (RST), : | such as | bit | devid | ce Y, M |
| | | | | | | | | X0 | | | | | Г | D0 ⁻ | т | MO | 7 | | | |
| | | | | | | | Γ | | | | | | | RS | I | M0 | | | | |
| | | | | | | | | | | | | | | RS | т | ТО | 1 | | | |
| | | | | | | | | | | | | | L | | | | | | | |
| | | | | | | | | | | | | | — | RS | Т | Y0 |] | | | |
| | | | | | | | | | | | | | _ | | | | _ | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

| AF 49 | |) | FLT | Ρ | | C | <u>s</u>)(| D) | | BI tra | | whole rmation | number | \rightarrow | binary | decimal |
|----------|--|-----|-----|---|---|--------|-------------|--------|---|-----------|------|------------------|------------------------|---------------|--------|-----------|
| | Bit | dev | ice | | | V | Vord | devic | е | | | 16-bit co | mmand | | |] |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | <u> </u> | <u> </u> | | | |
| S | | * | * | | | | | | * | * | * | | | | | |
| D | | * | * | | | | | | * | * | * | r | mmand (9ste | | | i |
| tabl | Notes on operand usage: Please refer to the function specifications table for each device in series for the scope of device usage The operand D will occupy 2 consecutive points S: Transformation source device D: Device storing transformation results | | | | | | | | | | | | | | | |
| E) | Explanation S: Transformation source device. D: Device storing transformation results. Transforms BIN whole number into a binary decimal value. | | | | | | | | | | | | | | | |
| | Exam | ple |) ■ | | | loatin | | int nu | | | hich | | of values ed in D20 | | | to D0 and |

| AF 15 | | MC | DDR | W P | <u>(S1</u> | ি ত | 20 | <u>S</u> 3 (| S | n | M | ODBUS data read/write | |
|----------|-----|-----|-----|-----|------------|-----|------|-------------------------|---|---|---|---------------------------------|--|
| | Bit | dev | ice | | | V | /ord | 16-bit command (5 STEP) | | | | | |
| | Х | Υ | М | K | Н | KnX | KnY | KnM | Т | С | D | MODRW Continuous MODRW Pulse | |
| S1 | | | | * | * | | | | | | * | execution type P execution type | |
| S2 | | | | * | * | | | | | | * | 7 | |
| S3 | | | | * | * | | | | | | * | <u>32-bit command</u> | |
| S | | | | | | | | | | | * | ╡ | |
| n | | | | * | * | | | | | | * | | |
| | | | | | 1 | 1 | | | | 1 | | | |

Explanation

- S1: online device address. S2: communications function code. S3: address of data to read/write. S: register for data to be read/written is stored. N: length of data to be read/written.
- COM1 must be defined as controlled by the PLC (set P9-31 = -12) before using this command, and the corresponding communications speed and format must also be set (set P09-01 and P09-04). S2: communications function code. Currently only supports the following function code; the remaining function code cannot be executed.

| Function | Description |
|----------|----------------------|
| H 02 | Input read |
| H 03 | Read word |
| H 06 | Write single word |
| H 0F | Write multiple coils |
| H10 | Write single word |

- After executing this command, M1077, M1078 and M1079 will be immediately changed to 0.
- As an example, when CH2000 must control another converter and PLC, if the converter has a station number of 10 and the PLC has a station number of 20, see the following example:

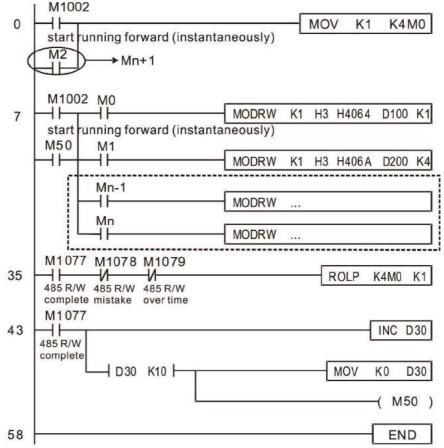
Control slave device converter

| | | | MODF | RW comr | mand | |
|-------|--|------------|---------------|-------------|----------|-------------|
| Seria | Example | S1 | S2 | S3 | S4 | n |
| l No. | - | Node ID | Function code | Addres s | Register | Leng th: |
| 1 | Reads 4 sets of data comprising the converter slave device parameters P01-00 to P01-03, and saves the read data in D0 to D3 | K10 | H3 | H100 | D0 | K4 |
| 2 | Reads 3 sets of data comprising the converter slave device addresses H2100 to H2102, and saves the read data in D5 to D7 | K10 | H3 | H2100 | D5 | K3 |
| 3 | Reads 3 sets of data comprising the converter slave device parameters P05-00 to P05-03, and writes the values as D10 to D12 | K10 | H10 | H500 | D10 | K3 |
| 4 | Writes 2 sets of data comprising the converter slave device addresses H2000 to H2001, and writes the values as D15 to D16 | K10 | H10 | H2000 | D15 | K2 |

| 0 0 | | | MOD | RW com | mand | |
|--------|---|------|---------|--------|---------|---------|
| Serial | Example | S1 | S2 | S3 | S4 | n |
| No. | | Node | Functio | Addres | Registe | |
| _ | | ID | n code | S | r | Length: |
| 1 | Reads 4 sets of data comprising the PLC slave device's X0 to X3 state, and saves the read data in bits 0 to 3 of D0 | K20 | H2 | H400 | D0 | K4 |
| 2 | Reads 4 sets of data comprising the PLC slave device's Y0 to Y3 state, and saves the read data in bits 0 to 3 of D1 | K20 | H2 | H500 | D1 | K4 |
| 3 | Reads 4 sets of data comprising the PLC slave device's M0 to M3 state, and saves the read data in bits 0 to 3 of D2 | K20 | H2 | H800 | D2 | K4 |
| 4 | Reads 4 sets of data comprising the PLC slave device's T0 to T3 state, and saves the read data in bits 0 to 3 of D3 | K20 | H2 | H600 | D3 | K4 |
| 5 | Reads 4 sets of data comprising the PLC slave device's C0 to C3 state, and saves the read data in bits 0 to 3 of D4 | K20 | H2 | HE00 | D4 | K4 |
| 6 | Reads 4 sets of data comprising the PLC slave device's T0 to T3 count value, and saves the read data of D10 to D13 | K20 | H3 | H600 | D10 | K4 |
| 7 | Reads 4 sets of data comprising the PLC slave device's C0 to C3 count value, and saves the read data of D20 to D23 | K20 | H3 | HE00 | D20 | K4 |
| 8 | Reads 4 sets of data comprising the PLC slave device's D0 to D3 count value, and saves the read data of D30 to D33 | K20 | H3 | H1000 | D30 | K4 |
| 9 | Writes 4 sets of the PLC slave device's Y0 to Y3 state, and writes the values as bits 0 to 3 of D1 | K20 | HF | H500 | D1 | K4 |
| 10 | Writes 4 sets of the PLC slave device's M0 to M3 state, and writes the values as bits 0 to 3 of D2 | K20 | HF | H800 | D2 | K4 |
| 11 | Writes 4 sets of the PLC slave device's T0 to T3 state, and writes the values as bits 0 to 3 of D3 | K20 | HF | H600 | D3 | K4 |
| 12 | Writes 4 sets of the PLC slave device's C0 to C3 state, and writes the values as bits 0 to 3 of D4 | K20 | HF | HE00 | D4 | K4 |
| 13 | Writes 4 sets of the PLC slave device's T0 to T3 state, and writes the values of D10 to D13 | K20 | H10 | H600 | D10 | K4 |
| 14 | Writes 4 sets of the PLC slave device's C0 to C3 state, and writes the values of D20 to D23 | K20 | H10 | HE00 | D20 | K4 |
| 15 | Writes 4 sets of the PLC slave device's D0 to D3 state, and writes the values of D30 to D33 | K20 | H10 | H1000 | D30 | K4 |

Example

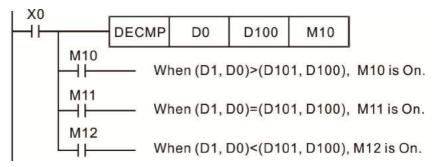
- Will trigger M0 On when the PLC begins to operate, and sends instruction to execute one MODRW command.
- After receiving the slave device's response, if the command is correct, it will execute one ROL command, which will cause M1 to be On.
- After receiving the slave device's response, will trigger M50 = 1 after a delay of 10 PLC scanning cycles, and then execute one MODRW command.
- After again receiving the slave device's response, if the command is correct, it will execute one ROL command, and M2 will change to On at this time (and M2 can be defined as a repeat of M); K4M0 will change to K1, and only M0 will remain 1. Transmission can proceed in a continuous cycle. If you wish to add a command, merely add the desired command in the empty frame, and change repeat M to Mn+1.



| AF 11 | | | CMF | P P S1 S2 D Word device | | | | | | C | Comparison of binary floating point numbers | | | | | |
|--|--------------------------|------------------|---------------------|--|---|--------------------------|-------------------------|------------------|--------|-------|---|---|--|--|--|--|
| | Bit | dev | ice | | | ٧ | Vord | devic | e | | | 16-bit command | | | | |
| | Х | Y | М | Κ | Н | KnX | KnY | KnM | Т | С | D | | | | | |
| S1 | | | | * | * | | | | | | * | ·· | | | | |
| S2 | | | | * | * | | | | | | * | <u>32-bit command (</u> 13 STEP) | | | | |
| D | | | | * | * | | | | | | * | DECMP Continuous DECMPP Pulse | | | | |
| The Plea seri | oper ase re es for | and E efer to | occu the cope | function of dev S 1: bin | on spo <u>vice u</u> Cor ary 1 | ecifica sage npari | tions t son ng po | of bii pint r | or ead | float | ing p | Flag signal: none oint numbers value 1. S ₂ : Comparison of 2. D : Results of comparison, occupies 3 | | | | |
| When binary floating point number 1 is compared with comparative floating point number 2, the result of comparison (>, =, <) will be expressed | | | | | | | | | | | | | | | | |
| If the source operand S₁ or S₂ designates a constant transform the constant to a binary floating-point nur comparison. | | | | | | | | | | | | | | | | |

Example

- When the designated device is M10, it will automatically occupy M10-M12.
- When X0=On, the DECMP command executes, and one of M10-M12 will be On. When X0=Off, the DECMP command will not execute, and M10-M12 will remain in the X0=Off state.
- If results in the form of ≥, ≤, or ≠ are needed, they can be obtained by series and parallel connection of M10-M12.
- Please use the RST or ZRST command to clear the result.

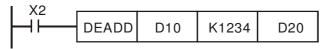


| | | devi | ice | | | | | devic | e | | | | | | | | | | | |
|---|----------------|-----------------|----------------|--|-------------------------------|--------------------------------|----------------------------------|--|--------------|------------------------------|------------------------|-------------------------|------------------------------|-------------------------------|----------------------------|-------------------------|---------------|------------------|-------------------|----------|
| ┝ | Х | Y | М | K | H | KnX | KnY | KnM | Т | С | D | <u>16-bit</u> | <u>comr</u> | nand | | | | | | |
| | | | | * | * | | | | | | * | · | i- | | | · | | | | |
| ╞ | | | | * | * | | | | | | * | 32-bit | | | | | | <u> </u> | Puls | _ |
| | | * | * | | | | | | | | | | | Conti execut | | | EZGP | | ecutior | - |
| , a | opera se re | and E fer to | the the tecope | ccupies three consecutive points e function specifications table for each device in be of device usage | | | | | | | | | | | | | 0.1 | 1 | | |
| < | plana | ation | | lim bin | it of ary ⁻ | bina | ry flo ng po | oating oint n | poir | nt nu | mbe | r in r | range | e cor | npar | ison | . S : | Com | nparis | on |
| | | | • | nui | nber | lowe | er lim | inary it valu 1paris | e S 1 | and | bina | ry floa | ating | value point | e S v num | with 1ber | binar uppe | ry flo er lim | ating iit valu | pe ue |
| | | | • | tra | nsfor | | - | erand onstan | | | | • | | | | | | | | |
| | | | • | lim cor | it biı npar | nary | floati with t | limit k ing po the up S 1. | oint i | numb | ber S | S₂, a | com | mano | d wi | ll be | ี issเ | led ' | to pe | erfo |
| | | | | | | | sign | ated c | levic | e is N | /10, it | will a | uton | natica | ally o | occup | oy M(| 0- M | 2. | |
| = | xamp | le | | Wł | ien t | ne de | Ŭ | | | | | | | | | | | f MO | -M2 v | vill |
| = | xamp | ole | • | Wł On | nen ≯ . Wh | (0=O | n, the D=Of | e DEZ f, the te. | | | | | | | | | | | | |
| = | xamp | le | • | Wł On in t | nen) . Wh he X | (0=0 en X(0=0f | n, the D=Of f stat | f, the | EZCI | P cor | nma | nd wil | ll not | exec | ute, | and | | | | |
| === | xamp | le | • | Wh On in t Ple | nen) . Wh he X | (0=0 en X(0=0f | n, the D=Of f stat he R | f, the te. ST or | ZRS | P cor | nma mma | nd wil and to | ll not | exec r the | ute, resu | and ılt. | | | | |
| ======================================= | xamp | le | • | Wh On in t Ple | ien > . Wh he X ease | (0=0 en X(0=0f | n, the D=Of f stat he R | f, the te. ST or EZCP | ZRS | P cor 5T co D0 | nma mma | nd wil | l not clea D2 | exec r the | ute, resu M | and Ilt. | | | | |
| = | xamp | le | • | Wh On in t Ple | ien > . Wh he X ease | (0=O en X(0=Of use t | n, the D=Of f stat he R | f, the te. ST or EZCP | EZCI ZRS | P cor 5T co 50 (D1, | nma mma [D0) | nd wil and to 010 | l not clea D2 1, D2 | exec r the 20 20), N | ute, resu M 10 is | and Ilt. 0 On. | M0-N | И2 w | rill cor | |

| AP | |) F | RAD | Ρ | | C | S (| D | | Aı | ngle | → Diameter |
|------|--|--------|-------------------------|---------|--------|--------|---------|--------|--------|---------------------------|-----------------|--|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit command |
| | Х | Υ | М | Κ | Н | KnX | KnY | KnM | Т | С | D | |
| S | | | | * | * | | | | | | * | |
| D | | | | | | | | | | | * | <u>32-bit command (9 STEP)</u> DRAD Continuous DRADD 版社的行刑 |
| Plea | ase re | fer to | and us the t cope | functio | | | tions 1 | able f | or ead | ch dev | /ice in | DRAD Continuous DRADP 脈波執行型 execution type Flag signal: none |
| Ex | plana | ation | | Us | es th | e foll | owing | g forr | | to co | | ansformation (diameter). t angles to radians. |
| E | Examp | ole | • | will | be c | conve | erted | to ra | | and | store | nated binary floating point number (D1, D0) ed in (D11, D10), with the content consisting |
| | | | | | <0 | -[[| DRAE | | D0 | | D10 |] |
| | | | | S | | D 1 | Ţ | D | | Contraction of the second | e valı decin | ue nal places |
| | $ \boxed{\begin{array}{c} \hline \\ \hline $ | | | | | | | | | | | |

| API 117 | | , C | DEG | Ρ | | C | <u>s</u> (| D | | Di | ame | ter \rightarrow angle |
|------------|-------|--------|---------|----------------------------|--------|-----------------|------------|---------|------------|-------------------------|---------------------|---|
| | Bit | devi | ce | | | ٧ | Vord | devic | e | | | 16-bit command |
| | Х | Y | М | Κ | Н | KnX | KnY | KnM | Т | С | D | |
| S | | | | * | * | | | | | | * | 32-bit command (9 STEP) |
| Pleas | se re | fer to | the the | sage: functio of dev | on spe | ecifica sage | tions 1 | table f | or ead | h dev | | DDEG Continuous DDEGP Pulse |
| Exp | lana | ition | | S : | data | sour | ce (d | iame | ter). I | D: res | sults | of transformation (angle). |
| <u> </u> | | | | Us | es th | e foll | owing | g forr | nula | to co | nver | t radians to an angle. |
| | | | | An | gle = | =Dia | mete | er × (1 | I 80/π | г) | | |
| Ex | amp | le | • | rad | lians | will k | be co | nver | ted to | an a | angle | ed binary floating point number (D1, D0) in a and stored in (D11, D10), with the content umber. |
| | | | | | <0 | -[| DEC | à | D0 | | D10 |] |
| | | | | S | | D 1 | Т Л | D (| <i>י</i> ו | 徑度 [/] 2 進/ | 值 小數黑 | 1 <u>-</u> |
| | | | | | | D 11 | Ť | D 1 | | | 值 (徑 小數黑 | ≤度值 × 180/π) 站 |

| AP 12 | _ | D | E/ | ٩DD |) P | | S 1 | <u>(S2</u> | | D | Ac | dding | binary floating point numbers | |
|----------|--|------|------|-----|----------------------------|-----------------------------|-------------------------------|-------------------------|------------------------|---------------------------------|----------------------|-------------------------------|--|--|
| | Bit device Word device X Y M K H KnX KnY KnM T C | | | | | | | | | | | | 16-bit command | |
| | Х | ` | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | | |
| S1 | | | | | * | * | | | | | | * | 122 bit command (0 CTED) | |
| S2 | | | | | * | * | | | | | | * | <u>32-bit command</u> (9 STEP) DEADD Continuous DEADDP Pulse | |
| D | | | | | | | | | | | | * | execution type execution type | |
| Plea | se i | refe | r to | the | sage: functio of dev | | | tions | able f | or eac | h dev | vice in | Flag signal: none | |
| Fx | nlar | nati | on | | S 1: | add | end. | S₂ : a | ugen | d. D : | sum | • | | |
| | S₁: addend. S₂: augend. D: sum. When the content of the register designated by S₂ is added to the content of the register designated by S₁, and the result is stored in the register designated by D. Addition is performed entirely using binary floating-point numbers. If the source operand S₁ or S₂ designates a constant K or H, the command will transform that constant into a binary floating point number for use in addition. | | | | | | | | | | | | | |
| | | | | • | In "co the | the ntinu regi | situa ious ister | ation exec will p | whe ution perfor | en S ₁ " corr m ad | anc nmar ditio | d S₂ nd is n one | designate identical register numbers, if a employed, when conditional contact is On, ce during each scan. Pulse execution type used under ordinary circumstances. | |
| E | xam | nple | • | • | | | | | | | | | number (D1, D0) will be added to a binary ne results stored in (D11, D10). | |
| | | | | | | ≺0 ┣── | D | EAD | D | D0 | | D2 | D10 | |
| | | | | • | (wł | nich I | nas b | een | autor | | ally c | onve | number (D11, D10) will be added to K1234 rted to a binary floating-point number), and | |



| AF 12 | |) E | SUB | Ρ | | S 1 | <u>(S2</u> | | D | Sı | ubtra | ction of binary floating point numbers | | |
|---|---|-----|-----|-------------------|----------------------|------------------------|------------------------|-------------------------|------------------------|-------------------------|-------------------------|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit command | | |
| | Х | Y | Μ | Κ | Н | KnX | KnY | KnM | Т | С | D | | | |
| S1 | | | | * | * | | | | | | * | | | |
| S2 | | | | * | * | | | | | | * | 32-bit command (13 STEP) | | |
| D | | | | | | | | | | | * | DESUB Continuous DESUBP Pulse execution type execution type | | |
| Please refer to the function specifications table for each device in series for the scope of device usage | | | | | | | | | | | | | | |
| E | $\blacksquare S_1: \text{ minuend. } S_2: \text{ subtrahend. } D: \text{ difference.}$ | | | | | | | | | | | | | |
| | When the content of the register designated by S₂ is subtracted from the content of the register designated by S₁, the difference will be stored in the register designated by D; subtraction is performed entirely using binary floating-point numbers. If the source operand S₁ or S₂ designates a constant K or H, the command will transform that constant into a binary floating point number for use in subtraction. | | | | | | | | | | | | | |
| _ | | | • | "co the cor | ntinu regi nma | ious ister nds (| exec will p DESI | ution perfor UBP) | " con m ad are (| nmar Iditioi gene | nd is n one rally | designate identical register numbers, if a employed, when conditional contact is On, ce during each scan. Pulse execution type used under ordinary circumstances. | | |
| | Exam | ple | | | | | | | | | | nt number (D1, D0) will be subtracted to a , and the results stored in (D11, D10). | | |
| | X0 DESUB D0 D2 D10 | | | | | | | | | | | | | |
| | When X2 =On, the binary floating point number (D1, D0) will be subtracted from K1234 (which has been automatically converted to a binary floating-point number), and the results stored in (D11, D10). | | | | | | | | | | | | | |



| AP 12 | | כ | EM | UL | Ρ | | S 1 | <u>(S2</u> | | D | М | ultipl | cation of binary floating point numbers |
|----------|-------|-----|------|----------|-------------------------|------------------|-----------------|----------------|----------------|---------------|-----------------|-----------------|---|
| | Bit | de | evic | <u>-</u> | | | V | Vord | devic | e | | | 16-bit command |
| | X |) | | M | К | Н | | KnY | | | С | D | |
| S1 | | | | | * | * | | | | | | * | · |
| S2 | | | | | * | * | | | | | | * | <u>32-bit command (13 STEP)</u> |
| D | | | | | | | | | | | | * | DEMUL Continuous DEMULP Pulse |
| Note | es on | op | erar | d us | age: | | | | | | | | execution type : execution type : |
| | | | | | | on spe vice u | | tions 1 | able 1 | or eac | h dev | /ice in | Flag signal: none |
| Ex | plan | ati | on | | S ₁ : | mult | iplica | and. S | S₂ : m | ultipli | er. | D | product. |
| | | | | • | the de | reg | ister ited b | des | ignat | ed b | y S | ₂, th | ignated by \mathbf{S}_1 is multiplied by the content of e product will be stored in the register erformed entirely using binary floating-point |
| | | | | | tra | nsfor | | nat o | | | | | gnates a constant K or H, the command will inary floating point number for use in |
| | | | | | "cc the | ntinu regi | ious ster | exec will p | ution erfoi | " con m mu | nmar ultipli | nd is icatic | designate identical register numbers, if a employed, when conditional contact is On, n once during each scan. Pulse execution rally used under ordinary circumstances. |
| | Exam | ۱pl | e | | bin | ary f | loatir | ng po | oint r | | er (D |)11, [| nt number (D1, D0) will be multiplied by the D10), and the product will be stored in the |
| | | | | | | X1 | D | EMU | L | D0 | | D10 | D20 |
| | | | | • | K1 | 234 | (whio | ch h | as b | een | auto | matio | pint number (D1, D0) will be multiplied from cally converted to a binary floating-point 11, D10). |

|--|

| AF 12 | |) E | DIV | Ρ | | <u>S1</u> | <u>S2</u> | n of bina | ry floating point numbers | | | | | | | | |
|--|--|-----|-----|---|---|-----------|-----------|-----------|---------------------------|---|---|----------------------------------|--|--|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit con | nmand | | | | |
| | Х | Y | М | К | Н | KnX | KnY | KnM | Т | С | D | | | | | | |
| S1 | | | | * | * | | | | | | * | | | | | | |
| S2 | | | | * | * | | | | | | * | <u>32-bit command (</u> 13 STEP) | | | | | |
| D | | | | | | | | | | | * | | DEDIV Continuous DEDIVP Pulse execution type execution type | | | | |
| Plea | Please refer to the function specifications table for each device in series for the scope of device usage | | | | | | | | | | | | | | | | |
| Ex | S₁: dividend. S₂: divisor. D: quotient and remainder. When the content of the register designated by S₁ is divided by the content of the register designated by S₂, the quotient will be stored in the register designate by D; division is performed entirely using binary floating-point numbers. | | | | | | | | | | | | | | | | |
| | If the source operand S₁ or S₂ designates a constant K or H, the command wil transform that constant into a binary floating point number for use in division. | | | | | | | | | | | | | | | | |
| Example When X1=On, the binary floating point number (D1, D0) w be divided by the binary floating point number (D11, D10 and the quotient stored in the register designated by (D2- D20). | | | | | | | | | | | | | floating point number (D11, D10), | | | | |

| DEDIV D0 D10 D20 |
|------------------|
|------------------|

When X2 =On, the binary floating point number (D1, D0) will be divided by K1,234 (which has been automatically converted to a binary floating-point number), and the results stored in (D11, D10).

|--|

END

| API 124 D EX | P P | | C | s) (| D | | Bi | nary | floating point number obtain exponent | | | | | |
|---|-----|---|----------|---------|--------|-------------|-----------------|---------|---|--|--|--|--|--|
| Bit device | | | V | Vord | devic | e | | | 16-bit command | | | | | |
| X Y M | _ | H | | | KnM | | С | D | | | | | | |
| S | * | * | | | | | | * | | | | | | |
| D | | | | | | | | * | 32-bit command (9 STEP) | | | | | |
| Notes on operand | | | | | | | | | DEXP Continuous DEXPP Pulse execution type execution type | | | | | |
| Please refer to th series for the score | | | | tions 1 | able f | or ead | ch dev | vice in | | | | | | |
| series for the scor | | vice u | Saye | | | | | | Flag signal: none | | | | | |
| | | S: operation source device. D: operation results device. | | | | | | | | | | | | |
| Explanation | - | | | | | | | | | | | | | |
| | | ■ Taking e =2.71828 as a base, S is the exponent in the EXP operation. | | | | | | | | | | | | |
| | _ | | | | | | | 1 | | | | | | |
| | | Į L |)+1, | D]= | EXP | 'S + | ۲ ، S | 1 | | | | | | |
| | • | e content of S has a positive or negative D must have a 32-bit data format. This pating-point numbers, and S must therefore | | | | | | | | | | | | |
| | | | | | | | | | number. | | | | | |
| | - | Сс | onten | t of o | pera | nd D | =e ^s | ; e=2 | 2.71828, S is the designated source data | | | | | |
| Example | • | | | | | | | • | 01, D0) will be converted to a binary floating ed in register (D11, D10). | | | | | |
| | • | When M1 is On, the EXP operation is performed on the exponent of (D D10); its value is a binary floating point number stored in register (D D20). | | | | | | | | | | | | |
| | | 02 | с). Т | Μ | 0 | | | | | | | | | |
| | | | | | | | | | DFLT D0 D10 | | | | | |
| | | | | М | 4 | | | | | | | | | |
| | | | | | I | | | | DEXP D10 D20 | | | | | |
| | | | | | | | | | DENI DIO DZO | | | | | |

| API D LN P S D Binary floating point number obtain logarithm | | | | | | | | | | floating point number obtain logarithm | | | |
|---|--------------------|------|------|---|----------|----------------|-------------|---------|-------------------|--|----------------|--|--|
| | Bit o | dev | rice | | | ٧ | Vord | devic | e | | | 16-bit command | |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | | |
| S | | | | * | * | | | | | | * | 32-bit command (9 STEP) | |
| | es on c | | | | | | | | | | * | DLN Continuous DLNP Pulse | |
| | se ret es for t | | | | | | tions | able to | or eaci | n dev | vice in | Flag signal: none | |
| Ex | plana | tior | I) | | S: | oper | ation | sour | ce de | vice | . D : c | peration results device. | |
| Taking e =2.71828 as a base, S is the exponent in the EXP operation. [D+1, D]=EXP[[]S+1, S[]] | | | | | | | | | | | | | |
| | | | | | [[|)+1; | D]= | EXP | [[] S +1 | , S |] | | |
| Valid regardless of whether the content of S has a positive or negative. The designated register D must have a 32-bit data format. The operation is performed using floating-point numbers, and S must therefore be converted to a floating point number. | | | | | | | | | | | | | |
| | | | | | Сс | onten | t of o | perar | nd D = | =e ^s | ; e=2 | .71828 , S is the designated source data | |
| [| Examp | ole | | | | | | | | | | 1, D0) will be converted to a binary floating d in register (D11, D10). | |
| | | | | | D1 D2 | 0); it: 0). | | | | | | ation is performed on the exponent of (D11, ting point number stored in register (D21, | |
| | | | | | r | ло | | | | | [| DFLT D0 D10 | |
| | | | | | N | Л1 | | | | | [| DLN D10 D20 | |
| | | | | | | | | | | | | END | |

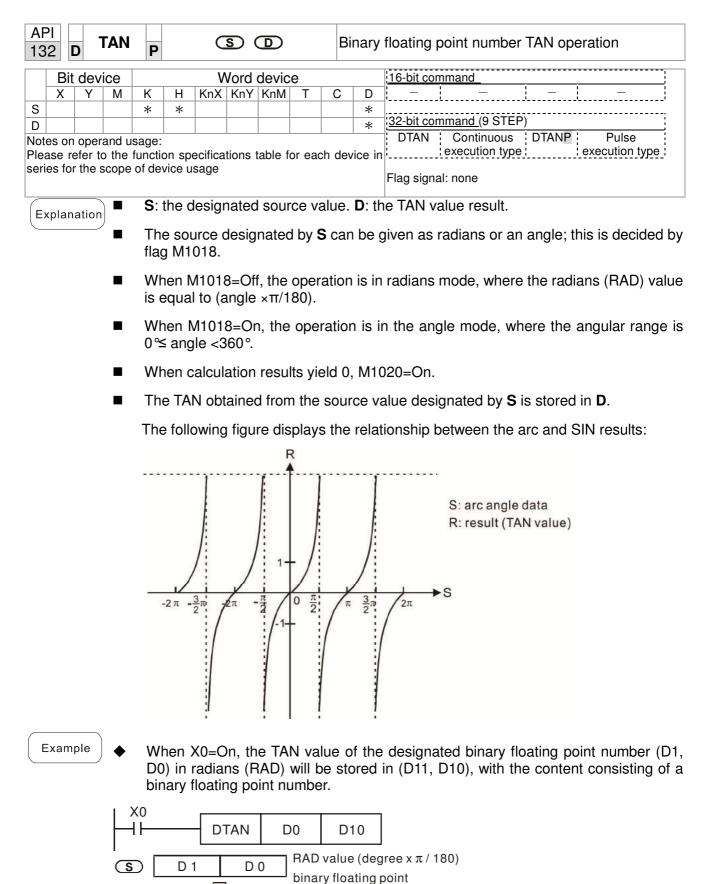
| AP | |) ES | SQR | Ρ | | C | <u>s</u> (| D | | Bi | nary | floating point number find square root | | | | |
|--|-------|--------|-----|---|----------|-----------------------------------|------------|---------|--|-------|--------------|---|--|--|--|--|
| | Bit | dev | ice | | | V | /ord | devic | e | | | 16-bit command | | | | |
| | Х | Y | M | K | Н | KnX | KnY | KnM | Т | С | D | | | | | |
| S | | | | * | * | | | | | | * | 3 <u>2-bit command (</u> 9 STEP) | | | | |
| Plea | se re | fer to | | | | ecificat age | ions t | able fo | or eac | h dev | * rice in | DESQR Continuous DESQR Pulse | | | | |
| Ex | plan | ation |) | | S: ro | | ce de | evice | re root is desired D : result of finding square | | | | | | | |
| When the square root is taken of the content of the register desi S, the result is temporarily stored in the register designated by square roots is performed entirely using binary floating-point num | | | | | | | | | | | | | | | | |
| If the source operand S refers to a constant K or H, the community transform that constant into a binary floating point number for us operation. | | | | | | | | | | | | | | | | |
| E | xamp | ole | • | | | | | | | | | en of the binary floating point number (D1, gister designated by (D11, D10). | | | | |
| | | | | | \vdash | X0 ┨┠── | | DE | SQR | [| D0 | D10 | | | | |
| | | | | | | (D1, Sinary flo oint | ' | I | (D11 , Binary f point | | , | | | | | |
| | | | • | | nvert | | | | | | | en of K1,234 (which has been automatically number), and the results stored in (D11, | | | | |



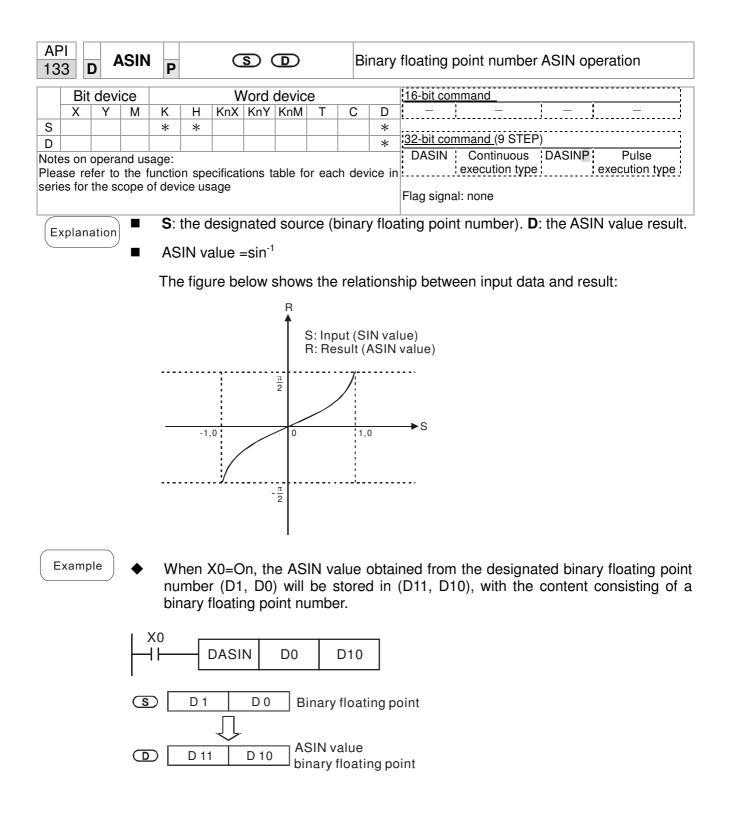
| | 29 D INT P S D numb | | | | | | | | | | - | floating r transfor | • | number | \rightarrow | BIN | whole |
|-------------|--|-----|--------|------|------|--------|-------|--------|---------|--------|--------|------------------------|-----------|----------------------|---------------|--------------|------------------|
| | Bit | dev | ice | | | V | /ord | devic | e | | | 16-bit com | mand | | | | |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | | | | - ! | | - |
| S | | | | | | | | | | | * | 22 hit com | mond (| | | | |
| D | | | | | | | | | | | * | 32-bit com | | | | | |
| | | | nd usa | | | | | | | | | DINT | | ious DIN h type : | | - | ulse ion type |
| | lease refer to the function specifications table for each device in eries for the scope of device usage | | | | | | | | | | | ' <u>'</u> | execution | Туре | | , ACCUL | ion type |
| sene | mes for the scope of device usage | | | | | | | | | | | Flag signal | : none | | | | |
| | S : the source device to be transformed. D : results of transformation. | | | | | | | | | | | | | | | | |
| Ex | (Explanation) S : the source device to be transformed. D : results of transformation. | | | | | | | | | | | | | | | | |
| \subseteq | ■ The content of the register designated by S is transformed from a bina | | | | | | | | | | | | | | binony | | |
| | floating point number format into a BIN whole number, and is temporari | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | stored in D . The BIN whole number floating point number will be discarded | | | | | | | | | | | | | arded. | | | |
| | | | | | Th | a acti | ion o | f this | | nmar | nd is | the oppo | nsite of | that of c | omm | and <i>i</i> | 4 PI 49 |
| | | | | - | (FL | | | n tine | 5 001 | mai | 10 15 | ine oppe | 5110 01 | that of t | | | 11 40 |
| | | | | | (1 - | ••)• | | | | | | | | | | | |
| — | | | | | | | | | | | | | | | | | |
| (E) | kamp | le | | | | | | | | | | int numbe | | | | | |
| | | | | BIN | who | ole ni | umbe | er, ar | nd th | e res | sult i | s stored i | in (D10 |); the BI | N wh | ole n | lumber |
| | | | | floa | ting | point | num | ber w | vill be | e disc | arde | d. | | | | | |
| | | | | | | | Vo | | | | | | | | | | |
| | | | | | | | X0 | | | | | | | | | | |
| | | | | | | | | | | | | | INT | D0 D | 10 | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | EI | VD | | |
| | | | | | | I | | | | | | | | | | | |

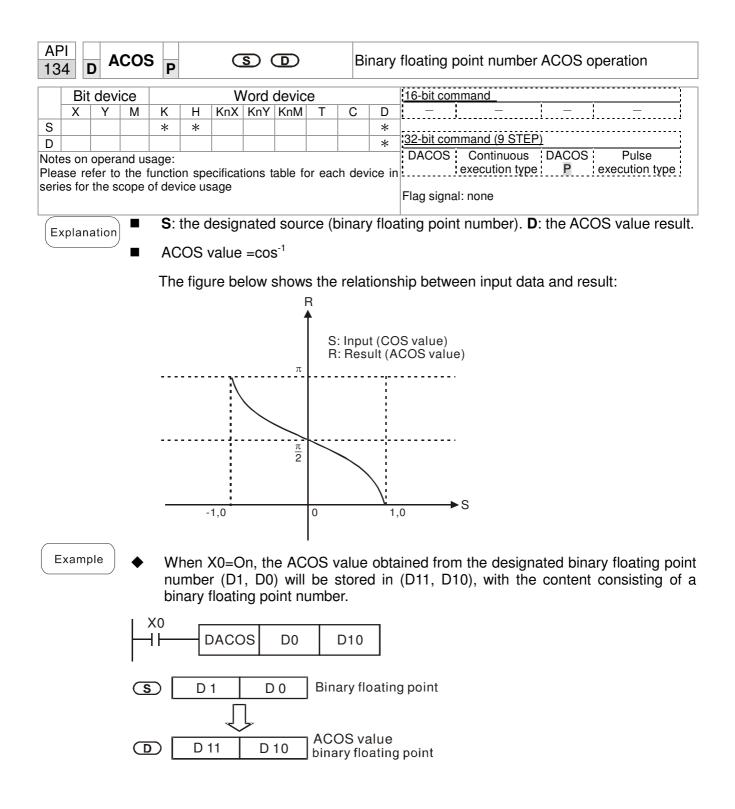
| AP 130 | | D | SIN | Ρ | | C | s) (| D | | Bi | nary | floating point number SIN operation | | | | |
|---|--|----------|----------|--------|-------------------------------|---------|-------------------------------|--------------|-------|----|----------|---|--|--|--|--|
| | Bi | t devid | ce | | | V | /ord | devic | е | | | 16-bit command | | | | |
| | Х | Y | M | Κ | Н | | | KnM | Т | С | D | | | | | |
| S | | | | * | * | | | | | | * | : <u>32-bit command (</u> 9 STEP) | | | | |
| D Notes | on on | erand u | Isade. | | | | | | | | * | DSIN Continuous DSINP Pulse | | | | |
| | | to the f | | n spec | cificat | ions ta | execution type execution type | | | | | | | | | |
| for the | e scope | e of dev | vice usa | age | | | | | | | | Flag signal: none | | | | |
| Expl | S: the designated source value. D: the SIN value result. S is the designated source in radians. The value in radians (RAD) is equal to (angle ×π/180). | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| • The SIN obtained from the source value designated by S is stored in D . | | | | | | | | | | | | | | | | |
| | The following figure displays the relationship between the arc and SIN results: R S: Radian R: Result (SIN value) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | 2π - | $\frac{1}{\frac{3}{2}\pi}$ -2 | 2π - | $\frac{1}{\frac{\pi}{2}}$ | | | | π | 2π→s | | | | |
| | | | <u>.</u> | | 2 | | 2 -1 | | | 2 | <u> </u> | | | | | |
| Exa | ample | ♦ | D0) | in ra | adiar | ıs (R | AD) | | e sto | | | signated binary floating point number (D1, D11, D10), with the content consisting of a | | | | |
| | | | (0 | | DS | SIN | D | 0 | D1 | 0 | | | | | | |
| | | (\$ | | D 1 | Л Г | D(|) | RAD binai | | | | | | | | |
| | | | | D 11 | Ť | D 1 | 0 | SIN binar | | | poin | t | | | | |

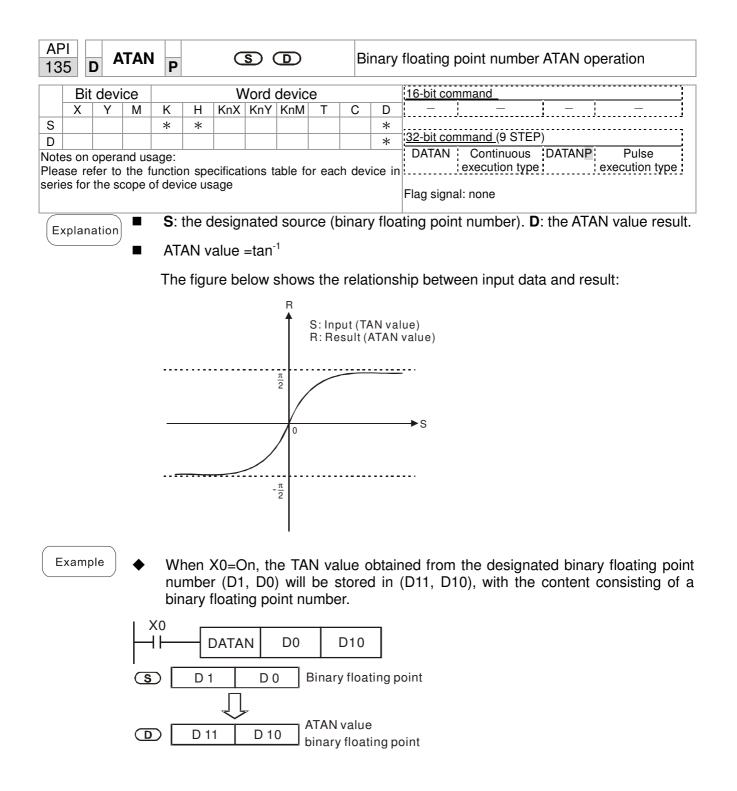
| AP 131 | | D | cos | Ρ | | C | <u>s</u> (| Ð | | Bi | nary | floating | point number | COS oper | ration |
|-----------|------|----------|--------------|--------|---------|----------------|------------|-----------------|---------|------------------|---------|----------------------|-----------------------|-------------|---------------------------------|
| | Die | t dev | <i>i</i> ioo | | | ۱۸ | lord | devic | | 1 | | 16-bit cor | mand | | |
| - | | | | K | Н | | | KnM | | С | D | | | | |
| S | ~ | <u> </u> | | * | * | | | | - · | | * | | | JJ | |
| D | | | | | | | | | | | * | s | <u>mmand (</u> 9 STEP | | |
| Notes | s on | oper | and usa | age: | | | | | | | | DCOS | Continuous | DCOSP | Pulse |
| | | | | | | | ions t | able fo | or eac | h dev | ice in | ! | execution type | i ie | xecution type |
| serie | SIO | tries | scope o | dev | ice us | age | | | | | | Flag signa | al: none | | |
| Ex | plan | atior | n) 🔳 | S: | the c | lesigr | nated | l sou | rce v | alue. | D: tł | ne COS v | value result. | | |
| | | | | | | ource d by | | - | | by S | can | be give | en as radian | is or an a | ngle; this is |
| | | | • | | | M101 s equa | | | • | | | in radia | ns mode, wł | nere the ra | adians (RAD) |
| | | | • | | | /101 gle <3 | | n, the | ope | ratior | n is ir | n the ang | gle mode, wh | ere the an | gular range is |
| | | | • | Wł | nen c | alcul | ation | resu | ilts yi | eld 0 | , M1(|)20=On. | | | |
| | | | • | Th | e CC |)S ob | taine | d fro | m the | e sou | rce v | alue des | signated by S | is stored i | n D . |
| | | | | The | e follo | owing | , figu | re dis | splay | s the | relat | ionship | between the a | arc and SI | N results: |
| | | | | | | | | | R | | | S: Radia | an | | |
| | | | | | | | | | 1 | | | R: Resu | lt (COS valu | e) | |
| | | | | | | | | | | | | / | | | |
| | | | | | -2 π | $-\frac{3}{2}$ | -2π | $\frac{\pi}{2}$ | | $\frac{1}{2}$ | | $\pi \frac{3}{2}\pi$ | 2π S | | |
| | | | | | | | | | -1 | | | <u></u> | | | |
| Ex | amp | ole | • | D0 |) in r | | ns wi | ll be | | | | | | | t number (D1, ng of a binary |
| | | | | <0 | | DC | cos | | 00 | D | 10 | | | | |
| | | | (\$ | | D | | D | 0 | | | • | τ/180) point | | | |
| | | | | | D | 1 | ۳ D 1 | 0 | | s valı ry flo | | point | | | |











| AP 13 | | 5 | SINH | Ρ | | C | S (| Ð | | В | inary | floating point number SINH operation | | | | | |
|--|--|------|-------|---------|-----|------|--------|---------|--------|-------|---------|--------------------------------------|--|--|--|--|--|
| | Bit | devi | ce | | | V | lord | devic | e | | | 16-bit command | | | | | |
| | Х | Y | М | Κ | Н | KnX | KnY | KnM | Т | С | D | | | | | | |
| S | | | | * | * | | | | | | * | | | | | | |
| D | | | | | | | | | | | * | 32-bit command (9 STEP) | | | | | |
| | | | nd us | | | | | | | | | DSINH Continuous DSINHP Pulse | | | | | |
| | | | | | | | ions t | able fo | or eac | h dev | vice in | execution type : : execution type : | | | | | |
| series for the scope of device usage Flag signal: none Flag signal: none S: the designated source (binary floating point number). D: the SINH value result | | | | | | | | | | | | | | | | | |
| E | SINH value =(e^s-e^{-s})/2 When X0=On, the SINH value obtained from the designated binary floating point number (D1, D0) will be stored in (D11, D10), with the content consisting of a binary floating point number. | | | | | | | | | | | | | | | | |
| | | | | <0 I | [] | DSIN | Н | D0 | 1 | D10 | | | | | | | |
| | S D1 D0 binary floating point | | | | | | | | | | | | | | | | |
| | | | | | - П | 11 | | 10 | ן SINF | lvalı | le | | | | | | |

binary floating point

D 11

D 10

| AP 13 | | c | OSł | I P | | C | <u>s</u> (| D | | Bi | nary f | loating point number COSH operation | | |
|-------------|--|-----|-----|--------|-------------------|---------|------------|--------|--------|-------------------|---------------|-------------------------------------|--|--|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit command | | |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | | | |
| S | | | | * | * | | | | | | * | 32-bit command (9 STEP) | | |
| D | | | | | | | | | | | - 10 L | DCOSH Continuous DCOSHP Pulse | | |
| | | | | sage: | | olifico | tione t | abla f | or oor | h day | | execution type execution type | | |
| | eries for the scope of device usage | | | | | | | | | | | | | |
| | | | | 0.00 | Flag signal: none | | | | | | | | | |
| \subseteq | S: the designated source (binary floating point number). D: the COSH value result. COSH value =(e^s+e^{-s})/2 When X0=On, the COSH value obtained from the designated binary floating point number (D1, D0) will be stored in (D11, D10), with the content consisting of a binary floating point number. | | | | | | | | | | | | | |
| | | | ; | ×0 | C | COS | н | D0 | | D10 | | | | |
| | | | S | D [| D | 1 [| D | 0 | bina | ry floa | ting po | int | | |
| | | | | D [| D 1 | 1 | D | 10 | | SH val ry floa | ue ting po | bint | | |

| | API D TANH P S D Binary floating point number TANH operation Bit device Word device 16-bit command 16-bit command | | | | | | | | | | | | | |
|---|---|--------|-----|---------|-------|---------|-------|----------|--------|-------------------|---------------|-------------------------------|--|--|
| | Bit | t dev | ice | | | V | Vord | devic | е | <u>1</u> | 6-bit command | | | |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | | | |
| S | | | | * | * | | | | | | * : | 32-bit command (9 STEP) | | |
| D | | | | | | | | | | | | DTANH Continuous DTANHP Pulse | | |
| | | n oper | | | n sne | ocifica | tions | tahle fi | or eac | h dev | | execution type execution type | | |
| | series for the scope of device usage Flag signal: none | | | | | | | | | | | | | |
| | Explanation S: the designated source (binary floating point number). D: the TANH value result. | | | | | | | | | | | | | |
| | $\blacksquare \text{tanh value} = (e^{s} - e^{-s})/(e^{s} + e^{-s})$ | | | | | | | | | | | | | |
| | $\blacksquare \tanh value = (e^{s} - e^{-s})/(e^{s} + e^{-s})$ | | | | | | | | | | | | | |
| E | Example When X0=On, the TANH value obtained from the designated binary floating point number (D1, D0) will be stored in (D11, D10), with the content consisting of a binary floating point number. | | | | | | | | | | | | | |
| | | | | ×0 I | [C | TAN | н | D0 | | D10 | | | | |
| | | | S | > [| D | 1 | D | 0 | bina | ry floa | ting poi | int | | |
| | | | | d [| D 1 | 1 | D | 10 | | H valu ry floa | e ting poi | int | | |

| AP 16(| | Т | СМР | Ρ | S | | | <u>S</u> 3) | S | Ð | C | Comparison of calendar data | |
|--|-------|-----------------|--------|----------------|----------------|----------------|--------------|---------------|------------------|-----------------|-------------|--|--|
| | Bit | dev | ice | | | V | Vord | devic | :e | | 1 | | |
| F | X | Y | M | K | Н | | KnY | | , т т | С | D | 16-bit command (11 STEP) | |
| 1 | | | | * | * | * | * | * | * | * | * | TCMP Continuous TCMPP Pulse | |
| 2 | | | | * | * | * | * | * | * | * | * | execution type execution type | |
| 3 | | | | * | * | * | * | * | * | * | * | <u>32-bit command</u> | |
| ╞ | | * | * | | | | | | * | * | * | | |
| а | se re | oper efer to | and us | unction of dev | vice us | sage | | | ior eac | | | | |
| :x | plan | ation |) - | mir the | nutes con | of th npari | ne co | mpar time, | rison t setti | time, | setti | In time, setting range is "K0-K23." S_2 : Sets the ting range is "K0-K59." S_3 : Sets the seconds o e is "K0-K59." S : current calendar time. D | |
| | | | • | cal | | r tim | ie in | | | - | | es, and seconds set in $\mathbf{S_1}$ - $\mathbf{S_3}$ with the curren and seconds, with the results of comparisor | |
| | | | • | mir | nutes | of th | ie cui | rrent | caler | ndar t | ime, | alendar time is "K0-K23." $S + 1$ comprises the , and consists of "K0-K59." $S + 2$ comprises the , and consists of "K0-K59." | |
| seconds of the current calendar time, and consists of "K0-K59." The current calendar time designated by S is usually compared using the TCMP command after using the TRD command to read the current calendar time. If the content value of S exceeds the range, this is considered an operating error, the command will not execute, and M1068=On. | | | | | | | | | | | | | |
| E | xamı | ole | • | D2 dis | 0-D2 playe | 2 wil ed in | l be M10- | com M12 | oared . Whe | l with en X1 | the 0 Or | I execute, and the current calendar time in e preset value of 12:20:45; the results will be $n \rightarrow Off$, the command will not be executed, but will be maintained. | |
| | | | • | par | | | | | of ≥, ≤ M10-l | | ≠ are | e needed, they can be obtained by series and | |
| | | | | (10 | | тс | MP | ĸ | (12 | К | 20 | K45 D20 M10 | |
| | | | 1 | | М [.] | 10 | – ON | wher | 12: 2 | 0: 45 | > | D20 (hr) D21(min) D22(sec) | |
| | | | | | M [.] | 11 | - ON | when | 12: 2(| 0: 45 | = | D20 (hr) D21(min) D22 (sec) | |
| | | | | | M [.] | 12 | – ON | when | 12: 20 | 0:45 | < | D20 (hr) D21 (min) D22(sec) | |

| AF 16 | | - T | ZCF | P | | <u>S1</u> | <u>S2</u> |) (<u>s</u> | D | D | (| Comparison of calendar data | | | | |
|----------|---|-------|-----|-------------------------|-----|-----------|-----------|--------------|-------------------------|---|---|---|--|--|--|--|
| | | dev | 1 | | | 1 | | devic | 16-bit command (9 STEP) | | | | | | | |
| | Х | Y | M | K | Н | KnX | KnY | KnM | Т | C | D | TZCP Continuous TZCPP Pulse | | | | |
| S1 | | | | | | | | | * | * | * | execution type execution type | | | | |
| S2 | | | | | | | | | * | * | * | | | | | |
| S | | | | | | | | | * | * | * | <u>32-bit command</u> | | | | |
| D | | * | * | | | | | | | | | | | | | |
| Plea | D * | | | | | | | | | | | | | | | |
| | | ation |) | S ₁ : | Set | s the | | | | | | parison time. S_2 : Sets the upper limit of the r time D : Besults of comparison | | | | |

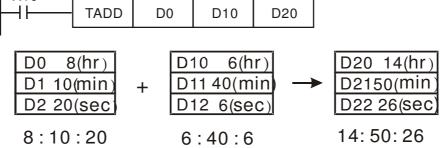
- Performs range comparison by comparing the hours, minutes, and seconds of the current calendar time designated by S with the lower limit of the comparison time set as S₁ and the upper limit of the comparison time set as S₂, and expresses the results of comparison in D.
- **S**₁ \cdot **S**₁ +1 \cdot **S**₁ +2: Sets the hours, minutes, and seconds of the lower limit of the comparison time.
- **S**₂ \cdot **S**₂ +1 \cdot **S**₂ +2: Sets the hours, minutes, and seconds of the upper limit of the comparison time.
- S · S +1 · S +2: The hours, minutes, and seconds of the current calendar time
- The D0 designated by the **S** listed in this program is usually obtained by comparison using the TZCP command after using the TRD command in advance to read the current calendar time. If the value of S_1 , S_2 , or **S** exceeds the range, this is considered an operating error, the command will not execute, and M1068=On.
- When the current time **S** is less than the lower limit value **S**₁ and **S** is less than the upper limit value **S**₂, **D** will be On. When the current time **S** is greater than the lower limit value **S**₁ and **S** is greater than the upper limit value **S**₂, **D** +2 will be On; **D** +1 will be On under other conditions.

Example

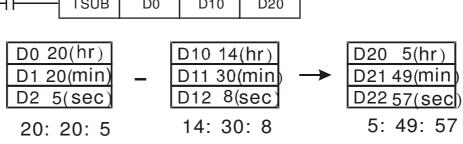
■ When X10=On, the TZCP command executes, and one of M10-M12 will be On. When X10=Off, the TZCP command will not execute, and M10-M12 will remain in the X10=Off state.

| X10 | | | | | | | | |
|-----|----------------|-------------------|-------------------------------|-----|---|---------------------------------|----|------------------------------------|
| | | TZCP | D0 | D2(| C | D10 | | VI10 |
| I | М ⁻ | 10 N when | D0 (hr) D1 (min D2 (sec | | D | 10 (hr) 11 (min) 12 (sec) | | |
| | | 11 Nwhen | D0 (hr) D1 (min D2 (sec | 4 – | D | 10 (hr) 11 (min) 12 (sec) | <= | D20 (hr) D21 (min) D22 (sec) |
| | | 12 Nwhen | | | D | 10 (hr) 11 (min) 12 (sec) | > | D20 (hr) D21(min) D22 (sec) |

| AF 16 | | - T | ADD | Ρ | | 3 | <u>5</u>) (| <u>S</u> 2 | D | | C | Calendar data addition | |
|---|--------|------------|--------------------------|-------------------|--------|-------|--------------|------------|-------------------------|--|---|--|--|
| | Bit | dev | ice | | | V | Vord | devic | 16-bit command (7 STEP) | | | | |
| | X | Y | M | K | Н | | | KnM | T | С | D | TADD Continuous TADDP Pulse | |
| S1 | | | | | | | | | * | * | * | execution type execution type | |
| S2 | | | | | | | | | * | * | * | 32-bit command | |
| D | | | | | | | | | * | * | * | | |
| Plea | ase re | efer to | and us the fuscope of | unction of dev | vice u | sage | | | | Flag signal: M1020 Zero flag M1022 Carry flag M1068 Calendar error | | | |
| S₁: time addend. S₂: time augend. D: time sum. The calendar data in hours, minutes, and seconds designated by S₂ is add calendar data in hours, minutes, and seconds designated by S₁, and the stored as hours, minutes, and seconds in the register designated by D. If the value of S₁ or S₂ exceeds the range, this is considered an operating command will not execute, M1067, M1068=On, and D1067 will record code 0E1A(HEX). If the results of addition are greater than or equal to 24 hours, or equal to 24 hours. | | | | | | | | | | | | | |
| | | | • | lf ti | | sults | | | • | • | | esults of addition minus 24 hours. o 0 (0 hours, 0 minutes, 0 seconds), zero flag | |
| Example When X10=On, the TADD command will be executed, and the calendar data in hours, minutes, and seconds designated by D0 to D2 will be added to the calendar data in hours, minutes, and seconds designated by D10 to D12, and the results are stored as a total number of hours, minutes, and seconds in the registers designated by D20 to D22. | | | | | | | | | | | | | |
| | | | | X | (10 | Г | | | | | | | |



| API 163 | - | ISUB | Ρ | | 3 | 50 (| <u>S</u> 2) (| D | | C | Calenda | r data su | otraction | | | |
|--|-------|-------------------|---|---|------|-------|---------------|------|-------|-----|-----------------|--------------|--|-------------------|--|--|
| B | it de | vice | | | V | Vord | devic | е | | | <u>16-bit o</u> | command | | | | |
| Х | Y | Μ | Κ | Н | KnX | KnY | KnM | Т | С | D | TSUE | | | | | |
| 1 | | | | | | | | * | * | * | F | execution | on type | execution type | | |
| 2 | | | | | | | | * | * | * | | | | | | |
|) | | rand us | | | | | | * | * | * | | | - ! _ | <u> </u> | | |
| ease | refer | to the f scope | unction of de | on spe vice u | sage | | | | | | • Fla | M1 M1 | 1020 Zero flag 022 Carry flag 068 Calendar err | or | | |
| Evola | natio | | S_1 : time minuend. S_2 : time augend. D: time sum. | | | | | | | | | | | | | |
| the calendar data in hours, minutes, and se is temporarily stored as hours, minutes, and D. If the value of S₁ or S₂ exceeds the range, th command will not execute, M1067, M1068 and 0E1A(HEX) | | | | | | | | | | | his is con | sidered an o | perating error, tl | | | |
| | | • | lf s | code 0E1A(HEX). If subtraction results in a negative number, borrow flag M1021=On, and the result of that negative number plus 24 hours will be displayed in the register designated by | | | | | | | | | | | | |
| | | • | | he re 020= | | of su | ıbtrac | tion | are e | qua | ll to 0 (0 | hours, 0 | minutes, 0 s | econds), zero fla | | |
| Example When X10=On, the TADD command will be executed, and the calendar data in hours, minutes, and seconds designated by D10 to D12 will be subtracted from the calendar data in hours, minutes, and seconds designated by D0 to D2, and the results are stored as a total number of hours, minutes, and seconds in the registers designated by D20 to D22. | | | | | | | | | | | | | | | | |
| | | | | | 10 | | TSUE | 3 | D0 | Τ | D10 | D20 | | | | |



| AF 16 | | | ſRD | P | | | | | | | C | Calendar data read | | | | | |
|------------|-----------------|-------|-------|------------------|--------|---------|---------|---------|-------------------------|-------------------|--------------------------|-------------------------------|--|--|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | 16-bit command (3 STEP) | | | | | | | | |
| | Х | | | | | | | KnM | Т | D | TRD Continuous 120 Pulse | | | | | | |
| D | | | | | | | | | * | * | * | execution type execution type | | | | | |
| Not Ple | es on ase re | oper | and u | sage: functio | on spe | ecifica | tions t | able fo | or ead | ch dev | ice in | in <u>32-bit command</u> | | | | | |
| seri | es foi | the s | scope | of dev | /ice u | sage | | | on out | | | | | | | | |
| | | | | | | | | | | Flag signal: none | | | | | | | |

- **S**₁: time minuend. S_2 : time augend. **D**: time sum.
 - D: device used to store the current calendar time after reading.
- The EH/EH2/SV/EH3/SV2/SA/SX/SC main units have a built-in calendar clock, and the clock provides seven sets of data comprising year, week, month, day, hour, minute, and second stored in D1063 to D1069. The TRD command function allows program designers to directly read the current calendar time into the designated seven registers.
- D1063 only reads the two right digits of the Western calendar year.
 - When X0=On, the current calendar time is read into the designated registers D0 to D6.
 - In D1064, 1 indicates Monday, 2 indicates Tuesday, and so on, with and 7 indicating Sunday.



| Special D | Item | Content | | General D | Item |
|--------------|-------------------|---------|---|--------------|-------------------|
| D1063 | Year (Western) | 00~99 | - | D0 | Year (Western) |
| D1064 | Weeks | 1~7 | + | D1 | Weeks |
| D1065 | Month | 1~12 | + | D2 | Month |
| D1066 | Day | 1~31 | + | D3 | Day |
| D1067 | Hour | 0~23 | → | D4 | Hour |
| D1068 | Minute | 0~59 | + | D5 | Minute |
| D1069 | Second | 0~59 | → | D6 | Second |

Example

Explanation

| AF 17 | |) | GRY | Ρ | | | S | | C | | E | BIN→GRAY code transformation | | | |
|--|---|-----|-----|--------|----------|-----------------|----------|-------------------|-----------|--|--------|--|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | e | | | 16-bit command (5 STEP) | | | |
| S | Х | Y | Μ | K * | H * | KnX * | KnY * | KnM * | T * | C * | D * | GRY Continuous GRYP Pulse execution type execution type | | | |
| D | | | | | | | * | * | * | * | * | | | | |
| Plea | Notes on operand usage: Please refer to the function specifications table for each device in series for the scope of device usage • Flag signal: none S: source device. D: device storing GRAY code. | | | | | | | | | | | | | | |
| E | Explanation S: source device. D: device storing GRAY code. | | | | | | | | | | | | | | |
| | | |) | | | | | | | value) of the device designated by S to GRAY designated by D . | | | | | |
| The valid range of S is as shown below; if this range is exceed considered an error, and the command will not execute. | | | | | | | | | | | | | | | |
| | | | | 16- | bit co | omma | and: (| 0~32 | ,767 | | | | | | |
| | | | | 32- | bit c | omm | and: | 0~2, ⁻ | 147,4 | 183,6 | 47 | | | | |
| E | Exam | ple |) | ٠ | | nen 3 pred i | | | ie co | onsta | nt k | (6513 will be transformed to GRAY code and | | | |
| | | | | | \vdash | (0 | _ | GRY | k | 6513 | 3 | DO | | | |
| | | | | | | K65 | 13=H | 1971 | b15 00 | 0 1 | 1 0 | | | | |
| | | | | | GR. | AY C | ODE | 6513 | b15 00 | 0 1 | 0 1 | ьо 0111001001 D0 | | | |

| API 171 D | GBIN | Ρ | | | S | | C | | (| GRAY code →BIN transformation | | | | |
|--|---|------------|---------------|-------------|--------------------------------|-------------------|-----|--------|--------|---|--|--|--|--|
| Bit de X | evice / M | K * | H * | | | devic KnM * | | C * | D * | 16-bit command(5 STEP) GBIN Continuous GBINP Pulse execution type execution type execution type | | | | |
| Please refe | Notes on operand usage: Please refer to the function specifications table for each device in series for the scope of device usage • Flag signal: none • Flag signal: none | | | | | | | | | | | | | |
| Explanati | on | tra The | nsfor e GF | matic | on. code | corr | | | | | | | | |
| This command will transform the value of the absolute position encoder co with the PLC's input and (this encoder usually has an output value in the GRAY code) into a BIN value, which is stored in the designated register. | | | | | | | | | | | | | | |
| | The valid range of S is as shown below; if this range is exceeded, it wil considered an error, and the command will not execute. | | | | | | | | | | | | | |
| | | | | omma omm | | | | 483,6 | 647 | | | | | |
| Example | • | • | | th inp | | | | | | de of the absolute position encoder connected Il be transformed into BIN value and stored in | | | | |
| | | | | 20 | | GBIN | | K4X0 |) | D10 | | | | |
| | | | GR | AY C | K4X0 x0 0 1 1 1 0 0 1 0 0 1 | | | | | | | | | |
| | | | | H197 | 71=K | 6513 | b15 | 0 1 | 1 0 | | | | | |

| 215 21 | 5~ I | D | LD# | | | | S1) (| <u>S2</u>) | | C | Conta | ct form logical operation LD# | | | |
|-----------|-------|---------|-------|-------|--------|---------|-------|-------------|-------------------------|-------|---------|-------------------------------|--|--|--|
| | Bit | dev | ice | | | V | Vord | devic | 16-bit command (5 STEP) | | | | | | |
| | Х | Y | M | Κ | Н | KnX | KnY | KnM | Т | С | D | LD# Continuous – – | | | |
| S1 | | | | * | * | * | * | * | * | * | * | execution type | | | |
| S2 | | | | * | * | * | * | * | * | * | * | 32-bit command (9 STEP) | | | |
| Not | es on | oper | and u | sage: | # : | & \ \ | ٨ | | | | | DLD# Continuous – – | | | |
| | | | | | | | tions | table f | or ead | ch de | vice in | execution type | | | |
| seri | es fo | r the i | range | ofdev | /ice u | sage | | | | | | Flag signal: none | | | |

```
Explanation
```

S₁: data source device 1. **S**₂: data source device 2.

- This command performs comparison of the content of S_1 and S_2 ; when the result of comparison is not 0, this command will be activated, but this command will not be activated when the result of comparison is 0.
- The LD#This command can be used while directly connected with the busbar

| API No. | 16-bit commands | 32-bit commands | | | tions fo vation | or | Conditio | ons f | or inacti | vation |
|---------|--------------------|--------------------|----------------|---|--------------------|----|----------------|-------|----------------|--------|
| 215 | LD& | DLD& | S ₁ | & | S ₂ | ≠0 | S ₁ | & | S ₂ | =0 |
| 216 | LD | D LD | S ₁ | | S ₂ | ≠0 | S ₁ | | S ₂ | =0 |
| 217 | LD^ | DLD^ | S ₁ | ۸ | S ₂ | ≠0 | S ₁ | ^ | S ₂ | =0 |

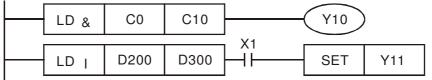
&: logical AND operation.

: logical OR operation.

^: logical XOR operation.

Example

- When the content of C0 and C10 is subjected to the logical AND operation, and the result is not equal to 0, Y10=On.
- When the content of D200 and D300 is subjected to the logical OR operation, and the result is not equal to 0, and X1=On, Y11=On and remains in that state.



| AF 218 220 | ·~ r | , А | ND# | ŧ — | | | 61) (| S 2) | | С | ontac | t form logical operation AND# |
|------------------|---|-----|-----|-----|---|-----|-------|-------------|---|---|---------|-------------------------------|
| | Bit device Word device | | | | | | | | | | | 16-bit command (5 STEP) |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | AND# Continuous – – |
| S1 | S1 * </td <td>*</td> <td>*</td> <td>execution type</td> | | | | | | | | | * | * | execution type |
| S2 | | | | | | | | | | * | * | 32-bit command (9 STEP) |
| Plea | 2 * | | | | | | | | | | vice in | DAND# Continuous – – |

Explanation **S**₁: data

S₁: data source device 1. **S**₂: data source device 2.

- This command performs comparison of the content of S_1 and S_2 ; when the result of comparison is not 0, this command will be activated, but this command will not be activated when the result of comparison is 0.
- The AND# command is an operation command in series with the contact.

| AF | PI No. | 16-bit commands | 32-bit commands | | | tions fo vation | or | Conditio | ons f | or inactiv | vation |
|----|--------|--------------------|--------------------|----------------|---|--------------------|----|----------------|-------|----------------|--------|
| | 218 | AND& | DAND& | S ₁ | & | S ₂ | ≠0 | S ₁ | & | S ₂ | =0 |
| | 219 | AND | D AND | S ₁ | | S ₂ | ≠0 | S ₁ | | S ₂ | =0 |
| | 220 | AND^ | DAND^ | S ₁ | ^ | S ₂ | ≠0 | S ₁ | ۸ | S ₂ | =0 |

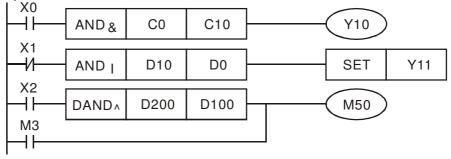
&: logical AND operation.

: logical OR operation.

^: logical XOR operation.

Example

- When X0=On and the content of C0 and C10 is subjected to the logical AND operation, and the result is not equal to 0, Y10=On.
- When X1=Off and D10 and D0 is subjected to the logical OR operation, and the result is not equal to 0, Y11=On and remains in that state.
- When X2 =On and the content of the 32-bit register D200(D201) and 32-bit register D100(D101) is subjected to the logical XOR operation, and the result is not equal to 0 or M3=On, M50=On.



| AF 22 ⁻ 22 | ~ | D | OR# | | | (S1) (S2) | | | | | | ct form logical operation OR# | |
|-----------------------------|-------|-------|--------|-------|--------|-----------|-------|---------|---------|------------------|---|-------------------------------|----|
| | Bit | dev | /ice | | | ٧ | Vord | devic | е | | | 16-bit command (5 STEP) | 7 |
| | Х | Y | M | К | H | KnX | KnY | KnM | Т | С | D | OR# Continuous – – | |
| S1 | | | | * | * | * | * | * | * | * | * | execution type | 4 |
| S2 | | | | * | * | * | * | * | * | * | * | | -! |
| Not | es on | ope | rand u | sage: | - | ‡∶&∖ | ^ | | | | | DOR# Continuous – – | ÷ |
| | | | to the | | | | tions | table f | vice in | n execution type | j | | |
| ser | es to | r the | scope | orde | vice u | Isage | | | | | | Flag signal: none | - |

Explanation

S₁: data source device 1. **S**₂: data source device 2.

- This command performs comparison of the content of S₁ and S₂; when the result of comparison is not 0, this command will be activated, but this command will not be activated when the result of comparison is 0.
- The OR# command is an operation command in series with the contact.

| , | API No. | 16-bit commands | 32-bit commands | | | tions fo vation | or | Conditio | ons f | or inacti | vation |
|---|---------|--------------------|--------------------|----------------|---|--------------------|----|----------------|-------|----------------|--------|
| | 221 | OR& | DOR& | S ₁ | & | S ₂ | ≠0 | S ₁ | & | S ₂ | =0 |
| | 222 | OR | D OR | S ₁ | | S ₂ | ≠0 | S ₁ | | S ₂ | =0 |
| | 223 | OR^ | DOR^ | S ₁ | ^ | S ₂ | ≠0 | S ₁ | ^ | S ₂ | =0 |

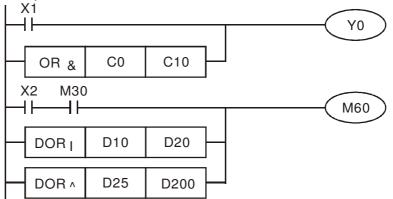
&: logical AND operation.

|: logical OR operation.

^: logical XOR operation.

Example

- When X1=On or the content of C0 and C10 is subjected to the logical AND operation, and the result is not equal to 0, Y0=On.
- When X2 and M30 are both equal to On, or the content of 32-bit register D10 (D11) and 32-bit register D20 (D21) is subjected to the logical OR operation, and the result is not equal to 0, or the content of the 32-bit counter C235 and the 32-bit register D200 (D201) is subjected to the logical XOR operation, and the result is not equal to 0, M60=On.



| 224 | API 224~ 230 D LD% S1 S2 | | | | | | | | | С | ontac | t form compare LD* |
|------|--------------------------------|---------|-------|---|--------|---------|------|-------------------|---------|--|-------------------------|--------------------------------|
| | Bit | dev | ice | | | V | Vord | devic | е | | | <u>16-bit command</u> (5 STEP) |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | LD※ Continuous – – |
| S1 | | | | * | * | * | * | * | * | * | * | execution type |
| S2 | | | | | | | | | | | 32-bit command (9 STEP) | |
| Plea | ase re | efer to | o the | • | on spe | ecifica | | · <> · table f | vice in | DLD ※ Continuous – – execution type | | |
| | | | | | | | | | | | | Flag signal: none |



 S_1 : data source device 1. S_2 : data source device 2.

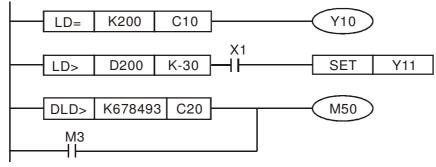
- This command compares the content of **S**₁ and **S**₂. Taking API 224 (LD=) as an example, this command will be activated when the result of comparison is "equal," and will not be activated when the result is "unequal."
- The LD* can be used while directly connected with the busbar

| API No. | 16-bit commands | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|-----------------|---------------------------------|--------------------------------|
| 224 | LD= | D LD= | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 225 | LD> | D LD> | $\mathbf{S_1} > \ \mathbf{S_2}$ | $S_1 \leq S_2$ |
| 226 | LD< | D LD< | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 228 | LD<> | DLD<> | $S_1 \neq S_2$ | $S_1 = S_2$ |
| 229 | LD < = | DLD < = | $S_1 \leq S_2$ | $S_1 > S_2$ |
| 230 | LD>= | D LD>= | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

When the content of C10 is equal to K200, Y10=On.

When the content of D200 is greater than K-30, and X1=On, Y11=On and remains in that state.



| AF 232 233 | ·~ r |) AI | NDX | × – | | | <u>S1</u>) (| <u>S2</u>) | | C | ontac | t form compare AND* |
|------------------|--------|---------|-------|---------|---|---------|---------------|-------------------|---|---|---------|-------------------------|
| | Bit | dev | ice | | | ٧ | Vord | devic | е | | | 16-bit command (5 STEP) |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | AND XContinuous – – – |
| S1 | | | | * | * | * | * | * | * | * | * | execution type |
| S2 | | | | * | * | * | * | * | * | * | * | 32-bit command (9 STEP) |
| Plea | ase re | efer to | b the | functio | | ecifica | | × <> × table f | | | vice in | DAND X Continuous – – |

```
Explanation
```

 S_1 : data source device 1. S_2 : data source device 2.

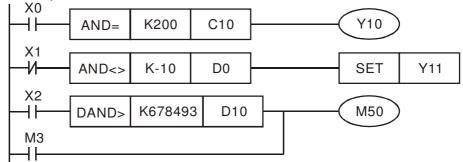
- This command compares the content of S_1 and S_2 . Taking API 232 (AND=) as an example, when the result of comparison is equal, this command will be activated; when the result of comparison is unequal, this command will not be activated.
- The AND* command is a comparison command in series with a contact.

| API No. | 16-bit commands | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|-----------------------|---------------------------------|--------------------------------|
| 232 | AND= | D AND = | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 233 | AND> | D AND> | $\mathbf{S_1} > \ \mathbf{S_2}$ | $S_1 \leq S_2$ |
| 234 | AND< | D AND< | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 236 | AND <> | DAND <> | $S_1 \neq S_2$ | $\mathbf{S_1}=~\mathbf{S_2}$ |
| 237 | AND < = | \mathbf{D} AND $<=$ | $S_1 \leq S_2$ | $\mathbf{S_1} > \mathbf{S_2}$ |
| 238 | AND > = | DAND>= | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

When X0=On and the current value of C10 is also equal to K200, Y10=On.

- When X1=Off and the content of register D0 is not equal to K-10, Y11=On and remains in that state.
- When X2 =On and the content of the 32-bit register D0(D11) is less than 678,493, or M3=On, M50=On.



| 240 | API 240~ 246 D ORX (S1) (S2) | | | | | | | | | С | ontac | t form compare OR* |
|------|--|---|---|---|---|-----|-----|-----|---|---|-------|--|
| | Bit device Word device | | | | | | | | | | | 16-bit command (5 STEP) |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | OR X Continuous – – – |
| S1 | 1 * * * * * * * | | | | | | | | | | * | execution type |
| S2 | | | | | | | | | | | * | 32-bit command (9 STEP) |
| Plea | bites on operand usage: $\%$: = $\cdot > \cdot < \cdot < \cdot \leq \cdot \geq$ ease refer to the function specifications table for each device bries for the scope of device usage | | | | | | | | | | | DOR X Continuous – – – execution type |
| | | | | | | | | | | | | Flag signal: none |

Explanation

 S_1 : data source device 1. S_2 : data source device 2.

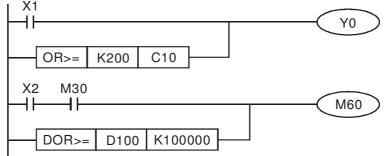
- This command compares the content of S_1 and S_2 . Taking API 240 (OR=) as an example, when the result of comparison is equal, this command will be activated; when the result of comparison is unequal, this command will not be activated.
- The OR* command is a compare command in parallel with a contact.

| API No. | 16-bit commands | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|-----------------|------------------------------|--------------------------------|
| 240 | OR= | D OR= | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 241 | OR> | DOR> | $S_1 > S_2$ | $S_1 \leq S_2$ |
| 242 | OR< | DOR< | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 244 | OR<> | DOR<> | $S_1 \neq S_2$ | $S_1 = S_2$ |
| 245 | OR<= | DOR < = | $S_1 \leq S_2$ | $S_1 > S_2$ |
| 246 | OR>= | DOR>= | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

When X0=On and the current value of C10 is also equal to K200, Y10=On. When X1=Off and the content of register D0 is not equal to K-10, Y11=On and remains in that state.

When X2 =On and the content of the 32-bit register D0(D11) is less than 678,493, or M3=On, M50=On.



| 275 28 | 5~ | F | 'LD) | * | _ | (| <u>S1</u>) | (S2) | | FI | oatin | g point number contact form compare LD* | |
|------------------------|---|---|------|-----------------|---|-----|-------------|---------|--------|-------|---------|---|----|
| Bit device Word device | | | | | | | | devic | е | | | 16-bit command |] |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | | j |
| S1 | | | | | | | | | * | * | * | | -, |
| S2 | | | | | * | | | | | | | 32-bit command (9 STEP) | 4 |
| | S2 * * * Iotes on operand usage: # : & \ \^ 'lease refer to the function specifications table for each device in | | | | | | | | | | | FLD Continuous – – – | |
| | | | | function of dev | | | tions | table f | or eac | h dev | /ice in | Flag signal: none | |

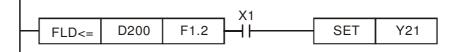
- S₁: data source device 1. S₂: data source device 2.
- This command compares the content of S₁ and S₂. Taking "FLD=" as an example, if the result of comparison is "equal," this command will be activated; but it will not be activated when the result is "unequal."
- The FLD* command can directly input floating point numerical values (for instance: F1.2) to the S₁, S₂ operands, or store floating-point numbers in register D for use in operations.
- This command can be used while directly connected with the busbar

| API No. | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|------------------------------|--------------------------------|
| 275 | FLD= | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 276 | FLD> | $S_1 > S_2$ | $S_1 \leq S_2$ |
| 277 | FLD< | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 278 | FLD<> | $S_1 \neq S_2$ | $S_1 = S_2$ |
| 279 | FLD < = | $S_1 \leq S_2$ | $S_1 > S_2$ |
| 280 | FLD> = | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

Explanation

When the floating point number of register D200 (D201) is less than or equal to F1.2, and X1 activated, contact Y21 will be activated and remain in that state.



Explanation

| 281 28 | ~ | F | AND | * | | (| <u>S1</u>) | (S2) | | FI | Floating point number contact form compare AN | | | | | |
|------------------------|---|---|-----|-----------------|---|------------------|-------------|---------|--------|--------|---|--|--|--|--|--|
| Bit device Word device | | | | | | | | | | | 16-bit command | | | | | |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | | | | | |
| S1 | | | | | | | | | * | * | * | | | | | |
| S2 | | | | | | | | | * | * | * | <u>32-bit command</u> (9 STEP) | | | | |
| | | • | | • | | | • | | | | | FAND※ Continuous – – – execution type | | | | |
| | | | | function of dev | | ecifica Isage | tions | table f | or ead | ch dev | /ice in | Flag signal: none | | | | |

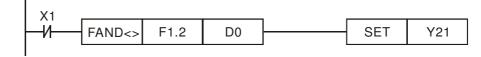
S₁: data source device 1. S₂: data source device 2.

- This command compares the content of S₁ and S₂. Taking "FAND=" as an example, if the result of comparison is "equal," this command will be activated; but it will not be activated when the result is "unequal."
- The FAND* command can directly input floating point numerical values (for instance: F1.2) to the S₁, S₂ operands, or store floating-point numbers in register D for use in operations.
- This command can be used while directly connected with the busbar

| API No. | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|-------------------------------|--------------------------------|
| 281 | FAND | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 282 | FAND> | $\mathbf{S_1} > \mathbf{S_2}$ | $S_1 \leq S_2$ |
| 283 | FAND < | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 284 | FAND<> | $S_1 \neq S_2$ | $S_1 = S_2$ |
| 285 | FAND <= | $S_1 \leq S_2$ | $S_1 > S_2$ |
| 286 | FAND>= | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

When X1=Off, and the floating point number in register D100 (D101) is not equal to F1.2, Y21=On and remains in that state.



| AF 287 29 | 7~ | F | OR; | * | | (| <u>S1</u>) | (S2) | | FI | oatin | g point number contact form compare OR* |
|-----------------|-------|---------|-------|---|-------|-----------------------------|-------------|---------|--------|--------|----------------|---|
| | | | | | | | | | | | 16-bit command | |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | |
| S1 | | | | | | | | | * | * | * | |
| S2 | | | | | | | | | * | * | * | 32-bit command (9 STEP) |
| Plea | ase r | efer to | o the | • | on sp | ⊭ ∶ & ∖ ecifica Isage | • | table f | or ead | ch dev | /ice in | FOR Continuous – – execution type Flag signal: none |

S₁: data source device 1. S₂: data source device 2.

- This command compares the content of S₁ and S₂. Taking "FOR=" as an example, if the result of comparison is "equal," this command will be activated; but it will not be activated when the result is "unequal."
- The FOR* command can directly input floating point numerical values (for instance: F1.2) to the S₁, S₂ operands, or store floating-point numbers in register D for use in operations.
- This command can be used while directly connected with the busbar

| API No. | 32-bit commands | Conditions for activation | Conditions for inactivation |
|---------|-----------------|------------------------------|--------------------------------|
| 287 | FOR= | $S_1 = S_2$ | $S_1 \neq S_2$ |
| 288 | FOR> | $S_1 > S_2$ | $S_1 \leq S_2$ |
| 289 | FOR< | $S_1 < S_2$ | $S_1 \ge S_2$ |
| 290 | FOR<> | $S_1 \neq S_2$ | $S_1 = S_2$ |
| 291 | FOR < = | $S_1 \leq S_2$ | $S_1 > S_2$ |
| 292 | FOR>= | $S_1 \ge S_2$ | $S_1 < S_2$ |

Example

Explanation

When X2 and M30 are both equal to "On," or the floating point number in register D100 (D101) is greater than or equal to F1.234, M60=On.

| | X2 M30 | | | | | | | M | 160 | |
|---|--------|------|--------|---|---|--|--|---|-----|--|
| | | | | _ | | | | | | |
| ┝ | FOR>= | D100 | F1.234 | ┢ | 1 | | | | | |
| | | | - | | | | | | | |

16-6-5 Detailed explanation of driver special applications commands

| API 139 - RPR | P (S1) (S2) Read | servo parameter | | | | | | | |
|---|--|---|--|--|--|--|--|--|--|
| Bit device | Word device | 16-bit command (5 STEP) RPR Continuous RPRP Pulse | | | | | | | |
| S1 * * * S2 Image: none * | | | | | | | | | |
| Explanation API | read is stored. | be read. S2: Register where data to be | | | | | | | |
| 140 | | | | | | | | | |
| Bit device X Y S1 Image: S2 Notes on operand us Explanation Example | M K H KnX KnY KnM T C * * * | f D10 will be written to the CH2000 driver multiple speed levels). | | | | | | | |
| Pacammandation | The CH2000's WPR command but the RPR command supports M1000 I normally open contact of operation monitoring (a) M0 | written successfully, M1017=On. does not support writing to the 20XX address, s reading of 21XX, 22XX. RPR H100 D0 RPR H101 D1 WPR D10 H400 END ommand. When writing parameters, because | | | | | | | |

ommendation Take care when using the WPR command. When writing parameters, because most parameters are recorded as they are written, these parameters may only be revised 109 times; a memory write error may occur if parameters are written more than 10⁹ times.

Because the following commonly-used parameters have special processing, there are **no** restrictions on the number of times they may be written.

- P00-10: Control method
- P00-11: Speed mode selection
- P00-12: P2P position mode
- P00-13: Torque mode select
- P00-27: User-defined value

- P01-12: Acceleration time 1
- P01-13: Deceleration time 1
- P01-14: Acceleration time 2
- P01-15: Deceleration time 2
- P01-16: Acceleration time 3
- P01-17: Deceleration time 3
- P01-18: Acceleration time 4
- P01-19: Deceleration time 4

P02-12: Select MI Conversion Time mode:

P02-18: Select MO Conversion Time mode:

P04-50 ~ P04-69: PLC register parameter 0 - 19

P08-04: Upper limit of integral

- P08-05: PID output upper limit
- P10-17: Electronic gear A
- P10-18: Electronic gear B
- P11-34: Torque command
- P11-43: P2P highest frequency
- P11-44: Position control acceleration time
- P11-45: Position control deceleration time

Calculation of the number of times written is based on whether the written value is modified. For instance, writing the same value 100 times at the same time counts as writing only once.

When writing a PLC program, if unsure of usage of the WPR command, we recommend that you use the WPRP command.

| AF 14 | | F | PID | Ρ | S | 1) (5 | 52) (| <u>S3</u> | <u>(S4)</u> | Dri | ver F | PID co | ntrol mode | e | | | |
|--|-------|-------|--------|--------|--------|-------|-------|---|---|---|--|--|---|--|--|---|--|
| | | devi | ce | | | ٧ | Vord | devic | е | 16-bit command (9 STEP) T C D FPID Continuous FPIDP | | | | | | | |
| | Х | Y | М | K | H | KnX | KnY | KnM | Т | С | D | FPID | Contini executio | | DP Priesecut | 1 | |
| S1 S2 | | | | * | * | | | | | | * | ' | | | | | |
| S3 | | | | * | * | | | | | | * | <u>32-bit c</u> | ommand | i | | | |
| S4 | | | * * | | | | | | | | * | | i | ····· | k | | |
| Not | es on | opera | and us | sage: | none | | | | | | | Flag sig | nal: none | | | | |
| Notes on operand usage: none Explanation S1: PID reproportional generation The FPID comproposal gain When M0=OrepID function), time I is 1 (ure 0.01 sec.). When M1=OrepID function) PID function in When M2=Ore(target freque) proportional generation of the pID function of the pID functi | | | | | | | | P. and -00 F 3-02 Set I PID 0.01 set I a set input P is 1 ential | S3 can PID re integr PID re functi sec.) PID re D fur ne I is PID re c is c (unit time | PID directed eferer ral time eferer on pr , and eferer nction s 0, ar referen ontrol s: 0.0 D is 0 | func tily of ice ta ice l, a ice l, a opor the ice ta opor the ice ta opor ice ta ice ta opor ice ta ice ta opor ice ta ice ta | ction i contro arget v and 08 arget v tional PID fu arget v oportion e PID targe from the he PID | ntegral ti I the drivalue inpu 0-03 different value inpu gain P is unction dif value inpu nal gain function c t value in he digital o function | me I. (S ver's feed ut terminal ential time t terminal 0, the PIE ferential t t terminal P is 1 (lifferential put termi keypad), | 4: PID dback co l selection D. selection function ime D is selection (units: 0.0 time D is nal select the PID | function ntrol of n, 08-01 is 0 (no integral 1 (units: is 0 (no 01), the 0. ion is 1 function | |
| | | | | N | /10 | | | | - F | PID | Τ | H0 | H0 | H1 | H1 | | |
| | | | | M1 | | | | | | FPID H0 H1 H0 H | | | | | H0 | | |
| | | | | | Л2 | | | | - F | PID | | H1 | H1 | H0 | H0 | | |
| | | | | | 1000 | | | | N | VON | D | 1027 | D1 |] | | | |
| | | | | | | | | | - E | END | | | | | | | |

| РІ .2 | F | REQ | Ρ | | (S1) | (S2 | 2) (S | 3 | Dr | iver | r speed control mode |
|----------|------|------------------------|---|--|--|---|--|--|---|--|--|
| Bit | devi | ce | | | V | Vord | devic | e | | | 16-bit command (7 STEP) |
| Х | Y | М | K * | H * | KnX | KnY | KnM | Т | С | D * | |
| | | | * | * | | | | | | * | —i32-bit command |
| es on | oper | and us | * | * none | | | | | | * | |
| 00 011 | open | | Juge. | none | | | | | | | Flag signal: M1015 |
| xplan | | Whe The and ■ | S2,5 dete mple en 01 setti the 5 The dece M10 ctive M10 | 53: 1 ermine 1-45= 53 (d FRE elerat 225: () 26: () 26: (| n acc ed by 0: uni 50 fo ecele 2Q co ion tir Contro Contro | ts of (tration ration mma ne; it of driv of driv | tion/d efinition (accel (accel (accel) (accel (accel) | ecele ons o ec. eratio setti an co uses JN(O eratin /Serv | eration f Pr01 on tim ng of ontrol specia n)/ST g dire o Off. | e) in 60 in drive DP(C ction | celeration time. (S3): Deceleration time me settings, the number of decimal places 5. In the ladder diagram below implies 0.5 sec, implies 0.6 sec ver frequency commands, and acceleration egister control actions, such as: (Off) (RUN requires Servo On (M1040 On) to on FWD(Off)/REV(On) of trigger quick stop (Off). |
| Exam | ple | • | M10 M10 direa |)52: L)25: ction | ock fı. [FWD | rèqué Driver (Off)/I | ncy ((REV((| On) [/] re RUN On). N | I(On)/ //1015 | STO : free | o ck frequency (Off) OP(Off), M1026: driver opera equency reached. frequency command K300(3.00Hz), with |
| | | • | acce Whe acce Whe | elerat en M elera | ion/de 11=Oi tion tii | eceler n, set me of | ration s the 50 (0 | time driveı).5 se | of 0. r frequ c.) an | iency d deo | cy command K3000 (30.00Hz), with an eceleration time of 60 (0.6 sec.). (When 01-45 mmand will now change to 0 |
| | | | H | I | | | | \geq | 1025 |) | |
| | | | | 1000 | | | | \geq | 1026 |) | |
| | | | | 112 | | | | \geq | 1042 |) | |
| | | | | 113 I ┣━━ | | | | -M1 | 1044 |) | |
| | | | | 114 | M1 ⁻ | 1 | | -M | 1052 |) | |
| | | | | //// //// //11 | —И М1(| | | FR | EQP | | K0 K0 |
| | | | | ├ | —И- | | | - FF | REQ | K3 | 3000 K50 K60 |
| | | | | | | | | ┥╒ | ND | 1 | |

been cleared before PLC operation

Bit 0 : Prior to PLC scanning procedures, whether the target frequency has been cleared is 0. (This will be written to the FREQ command when the PLC is On)

- Bit 1: Prior to PLC scanning procedures, whether the target torque has been cleared is 0. (This will be written to the TORQ command when the PLC is On)
- Bit 2: Prior to PLC scanning procedures, whether speed limits in the torque mode have been cleared is 0. (This will be written to the TORQ command when the PLC is On)

Example: When using r to write a program,

| M0 | FREQ | K2000 | K1000 | K1000 |
|--------|------|-------|-------|-------|
| | | | | END |

if we force M0 to be 1, the frequency command will be 20.00 Hz; but when M0 is set as 0, there will be a different situation.

Case 1: When the 09-33 bit 0 is 0, and M0 is set as 0, the frequency command will remain at 20.00Hz.

Case 2: When the 09-33 bit 0 is 1, and M0 is set as 0, the frequency command will change to 0.00Hz

The reason for this is that when the 09-33 bit 0 is 1 prior to PLC scanning procedures, the frequency will first revert to 0.

When the 09-33 bit 0 is 0, the frequency will not revert to 0.

| AF 26 | | - T | ORC |) P | | (| S1) (| S2) | | Dr | iver | torque control mode |
|----------|---|------------|-------|--------|------|-----|-------|-----|---|----|------|-------------------------------|
| | Bit device Word device | | | | | | | | | | | 16-bit command (5 STEP) |
| | Х | Y | Μ | Κ | Н | KnX | KnY | KnM | Т | С | D | TORQ Continuous TORQ P Pulse |
| S1 | | | | * | * | | | | | | * | execution type execution type |
| S2 | | | | * | * | | | | | | * | 32-bit command |
| Not | es on | oper | and u | sage: | none | | | | | | | |
| | Flag signal: M1063 | | | | | | | | | | | |
| E | Explanation S1: Torgue command (numbered, no more than one digit). S2: Speed limit. | | | | | | | | | | | |

The TORQ command can control the driver torque command and speed limits; it also uses special register control actions, such as:

M1040: Controls Servo On/Servo Off. When Servo is ON, if a TORQ command is executed, the torque will output the torque defined by the TORQ command, and the frequency restrictions will similarly be controlled by the TORQ command.

Example

- M1040: Control Servo On/Servo Off. M1063: set torque attained. D1060 is the mode controls. D1053 is the actual torque.
- When M0=Off, set the driver torque command K+500 (+50.0%), rotational speed restrictions is 3000 (30Hz).
- When M0=On, sets the driver torque command K-300 (-30.0%), rotational speed restrictions is 3000 (30Hz).
- When M10=On, driver began output torque command.
- When set torque is attained, M1063 will go On; this flag usually jumps continuously, however.

| M1000 | MOV K2 D1060 |
|--------------------------------|---------------------------------------|
| normally open contact | control mode setup (2: torque mode) |
| of operation monitoring (a) | MOV D1053 D0 |
| MO | actual torque force (-100.0% ~ +100%) |
| | |
| M0 | TORQ K500 K3000 |
| M10 | (M1040) |
| M1063 | Servo On |
| | (Y0) |
| reach the defined torque force | END |

Parameter 09-33 are defined on the basis of whether reference commands have been cleared before PLC operation

Bit 0: Prior to PLC scanning procedures, whether the target frequency has been cleared is 0. (This will be written to the FREQ command when the PLC is On)

Bit 1 : Prior to PLC scanning procedures, whether the target torque has been cleared is 0. (This will be written to the TORQ command when the PLC is On)

Bit 2 : Prior to PLC scanning procedures, whether speed limits in the torque mode have been cleared is 0. (This will be written to the TORQ command when the PLC is On)

Example:



If we now force M1 to be 1, the torque command will be K+300 (+30%), and the speed limit will be 400 (40Hz). But when M1 is set as 0, there will be a different situation

Case 1: When bit 1 and bit 2 of 09-33 are both set as 0, and M1 is set as 0, the torque command will remain at +30%, and the speed limit will be set as 40Hz.

Case 2: When bit 1 and bit 2 of 09-33 are both 1, and M1 is set as 0, the torque command will revert 0%, and the speed limit will be set as 0Hz.

| AP 262 | | - C | POS | P | | | (S1 |) | | | Driv | er | point-to-point control |
|-----------|------|------|---------|---|--|--|--|-----------------------------------|---|---------------------------------|-----------------------------------|----------------------------------|--|
| | Bit | dev | /ice | | | V | Vord | devic | e | | | | 16-bit command |
| | Х | Y | М | Κ | Н | KnX | KnY | KnM | Т | C | | D | |
| Note | s on | ope | rand us | * sage: | * none | | | | | | | * | <u>32-bit command (5 STEP)</u> DPOS Continuous DPOSP Pulse execution type execution type |
| | | | | | | | | | | | | | Flag signal: M1064, M1070 |
| Exp | olan | atio | | The spe M1 nev is i driv | DP(cial r 040: v pos n the ver w | OS c egist Cont sition. | omm er co trol S . If the vo O ove te | ntrol Servo e cor N sta | can c actio On/S ntrol r ate (N | con ns, Ser noc M1(| trol suc vo de is 040 | the ch a Off. s po = | e driver's position commands, and employs as: M1055 search for origin. M1048 move to osition mode (D1060 = 1), and the converter 1), if the DPOS command is executed, the conjunction with activation of M1048 once |
| E | xam | ple | | moo Whe Whe (mo has | le co en X(en X ve to chai go O | ntrol. 0=On 1=Or new nged n, an | . D10 n, M1 n, set posi at th nd Y0 | 51(L) 040 v ts DF ition) |) and vill be POS after ne; a | l D1 e O pos r a c | l 052 n (S sitio dela | 2(H Serv n a ay c | M1064: set position attained. D1060 is the) are the actual position points. vo On). Is +300000, and M1048 will change to On of 1 sec. Check whether the value of D1051 et position point has been reached, M1064 |
| | | | | 6 | s (| insta M100 | unnir Intane)0 | ng for eously | () | | | | MOV K2 D1060 control mode setup (1: position mode) DMOV D1051 D0 |
| | | | | 16 | C | | | pen c in mo | | | (a) | | actual position (Low word) (M1040) |
| | | | | 18 | | | 1 | | | | | | DPOS K300000 |
| | | | | | | | | T | го ├── | | | | (M1048) |
| | | | | 30 | | M10 H react | | defin | ed po | osit | ion | | move to a new p (Y0) RY1 |
| | | | | 32 | ŀ | | | | | | | | END |

| AP 26 | | C | ANR | X P | S | 1) (§ | <u>52</u>) (| S 3 | D |) | Re | ead C | CANopen | slave | station | data | |
|----------|-------|-------|-------|----------------------------|--------------------------|---------------------------|---------------------------|---------------------------|------------------------|------------------|------------------|------------------------|---|-----------------------|------------------------------------|------------------------------------|---|
| | Rit | dev | rice | | | v | Vord | devic | <u>е</u> | | | | 16-bit com | mand | (9 STFP | | |
| S1 | X | Y | M | K * | H * | | | KnM | | (| 2 | D | CANRX | Cont | | CANRXP | Pulse execution type |
| S2 S3 | | | | * | * | | | | | | _ | | 32-bit com | mand | | | |
| D | | | | | | | | | * | | * | * | - : | | <u> </u> | i | — |
| | es on | oper | and u | sage: | none | | | 1 | | | · | | Flag signal | | | | |
| Ex | plan | ation | | D The |): Pr | eset NRX | addro com | ess. mano | d car | n re | ead | d the | index of | the | correspo | onding s | x+bit length. slave station. slave station. |
| | | | | M10 read pres M10 | 066 a ding. set re | nd N If the egiste | /1106 e slav er, ar | 7 will re sta nd se | both tion (t M1 | n b giv 06 | e (es 7 a | 0 at the c as 1. | that time, correct res If the sla | and spons ave s | M1066 se, it will station ha | will be s write the as a res | et as 1 after value to the sponse error, to D1076 to |
| E | xam | ple |) | K4I | M400 | = K [.] ds, e | 1 each t | | | | | | mmand v vill switch | | | | and will set e. |
| | | | | 0 | 1 | M10 | 02 | | | | | | | | MOV | K1 k | (4M400 |
| | | | | 6 | | (ins M10 | tanta 66 | neous rite to | sly) | d | | | | | | T10 | K5 |
| | | | | | | | lopei plete | | | Г1(| C | | | | ROLP | K4M40 | 0 K1 |
| | | | | 17 | , | M40 | 0 | | | | | -[| CANRXP | K1 | H6041 | H10 | D120 |
| | | | | 27 | , | M40 | 1 | | | | | -[| CANRXP | K2 | H6041 | H10 | D121 |
| | | | | 37 | · | M40 | 2 | | | | | -[| CANTXP | K1 | D120 | H6040 | H10 |
| | | | | 47 | , | M40 —↓ - | - | | | | | -[| CANTXP | K2 | D120 | H6040 | H10 |
| | | | | 57 | 7 | M40 — - | 4 | | | | | | | | CA | | D2025 diagram |
| | | | | 61 | | M40 | 5 | | | | | | | | CA | sub-sta | ation 1 (H) D2125 |
| | | | | 65 | 5 | | | | | | | | | | | | diagram ation 1 (H) END |

| AF 26 | | C | ANT | X P | S | 1) (5 | 32) (| S 3 | <u>(S4</u>) | W | /rite (| CANopen slave station data |
|---|---------------------------------|-------|----------|------------------|------|-------|--------|------------|--------------|--------------------------------------|---|---------------------------------|
| | Bit | t dev | ice | | | W | /ord | devic | е | | | 16-bit command (9 STEP) |
| | Х | Y | М | K | Н | KnX | KnY | KnM | Т | С | D | CANTX Continuous CANTXP Pulse |
| S1 | | | | * | * | | | | | | | execution type execution type |
| S2 | | | | * | * | | | | * | * | * | 32-bit command |
| S3 | | | | * | * | | | | | | | |
| S4 | | | | * | * | | | | | | | // |
| Not | es on | opera | and us | age: r | none | | | | | | | Flag signal |
| (S1): Slave station number. (S2): Address to be written. (S3): Main index (S4): Subindex+bit length. The CANTX command can write a value to the index of the corresponding slav station. When it is executed, it will send the SDO message format to the slav station. M1066 and M1067 will both be 0 at that time, and M1066 will be set as after reading. If the slave station gives the correct response, it will write the value to the preset register, and set M1067 as 1. If the slave station has a response error, M1067 will be set as 0, and an error message will be recorded to D1076 to D1079. | | | | | | | | | | | end the SDO message format to the slave e 0 at that time, and M1066 will be set as 1 the correct response, it will write the value as 1. If the slave station has a response | |
| APICANFLSDRefresh special265PDRefresh special | | | | | | | | | | h special D corresponding to CANopen | | |
| 26 | Bit device Word device (3 STEP) | | | | | | | | | | | |
| 26 | Bit | uev | ice | | | V V | /010 0 | uevic | e | | | 16-bit command (3 STEP) |
| 26 | Bit X | Y | ICE M | K | Н | | | KnM | е Т | С | D | CANFLS Continuous CANFLSP Pulse |
| D | Х | Y | М | K * age: r | * | | | | T | С | D | |

Explanation

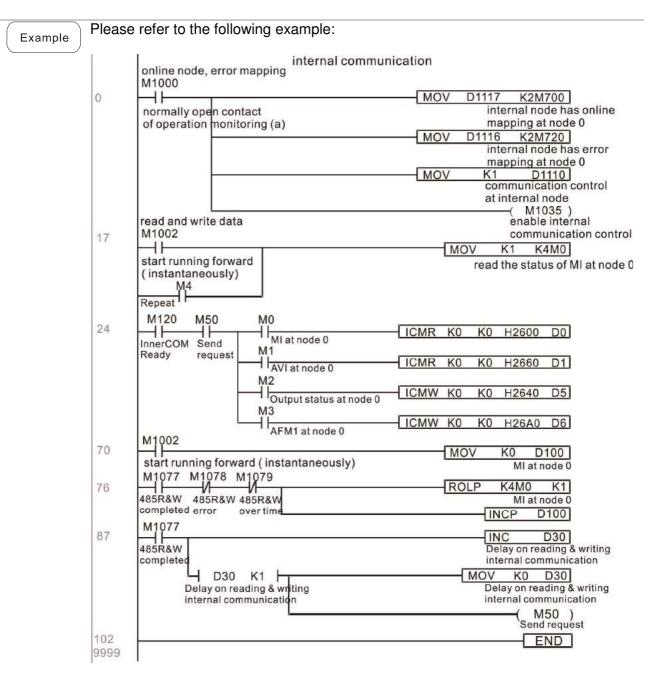
(D): Special D to be refreshed.

- The CANFLS command can refresh special D commands. When is a read only attribute, executing this command will send a message equivalent to that of CANRX to the slave station, and the number of the slave station will be transmitted back and refreshed to this special D. When there is a read/write attribute, executing this command will send a message equivalent to that of CANTX to the slave station, and the value of this special D will be written to the corresponding slave station.
- When M1066 and M1067 are both 0, and M1066 is set as 1 after reading, if the slave station gives a correct response, the value will be written to the designated register, and M1067 will be set as 1. If the slave station's response contains an error, then M1067 will be set as 0, and an error message will be recorded to D1076-D1079.

| | API ICOMR S1 S2 Internal communications read | | | | | | | | | | | | | | |
|-------------|---|-------|--------|--------|------|------|--------------------------------|-------------------------|-------|----------------------|-------|--|--|--|--|
| | Bit | dev | ice | | | V | /ord | 16-bit command (9 STEP) | | | | | | | |
| | Х | Y | Μ | K | Н | KnX | KnY | KnM | Т | С | D | ICOMR Continuous ICOMRP Pulse | | | |
| S1 | S1 * * execution type execution type | | | | | | | | | | | | | | |
| S2 | S2 * * * 32-bit command (17 STEP) | | | | | | | | | | | | | | |
| S3 | | | | * | * | | | | | | * | DICOMR Continuous DICOMRP Pulse | | | |
| D | | | | * | * | | | | | | * | execution type execution | | | |
| Note | es on | opera | and us | age: r | none | | | | | | | type | | | |
| | | | | | | | Flag signal: M1077 M1078 M1079 | | | | | | | | |
| E | kplan | ation | | _ | | | | | vice. | <u>(S2</u> |): De | evice selection (0: converter, 1: internal | | | |
| \subseteq | | | ΄ ΡΙ (| י) (: | S3). | Read | h add | Iress | (D | $) \cdot \mathbf{S}$ | avind | n taraet | | | |

PLC). S3: Read address. D: Saving target.
 The ICOMR command can obtain the slave station's converter and the internal PLC's register value.

| | API ICOMW S1 S2 Internal communications write | | | | | | | | | | | | |
|---|--|-------|--------|--------|------|-----|-----|-----|---|-----------------------------------|---|-------------------------------|--|
| | Bit device Word device | | | | | | | | | 16-bit command (9 STEP) | | | |
| | X Y M K | | | | Н | KnX | KnY | KnM | Т | С | D | ICOMW Continuous ICOMWP Pulse | |
| S1 | | | | * | * | | | | | | * | execution type execution type | |
| S2 * * * 32-bit command (17 STEP) * * | | | | | | | | | | | | | |
| S3 * * * * | | | | | | | | | | DICOMW: Continuous DICOMWP: Pulse | | | |
| D | | | | * | * | | | | | | * | execution | |
| Note | es on | opera | and us | age: r | ione | | | | | | | type type | |
| | Notes on operand usage: none type type Flag signal: M1077 M1078 M1079 | | | | | | | | | | | | |
| E: | Explanation S1: Selection of slave device. S2: Device selection (0: converter, 1: internal PLC). S3: Read address. D: Saving target. The ICOMW command write a value to the slave station's converter and the internal PLC's register. | | | | | | | | | | | | |



16-7 Error display and handling

| Code | ID | Descript | Recommended handling approach |
|------|----|--|--|
| PLrA | 47 | RTC time check | Turn power on and off when resetting the keypad time |
| PLrt | 49 | (incorrect RTC mode) | Turn power on and off after making sure that the keypad is securely connected |
| PLod | 50 | Data writing memory error | Check whether the program has an error and download the program again |
| PLSv | 51 | Data write memory error during program execution | Restart power and download the program again |
| PLdA | 52 | Program transmission error | Try uploading again; if the error persists, sent to the manufacturer for service |
| PLFn | 53 | Command error while downloading program | Check whether the program has an error and download the program again |
| PLor | 54 | Program exceeds memory capacity or no program | Restart power and download the program again |
| PLFF | 55 | Command error during program execution | Check whether the program has an error and download the program again |
| PLSn | 56 | Check code error | Check whether the program has an error and download the program again |
| PLEd | 57 | Program has no END stop command | Check whether the program has an error and download the program again |
| PLCr | 58 | MC command has been used continuously more than nine times | Check whether the program has an error and download the program again |
| PLdF | 59 | Download program error | Check whether the program has an error and download again |
| PLSF | 60 | PLC scan time excessively long | Check whether the program code has a writing error and download again |

16-8 CANopen Master control applications

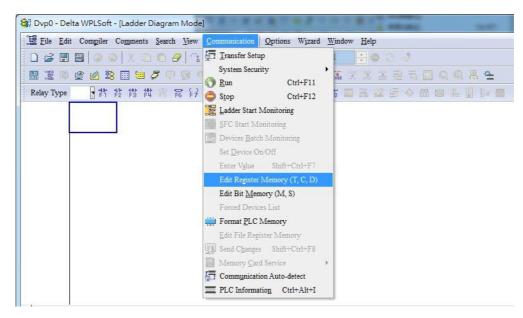
Control of a simple multi-axis application is required in certain situations. If the device supports the CANopen protocol, a CH2000 can serve as the master in implementing simple control (position, speed, homing, and torque control). The setting method comprises the following seven steps:

Step 1: Activating CANopen Master functions

- 1. Parameter 09-45=1 (initiates Master functions); restart power after completing setting, the status bar on the KPC-CC01 digital keypad will display "CAN Master".
- 2. Parameter 00-02=6 reset PLC (please note that this action will reset the program and PLC registers to the default values)
- 3. Turn power off and on again.
- 4. Use the KPC-CC01 digital keypad to set the PLC control mode as "PLC Stop" (if the KPC-CE01 digital keypad is used, set as "PLC 2"; if a newly-introduced driver is used, the blank internal PLC program will cause a PLFF warning code to be issued).

Step 2: Master memory settings

- 1. After connecting the 485 communications cable, use WPL Soft to set the PLC **status** as Stop (if the PLC mode has been switched to the **"PLC Stop"** mode, the PLC **status** should already be Stop)
- 2. Set the address and corresponding station number of the slave station to be controlled. For instance, if it is wished to control two slave stations (a maximum of 8 stations can be controlled simultaneously), and the station numbers are 21 and 22, it is only necessary to set D2000 and D2100 as 20 and 21, and then set D2200, D2300, D2400, D2500, D2600, and D2700 as 0. The setting method involves use of the PLC's WPL editing software WPL as follows:



Open WPL and implement communications > register edit (T C D) function

| Contraction of the local distance | | PLSoft - [Vie | | | _ | | | | - | | |
|--------------------------------------|----------|--|-------------|-----------------------------------|----------------------------|-----------|-----------|-----|-----|-------|-------|
| S File | Edit Cor | ngiler Com | nents Searc | h <u>V</u> iew <u>C</u> e | | 0 Options | Wizard Wi | | | | _ 8 × |
| 🗋 🖨 | | O O X | | 0 30 | 299 | 0 | 5 0 1 | ÷ 6 | 0 0 | | |
| B 32 | 隆 🔮 🕯 | 1 1 1 1 | 935 | 9 9 9 | 1 1 1 1 1 1 1 1 1 1 | 0 0 9 | 15 53 | 6 | 김근직 | 🖾 🔍 🔍 | 류 🤷 |
| D Regis Data Ty 16 b C 32 b | /pe | egister Cl Display Mod © Decimal © Hexadecir © Binary © Float | le | oits) T Re Transs Clear A | | Hint | | | | | |
| 1 | +0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 | +8 | +9 | |
| D0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| D40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D70 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D80 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| D100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| D110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

After leaving the PLC register window, the register setting screen will appear, as shown below:

If there is a new PLC program and no settings have yet been made, you can read default data from the converter, and merely edit it to suit the current application. If settings have already been made, however, the special D in the CANopen area will display the saved status (the CANopen D area is located at D1090 to D1099 and D2000 to D2799). Assuming it is a new program, we will first read the default data from the converter; check the communications format if there is no communications link (the default PLC station number is 2, 9600, 7N2, ASCII). Perform the following steps: 1. Switch the PLC to Stop status; 2. Press the transmit button; 3. click on read memory after exiting the window; 4. Ignore D0-D399; and 5. click on the confirm button.)

| | | | | | | ion Options | Wizard W | | | | - 8 |
|--|-------------|--|-----|----------------------------------|----|--------------|-----------|----------------|---------|--------|-------|
| | : 🖪 🗃 | 00) | | 3 30 | | 01 - | 30 | 1 🕂 🔿 1 | 0 4 | | |
| 8 | 障 💇 | 2 3 🗉 | 839 | 1 5 9 | | | 5 | X X X X | 관리 | | Q # 2 |
| D Regis Data Ty • 16 b • 32 b | vpe rits | egister C Display Moo O Decimal O Hexadeci O Binary O Float | | bits) T R 2 Trans Clear | | Hint | | | | | |
| | +0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 | +8 | +9 | |
| D0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| D10 | 0 | 0 | 0 | 0 | 0 | Transmission | Setup | | - | - | X |
| D20 | 0 | 0 | 0 | 0 | 0 | | 3 | 7.8- | - | 5 | |
| D30 | 0 | 0 | 0 | 0 | 0 | Read f | om PLC De | evice Register | | OK | |
| D40 | 0 | 0 | 0 | 0 | 0 | C Write t | o PLC Dev | ice Register | | Cancel | |
| D50 | 0 | 0 | 0 | 0 | 0 | Bank Area S | | | | | |
| D60 | 0 | 0 | 0 | 0 | 0 | 4 🔽 Bank | | Start | 0 | End | 300 |
| D70 | 0 | 0 | 0 | 0 | 0 | Z4 I♥ Dank | | J | 1. | 2.114 | |
| D80 | 0 | 0 | 0 | 0 | 0 | | | Range:D0 ~ D | 0399 | | |
| D90 | 0 | 0 | 0 | 0 | 0 | 1 | - | - | _ | | |
| D100 | 0 | 0 | 0 | 0 | 0 | Bank | I | Start | 1000 | End | 1099 |
| D110 | 0 | 0 | 0 | 0 | 0 | | | Range:D1000 | ~ D1099 | | |
| D120 | 0 | 0 | 0 | 0 | 0 | | | | | | |
| D130 | 0 | 0 | 0 | 0 | 0 | Bank | 2 | Start | 2000 | End | 2799 |
| D140 | 0 | 0 | 0 | 0 | 0 | | | Range:D2000 | | | |
| D150 | 0 | 0 | 0 | 0 | 0 | | | Kange D2000 | DIIYY | | |
| D160 | 0 | 0 | 0 | 0 | 0 | | - | - | - | - | |

After reading the data, it is necessary to perform some special D settings. Before proceeding, we will first introduce the special D implications and setting range. The CANopen Master's special D range is currently D1070 to D1099 and D2000 to D2799; this range is divided into 3 blocks:

The first block is used to display CANopen's current status, and has a range of D1070 to D1089;

the second block is used for CANopen's basic settings, and has a range of D1090 to D1099; the third block is the slave station mapping and control area, and has a range of D2000 to D2799; These areas are therefore introduced as follows:

The first contains the current CANopen status display:

When the master initializes a slave station, we can from find out from D1070 whether configuration of the slave device has been completed; we can find out whether an error occurred in the configuration process from D1071 and whether the configuration is inappropriate from D1074.

After entering normal control, we can find out whether the slave device is offline from D1073. In addition, we can check the slave device's read/write information using the CANRX, CANTX, and CANFLS commands; error information can be obtained from D1076 to D1079 if there has been a read/write failure.

| Special D | Description of Function | R/W |
|-----------|--|-----|
| | Channel opened by CANopen initialization (bit0=Machine code0) | R |
| D1071 | Error channel occurring in CANopen initialization process (bit0=Machine code0) | R |
| D1072 | Reserved | - |
| D1073 | CANopen break channel (bit0=Machine code0) | R |

| Special D | Description of Function | R/W |
|-----------|--|------|
| | Error code of master error | |
| D1074 | 0: No error | R |
| 01074 | 1: Slave station setting error | - 11 |
| | 2: Synchronizing cycle setting error (too small) | |
| D1075 | Reserved | - |
| D1076 | SDO error message (main index value) | R |
| D1077 | SDO error message (secondary index value) | R |
| D1078 | SDO error message (error code L) | R |
| D1079 | SDO error message (error code H) | R |

The second area is for basic CANopen settings: (the PLC must have **Stopped** when this area is used to make settings)

We must set the information exchange time for the master and slave station,

| Special D | Description of Function | Default: | R/W |
|-----------|-----------------------------|----------|-----|
| D1090 | Synchronizing cycle setting | 4 | RW |

Use D1090 to perform settings; setting time relationships include:



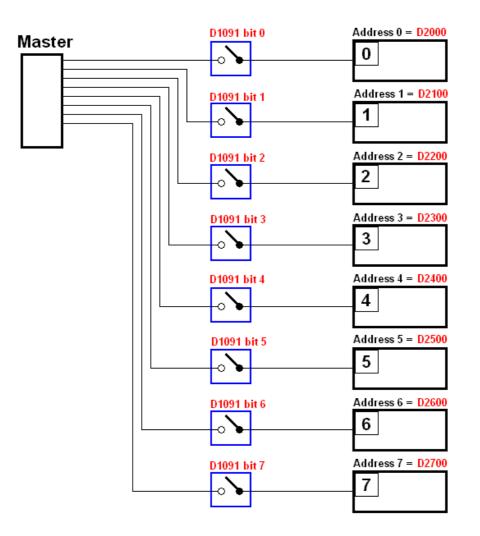
N: TXPDO + RXPDO

For instance, when communications speed is 500K, TXPDO + RXPDO have 8 sets, and synchronizing time will require more than 4 ms

We must also define how many slave stations will be open. D1091 is the channel for defining station opening, and D2000+100*n is the station number defining this channel. See the detailed explanation below.

Slave station number **n**=0-7

| Special D | Description of Function | R/W |
|---------------------|--|-----|
| | Sets slave station On or Off (bit 0-bit 7 correspond to slave stations number 0-7) | RW |
| D2000+100* n | Slave station number | RW |



If slave devices have a slow start-up, the master can delay for a short time before performing slave station configuration; this time delay can be set via D1092.

| Special D | Description of Function | Default: | R/W |
|-----------|--------------------------------------|----------|-----|
| D1092 | Delay before start of initialization | 0 | RW |

With regard to slave device initialization, a delay time can be set to judge whether failure has occurred. If the communications speed is relatively slow, the delay time can be adjusted to judge whether initialization has been completed, which will ensure that there is time to perform slave device initialization.

| Special D | Description of Function | Default: | R/W |
|-----------|---|----------|-----|
| | Initialization completion delay time Setting range: 1 to 60000 sec | 15 sec. | RW |

After communication is successful, the system must detect whether there is a break in communications with the slave station. D1093 is used to set detection time, and D1094 sets the number of consecutive errors that will trigger a break error.

| Special D | Description of Function | Default: | R/W |
|-----------|-------------------------|----------|-----|
| D1093 | Break time detection | 1000ms | RW |
| D1094 | Break number detection | 3 | RW |

The packet type transmitted by PDO is set before establishing normal communications and generally does not require adjustment.

| Special D | Description of Function | Default: | R/W |
|-----------|--|----------|-----|
| D1097 | Corresponding real-time transmission type (PDO) Setting range: 1~240 | 1 | RW |
| | Corresponding real-time receiving type (PDO) Setting range: 1~240 | 1 | RW |

The third block is the slave station mapping and control area.

CANopen provides a PDO method to perform mapping of the master and slave station memory, and enables the master to directly access read/write data in a certain memory area. The master will automatically perform data exchange with the corresponding slave device, and the read/write values can be seen directly from the special D area after real-time exchange (M1034 = 1 time) has been established. The CH2000 currently supports real-time mapping of four PDOs, and there are two types of PDO RXPDO (reads slave device information) and TXPDO (writes to slave device). In addition, in order to facilitate control, the CH2000 cannot perform mapping of commonly-used registers; the following is an overview of the current PDO mapping situation:

| TX PDO | | | | | | | | | | | |
|---|------------------------------------|-----------------------------------|---|--|--|------------------------------------|--|--|------------------------------------|--|--|
| PDO4 (1 | forque) | PDO3 (P | osition) | | PDO2 (Remote I/O) | | | PDO1 (Speed) | | | |
| Descriptio | Special D | Descriptio | Special D | | Description | Special D | | Descriptio | Special D | | |
| n Controller Word Target torque | D2008+1 00*n D2017+1 00*n | n Controller Word Target | D2008+1 00*n D2020+1 00*n D2021+1 00*n | | Slave device DO Slave device AO1 | D2027+1 00*n D2031+1 00*n | | n Controller Word Target speed | D2008+1 00*n D2012+1 00*n | | |
| Control method | D2010+1 00*n | Control method | D2010+1 00*n | | Slave device AO2 Slave device AO3 | D2032+1 00*n D2033+100 *n | | | | | |

| | RXPDO | | | | | | | | | | |
|------------------|-----------------|-----------------|------------------------------------|---------------------|-----------------|---------------------|-----------------|--|--|--|--|
| PDO4 (| Torque) | PDO3 (Position) | | PDO2 (Remote I/O) | | PDO1 (Speed) | | | | | |
| Description | Special D | Description | Special D | Description | Special D | Description | Special D | | | | |
| Mode word | D2009+100* n | Mode word | D2009+100* n | Slave device DI | D2026+100* n | Mode word | D2009+100* n | | | | |
| Actual torque | D2018+100* n | Actual position | D2022+100* n D2023+100* n | Slave device Al1 | D2028+100* n | Actual frequency | D2013+100* n | | | | |
| Actual mode | D2011+100* n | Actual mode | D2011+100* n | Slave device Al2 | D2029+100* n | | | | | | |
| | | | | Slave device Al3 | D2030+100* n | | | | | | |

Because usage requires only simple to open the corresponding PDO, where TXPDO employs D2034+100*n settings and RXPDO employs D2067+100*n settings.

These two special D areas are defined as follows:

| | | PDO4 | | PDO3 | PDO2 | | | PDO1 |
|--------------------|--------|---------|----------|---------|------|------------|-------|---------|
| Default definition | Torque | | Position | | | Remote I/O | Speed | |
| bit | 15 | 14 ~ 12 | 11 | 10 ~ 8 | 7 | 6 ~ 4 | 3 | 2 ~ 0 |
| Definition | En | Length: | En | Length: | En | Length: | En | Length: |

En: indicates whether PDO is used

Length: indicates mapping of several variables

In a simple example, if we wish to control a CH2000 slave device and cause it to operate in speed mode,

we only have to make the following settings:

| | | TX PDO | | | | | | | | | | |
|-------|--------------------|-----------------|--|--------------------|------------------------------------|--|------------------------|-----------------|--|--------------------|-----------------|--|
| Lengt | PDO4 | | | PDO3 | | | PDO2 | | | PDO1 | | |
| h: | Descriptio n | Special D | | Descriptio n | Special D | | Descriptio n | Special D | | Descriptio n | Special D | |
| 1 | Controller Word | D2008+100* n | | Controller Word | D2008+100* n | | Slave device DO | D2027+10 0*n | | Controller Word | D2008+100* n | |
| 2 | Target torque | D2017+100* n | | Target | D2020+100* n D2021+100* n | | Slave device AO1 | D2031+10 0*n | | Target speed | D2012+100* n | |
| 3 | Control method | D2010+100* n | | Control method | D2010+100* n | | Slave device AO2 | D2032+10 0*n | | | | |
| 4 | | | | | | | - | D2033+100* n | | | | |

D2034+100*n =000Ah

| | P | DO4 | | PDO3 | | PDO2 | PDO1 | | |
|------------|-------|------------|-----|---------|-----|----------|-------|-------|--|
| Definition | To | rque | P | osition | Re | mote I/O | Speed | | |
| bit | 15 | 15 14 ~ 12 | | 10 ~ 8 | 7 | 6 ~ 4 | 3 | 2 ~ 0 | |
| Definition | n 0 0 | | 0 0 | | 0 0 | | 1 | 2 | |

D2067+100*n =000Ah

| Longt | | | TX PDO | | | | | | | |
|-------------|--------------------|-----------------|--------------------|------------------------------------|--|---------------------|-----------------|---|---------------------|-----------------|
| Lengt h: | PD | D4 | PI | DO3 | | PDO2 | | | PD | 01 |
| | Description | Special D | Description | Special D | | Description | Special D | [| Description | Special D |
| 1 | Controller Word | D2009+100 *n | Controller Word | D2009+100 *n | | Slave device DI | D2026+100 *n | | Controller Word | D2009+100 *n |
| 2 | Actual torque | D2018+100 *n | Actual position | D2022+100 *n D2023+100 *n | | Slave device Al1 | D2028+100 *n | | Actual frequency | D2013+100 *n |
| 3 | Actual mode | D2011+100 *n | Actual mode | D2011+100 *n | | Slave device Al2 | D2029+100 *n | | | |
| 4 | | | | | | Slave device Al3 | D2030+100*n | | | |

| | P | DO4 | | PDO3 | ŀ | PDO2 | PDO1 | | |
|------------|----|---------|-----|---------|-----|----------|-------|-------|--|
| Definition | To | orque | P | osition | Rei | mote I/O | Speed | | |
| bit | 15 | 14 ~ 12 | 11 | 10 ~ 8 | 7 | 6 ~ 4 | 3 | 2 ~ 0 | |
| Definition | 0 | 0 | 0 0 | | 0 | 0 | 1 | 2 | |

Switch the PLC to Run after completing settings. Now wait for successful initialization of CANopen (M1059 = 1 and M1061 = 0), and then initiate CANopen memory mapping (M1034 = 1). The control word and frequency command will now automatically refresh to the corresponding slave device (D2008+n*100 and D2012+n*100), and the slave device's status word and currently frequency will also be automatically sent back to the master station (D2009+n*100 and D2013+n*100). This also illustrates how the master can handle these tasks through read/write operations in the special D area.

Furthermore, it should be noted that the remote I/O of PDO2 can obtain the slave device's current DI and AI status, and can also control the slave device's DO and AO status. Nevertheless, after introducing a fully automatic mapping special D, the CH2000 CANopen master also provides additional information refreshes. For instance, while in speed mode, acceleration/deceleration settings may have been refreshed. The special D therefore also stores some seldom-used real-time information, and these commands can be refreshed using the CANFLS command. The following is the CH2000's current CANopen master data conversion area, which has a range of D2001+100*n - D2033+100*n, as shown below:

1. The range of n is 0-7

2. ●Indicates PDOTX, ▲Indicates PDORX; unmarked special D can be refreshed using the CANFLS command

| Special D | Departmention of Euroption | Default | | PDO D | Default | • | R/W |
|-------------|---|---------|---|-------|---------|---|-----|
| Special D | Description of Function | : | 1 | 2 | 3 | 4 | |
| D2000+100*n | Station number n of slave station Setting range: 0~127 0: No CANopen function | 0 | | | | | RW |
| D2002+100*n | Manufacturer code of slave station number n (L) | 0 | | | | | R |
| D2003+100*n | Manufacturer code of slave station number n (H) | 0 | | | | | R |
| D2004+100*n | Manufacturer's product code of slave station number n (L) | 0 | | | | | R |
| D2005+100*n | Manufacturer's product code of slave station number n (H) | 0 | | | | | R |

Basic definitions

| Special D | Description of Function | Default: | | PDO D |)efault: | | R/W |
|-------------|--|----------|---|-------|----------|---|--------|
| Special D | Description of Function | Delault. | 1 | 2 | 3 | 4 | 11/ VV |
| D2006+100*n | Communications break handling method of slave station number n | 0 | | | | | RW |
| D2007+100*n | Error code of slave station number n error | 0 | | | | | R |
| D2008+100*n | Control word of slave station number n | 0 | • | | • | • | RW |
| D2009+100*n | Status word of slave station number n | 0 | | | | | R |
| D2010+100*n | Control mode of slave station number n | 2 | | | | | RW |
| D2011+100*n | Actual mode of slave station number n | 2 | | | | | R |

Velocity Control

| Special D | Description of Function | Default | | PDO D | efault: | | R/W |
|-------------|--|---------|---|-------|---------|---|-----|
| Special D | Description of Function | : | 1 | 2 | 3 | 4 | |
| D2001+100*n | Torque restriction on slave station number n | 0 | | | | | RW |
| D2012+100*n | Target speed of slave station number n (rpm) | 0 | • | | | | RW |
| D2013+100*n | Actual speed of slave station number n (rpm) | 0 | | | | | R |
| D2014+100*n | Error speed of slave station number n (rpm) | 0 | | | | | R |
| D2015+100*n | Acceleration time of slave station number n (ms) | 1000 | | | | | RW |
| D2016+100*n | Deceleration time of slave station number n (ms) | 1000 | | | | | RW |

Torque control

| Special D | Description of Function | Default: | | R/W | | | |
|-------------|--|----------|---|-----|---|---|----|
| Special D | Description of Function | Delault. | 1 | 2 | 3 | 4 | |
| D2017+100*n | Target torque of slave station number n(-100.0%~+100.0%) | 0 | | | | • | RW |
| D2018+100*n | Actual torque of slave station number n(XX.X%) | 0 | | | | | R |
| D2019+100*n | Actual current of slave station number n(XX.XA) | 0 | | | | | R |

Position control

| Special D | Description of Function | Default: | ŀ | R/W | | | |
|-------------|---|----------|---|-----|---|---|----|
| Special D | Description of Function | Delault. | 1 | 2 | 3 | 4 | |
| D2020+100*n | Target of slave station number n (L) | 0 | | | | | RW |
| D2021+100*n | Target of slave station number n (H) | 0 | | | • | | RW |
| D2022+100*n | Actual position of slave station number n (L) | 0 | | | | | R |

| D2023+100*n | Actual position of slave st number n (H) | tation 0 | | R |
|-------------|---|----------|--|----|
| | Speed chart of slave st number n (L) | | | RW |
| D2025+100*n | Speed chart of slave st number n (H) | tation 0 | | RW |

Remote I/O

| Special D | Description of Function | Default: | F | DO D |)efault | : | R/W |
|-------------|---------------------------------------|----------|---|------|---------|---|-----|
| Special D | Description of Function | Delault. | 1 | 2 | 3 | 4 | |
| D2026+100*n | MI status of slave station number n | 0 | | | | | R |
| D2027+100*n | MO setting of slave station number n | 0 | | • | | | RW |
| D2028+100*n | Al1 status of slave station number | 0 | | | | | R |
| D2029+100*n | Al2 status of slave station number n | 0 | | | | | R |
| D2030+100*n | Al3 status of slave station number n | 0 | | | | | R |
| D2031+100*n | AO1 setting of slave station number n | 0 | | ٠ | | | RW |
| D2032+100*n | AO2 setting of slave station number n | 0 | | • | | | RW |
| D2033+100*n | AO3 setting of slave station number n | 0 | | • | | | RW |

After gaining an understanding of special D definitions, we return to setting steps. After entering the values corresponding to D1090 to D1099, D2000+100*n, D2034+100*n and D2067+100*n, we cannot begin to perform downloading, which is performed in accordance with the following steps: (1. D2000 and D2100 are set as 20 and 21, and D2200, D2300, D2400, D2500, D2600, and D2700 are set as 0; if a setting of 0 causes problems, D1091 can be set as 3, and slave stations 2 to 7 can be closed. 2. Switch PLC to Stop status. 3. Press the transmit button. 4. click on write memory after exiting the window. 5. Ignore D0-D399. 6. Change the second range to D1090-D1099. 7. Click on Confirm.)

| Dvp0 | - Delta \ | WPLSoft - [Vie | w Register] | | |
|---|-----------|---|-------------|--------------------------------------|--|
| Si Eile | Edit C | lomgiler Com | ments Searc | h <u>V</u> iew <u>C</u> o | Communication Options Wizard Window Help |
| 0 6 | | 00) | 00 | 0 10 | Q < Q 2 = 3 0 1 ÷ ● 3 4 |
| E I | 障 🔮 | 1 2 2 1 | 889 | | |
| D Regist Data Ty 16 bi C 32 bi | pe | Register C Display Moo © Decimal © Hexadeci © Binary © Float | le | Dits) T Re 3 Transm Clear A | |
| | +0 | +1 | +2 | +3 | +4 +5 +6 +7 +8 +9 |
| D1990 | 0 | 0 | 0 | 0 | 0 0 0 0 0 0 |
| D2000 | 20 | 0 | 0 | 0 | Transmission Setup |
| D2010 | 0 | 0 | 0 | 0 | |
| D2020 | 0 | 0 | 0 | 0 | 4 © Read from PLC Device Register 7 OK |
| D2030 | 0 | 0 | 0 | 0 | C Write to PLC Device Register Cancel |
| D2040 | 0 | 0 | 0 | 0 | P. L. C. |
| D2050 | 0 | 0 | 0 | 0 | 5 Bank 0 Start 0 End 399 |
| D2060 | 0 | 0 | 0 | 0 | 5 Bank 0 Start 0 End 399 |
| D2070 | 0 | 0 | 0 | 0 | Range:D0 ~ D399 |
| D2080 | 0 | 0 | 0 | 0 | 6 |
| D2090 | 0 | 0 | 0 | 0 | I Bank 1 Start 1090 End 1099 |
| D2100 | 21 | 0 | 0 | 0 | Range:D1000 ~ D1099 |
| D2110 | 0 | 0 | 0 | 0 | |
| D2120 | 0 | 0 | 0 | 0 | I Bank 2 Start 2000 End 2799 |
| D2130 | 0 | 0 | 0 | 0 | Parent D2000 D2200 |
| D2140 | 0 | 0 | 0 | 0 | Range:D2000 ~ D2799 |
| D2150 | 0 | 0 | 0 | 0 | |
| BALLA | - | | | | |
| | | Overwrite | | | 0/10000 Steps |

Another method can be used to set D1091: Determine which of slave stations 0 to 7 will not be needed, and set the corresponding bits to 0. For instance, if it is not necessary to control slave stations 2, 6 and 7, merely set D1091 = 003B, and the setting method is the same as described above: Use WPL to initiate communications > use register edit (T C D) function to perform settings.

Step 3: Set the master's communications station number and communications speed

- ☑ When setting the master's station number (parameter 09-46, default is set as 100), make sure not to use the same number as a slave station.
- Set the CANopen communications speed (parameter 09-37); regardless of whether the driver is defined as a master or slave station, the communications speed is set via this parameter.

Step 4: Write program code

Real-time access: Can directly read/write to or from the corresponding D area.

Non real-time access:

- Read command: Use the CANRX command for reading. M1066 will be 1 when reading is complete; M1067 will be 1 if reading is successful, and M1067 will be 0 if an error has occurred.
- Write command: Use the CANTX command for writing. M1066 will be 1 when writing is complete; M1067 will be 1 if writing is successful, and M1067 will be 0 if an error has occurred.
- **Refresh command:** Use CANFLS command to refresh (if there are RW attributes, the master will write to the slave station; if there are RO attributes, the slave station will return the read values to the master); M1066 will be 1 if refresh has been completed; M1067 will be 1 if refresh is successful, and M1067 will be 0 if an error has occurred.

When using CANRX, CANTX or CANFLS, internal implementation commands will wait until M1066 is completed before executing the next CANRX, CANTX or CANFLS.

Afterwards, download program to the driver (Please note that the PLC's default communications format is ASCII 7N2 9600, and the station number is 2. The WPL must therefore be modified, and the WPL setting pathway is **settings > communications settings**)

Step 5: Set the slave stations' station numbers, communications speed, control source, and command source

Delta's CH2000 and EC series devices currently support the CANopen communications interface driver, and the corresponding slave station numbers and communications speed parameters are as follows:

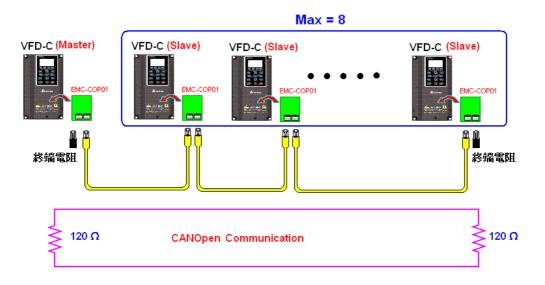
| | Corresponding device parameters | | Value | Definition | |
|-------------------|------------------------------------|-------|-------|------------------------------------|--|
| | CH2000 | E-C | | | |
| Slave station | 09-36 | 09-20 | 0 | Disable CANopen hardware interface | |
| address | 09-30 | 09-20 | 1~127 | CANopen Communication address | |
| | | 09-21 | 0 | 1M | |
| | | | 1 | 500K | |
| Communication | 09-37 | | 2 | 250K | |
| speed | 09-37 | | 3 | 125K | |
| | | | 4 | 100K | |
| | | | 5 | 50K | |
| Control source | 00-21 | - | 3 | | |
| Control source | - | 02-01 | 5 | | |
| Eroqueney equiree | 00-20 | - | 6 | | |
| Frequency source | - | 02-00 | 5 | | |
| Torquo oquroo | 11-33 | - | 3 | | |
| Torque source | - | - | - | | |
| Position source | 11-40 | - | 3 | | |
| r usilion source | - | - | - | | |

Delta's A2 Servo currently supports the CANopen communications interface, and the corresponding slave station numbers and communications speed parameters are as follows:

| | Corresponding device parameters A2 | Value | Definition |
|--------------------------|--|-------|-------------------------------|
| Slave station address | 03-00 | 1~127 | CANopen Communication address |
| | 03-01 bit 8-11 XRXX | R= 0 | 125K |
| Communication | | R= 1 | 250K |
| Communication | | R= 2 | 500K |
| speed | | R= 3 | 750K |
| | | R= 4 | 1M |
| Control/command source | 01-01 | В | |

Step 6: Connect hardware wiring

When performing wiring, note the head and tail terminal resistance; connection methods are as follows:



Step 7: Initiate control

After a program has been written and downloaded, switch the PLC mode to Run. Merely turn power to master and slave stations off and then on again.

Refer to CANMasterTest 1 vs. 2 driver.dvp

Example

CH2000 driver one-to-two control

Step 1: Activating CANopen Master functions

- Parameter 09-45=1 (initiates Master functions); restart power after completing setting, the status bar on the KPC-CC01 digital keypad will display "CAN Master".
- Parameter 00-02=6 reset PLC (please note that this action will reset the program and PLC registers to the default values)
- \square Turn power off and on again.

☑ Use the KPC-CC01 digital keypad to set the PLC control mode as "PLC Stop" (if the KPC-CE01 digital keypad is used, set as "PLC 2"; if a newly-introduced driver is used, the blank internal PLC program will cause a PLFF warning code to be issued).

Step 2: Master memory correspondences

- ☑ Enable WPL
- ☑ Use keypad set PLC mode as Stop (PLC 2)
- ☑ WPL read D1070 to D1099 D2000 to D2799
- ☑ Set D2000=10 D2100=11
- ☑ Set D2100 2200 2300 2400 2500 2600 2700=0
- ☑ Download D2000 to D2799 settings

Step 3: Set the master's communications station number and communications speed

- ☑ When setting the master's station number (parameter 09-46, default is set as 100), make sure not to use the same number as a slave station.
- Set the CANopen communications speed as 1M (parameter 09-37=0); regardless of whether the driver is defined as a master or slave station, the communications speed is set via this parameter.

Step 4: Write program code

Real-time access: Can directly read/write to or from the corresponding D area.

Non real-time access:

- **Read command**: Use the CANRX command for reading. M1066 will be 1 when reading is complete; M1067 will be 1 if reading is successful, and M1067 will be 0 if an error has occurred.
- Write command: Use the CANTX command for writing. M1066 will be 1 when writing is complete; M1067 will be 1 if writing is successful, and M1067 will be 0 if an error has occurred.
- **Refresh command:** Use CANFLS command to refresh (if there are RW attributes, the master will write to the slave station; if there are RO attributes, the slave station will return the read values to the master); M1066 will be 1 if refresh has been completed; M1067 will be 1 if refresh is successful, and M1067 will be 0 if an error has occurred.

When using CANRX, CANTX or CANFLS, internal implementation commands will wait until M1066 is completed before executing the next CANRX, CANTX or CANFLS.

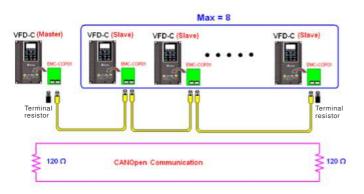
Afterwards, download program to the driver (Please note that the PLC's default communications format is ASCII 7N2 9600, and the station number is 2. The WPL must therefore be modified, and the WPL setting pathway is **settings** > **communications settings**)

Step 5: Set the slave stations' station numbers and communications speed

| Slave station no. 1: 09-37 = 0(Speed 1M) | 09-36=10(Node ID 10) |
|--|----------------------|
| Slave station no. 2: 09-37 = 0(Speed 1M) | 09-36=10(Node ID 11) |

Step 6: Connect hardware wiring

When performing wiring, note the head and tail terminal resistance; connection methods are as follows:



Step 7: Initiate control

After a program has been written and downloaded, switch the PLC mode to Run. Merely turn power to master and slave stations off and then on again.

Refer to CANMasterTest 1 vs. 2 driver.dvp

16-9 Explanation of various PLC mode controls (speed, torque,

homing, and position)

The torque mode and position mode are based on FOC vector control and speed mode also supports FOC vector control. Control therefore cannot be performed successfully unless you study motor parameters ahead of time for the torque mode and position mode, and the speed mode based on FOC.

In addition, motors are classified as two types: IM and PM. You therefore need to study IM motor parameters. For PM motors, after completing motor parameter study, you must also complete study of motor origin angle of deviation. Please refer to parameters 12-58 Pr. 05-00 detailed explanation.

If a PM motor belongs to Delta's ECMA series, motor parameters can be directly input from data in the servo motor catalog, and parameter study will not be needed.

Control methods and settings are explained as follows:

Speed control:

Register table for speed mode:

Control special M

| Special | Description of Function | Attributes |
|---------|--|------------|
| M | | |
| M1025 | Driver frequency = set frequency (ON)/driver frequency =0 (OFF) | RW |
| M1026 | Driver operating direction FWD(OFF)/REV(ON) | RW |
| M1040 | Hardware power (Servo On) | RW |
| M1042 | Quick stop | RW |
| M1044 | Pause (Halt) | RW |
| M1052 | Lock frequency (lock, frequency locked at the current operating frequency) | RW |

Status special M

| Special M | Description of Function | Attributes |
|--------------|--|------------|
| M1015 | Frequency attained (when used together with M1025) | RO |
| M1056 | Servo On Ready | RO |
| M1058 | On Quick Stopping | RO |

Control special D

| Special D | Description of Function | Attributes |
|--------------|--------------------------------|------------|
| D1060 | Mode setting (speed mode is 0) | RW |

Status special D

| Special D | Description of Function | Attributes |
|--------------|--|------------|
| D1037 | Converter output frequency (0.00~600.00) | RO |
| D1050 | Actual operating mode (speed mode is 0) | RO |

Speed mode control commands:

Target speed The first acceleration time setting The first

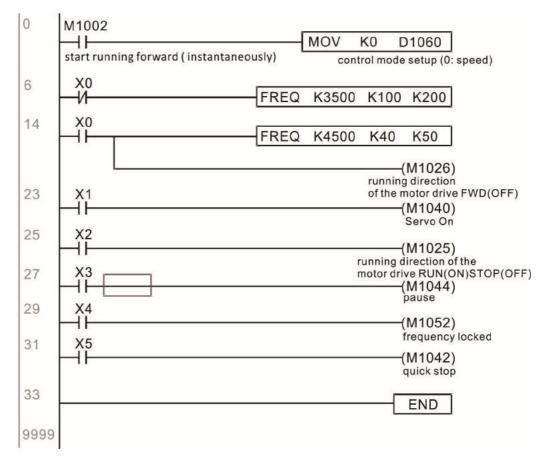
S3

deceleration time setting

Example of speed mode control:

Before performing speed control, if the FOC (magnetic field orientation) control method is used, setting of electromechanical parameters must first be completed.

- 1. Setting D1060 = 0 will shift the converter to the speed mode (default).
- 2. Use the FREQ command to control frequency, acceleration time, and deceleration time.
- 3. Set M1040 = 1, the driver will now be excited, but the frequency will be 0.
- Set M1025 = 1, the driver frequency command will now jump to the frequency designated by FREQ, and acceleration/deceleration will be controlled on the basis of the acceleration time and deceleration time specified by FREQ.
- 5. M1052 can be used to lock the current operating frequency.
- 6. M1044 can be used to temporarily pause operation, and the deceleration method will comply with deceleration settings.
- 7. M1042 can be used to perform quick stop, and deceleration will be as quick as possible without giving rise to an error. (There may still be a jump error if the load is too large.)
- 8. Control user rights: M1040(Servo ON) > M1042(Quick Stop) > M1044(Halt) > M1052(LOCK)



Torque control:

Register table for torque mode:

Control special M

| Special M | Description of Function | Attributes |
|--------------|-------------------------|------------|
| M1040 | Servo On | RW |

Status special M

| Special M | Description of Function | Attributes |
|--------------|-------------------------|------------|
| M1056 | Servo On Ready | RO |
| M1063 | Torque attained | RO |

Control special D

| Special | Description of Function | Attributes |
|---------|---|------------|
| D | | |
| D1060 | Operating mode setting (torque mode is 2) | RW |

Status special D

| Special | Description of Function | Attributes |
|---------|---|------------|
| D | | |
| D1050 | Actual operating mode (speed mode is 0) | RO |
| D1053 | Actual torque | RO |

Torque mode control commands:

| TORQ(P) | S1 | S2 | |
|---------|-----------|---------------------|------------------------|
| | Target to | rque (with numbers) | Frequency restrictions |

Example of torque mode control:

The setting of electromechanical parameters involved in torque control must be completed before implementing torque control.

- 1. Set D1060 = 2 to change the converted to the torque mode.
- 2. Use the TORQ command to implement torque control and speed limits.
- 3. Set M1040 = 1; the driver will now be excited, and immediately jump to the target torque or speed limit. D1053 can be used to find out the current torque.

| 0 | M1002 | MOV | | Diaco |
|------|---------------------------|------|------|---------------------------------|
| | ON only for 1scan a | MOV | K2 | D1060 Set control mode (0:V) |
| 6 | M1000 | TMR | T0 | K30 |
| | Normally open contact | | | wer on delay |
| | T0 H Power on delay | | | —(M0) Ready |
| 13 | X1 | TORQ | K100 | |
| 19 | Х1 И | TORQ | K-20 | 0 K1000 |
| 25 | Set Torque M0 X4 | | | —(M1040) |
| 28 | Ready | | | Power on END |
| 9999 | | | | |

Homing control/position control:

Register table in homing mode/position mode:

Control special M

| Special M | Description of Function | Attributes |
|--------------|--|------------|
| M1040 | Servo On | RW |
| | Move to new position, must use control mode as position mode (D1060 = 1) and $M1040 = 1$ | RW |
| M1050 | Absolute position/relative position (0: relative/1: absolute) | RW |
| M1055 | Search for origin (home start), must use control mode as position mode (D1060 = 3) and M1040 = 1 | RW |

Status special M

| Special | Description of Function | Attributes |
|---------|-------------------------|------------|
| М | | |
| M1064 | Target reached | RO |
| M1070 | Return home complete | RO |
| M1071 | Homing error | RO |

Control special D

| Special D | Description of Function | Attributes |
|--------------|---|------------|
| D1060 | Operating mode setting (position mode is 1, homing mode is 3) | RW |

Status special D

| Special | Description of Function | Attributes |
|---------|---|------------|
| D | | |
| D1050 | Actual operating mode (speed mode is 0) | RO |
| D1051 | Actual position (Low word) | RO |
| D1052 | Actual position (High word) | RO |

* D1051 and D1052 must be combined to give the actual location, and it has a serial number.

Position mode control commands:

DPOS(P) S1

Target (with numbers)

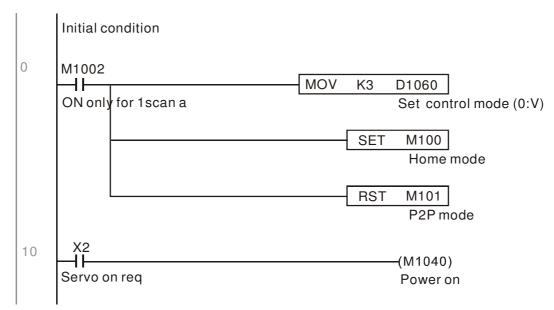
Example of homing mode/position mode control:

First complete setting of electromechanical parameters connected with position before implementing homing control or position control.

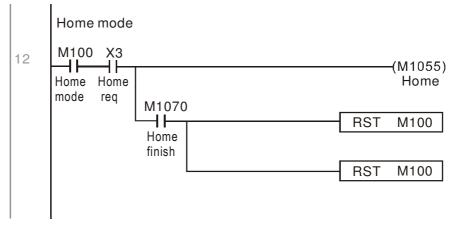
- 1. Set 00-40 to select the homing method and the corresponding limit sensors and origin. (Setting the MI function gives a reverse rotation limit of 44, a forward rotation limit of 45, and an origin proximity of 46. Because the CH2000 current only supports a Z-phase origin, the encoder card must a provide Z-phase.)
- 2. Set D1060 = 3 to change the converter to the homing mode.

- Set M1040 = 1
 In the VF/SVC/VFPG mode, will enter the STANDBY mode (01-34 can be used to access the STANDBY mode's action options).
 In the FOC+PG mode, zero speed holding will occur
- 4. Set M1055 = 1, and the driver will now start to search for the origin.
- 5. When homing is complete, M1070 will change to ON. If you now set D1060 = 1, the control mode will switch to position mode (please note that M1040 will not change to off; this mechanical origin move).
- 6. The DPOS command can now be used to designate the driver's target location. M1050 or parameter 00-12 can be used to set a change in absolute or relative position.
- Implement M1048 Pulse ON once (must be more than 1 ms in duration), and the converter will begin to move toward the target (M1040 must be 1 to be effective). The current position can be obtained from D1051 and D1052.

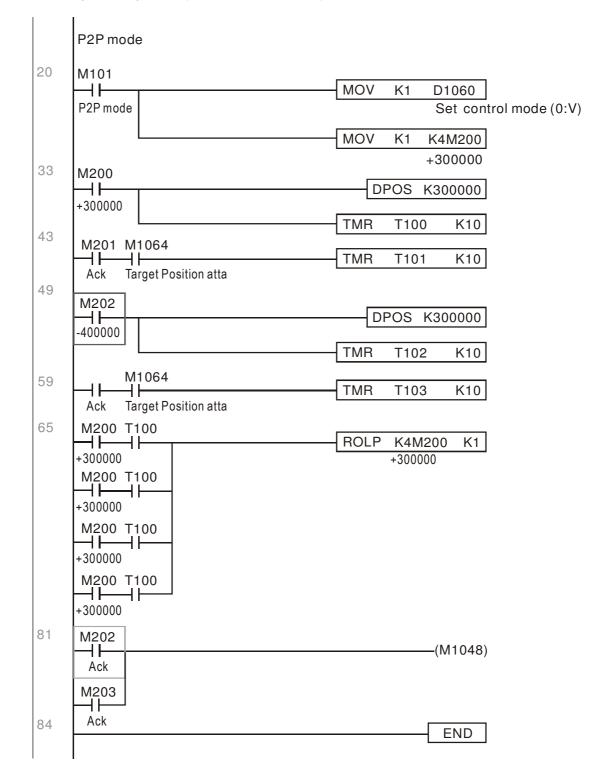
Part 1: The initialization mode is defined as the "homing" mode from the beginning (set D1060 = 3). X2 is used to implement converter excitation.



Part 2—homing: Use X3 to trigger homing action; will automatically switch to position mode after completion.



Part 3—point-to-point movement: Switch to position mode (set D1060 = 1), and move back and forth between position points. (+300000 ~ -300000)



If homing is not needed in an application, the first and second parts can be skipped. However, the M1040 condition from Part 1 must be included, and the writing method in Part 1 involve the use of X2 to achieve direct access. In addition, when M101 is used at the beginning of Part 3 to set the control mode, it can be rewritten as M1002, which will put the PLC immediately into the position mode when it starts running.

16-10 Internal communications main node control

The protocol has been developed in order to facilitate the use of 485 instead of CANopen in certain application situations. The 485 protocol offers similar real-time characteristics as CANopen; this protocol can only be used on the CH2000 and CT2000 devices. The maximum number of slave devices is 8.

Internal communications have a master-slave structure. The initiation method is very simple:

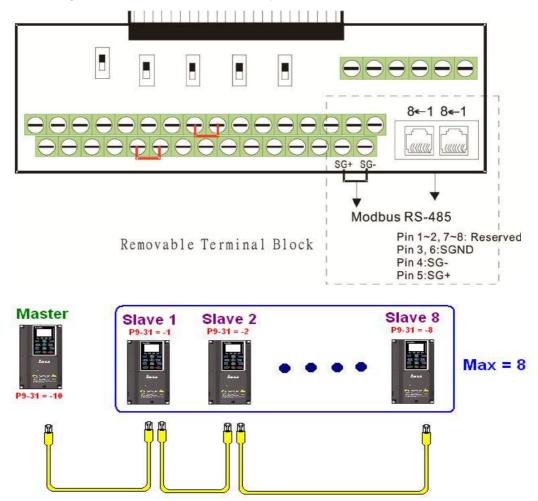
Slave device:

Set parameter 09-31 = -1 to -8 in order to access 8 nodes, and set parameter 00-20 = 1 to define the control source as 485 and access the reference sources that must be controlled, namely speed command (00-21 = 2), torque command (11-33 = 1), and position command (11-40=2). This will complete slave device settings. (PLC functions do not need to be activated)

System

Setting the master is even simpler; it is only necessary to set parameter 09-31 = -10, and enable the PLC.

Hardware wiring: The master and slave stations are connected via the 485 serial port. The CH2000 provide two types of 485 serial port interfaces, see the figure below: (please refer to 06 Control terminals concerning detailed terminal connections)



Master programming: In a program, D1110 can be used to define a slave station to be controlled (1-8, if set as 0, can jump between 8 stations). Afterwards, M1035 is set as 1, and the memory positions of the master and slave stations will correspond. At this time, it is only necessary to send commands to the correlation slave station address to control that station. The following is a register table connected with internal communications:

Control special M

| Special M | Description of Function | Attributes |
|-----------|---|------------|
| M1035 | Initiates internal communications control | RW |

Control special D

| Special D | Description of Function | Attributes |
|-----------|--|------------|
| | Internal node communications number 1-8 (set the station number of the slave station to be controlled) | RW |

| | | | De | scription of F | unction | | | |
|--------------|--|-------|----------------|-------------------------------------|--|--|---------------------|------------|
| Special D | Definition | bit | User rights | Speed mode | Location mode | Torque mode | Homing mode | Attributes |
| | | 0 | 4 | Command functions | - | - | Homing Origin | |
| | | 1 | 4 | Reverse rotation requirements | Immediate change | - | - | |
| | | 2 | 4 | - | - | - | - | |
| | | 3 | 3 | Temporary pause | Temporary pause | - | - | |
| | Internal node N control command | 4 | 4 | Frequency locking | - | - | Temporary pause | |
| D1120 + 10*N | | 5 | 4 | JOG | - | - | - | RW |
| | | 6 | 2 | Quick Stop | Quick Stop | Quick Stop | Quick Stop | |
| | | 7 | 1 | Servo ON | Servo ON | Servo ON | Servo ON | |
| | | 11~8 | 4 | Speed interval switching | Speed interval switching | - | - | |
| | | 13~12 | 4 | Deceleration time change | - | - | - | |
| | | 14 | 4 | Enable Bit 13 ~ 8 | Enable Bit 13 ~ 8 | - | - | |
| | | 15 | 4 | Clear error code | Clear error code | Clear error code | Clear error code | |
| D1121 + 10*N | Internal node N control mode | | | 0 | 1 | 2 | 3 | RW |
| | Internal node N reference command L | | | Speed command (no number) | Position command (with numbers) | Torque command (with numbers) | - | RW |
| D1123 + 10*N | Internal node N reference command H | | | - | | Speed limit | - | RW |

₩ N = 0 ~ 7

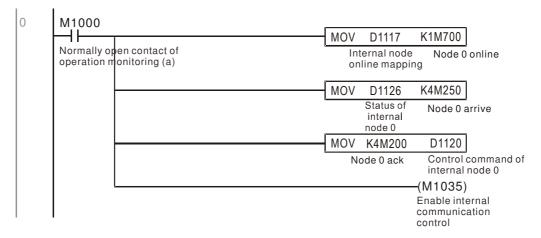
Status special D

| Special D | Description of Function | Attributes |
|-----------|--|------------|
| D1115 | Internal node synchronizing cycle (ms) | RO |
| 1 1111n | Internal node error (bit0 = slave device 1, bit1 = slave device 2,bit7 = slave device 8) | RO |
| | Internal node online correspondence (bit0 = slave device 1, bit1 = slave device 2,bit7 = slave device 8) | RO |

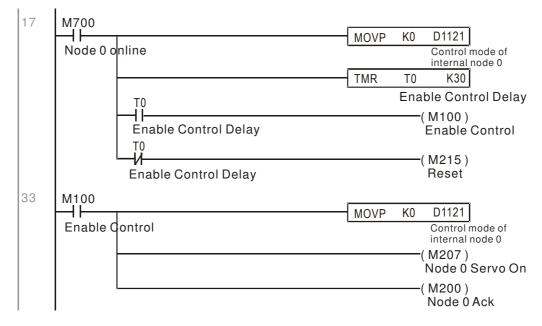
| Special D | Description of Function | | | | | | | | | |
|--------------|-------------------------|---------------------------------|-----------------------------------|-------------------|-------------------|------------|--|--|--|--|
| Special D | bit | Speed mode Location mode Torque | | Torque mode | Homing mode | Attributes | | | | |
| | 0 | Frequency command | Position command | Torque command | Zero command | | | | | |
| | 0 | arrival | attained | attained | completed | | | | | |
| | 4 | Clockwise | Clockwise | Clockwise | Clockwise | | | | | |
| | I | Counterclockwise: | Counterclockwise: | Counterclockwise: | Counterclockwise: | 1 | | | | |
| D1126 + 10*N | 2 | Warning | Warning | Warning | Warning | RO | | | | |
| | 3 | Error | Error | Error | Error | | | | | |
| | 5 | JOG | | | |] | | | | |
| | 6 | Quick Stop | Quick Stop | Quick Stop | Quick Stop |] | | | | |
| | 7 | Servo ON | Servo ON | Servo ON | Servo ON |] | | | | |
| D1127 + 10*N | | Actual fraguanay | Actual position | Actual torque | | | | | | |
| D1127 + 10 M | | Actual frequency | Actual position (with numbers) | (with numbers) | - | RO | | | | |
| D1128 + 10*N | | - | (with numbers) | - | - | | | | | |

₩ N = 0 ~ 7

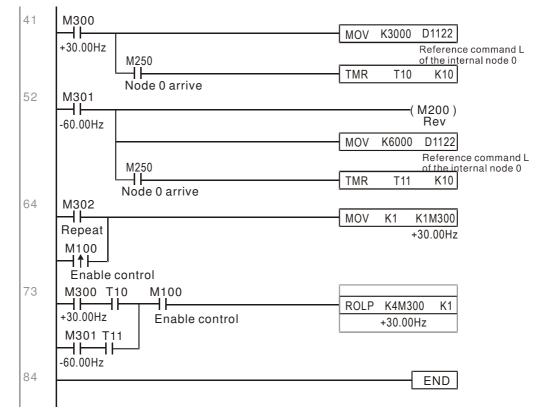
Example: Assume it is desired to control slave station 1 operation at frequencies of 30.00Hz and 60.00 Hz, status, and online node correspondences:



When it is judged that slave station 1 is online, delay 3 sec. and begin control



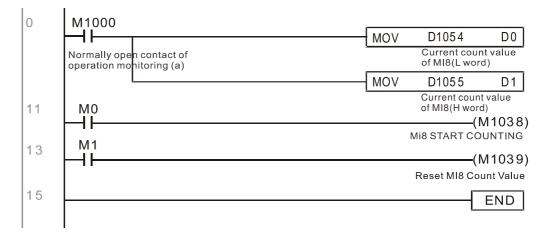
It is required slave station 1 maintain forward rotation at 30.00Hz for 1 sec., and maintain reverse rotation at 60.00 Hz for 1 sec., and repeat this cycle continuously.



16-11 Count function using MI8

16-11-1 High-speed count function

The CH2000's MI8 supports one-way pulse counting, and the maximum speed is 100K. The starting method is very simple, and only requires setting M1038 to begin counting. The 32 bit count value is stored on D1054 and D1055 in non-numerical form. M1039 can reset the count value to 0.



* When the PLC program defines MI8 for use as a high-speed counter, and also for use in PLC procedures, it must be written to M1038 or M1039, and the original MI8 functions will be disabled.

16-11-2 Frequency calculation function

Apart from high-speed counting, the CH2000's MI8 can also convert a received pulse to frequency. The following figure shows that there is no conflict between frequency conversion and count calculations, which can be performed simultaneously.

PLC speed calculation formula D1057 Speed D1058 Interval between calculations D1059 Decimal places Assuming that there are 5 input pulses each second, (see figure below) we set D1058=1000ms=1.0 sec. as the calculation interval. This enables five pulses to be sent to the converter each second.

Assuming that we wish to display numbers to two decimal places, we set D1059=2, which is also 1.00Hz. The numerical value displayed at D1056 is 100. For simplicity, the D1059 conversion formula can be expressed as in the following table:

D1058= $\frac{\text{Pulses per second}}{\text{D1057}} \times \frac{1000}{\text{D1057}} \times 10^{\text{D1059}}$

16-12 Modbus remote IO control applications (use MODRW)

The CH2000's internal PLC supports 485 read/write functions, which can be realized using the MODRW command. However, the 485 serial port must be defined as available for the PLC's 485 use before writing a program, and the parameter 09-31 must be set as -12. After completing settings, the standard functions defined by 485 can be used to implement read/write commands at other stations. Communications speed is defined by parameter 09-01, the communications format is defined by parameter 09-04, and the PLC's current station number is defined by parameter 09-35. The CH2000 currently supports the functions

read coil (0x01), read input (0x02), read register (0x03), write to single register (0x06), write to several coils (0x0F), and write to several registers (0x10). Explanations and the usage of these functions are provided as follows:

| | MODRW command | | | | | | |
|------------|---------------|---------|-------------------|-------------|--|---|--|
| S1 | S2 | S3 | S4 | S5 | General | Slave device is Delta's PLC | Slave device is Delta's |
| Node ID | Comman d | Address | Return: D area | Length : | meaning | meaning | converter meaning |
| КЗ | H01 | H500 | D0 | K18 | Read coil (Bit) | Read 18 bits of data corresponding to slave station 3 PLC Y0 to Y21. This data is stored by bit 0 to 15 of the this station's D0 and bit 0 to bit 3 of D1. | Does not support this function |
| КЗ | H02 | H400 | D10 | K10 | Read input (Bit) | Read 10 bits of data corresponding to slave station 3 PLC X0 to X11. This data is stored by bit 0 to 9 of this station's D10. | Does not support this function |
| КЗ | H03 | H600 | D20 | n.1 | Read register (word) | Read 3 words of data corresponding to slave station 3 PLC T0 to T2. This data is stored by D20 to D22. | Read 3 words of data corresponding to slave station 3 converter parameters 06-00 to 06-02. This data is stored by D20 to D22 |
| K3 | H06 | H610 | D30 | XX | Write to single register (word) | Write slave station 3 PLC's T16 to this station's D30 value | Write slave station 3 converter 06 to 16 parameter to this station's D30 value |
| К3 | H0F | H509 | D40 | | Write to multiple coils (Bit) | Write slave station 3 PLC's Y11 to Y22 to bit 0 to 9 of D40. | Does not support this function |
| К3 | H10 | H602 | D50 | K4 | Write to multiple registers (word) | Write slave station 3 PLC's T2 to T5 to D50 to D53 | Write slave station 3 converter 06-02 to 06-05 parameters to this station's D50 to D53 |

※ XX indicates doesn't matter

After implementing MODRW, the status will be displayed in M1077 (485 read/write complete), M1078 (485 read/write error), and M1079 (485 read/write time out). M1077 is defined so as to immediately revert to 0 after the MODRW command has been implemented. However, any of three situations—a report of no error, a data error report, or time out with no report—will cause the status of M1077 to change to On.

Example program: Testing of various functions

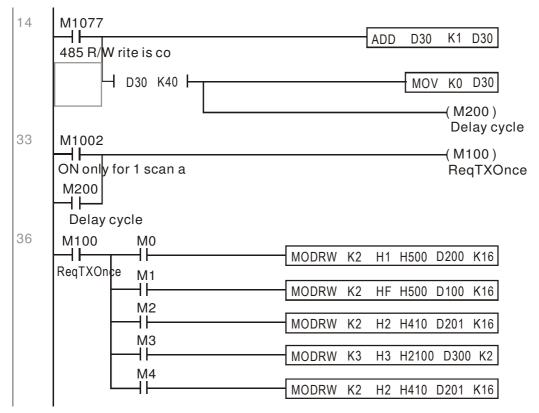
At the start, will cause the transmitted time sequence to switch to the first data unit.

| 0 | M1002 | | | | |
|---|---------|--------------|-----|----|------|
| | ┝─┤┠─── | | MOV | K1 | K4M0 |
| | On only | for 1 scan a | | | |

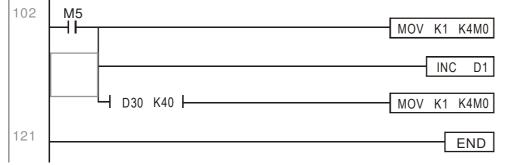
When the reported message indicates no error, it will switch to the next transmitted command

| 6 | M1077 M1078 M1079 | | | | | | |
|---|--|------|------|----|--|--|--|
| | | ROLP | K4M0 | K1 | | | |
| | 485 R/W 485 R/W 485 R/W | | | | | | |
| | rite is co rite is fail rite is time 0 | | | | | | |

If time out occurs or an error is reported, the M1077 will change to On. At this time, after a delay of 30 scanning cycles, it will re-issue the original command once



It will repeat after sending all commands



Practical applications:

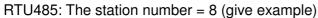
Actual use to control the RTU-485 module.

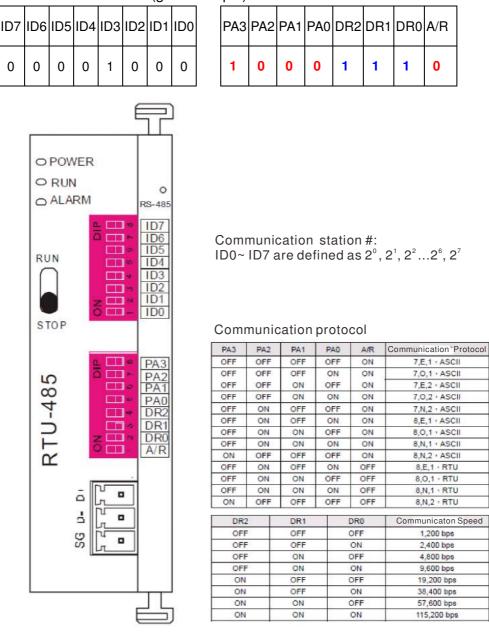
Step 1: Set the communications format. Assume that the communications format is 115200, 8,N,2, RTU

CH2000 : The default PLC station number is set as 2 (09-35)

09-31=-12(COM1 is controlled by the PLC), 09-01=115.2(The communications speed is 115200)

09-04=13(The format is 8,N,2, RTU)

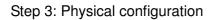




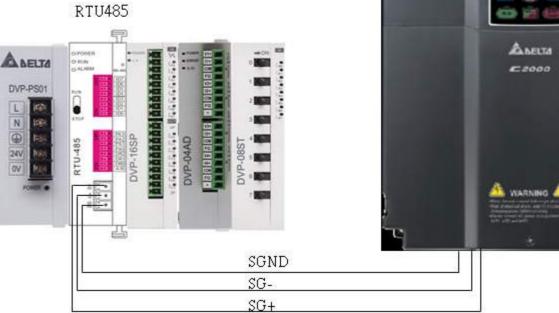
Step 2: Install control equipment. We sequentially connect a DVP16-SP (8 IN 8 OUT), DVP-04AD (4 channels AD), DVP02DA (2 channels DA), and DVP-08ST (8 switches) to the RTU485.

The following corresponding locations can be obtained from the RTU485's configuration definitions:

| Module | Terminals | 485 Address | | |
|----------|--------------|---------------|--|--|
| DVP16-SP | X0 ~ X7 | 0400H ~ 0407H | | |
| DVF10-SF | Y0 ~ Y7 | 0500H ~ 0507H | | |
| DVP-04AD | AD0 ~ AD3 | 1600H ~ 1603H | | |
| DVP02DA | DA0 ~ DA1 | 1640H ~ 1641H | | |
| DVP-08ST | Switch 0 ~ 7 | 0408H ~ 040FH | | |

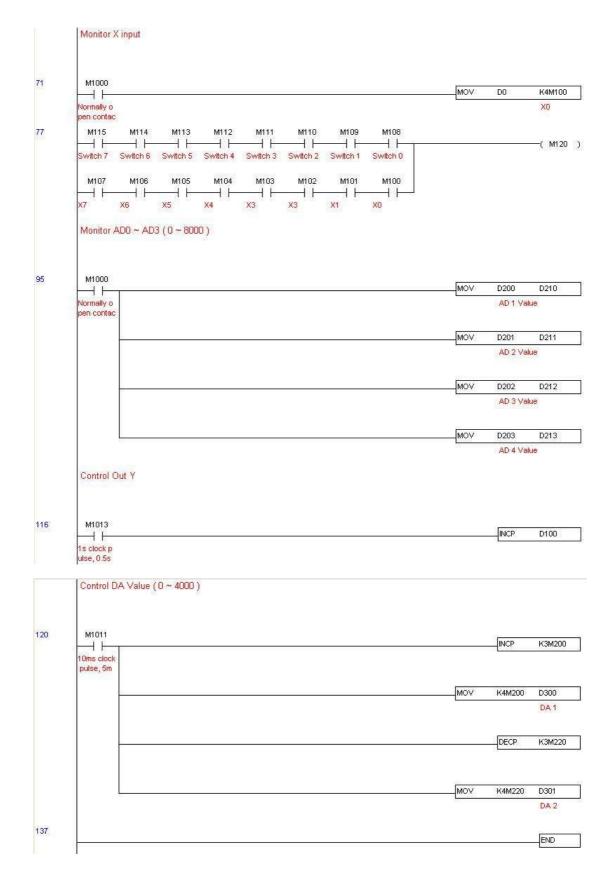






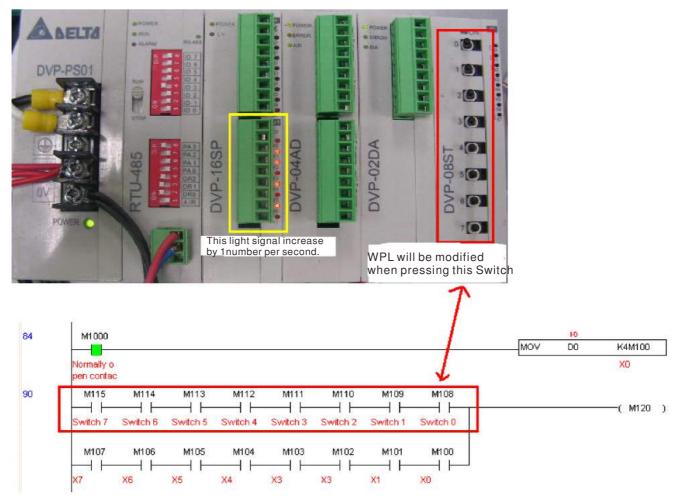
Step 4: Write to PLC program

| M1002 | | | | MOV | K1 | K4M0 |
|---|--------|----|----|-------|-----------------|----------------------|
| ON only to r1 scan a M3 Multi-word | | | | | | X Input re ad |
| write M1002 M0 | | | | | | |
| ON only fo X Input re | MODRVV | K8 | H2 | H400 | DO | K16 |
| r1 scan a ad M50 M1 | MODRVV | K8 | HF | H500 | D100 | К8 |
| Delay cycl Mutti-Y ou e t write | | | | | | |
| M2 | MODRVV | K8 | H3 | H1606 | D200 | K4 |
| Word read | | | | | AD 1 Va | lue |
| M1077 M1078 M1079 | | | | ROLP | K4M0 | K1 |
| 485 read/w 485 read/w 485 read/w rite is co rite fail rite timeo | | | | | X Input read | e |
| M1077 | | | | | | D30 |
| 485 read/w rite is co | | | | | 90 0 | Delay cyc e times |
| Ц> D30 K10 Ц | | | | MOV | KO | D30 |
| Delay cycl e times | | | | | | Delay cyc e times |

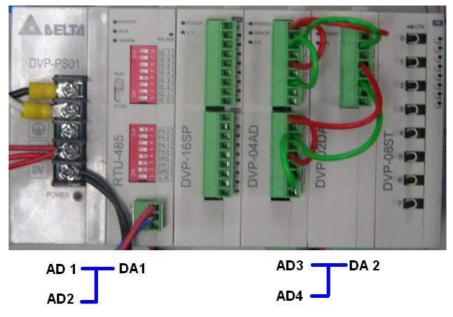


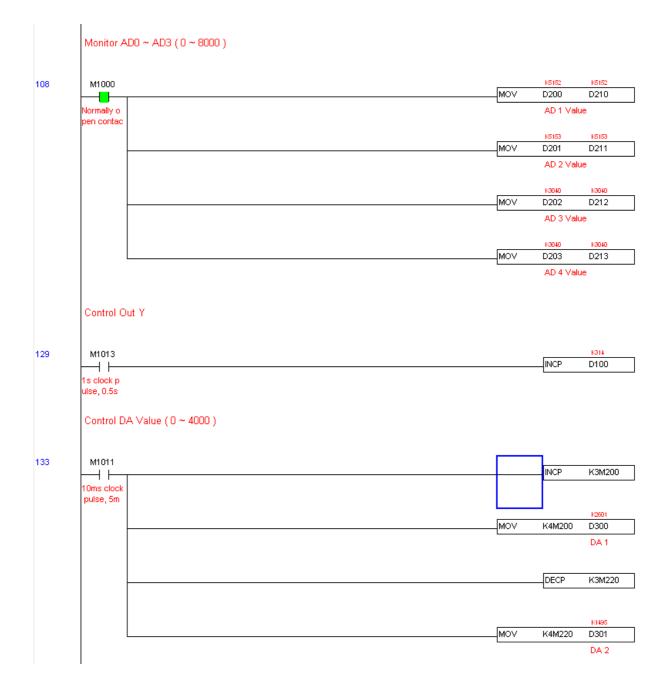
Step 5: Actual testing situation:

I/O testing: When the switch is activated, it can be discovered that the display corresponds to M115 -M108. Furthermore, it can be seen that one output point light is added every 1 sec. (the display uses a binary format)



AD DA testing: It can be discovered that D200 and D201 are roughly twice the D300, and continue to increase progressively. For their part, the D202 and D203 are roughly twice the D301, and continue to decrease progressively.





16-13 Calendar functions

The CH2000's internal PLC includes calendar functions, but these may only be used when a keypad (KPC-CC01) is connected, and otherwise cannot be used. Currently-support commands include TCMP (comparison of calendar data), TZCP (calendar data range comparison), TADD (calendar data addition), TSUB (calendar data subtraction), and TRD (calendar reading). Please refer to the explanation of relevant commands and functions for the usage of these commands.

In real applications, the internal PLC can judge whether calendar function have been activated; if they have been activated, calendar warning codes may be displayed in some situations. The basis for whether a calendar function has been activated is whether the program has written the calendar time (D1063 to D1069) in connection with the foregoing calendar commands or programs.

| Special D | Item | Item Content | |
|--------------|-------------------|------------------|----|
| D1063 | Year (Western) | 20xx (2000~2099) | RO |
| D1064 | Weeks | 1~7 | RO |
| D1065 | Month | 1~12 | RO |
| D1066 | Day | 1~31 | RO |
| D1067 | Hour | 0~23 | RO |
| D1068 | Minute | 0~59 | RO |
| D1069 | Second | 0~59 | RO |

The calendar's time display is currently assigned to D1063 to D1069, and is defined as follows:

Calendar-related special M items are defined as follows:

| Special D | Item | Attributes |
|--------------|---|------------|
| M1068 | Calendar time error | RO |
| M1076 | Calendar time error or refresh time out | RO |
| M1036 | Ignore calendar warning | RW |

*When a program writes to the commands TCMP, TZCP, TADD, or TSUB, if it is discovered that a value exceeds the reasonable range, M1026 will be 1.

*When the keypad display is PLra (RTC correction warning) or PLrt (RTC time out warning), M1076 will be ON.

*When M1036 is 1, the PLC will ignore the calendar warning.

Calendar trigger warning code is defined as follows:

| Warning | Description | Reset approach | Whether it affects PLC operation |
|---------|--------------------------------|---------------------------|-------------------------------------|
| PLra | Calendar time correction | Requires power restart | Will not have any effect |
| PLrt | Calendar time refresh time out | Requires power restart | Will not have any effect |

*When the PLC's calendar functions are operating, if the keypad is replaced with another keypad, it will jump to PLra.

*When it is discovered at startup that the keypad has not been powered for more than 7 days, or the time is wrong, PLra will be triggered.

*When it is discovered that the CH2000 has no keypad 10 sec. after startup, PLrt will be triggered.

*If the keypad is suddenly pulled out while the calendar is operating normally, and is not reconnected for more than 1 minute, PLrt will be triggered.

Practical applications:

We will perform a demo of simple applications.

We first correct the keypad time. After pressing Menu on the keypad, select the 9th time setting option. After selection, set the current time.



We set converter on during the period of 8:00-17:20, which allows us to write the following example

| 0 | M1000 | | | | | At K16 | |
|--------------|----------------------|------|-----|------|-------|---------------|---------------|
| | | TCMP | K8 | KO | KO | D1067 | MO |
| | Normally open | | | | | | |
| | contact of | | | | | | |
| | operation | | | | | <u>At K16</u> | |
| | monitoring (a) | TCMP | K17 | K20 | KO | D1067 | M10 |
| | | | | | | | <17:20 |
| 23 | M2 M10 | | | | | | |
| 20 | | | | | | | (M1040) |
| | >8:00 <17:20 | | | | | | Servo on |
| | | | | | | | 00.0000 |
| | | | | | | | |
| | | | | | | | (M1025) |
| | | | | | | Motor d | rive |
| | | | | | | Run (Of | I)/ Stop(OFF) |
| 27 | M1000 | | | | | | |
| | | | | FREQ | K3000 | K1000 | K1000 |
| | Normally open | | | | | | |
| | contact of operation | | | | | | |
| 35 | monitoring (a) | | | | | | E UD |
| | | | | | | | END |
| | | | | | | | |
| variation in | | | | | | | |
| 9999 | | | | | | | |

Chapter 17 Safety Torque Off Function

- 17-1 The drive safety function failure rate
- 17-2 Safety torque off terminal function description
- 17-3 Wiring diagram
- 17-4 Parameter
- 17-5 Operating sequence description
- 17-6 New error code for STO function

| Item | Definition | Standard | Performance |
|--|--|------------|--|
| SFF | Safe Torque Off | IEC61508 | Channel 1: 80.08% Channel 2: 68.91% |
| HFT (Type A subsystem) | Hardware Fault Tolerance | IEC61508 | 1 |
| SIL | Safety Integrity Level | IEC61508 | SIL 2 |
| SIL | | IEC62061 | SILCL 2 |
| PFH | Average frequency of dangerous failure [h-1] | IEC61508 | 9.56×10 ⁻¹⁰ |
| PFD _{av} Probability of Dangerous Failure on Demand | | IEC61508 | 4.18×10 ⁻⁶ |
| Category | Category Category | | Category 3 |
| PL | PL Performance level | | d |
| MTTF _d | Mean time to dangerous failure | ISO13849-1 | High |
| DC | Diagnostic coverage | ISO13849-1 | Low |

17-1 The drive safety function failure rate

17-2 Safety Torque Off terminal function description

The safety Torque Off function is to cut off the power supply to motor through the hardware, thereby the motor couldn't produce torque.

The safety Torque Off function is respectively by two independent hardware to control the motor current drive signal, and thus cut off the inverter power module output in order to achieve the status of safety stop.

Operation principle Description as below table 1:

Table 1: Terminal operation description

| Signal | Channel | Photo-coupler status | | | | | | |
|----------------------|-----------|----------------------|-------------------------------------|--------------------------------------|------------------------------------|--|--|--|
| STO | STO1~SCM1 | ON(High) | ON(High) | OFF(Low) | OFF(Low) | | | |
| signal | STO2~SCM2 | ON(High) | OFF(Low) | ON(High) | OFF(Low) | | | |
| Driver Output status | | Ready | STL2 mode (Torque output off) | STL1 mode (Ttorque output off) | STO mode (Torque output off) | | | |

STO mode means Safe Torque Off

STL1~STL3 means Safety Torque Off hardware abnormal.

STL3 means STO1~SCM1 and STO2~SCM2 internal circuit detected abnormal.

STO1~SCM1 ON(High): means STO1~SCM1has connect to a +24VDC power supply.

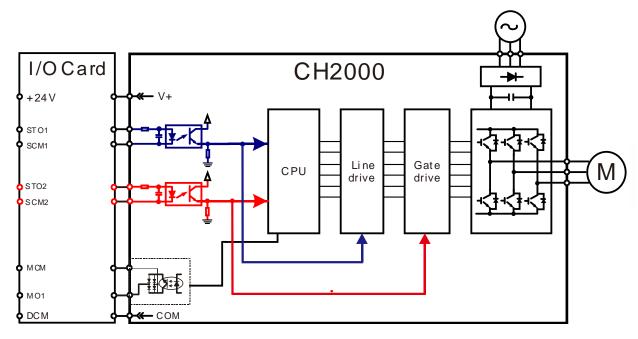
STO2~SCM2 ON(High): means STO2~SCM2 has connect to a +24V power supply.

STO1~SCM1 OFF(Low): means STO1~SCM1hasn't connect to a +24VDC power supply.

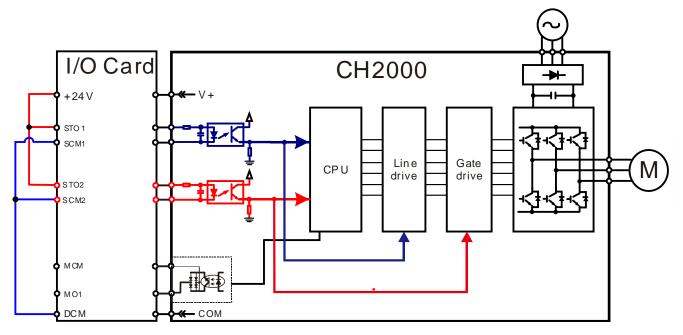
STO2~SCM2 OFF(Low): means STO2~SCM2hasn't connect to a +24VDC power supply.

17-3 Wiring diagram

17-3-1Internal STO circuit as below:

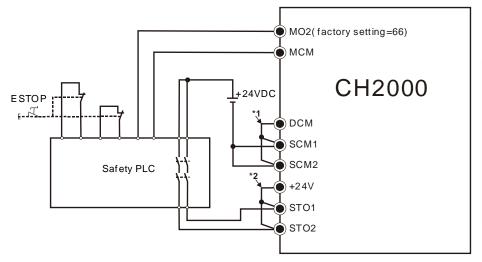


17-3-2 In the figure below, the factory setting for +24V-STO1-STO2 and SCM1-SCM2-DCM is short circuit:



17-3-3 The control loop wiring diagram:

- 1. Remove the shot-circuit of +24V-STO1-STO2 and DCM-SCM1-SCM2.
- 2. The wiring as below diagram. The ESTOP switch must at Close status in normal situation and drive will be able to Run.
- 3. STO mode, switch ESTOP open. Drive output stop and keypad display STO.



*1: factory short circuit of DCM-SCM1-SCM2. To use the Safety function, please remove this short circuit *2: factory short circuit of +24V-STO1-STO2. to use the Safety function, please remove this short circuit.

17-4 Parameter

| × | 응용 - 부부 STO Alarm Latch | | | | | | | |
|---|-------------------------|--|---------|------------------------|---|--|--|--------------------|
| | | | | | | | | Factory setting: 0 |
| | Settings 0 : S | | TO Alar | rm Latc | h | | | |
| | | | 1 : S | 1 : STO Alarm no Latch | | | | |

Pr06-44=0 STO Alarm Latch: after the reason of STO Alarm is cleared, a Reset command is need to clear STO Alarm.

- Pr06-44=1 STO Alarm no Latch: after the reason of STO Alarm is cleared, the STO Alarm will be cleared automatically.
- All of STL1~STL3 error are "Alarm latch" mode (in STL1~STL3 mode, the Pr06-44 function is no effective).

| × | 82-13 | Multi-function Output 1 (Relay1) | | | | | |
|---|---------|-------------------------------------|-----------------|--------|----------|--------|--|
| | | | | Factor | ry Setti | ing:11 | |
| ~ | 82-14 | Iulti-function Output 2 (Relay2) | | | | | |
| | | Factory Setting:1 | | | | | |
| ~ | 82 - 18 | Multi-function Output 3 (MO1) | | | | | |
| | | | Factory Setting | | | | |
| ~ | 02-17 | - ; ; Multi-function Output 4 (MO2) | | | | | |
| | | Factory Setting | | | | | |
| | | Settings | | | | | |
| | | 66: SO N.O. output | | | | | |
| | | 68: SO N.C. output | | | | | |

| Settings Functions | | Descriptions | | |
|--------------------|---|--------------|--|--|
| 66 | SO Logic A output Safety Output Normal Open | | | |
| 68 | 68 SO Logic B output Safety Output Normal Close | | | |

CH2000 factory setting Pr02-17(MO2)=66(N.O.) and Multi-function Output setting item has add 2 new function: 66 and 68.

| | Safety Output status | | | |
|--------------|----------------------|---------|--|--|
| Drive status | N.O. | N.C. | | |
| | (MO=66) | (MO=68) | | |
| Normal run | Open | Close | | |
| STO | Close | Open | | |
| STL1~STL3 | 1~STL3 Close Ope | | | |

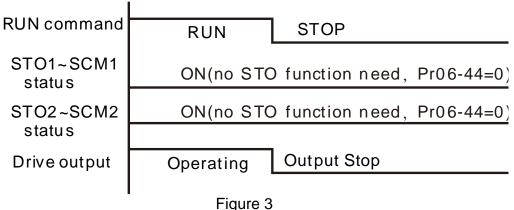
| ~ | 00-04 | Content | t of Mult | Iti-function Display | | | |
|---|-------|---------|-----------|----------------------|--|--------------------|--|
| | | | | Factory settin | | Factory setting: 3 | |
| | | Sett | ings | 45: Hardware versio | | ersion | |

| | 00-04=45 | Hardware version |
|--|----------|------------------|
|--|----------|------------------|

17-5 Operating sequence description

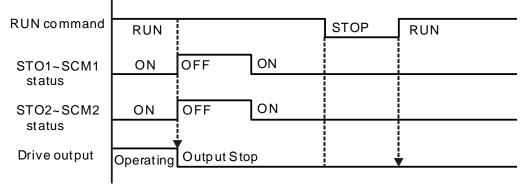
17-5-1Normal operation status

As shown in Figure 3: When the STO1~SCM1 and STO2~SCM2=ON (no STO function is need), the drive will execute "Operating" or "Output Stop" according to RUN/STOP command.



17-5-2-1 STO , Pr06-44=0 , Pr02-35=0

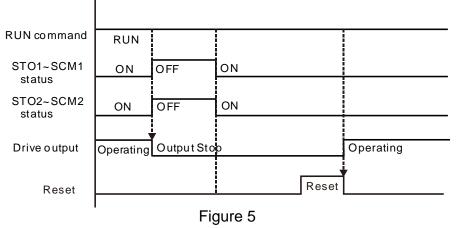
As shown in Figure 4: When both of STO1~SCM1 and STO2~SCM2 channel has turn off during operating, the STO function enabling and the drive will stop output regardless of Run command is ON or OFF status.





17-5-2-2 STO , Pr06-44=0 , Pr02-35=1

As shown in Figure 5: As same as the figure 4. But, because the Pr02-35=1, therefore, after the Reset command, if the operating command still exists, then the drive will immediately execute the run command again.



17-5-3 STO , Pr06-44=1

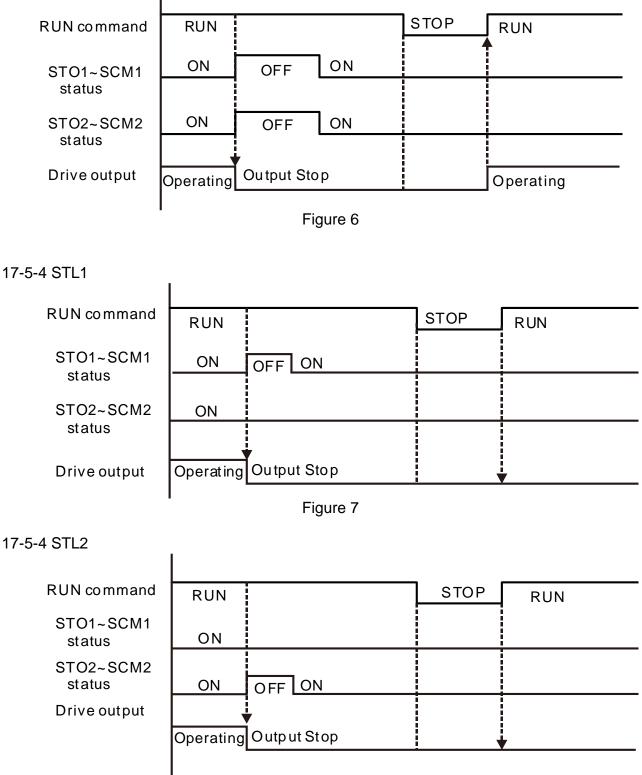


Figure 8

17-6 New Error code for STO function

| | 06-17 | Present Fault Record | | | | |
|---|---------|--|--|--|--|--|
| | 8: - 30 | Second Most Recent Fault Record | | | | |
| | 86 - 19 | Third Most Recent Fault Record | | | | |
| Į | 06-20 | Fourth Most Recent Fault Record | | | | |
| | 15-30 | Fifth Most Recent Fault Record | | | | |
| | 55-30 | Sixth Most Recent Fault Record | | | | |
| | | Settings | | | | |
| | | 72 : Channel 1(STO1~SCM1)internal hardware error | | | | |
| | | 76 : STO(Safety Torque Off | | | | |
| | | 77 : Channel 2(STO2~SCM2)internal hardware error | | | | |
| | | 78 : Channel 1 and Channel 2 internal hardware error | | | | |

| Error code | Name | Description |
|------------|---------------------|---|
| 76 | STO | Safety Torque Off function active |
| 72 | STL1 (STO1~SCM1) | STO1~SCM1 internal hardware detect error |
| 77 | STL2 (STO2~SCM2) | STO2~SCM2 internal hardware detect error |
| 78 | STL3 | STO1~SCM1 and STO2~SCM2 internal hardware detect error |

The Old/New control board and Old/New I/O card: :

| CH2000 | v1.12 firmware | v1.20 firmware |
|---|----------------|----------------|
| v1.12 control board + old I/O card(no STO function) | OK | OK |
| v1.12 control board + new I/O card(with STO function) | Error | Error |
| v1.20 control board + old I/O card(no STO function) | Error | Error |
| v1.20 control board + new I/O card(with STO function) | Error | OK |

Appendix A. Publication History

| V1.20 | | | | | |
|--------------------|-----------|--|--|--|--|
| Explanations | Coverage | | | | |
| | Revise | | | | |
| Label modification | Chapter 1 | | | | |
| New UL mark | Chapter 9 | | | | |
| | | | | | |