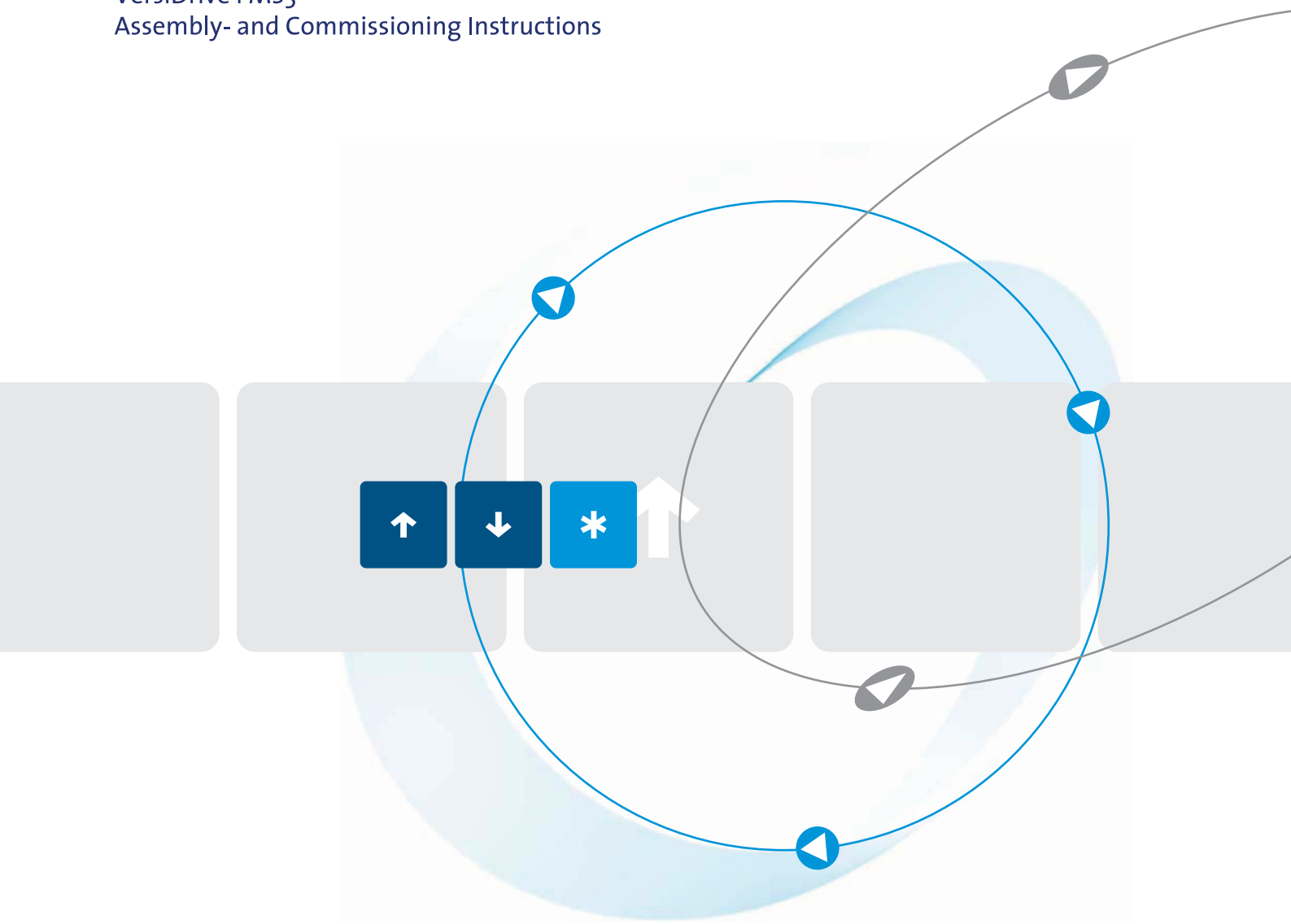
PETER electronic

AC Motor Drive
VersiDrive i MS3
Assembly- and Commissioning Instructions



Quality is our motivation.

Thank you for choosing this VersiDrive i MS3.

This manual provides instructions for advanced use of the VersiDrive i MS3 series. Incorrect handling might cause an unexpected fault. Before using the inverter, always read this manual to use the equipment to its optimum.

Safety instructions

Do not attempt to install, operate, maintain or inspect the inverter until you have read through this manual and appended documents carefully and can use the equipment correctly. Do not use the inverter until you have a full knowledge of the equipment, safety information and instructions.

Installation, operation, maintenance and inspection must be performed by qualified personnel. Here, qualified personnel means personnel who meets all the conditions below.

- A person who took a proper engineering training.
- A person who can access operating manuals for the protective devices (e.g. light curtain) connected to the safety control system. A person who has read and familiarized himself/ herself with the manuals.

In this manual, the safety instruction levels are classified into “DANGER” and “CAUTION”.

DANGER:

Assumes that incorrect handling may cause hazardous conditions, resulting in death or severe injury.

CAUTION:

Assumes that incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause physical damage only.

Note that even the CAUTION level may lead to a serious consequence according to conditions. Please follow strictly the instructions of both levels because they are important to personnel safety.

General safety information and precautions

In this manual special warnings that are important for the proper and safe use of the products are clearly identified as follows:

DANGER:

- 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.

CAUTION:

- Never connect the AC motor drive output terminals U/T1, V/T2 and W/T3 directly to the AC mains circuit power supply.
- The rated voltage of power system to install motor drives is listed below. Ensure that the installation voltage is in the correct range when installing a motor drive.
  For 115 V models, the range is between 85–132 V.
  For 230 V models, the range is between 170–264 V.
  For 460 V models, the range is between 323–528 V.
- 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 you store the AC motor drive in a not-charged condition for more than three months, the ambient temperature should not be higher than 30°C. Storage longer than one year is not recommended and 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):
  - If you need to sterilize, deworm the wooden crate or carton box, please do not use steamed smoking sterilization or you will damage the VFD. The warranty does not cover VFD damaged by steamed smoking sterilization.
  - Please use other ways to sterilize or deworm.
  - You may use high temperature to sterilize or deworm. Leave the packaging materials in an environment of over 56 °C for 30 minutes.
- Connect the drive to a 3-phase three-wire or 3-phase four-wire Wye system to comply with UL standards.

NOTES

- For a detailed explanation of the product specifications, the cover or the safety shields will be disassembled on some pictures or graphics. When the product is put to operation, please install the top cover and safety shield and ensure correct wiring. Refer to the manual to ensure safe operation.
- The figures in this instruction are for reference only, they may be slightly different from your actual drive, but it will not affect your customer rights.
- The content of this manual may be revised without prior notice. Please consult our distributors or download the most recent version at https://www.peter-electronic.com/en/service/documentcenter/.

Symbols used in the manual

Use of instructions

Instructions concerning important information are marked separately and are displayed as follows:

NOTE Text of instruction

Use of numbering in the figures

Numbering within the figures is displayed by white numbers within black circles and is explained in a table following it using the same number, e.g.:

❶ ❷ ❸ ❹

Use of handling instructions

Handling instructions are steps that must be carried out in their exact sequence during startup, operation, maintenance and similar operations.

They are numbered consecutively (black numbers in white circles):

① Text.

② Text.

③ Text.

Use of footnotes in tables

Instructions in tables are explained in footnotes underneath the tables (in superscript). There is a footnote character at the appropriate position in the table (in superscript).

If there are several footnotes for one table then these are numbered consecutively underneath the table (black numbers in white circle, in superscript):

① Text.

② Text.

③ Text.

Contents

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 ensure 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 mains voltage is 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 devices, including mains 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” is correct to prevent drive damage.

⑤ When power is applied, select the language and set parameters via the digital keypad (Versi-KP-LED). When executing a trial run, please begin with low speed and then gradually increase the speed until the desired speed is reached.

1.2 Nameplate information

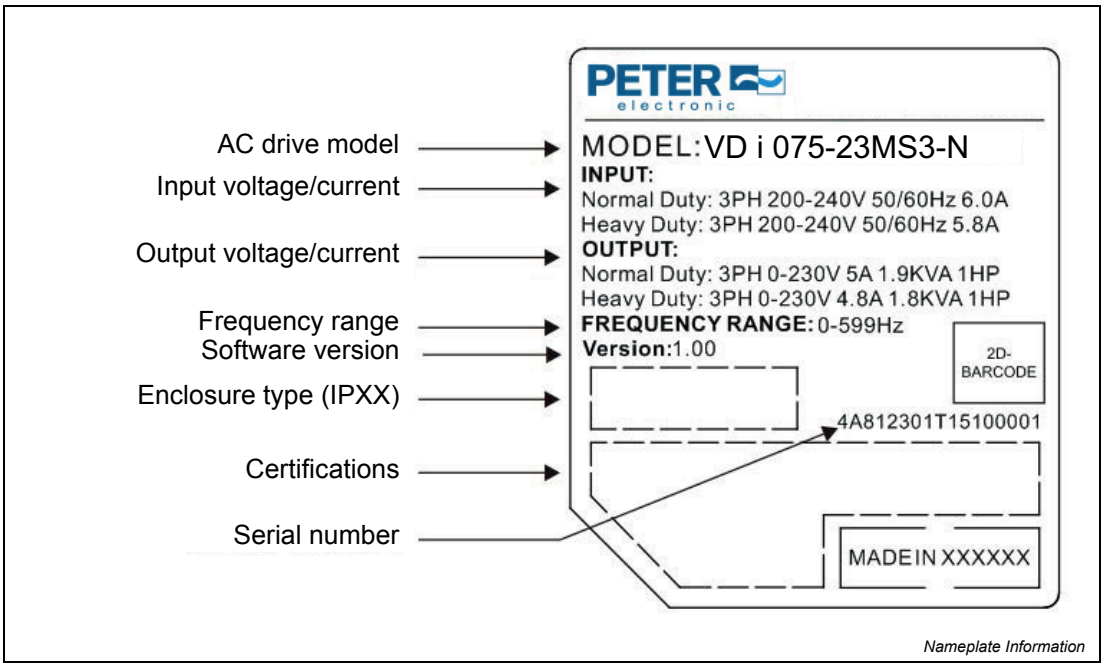


Fig. 1-1: Description of the nameplate

1.3 Model name

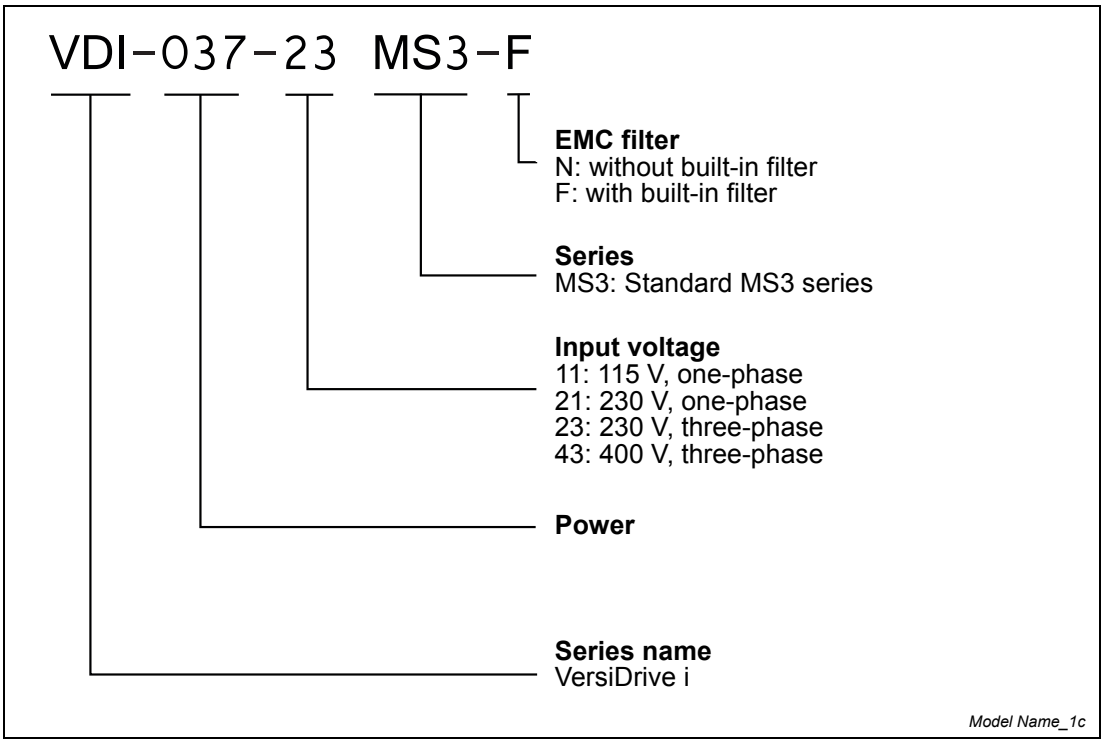


Fig. 1-2: Description of the model name

1.4 RFI jumper

- In the drive there are Varistor/MOVs, which are connected from phase to phase and from phase to ground, to protect the drive against mains surges or voltage spikes.
  Because the Varistors/MOVs from phase to ground are connected to ground via the RFI jumper, the protection will be ineffective when the RFI jumper is removed.
- In the models with built-in EMC filter the RFI jumper connects the filter capacitors to ground to form a return path for high frequency noise to isolate the noise from contaminating the mains power. Removing the RFI jumper strongly reduces the effect of the built-in EMC filter.
- Although a single drive complies with the international standards for leakage current, an installation with multiple drives with built-in EMC filter can trigger the RCD. Removing the RFI jumper helps, but the EMC performance of each drive is no longer guaranteed.

Frame A–F

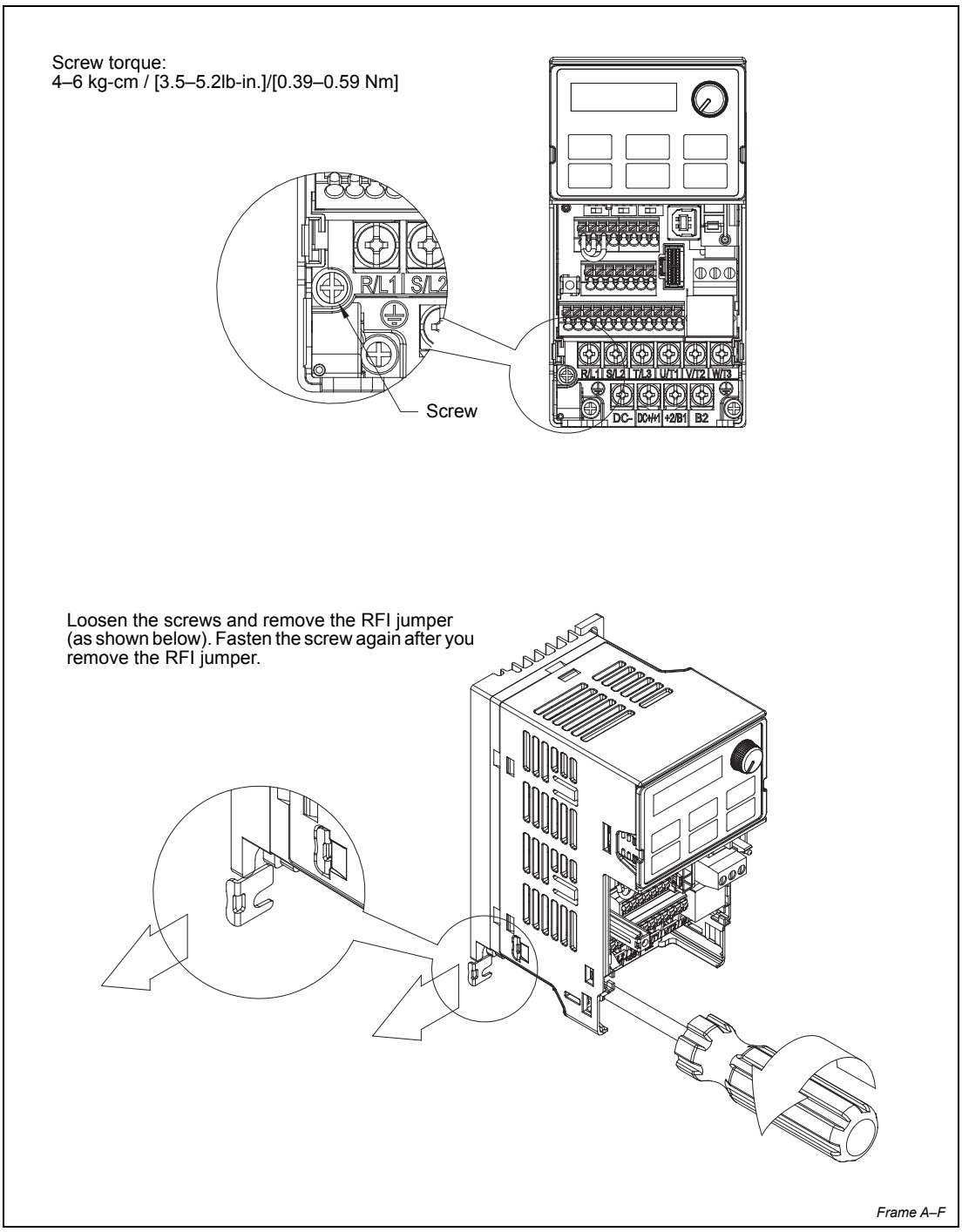


Fig. 1-3: Removal of the RFI jumper (frame A–C)

Frame B–F (model with built-in EMC filter)

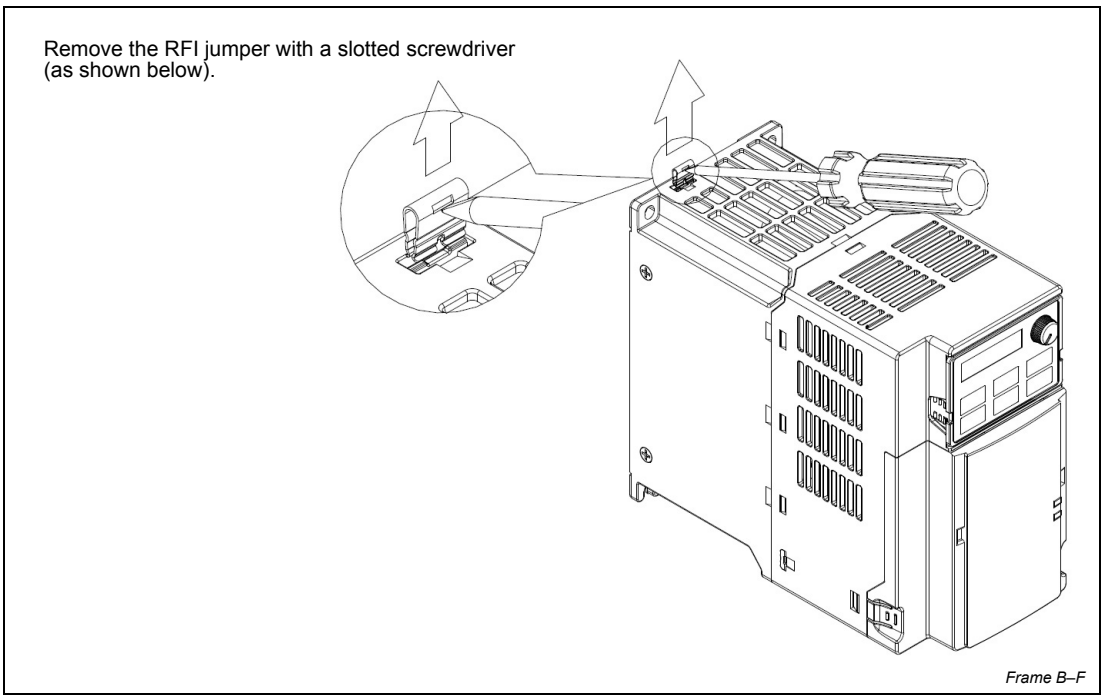


Fig. 1-4: Removal of the RFI jumper (frame B–F)

Isolating main power from ground

When the power distribution system of the drive is a floating ground system (IT) or an asymmetric ground system (TN), the RFI jumper must be removed. Removing the RFI jumper disconnects the internal capacitors from ground to avoid damaging the internal circuits and to reduce the ground leakage current.

Important points regarding ground connection:

- To ensure the safety of personnel, proper operation, and to reduce electromagnetic radiation, the drive must be properly grounded during installation.
- The diameter of the cables must comply with the local safety regulations.
- The shield of shielded cables must be connected to the ground of the drive to meet safety regulations.
- The shield of shielded power cables can only be used as the ground for equipment when the aforementioned points are met.
- When installing more than one drive, do not connect the grounds of the drives in series, but connect each drive to ground via one single point (refer to fig. 1-5).

NOTE The EU directives must be observed for grounding/earthing (Low Voltage Directive).

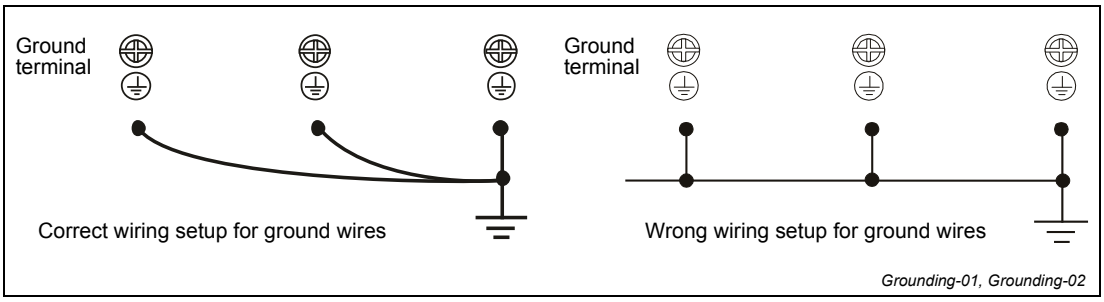


Fig. 1-5: Grounding more than one drive

Pay particular attention to the following points:

- Do not remove the RFI jumper while the power is on.
- Removing the RFI jumper will also disconnect the built-in EMC filter capacitors. Compliance with the EMC specifications is no longer guaranteed.
- The RFI jumper may not be removed if the mains power is a grounded power system.
- The RFI jumper must be removed while conducting high voltage insulation tests. When conducting a high voltage insulation test to the entire facility, the mains power and the motor must be disconnected if the 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 30 Ω) grounding system.

- Disconnect the RFI jumper.
- Check whether there is excess electromagnetic radiation affecting nearby low-voltage circuits.
- In some situations, the transformer 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 EMC filter. The EMC filter is connected to ground through the filter capacitors, thus connecting power input to ground. This is very dangerous and can easily damage the drive.

Asymmetric ground system (Corner grounded TN systems)

CAUTION:
Do not remove the RFI jumper while the input terminal of the AC motor drive carries power.

In the following situations the RFI jumper must be removed. This is to prevent the system from grounding through the RFI capacitor and damaging the AC motor drive.

RFI jumper must be removed

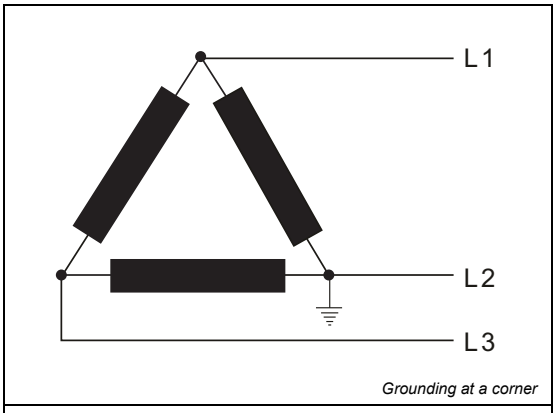


Fig. 1-6: Grounding at a corner in a triangle configuration

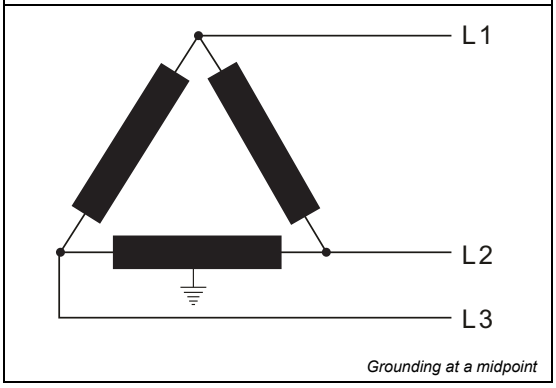


Fig. 1-7: Grounding at a midpoint in a polygonal configuration

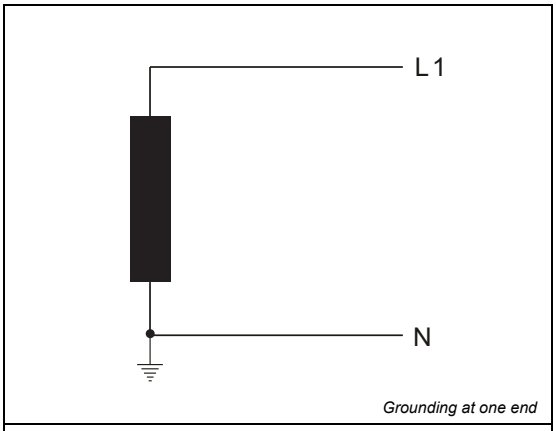


Fig. 1-8: Grounding at one end in a single-phase configuration

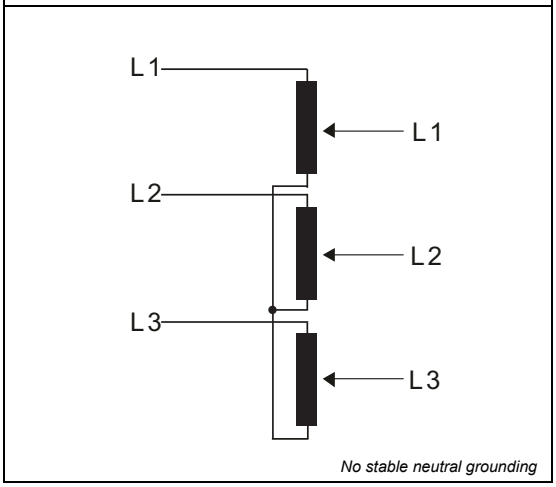


Fig. 1-9: No stable neutral grounding in a three-phase autotransformer configuration

RFI jumper can be used

Internal grounding through RFI capacitors, which reduce electromagnetic radiation. In a symmetrical grounding power system with higher requirements for electromagnetic compatibility an EMC filter can be installed. As a reference, the diagram in fig. 1-10 is a symmetrical grounding power system.

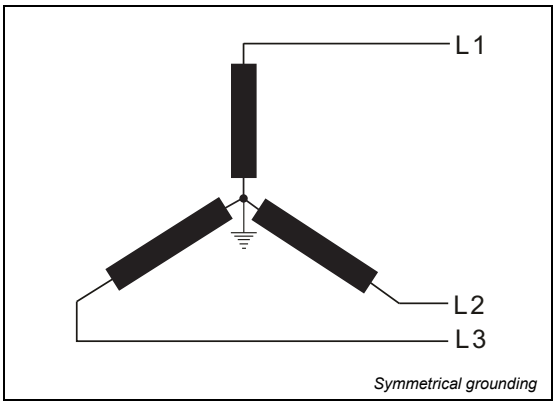


Fig. 1-10: Symmetrical grounding power system (star configuration)

2 Dimensions

2.1 Frame A

A1: VD i 020-11MS3-N; VD i 020-21MS3-N; VD i 020-23MS3-N

A2: VD i 037-23MS3-N

A3: VD i 037-11MS3-N; VD i 037-21MS3-N

A4: VD i 037-43MS3-N

A5: VD i 075-23MS3-N; VD i 075-43MS3-N

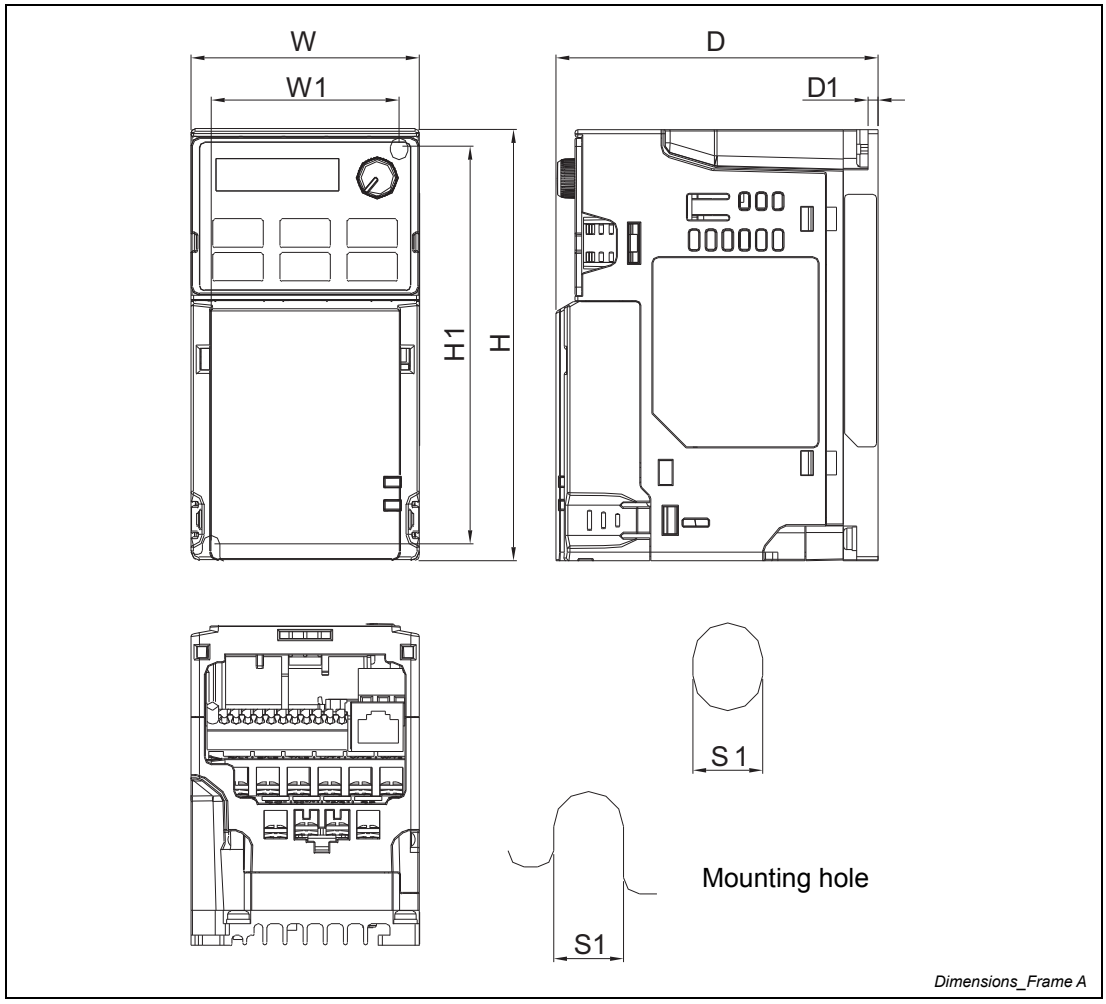


Fig. 2-1: Dimensions frame A

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
A1	68.0 [2.68]	128.0 [5.04]	96.0 [3.78]	56.0 [2.20]	118.0 [4.65]	3.0 [0.12]	5.2 [0.20]
A2	68.0 [2.68]	128.0 [5.04]	110.0 [4.33]	56.0 [2.20]	118.0 [4.65]	3.0 [0.12]	5.2 [0.20]
A3	68.0 [2.68]	128.0 [5.04]	125.0 [4.92]	56.0 [2.20]	118.0 [4.65]	3.0 [0.12]	5.2 [0.20]
A4	68.0 [2.68]	128.0 [5.04]	129.0 [5.08]	56.0 [2.20]	118.0 [4.65]	3.0 [0.12]	5.2 [0.20]
A5	68.0 [2.68]	128.0 [5.04]	143.0 [5.63]	56.0 [2.20]	118.0 [4.65]	3.0 [0.12]	5.2 [0.20]

2.2 Frame B

B1: VD i 150-23MS3-N; VD i 150-43MS3-N

B2: VD i 075-21MS3-N

B3: VD i 020-21MS3-F; VD i 037-21MS3-F; VD i 075-21MS3-F; VD i 037-43MS3-F; VD i 075-43MS3-F; VD i 150-43MS3-F

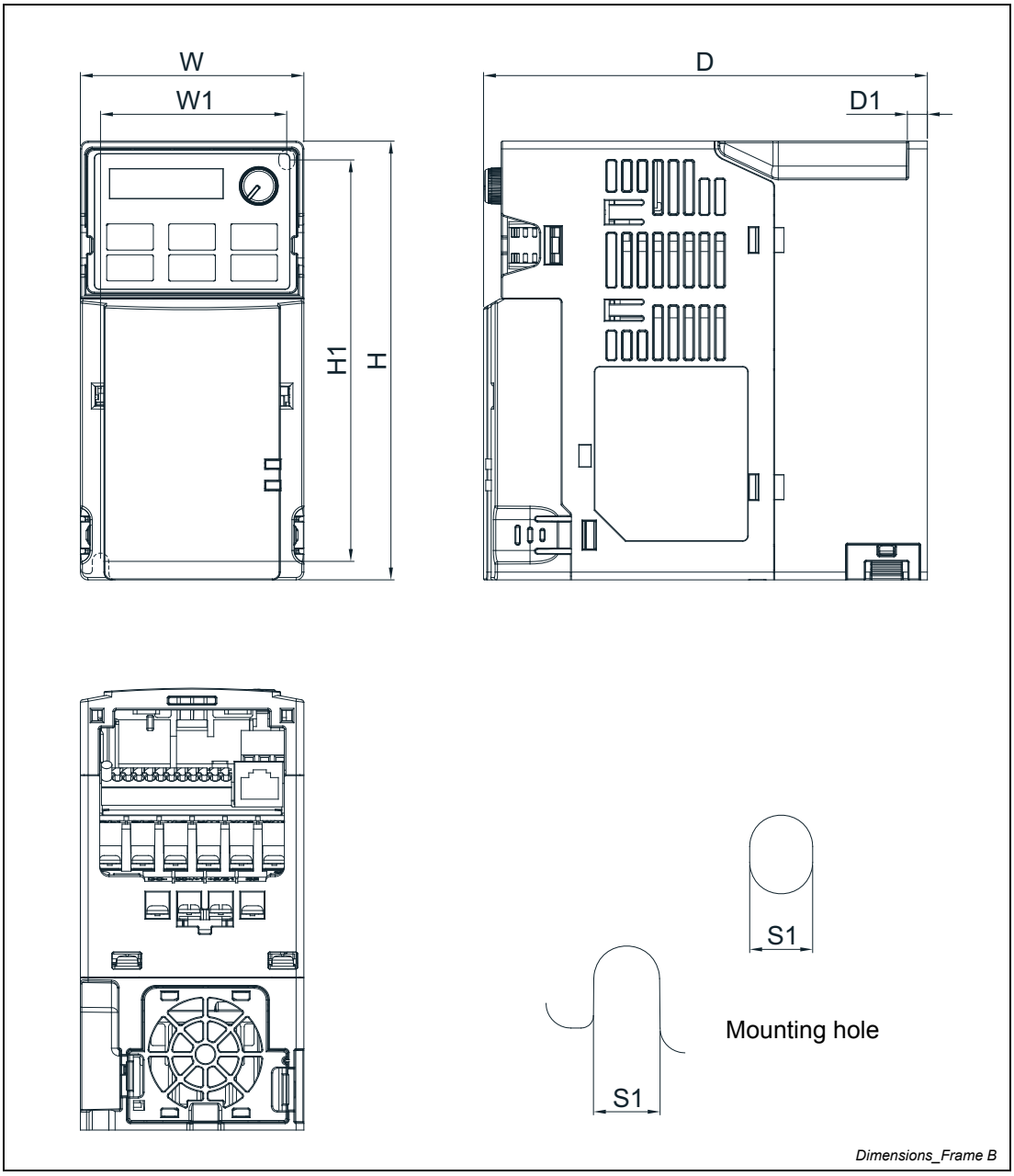


Fig. 2-2: Dimensions frame B

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
B1	72.0 [2.83]	142.0 [5.59]	143.0 [5.63]	60.0 [2.36]	130.0 [5.63]	6.4 [0.25]	5.2 [0.20]
B2	72.0 [2.83]	142.0 [5.59]	143.0 [5.63]	60.0 [2.36]	130.0 [5.63]	3.0 [0.12]	5.2 [0.20]
B3	72.0 [2.83]	142.0 [5.59]	159.0 [6.26]	60.0 [2.36]	130.0 [5.63]	4.3 [0.17]	5.2 [0.20]

2.3 Frame C

C1: VD i 075-11MS3-N; VD i 150-21MS3-N; VD i 220-21MS3-N; VD i 220-23MS3-N; VD i 400-23MS3-N; VD i 220-43MS3-N; VD i 400-3MS3-N

C2: VD i 150-21MS3-F; VD i 220-21MS3-F; VD i 220-43MS3-F; VD i 400-3MS3-F

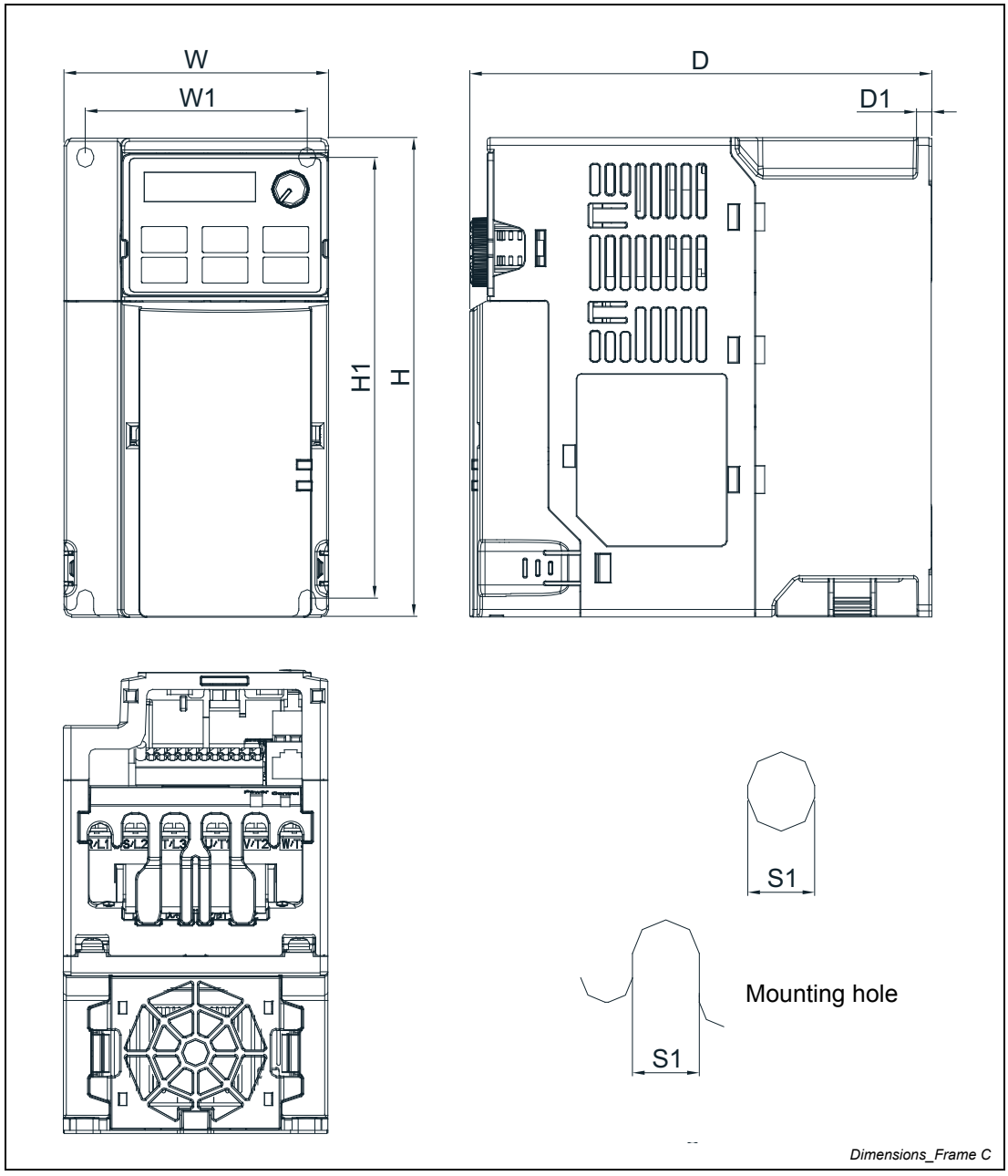


Fig. 2-3: Dimensions frame C

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
C1	87.0 [3.43]	157.0 [6.18]	152.0 [5.98]	73.0 [2.87]	144.5 [5.69]	5.0 [0.20]	5.5 [0.22]
C2	87.0 [3.43]	157.0 [6.18]	179.0 [7.05]	73.0 [2.87]	144.5 [5.69]	5.0 [0.20]	5.5 [0.22]

2.4 Frame D

D1: VD i 550-23MS3-N; VD i 550-3MS3-N; VD i 750-43MS3-N

D2: VD i 550-3MS3-F; VD i 750-43MS3-F

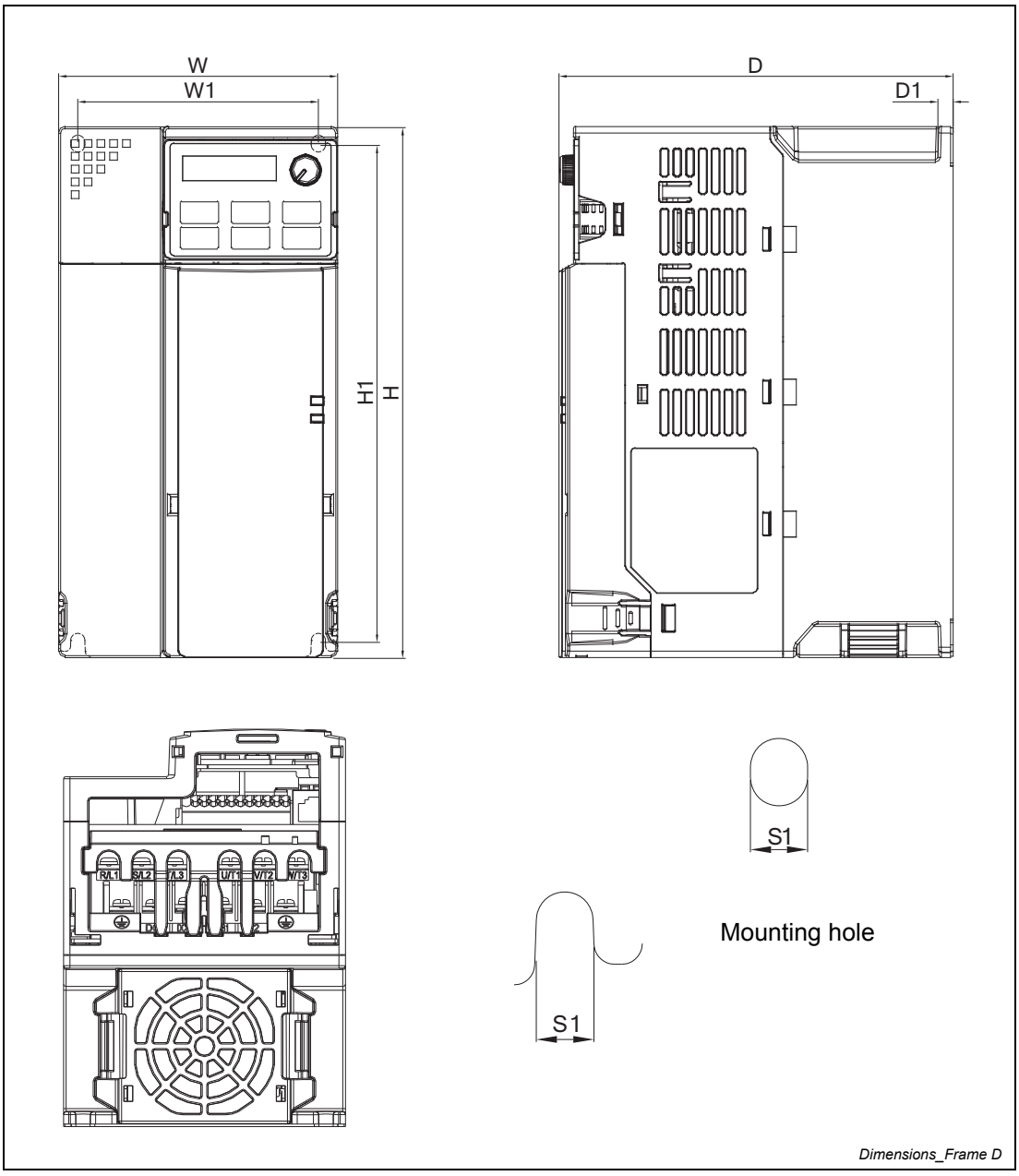


Fig. 2-4: Dimensions frame D0-1

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
D1	109.0 [4.29]	207.0 [8.15]	154.0 [6.06]	94.0 [3.70]	193.8 [7.63]	6.0 [0.24]	5.5 [0.22]
D2	109.0 [4.29]	207.0 [8.15]	187.0 [7.36]	94.0 [3.70]	193.8 [7.63]	6.0 [0.24]	5.5 [0.22]

2.5 Frame E

E1: VD i 750-23MS3-N; VD i 1100-23MS3-N; VD i 1100-43MS3-N; VD i 1500-43MS3-N

E2: VD i 1100-43MS3-F; VD i 1500-43MS3-F

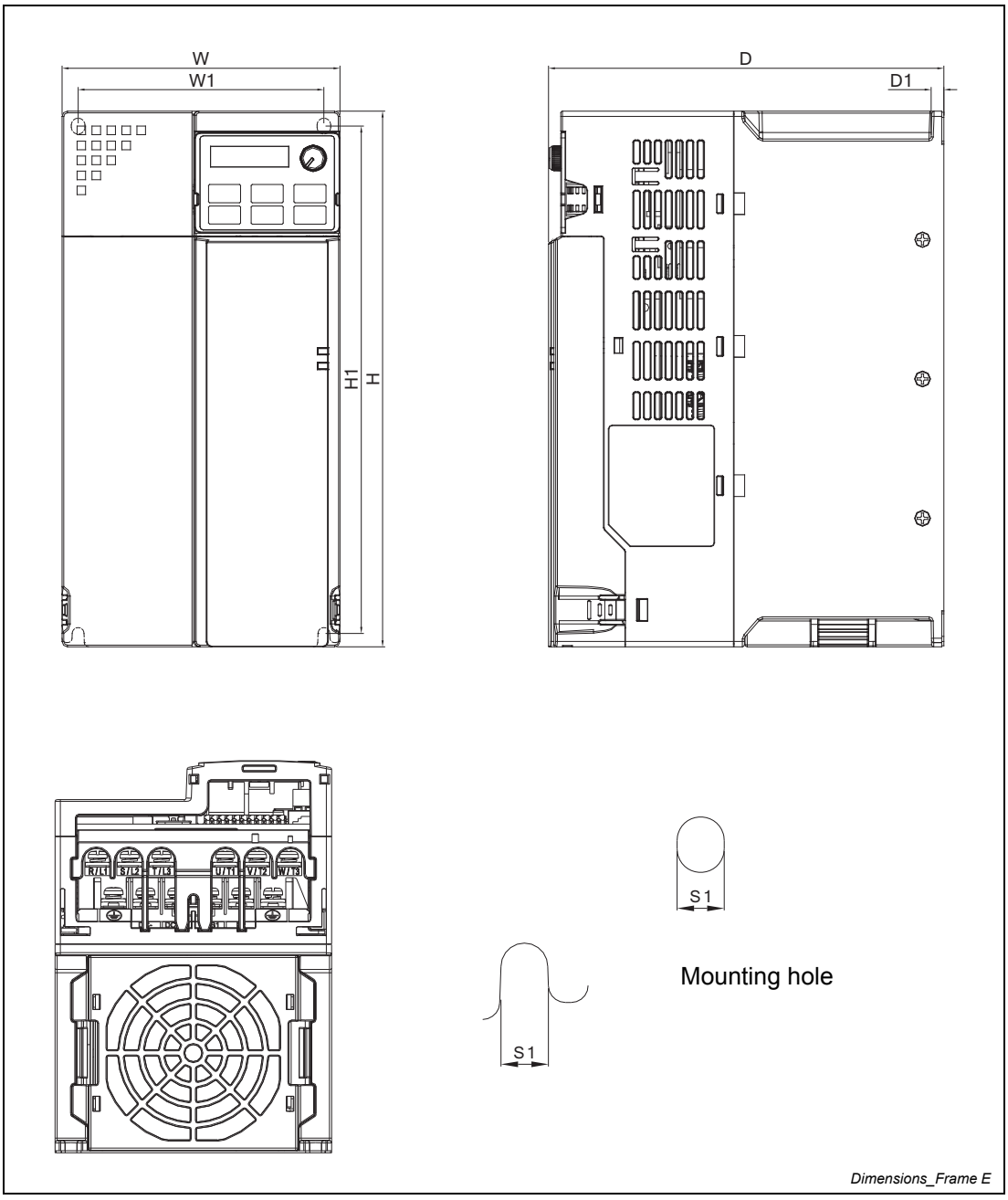


Fig. 2-5: Dimensions frame D0-2

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
E1	130.0 [5.12]	250.0 [9.84]	185.0 [7.83]	115.0 [4.53]	236.8 [9.32]	6.0 [0.24]	5.5 [0.22]
E2	130.0 [5.12]	250.0 [9.84]	219.0 [8.62]	115.0 [4.53]	236.8 [9.32]	6.0 [0.24]	5.5 [0.22]

2.6 Frame F

F1: VD i 1500-23MS3-N; VD i 1850-43MS3-N; VD i 2200-43MS3-N

F2: VD i 1850-43MS3-F; VD i 2200-43MS3-F

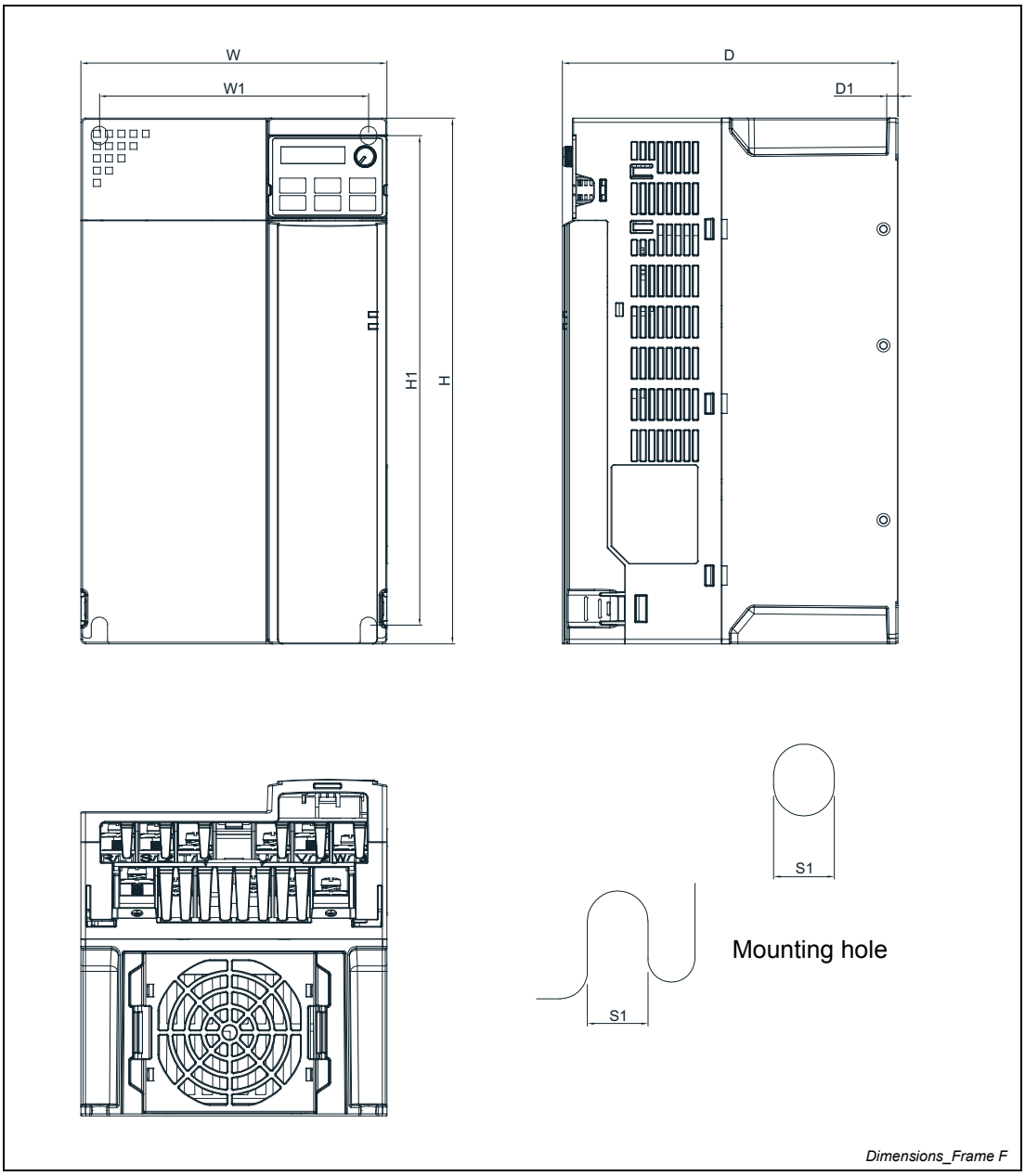


Fig. 2-6: Dimensions frame D1

Unit: mm [inch]

Frame	W	H	D	W1	H1	D1	S1
F1	175.0 [6.89]	300.0 [11.81]	192.0 [7.56]	154.0 [6.06]	279.5 [11.00]	6.5 [0.26]	8.4 [0.33]
F2	175.0 [6.89]	300.0 [11.81]	244.0 [9.61]	154.0 [6.06]	279.5 [11.00]	6.5 [0.26]	8.4 [0.33]

2.7 Digital keypad

Versi-KP-LED

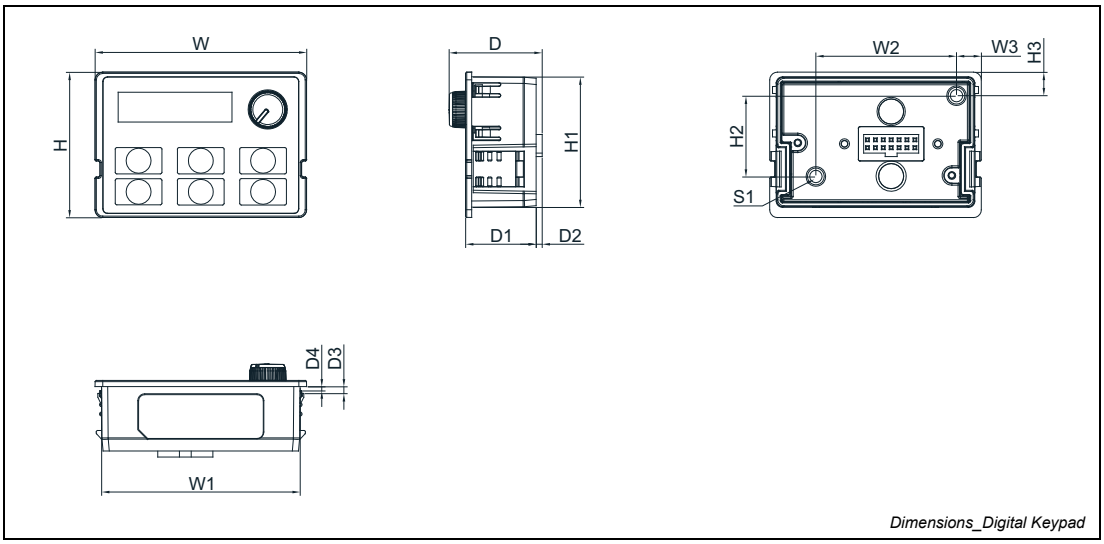


Fig. 2-7: Digital keypad Versi-KP-LED

Unit: mm [inch]

W	W1	W2	W3	H	H1	H2
68.0 [2.67]	63.8 [2.51]	45.2 [1.78]	8.0 [0.31]	46.8 [1.84]	42.0 [1.65]	26.0 [1.02]

H3	D	D1	D2	D3	D4	S1
7.5 [0.31]	30.0 [1.18]	22.7 [0.89]	2.0 [0.08]	2.2 [0.09]	1.3 [0.05]	M3*0.5(2X)

3 Installation

3.1 Minimum mounting clearance and installation

- Prevent fiber particles, scraps of paper, shredded wood saw dust, metal particles, etc. from adhering 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: normally only nonconductive pollution occurs and temporary conductivity caused by condensation is expected.
- Mount the drive in an IP54 cabinet in order to maintain the Pollution Degree 2 or in a pollution-controlled environment.

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

Airflow direction: Inflow Outflow Distance

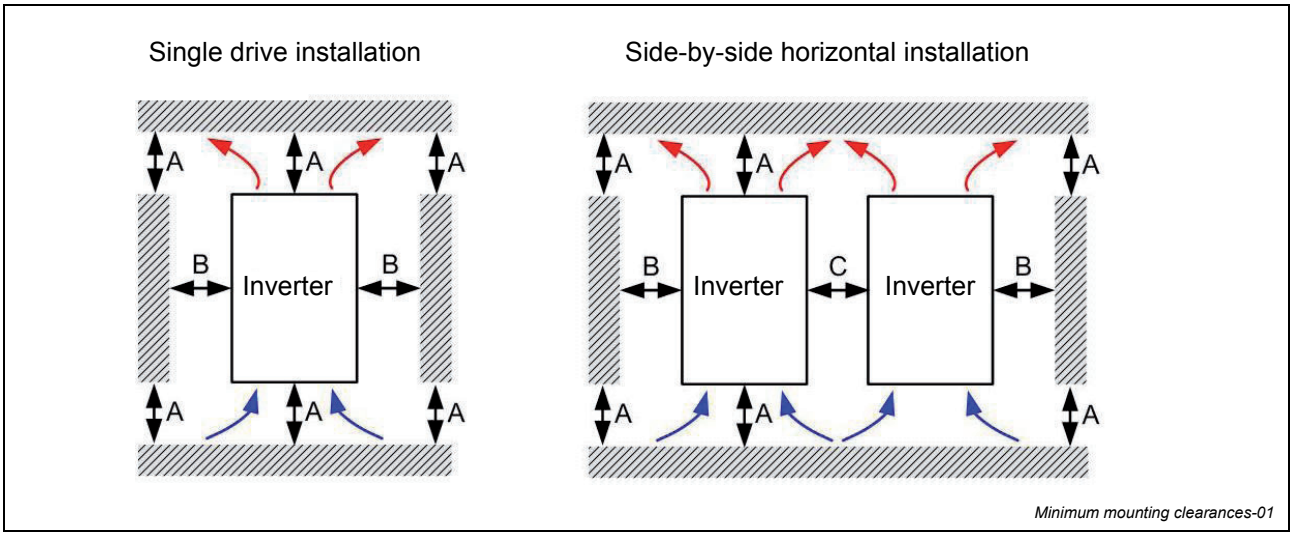


Fig. 3-1: Minimum mounting clearances

3.2 Minimum mounting clearance

Installation method	A (mm)	B (mm)	C (mm)	Ambient temperature (°C)	
				Max. (without derating)	Max. (derating)
Single drive installation	50	30	-	50	60
Side-by-side horizontal installation	50	30	30	50	60
Zero stack installation	50	30	0	40	50

Tab. 3-1: Minimum mounting clearances

NOTE

The minimum mounting clearances A to C stated in tab. 3-1 above apply to AC motor drives installation. Failing to follow the minimum mounting clearances may cause the fan to malfunction and heat dissipation problems.

Frame	Airflow rate for cooling			Power dissipation		
	Model no.	Flow rate (unit: cfm)	Flow rate (unit: m^3/hr)	Loss external (heat sink, unit: W)	Internal (unit: W)	Total (unit: W)
A	VD i 020-11MS3-N	0.0	0.0	8.0	10.0	18.0
	VD i 037-11MS3-N			14.2	13.1	27.3
	VD i 020-21MS3-N			8.0	10.3	18.3
	VD i 037-21MS3-N			16.3	14.5	30.8
	VD i 020-23MS3-N			8.6	10.0	18.6
	VD i 037-23MS3-N			16.5	12.6	29.1
	VD i 075-23MS3-N			31.0	13.2	44.2
	VD i 037-43MS3-N			17.6	11.1	28.7
	VD i 075-43MS3-N			30.5	17.8	48.3
B	VD i 020-21MS3-F	0.0	0.0	8.0	10.3	18.3
	VD i 037-21MS3-F	10.0	16.99	16.3	14.5	30.8
	VD i 075-21MS3-N	0.0	0.0	29.1	20.1	49.2
	VD i 075-21MS3-F	10.0	16.99	29.1	20.1	49.2
	VD i 150-23MS3-N			50.1	24.2	74.3
	VD i 037-43MS3-F			17.6	11.1	28.7
	VD i 075-43MS3-F			30.5	17.8	48.3
	VD i 150-43MS3-N VD i 150-43MS3-F			45.9	21.7	67.6

Tab. 3-2: Air flow rate and power dissipation (1)

Frame	Airflow rate for cooling			Power dissipation		
	Model no.	Flow rate (unit: cfm)	Flow rate (unit: m^3 / hr)	Loss external (heat sink, unit: W)	Internal (unit: W)	Total (unit: W)
C	VD i 075-11MS3-N	16.0	27.2	29.1	23.9	53.0
	VD i 150-21MS3-N VD i 150-21MS3-F			46.5	31.0	77.5
	VD i 220-21MS3-N VD i 220-21MS3-F			70.0	35	105
	VD i 220-23MS3-N			76.0	30.7	106.7
	VD i 400-23MS3-N			108.2	40.1	148.3
	VD i 220-43MS3-N VD i 220-43MS3-F			60.6	22.8	83.4
	VD i 400-3MS3-N VD i 400-3MS3-F			93.1	42	135.1
D	VD i 550-23MS3-N	23.4	39.7	192.8	53.3	246.1
	VD i 550-3MS3-N VD i 550-3MS3-F			132.8	39.5	172.3
	VD i 750-43MS3-N VD i 750-43MS3-F			164.7	55.8	220.5
E	VD i 750-23MS3-N	53.7	91.2	244.5	79.6	324.1
	VD i 1100-23MS3-N			374.2	86.2	460.4
	VD i 1100-43MS3-N VD i 1100-43MS3-F			234.5	69.8	304.3
	VD i 1500-43MS3-N VD i 1500-43MS3-F			319.8	74.3	394.1
F	VD i 1500-23MS3-N	67.9	115.2	492.0	198.2	690.2
	VD i 1850-43MS3-N VD i 1850-43MS3-F			423.5	181.6	605.1
	VD i 2200-43MS3-N VD i 2200-43MS3-F			501.1	200.3	701.4

Tab. 3-2: Air flow rate and power dissipation (2)

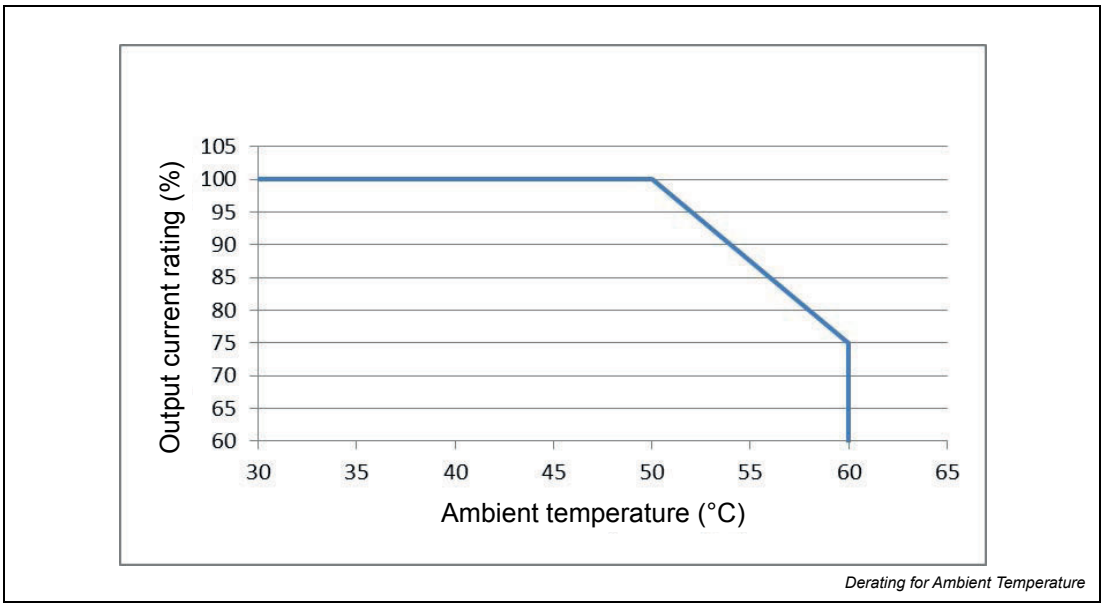


Fig. 3-2: Derating for ambient temperature

4 Wiring

After removing the front cover, please check if the power and control terminals are clearly noted. Please read following precautions to avoid wiring mistakes.

DANGER:

- It is crucial to turn off the AC motor drive power before any wiring. A charge may still remain in the DC bus capacitors with hazardous voltages even if the power has been turned off only after a short time. Therefore it is suggested to wait at least 10 minutes and measure the remaining voltage by a DC voltage meter before wiring. For your personnel safety, please do not perform any wiring before the voltage drops to a safe level <25 V DC. Wiring installation with remaining voltage condition may cause 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.
- The main circuit terminals R/L1, S/L2, T/L3 are for power input. If the power is wrongly connected to other terminals, it may result in damage to the equipment.
  The voltage and current should lie within the range as indicated on the nameplate (see section 1.2 “Nameplate information”).
- All the units must be grounded directly to a common ground terminal to prevent lightning strike or electric shock.
- Please make sure to tighten the screws of the main circuit terminals to prevent sparks due to vibrations caused by loose screws.

CAUTION:

- When wiring, please choose the wires with specification that complies with local regulation for your personnel safety.
- Check following items after finishing the wiring:
  - Are all connections correct?
  - Any loose wires?
  - Any short-circuits between the terminals or to ground?

4.1 Wiring

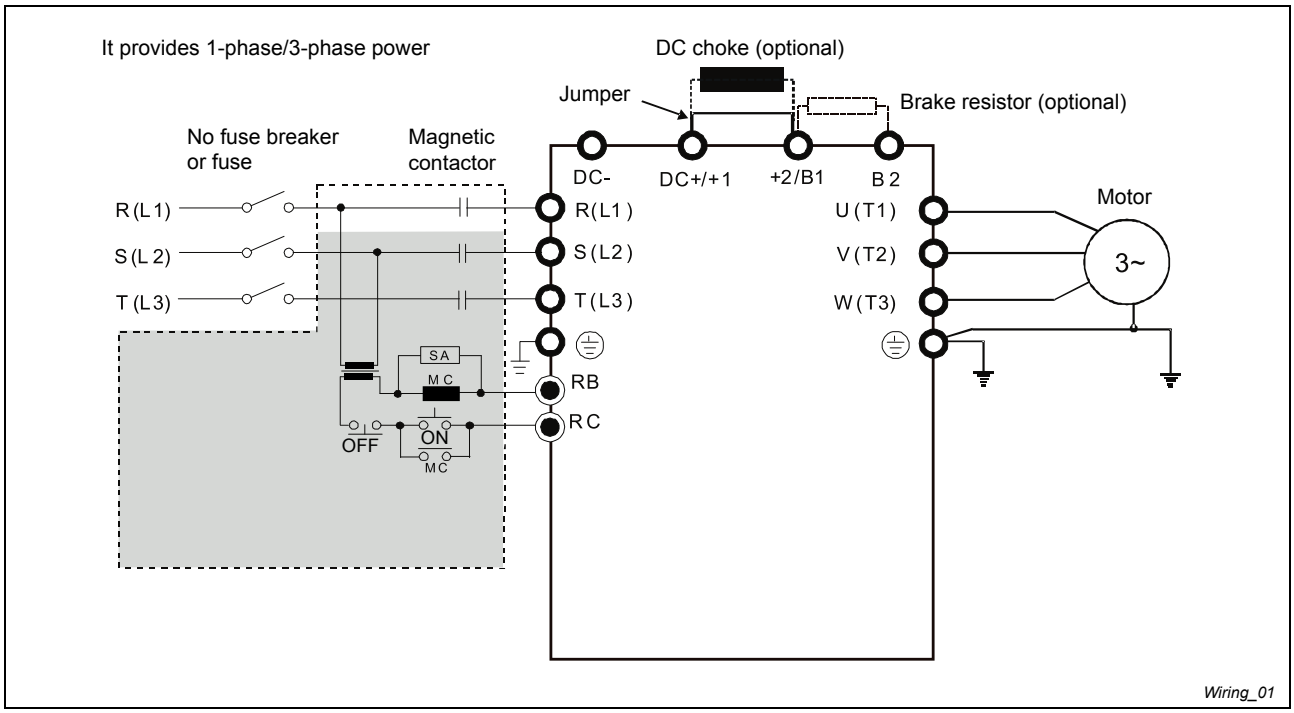


Fig. 4-1: Wiring of the power terminals

NOTE

It is recommended to install a protective circuit at RB-RC to protect it from system damage. When a fault occurs, the contact will switch ON to shut the power and protect the power system. RB and RC are the multi-function relay contacts.

4.1.1 Wiring of the input/output terminals

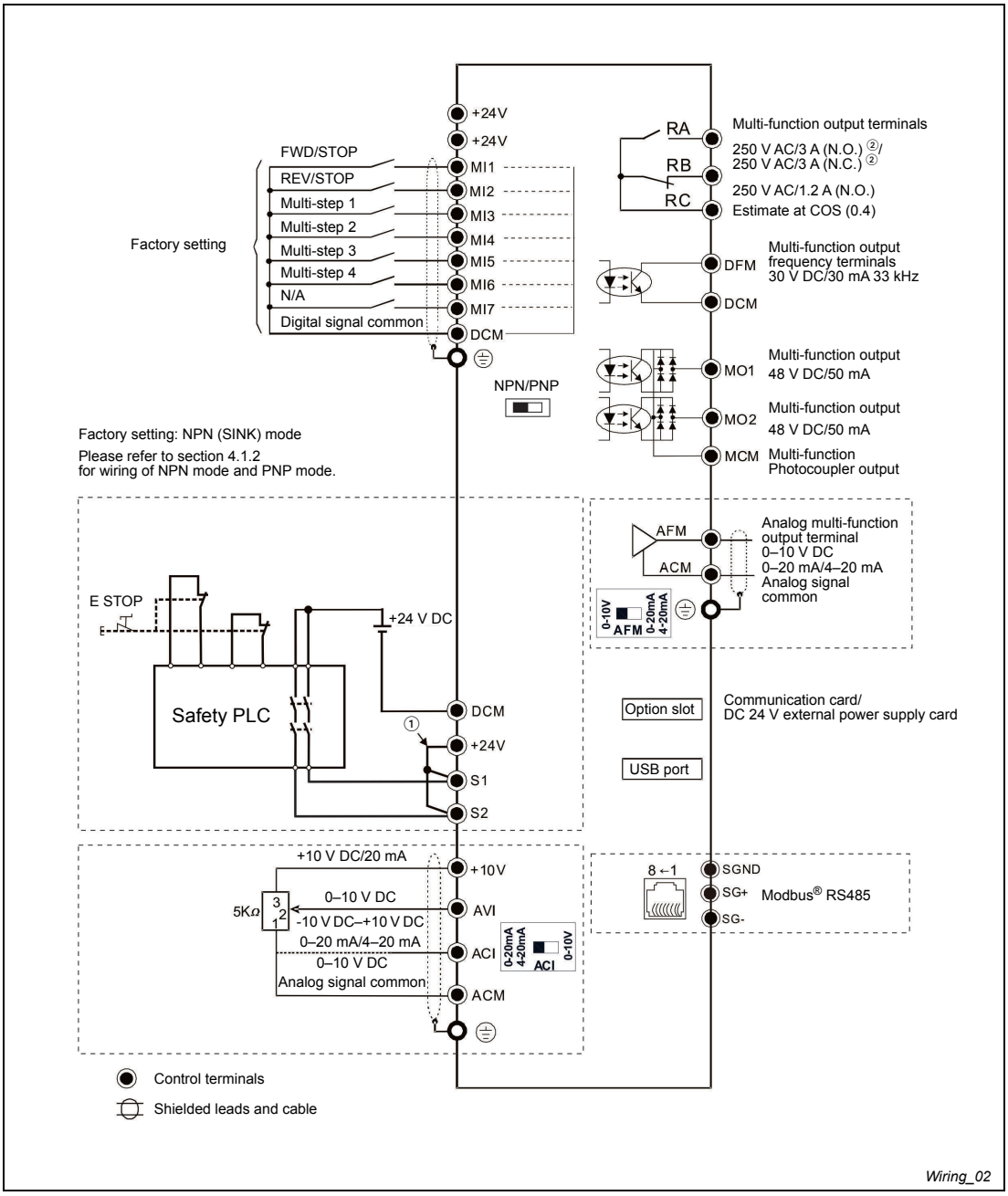


Fig. 4-2: Wiring of the control terminals

① It is a short circuiting jumper installed between +24 V, S1 and S2 short when MS3 leaves the factory. Remove this short cicuiting jumper before using the safety function while wiring.

② N.O. = Normally Open
N.C. = Normally Closed

NOTES

- MI7 can input 33 kHz pulses.
- Do NOT apply the mains voltage directly to external terminals.

4.1.2 SINK (NPN)/SOURCE (PNP) mode

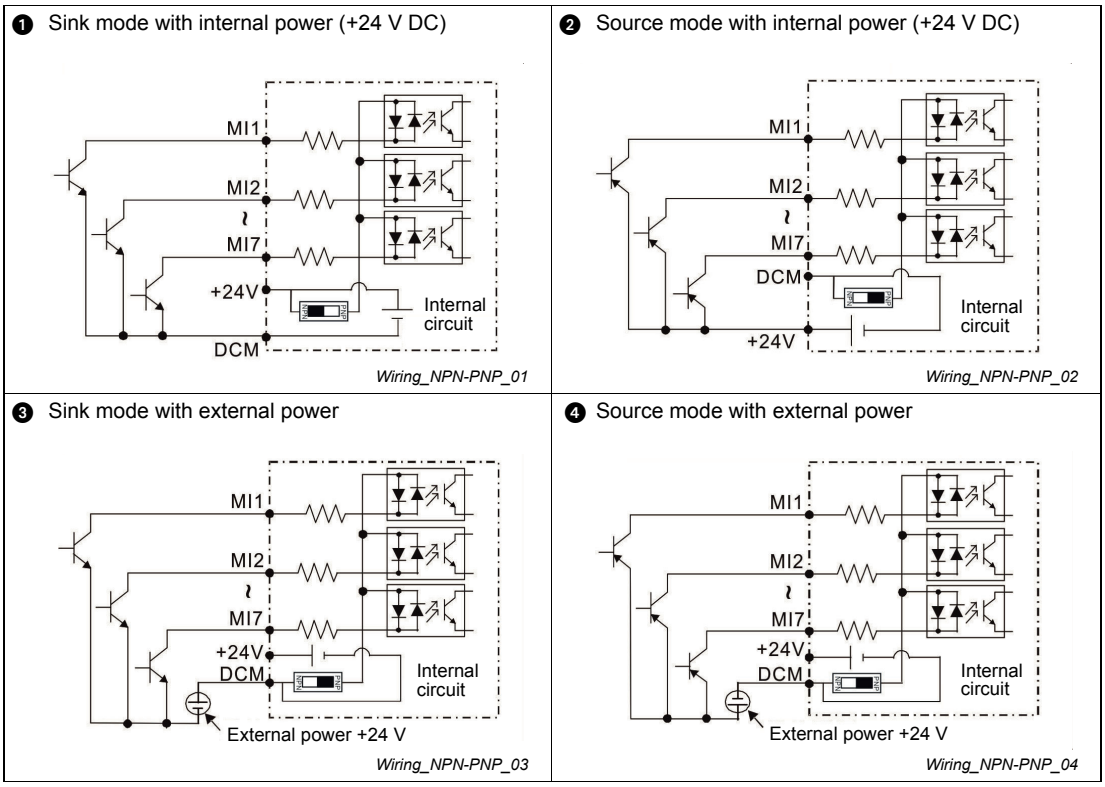
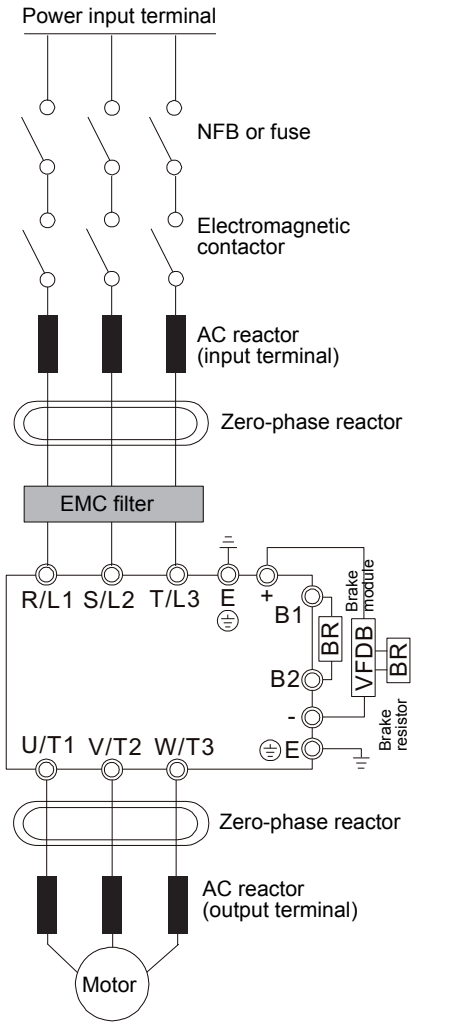


Fig. 4-3: Sink (NPN)/source (PNP) mode

4.2 System wiring diagram



Power input terminal	Please refer to specification tables for details. Please contact your supplier for more information about the power input terminal.
NFB or fuse	There may be a large inrush current during power on. Please contact your supplier for more information about the selection of a suitable NFB or fuse.
Electromagnetic contactor	Switching the power ON/OFF before the magnetic contactor more than once an hour can cause damage to the drive.
AC reactor (input terminal)	When the mains power capacity exceeds 500 kVA, or when the drive is preceded by a capacitor bank, the instantaneous peak voltage and current generated may destroy the drive. In that case it is recommended to install an AC input reactor which will also improve the power factor and harmonics. The cable length between reactor and drive should be within 10 m. Please contact your supplier for more information about the AC reactor.
Zero-phase reactor	Used to reduce radiated emission, especially in environments with audio devices, and reduce input and output side interference. The effective range is AM band to 10 MHz. Please contact your supplier for more information about the zero-phase reactor.
EMC filter	Can be used to reduce electromagnetic interference. Please contact your supplier for more information about the EMC filter.
Brake module and Brake resistor (BR)	Used to shorten the deceleration time of the motor. Please contact your supplier for more information about the selection of brake resistors and units.
AC reactor (output terminal)	The motor cable length will affect switching current peaks. Please contact your supplier for more information about the cable length.

Fig. 4-4: System wiring diagram

5 Main circuit terminals

DANGER:

- Fasten the screws of the main circuit terminal to prevent sparks condition due to vibrations caused by loose screws.
- When it is required 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-Capacitor) or R-C (Resistance-Capacitor), unless approved by Peter Electronic.
- DO NOT connect phase-compensation capacitors or surge absorbers at the output terminals of AC motor drives.
- DO NOT connect +1/DC+ to DC-, +2/B1 to DC- or brake resistor directly to prevent drive damage.
- Ensure the insulation of the main circuit wiring in accordance with the relevant safety regulations.

CAUTION:

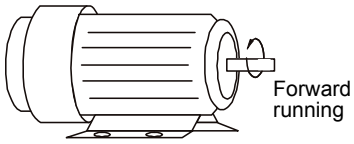
Main power terminals

- R/L1, S/L2 and T/L3 has no phase-sequence requirement, it can be used upon random selection.
- It is recommended 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.
- Please use voltage and current within the specification.
- When using a general GFCI (Ground Fault Circuit Interrupter), select a current sensor with sensitivity of 200 mA or above and not less than 0.1-second operation time to avoid nuisance tripping.
- Please use the shielded wire or tube for the power wiring and ground the two ends of the shielded wire or tube.
- Do NOT run/stop AC motor drives by turning the power ON/OFF. Start and Stop the drives by RUN/STOP command. If you still need to run/stop the drive by turning power ON/OFF, it is recommended to do so only ONCE per hour.
- Connect the drive to a 3-phase three-wire or 3-phase four-wire Wye system to comply with UL standards.

CAUTION:

Output terminals for main circuit

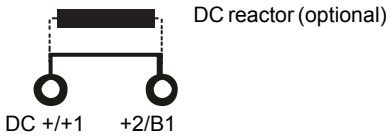
- Use well-insulated motor, suitable for inverter operation.
- When the AC drive output terminals U/T1, V/T2, and W/T3 are connected to the motor terminals U/T1, V/T2, and W/T3, respectively, the motor will rotate counterclockwise (as viewed on the shaft end of the motor) when a forward operation command is received. To permanently reverse the direction of motor rotation, switch over any of the two motor leads.



Motor_rotation

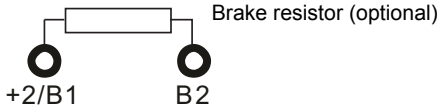
Connection terminals for DC reactor, the external brake resistor and a DC circuit

- These are the terminals used to connect the DC reactor to improve the power factor and harmonics. At delivery they are shorted by a jumper. Remove the jumper before connecting the DC reactor.
- You must tightly fasten the teminal screws of the jumper when no DC reactor is connected to DC+/+1, +2/B1 to execute a low-ohmic common DC BUS; otherwise the drive might lose power or the terminals might be burnt by overheat.



DC reactor

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

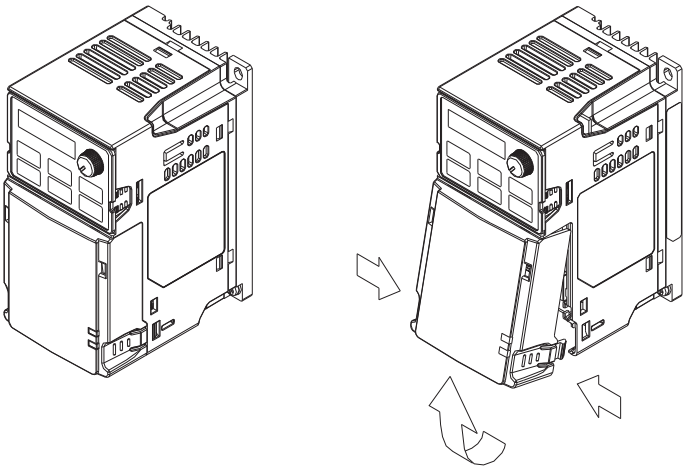


Brake resistor

- Connect the external brake resistor to the terminals [+2/B1], [B2] on AC motor drives.
- DO NOT short-circuit or connect a brake resistor directly to DC+/+1 and DC-, +2/B1 to DC-; otherwise the drive will be damaged.
- DC+ and DC- are connected by common DC bus, please refer to section 5.3 “Main circuit terminals” for the wiring terminal specification and the wire gauge information.

5.1 Remove the front cover

- Remove the front cover before connecting the main circuit terminals and control circuit terminals. Remove the cover according to the figure below.
- The figure below shows the Frame A model for example. Removing the cover on the other frame sizes is similar.



Remove the frontcover

Fig. 5-1: Remove the frontcover

5.2 Main circuit diagram

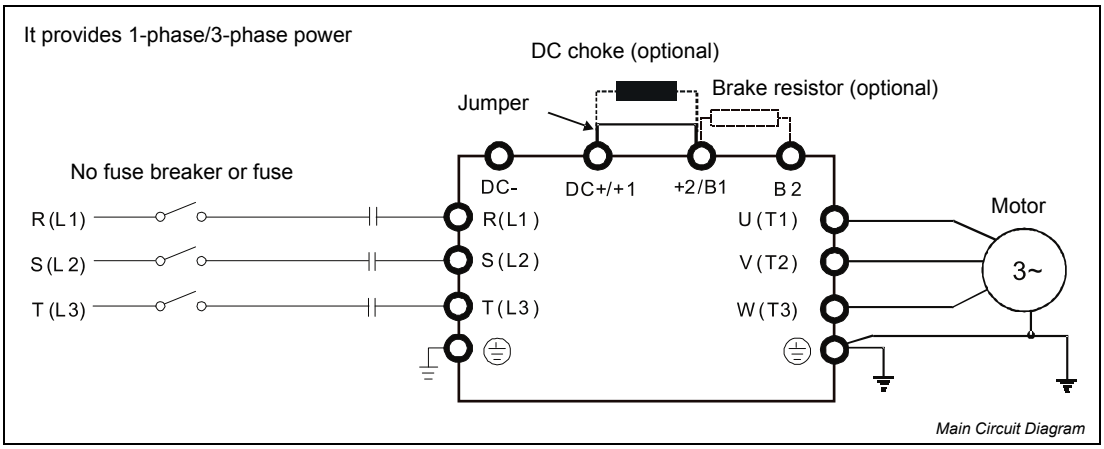


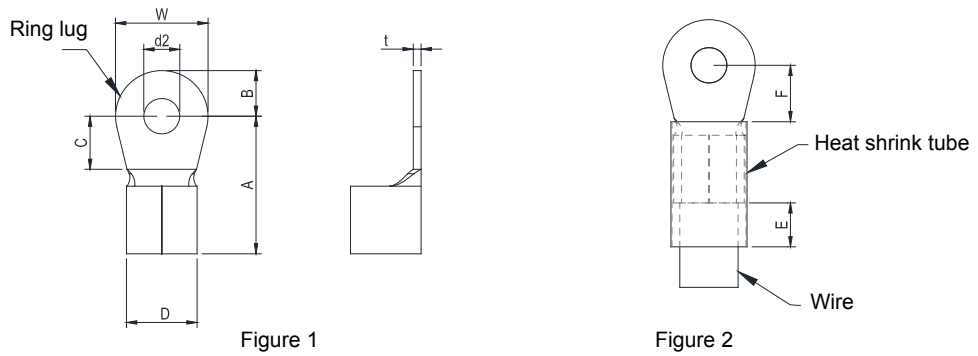
Fig. 5-2: Main circuit wiring diagram

Terminals	Description
R/L1, S/L2	Mains input terminals one-phase
R/L1, S/L2, T/L3	Mains input terminals three-phase
U/T1, V/T2, W/T3	Motor output terminals for connecting three-phase IM and PM motors.
+1, +2	Connections for DC reactor to improve the power factor and harmonics. Remove the jumper when using a DC reactor.
DC+, DC-	Connections for brake unit (VFDB series) Common DC BUS
B1, B2	Connections for brake resistor (optional)
⏚	Ground connection; comply with local regulations.

Tab. 5-1: Main power terminals

5.3 Main circuit terminals

- The following additional terminals are needed when wiring. The additional terminal dimension should comply with Figure 1 below.
- After crimping the wire to the ring lug (must be UL approved) install an UL and CSA approved heat shrink tubing made of YDPU2 and rated at a minimum of 600 V AC insulation over the live part. Refer to Figure 2 below.



Ring lug specifications

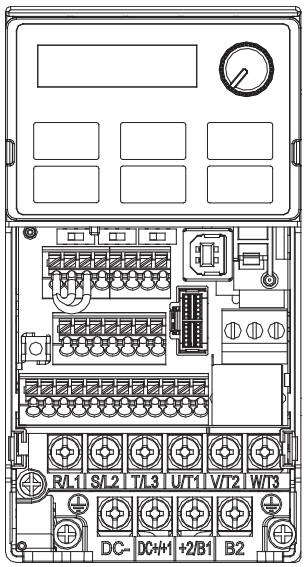
Fig. 5-3: Ring lug and insulated heat shrink tubing (UL compliant) specifications

Unit: mm

Frame	AWG	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
A	18	RNBS1-3.7	9.8	3.2	4.8	4.1	3.7	13.0	4.2	6.6	0.8
	16	RNBS 2-3.7									
	14										
B	14	RNBS2-4	12.1	3.6	6.1	5.6	4.3	13.0	4.5	7.2	1
	12	RNBS5-4									
C	14	RNBS2-4	17.8	5.0	6.1	7.2	4.3	13.0	5.5	8.0	1.2
	12	RNBS5-4									
	10	RNBS2-4									
	8	RNBS5-4									
D	12	RNBS5-4	17.8	5.0	6.1	7.2	4.3	13.0	5.5	8.0	1.2
	10										
	8	RNBS8-4									
E	8	RNBS8-5	27.1	6.1	10.5	11.5	5.3	13.0	6.5	12.2	1.7
	6	RNB14-5									
	4	RNBS22-5									
F	6	RNBS14-6	35.0	9.0	13.3	14.0	6.2	13.0	19.5	18.0	1.8
	4	RNBS22-6									
	2	RNBS38-6									

Tab. 5-2: Ring lug dimensions (fig. 5-3)

Frame A



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

Main Circuit Diagram_Frame A

Fig. 5-4: Main circuit terminals frame A

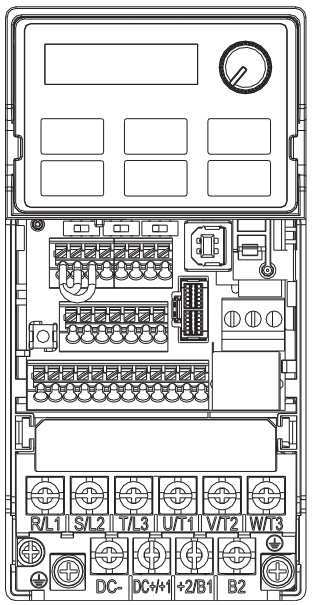
NOTE One-phase model with no T/L3 terminal

Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 020-11MS3-N	14 AWG [2.1 mm²]	16 AWG [1.3 mm²]	M3.5	9 kg-cm [7.8 lb-in.] [0.88 Nm]
VD i 037-11MS3-N		14 AWG [2.1 mm²]		
VD i 020-21MS3-N		16 AWG [1.3 mm²]		
VD i 037-21MS3-N		14 AWG [2.1 mm²]		
VD i 020-23MS3-N		18 AWG [0.82 mm²]		
VD i 037-23MS3-N				
VD i 075-23MS3-N		16 AWG [1.3 mm²]		
VD i 037-43MS3-N		18 AWG [0.82 mm²]		
VD i 075-43MS3-N				

Tab. 5-3: Usable wirings for main circuit terminals frame A

- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on a temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Frame B



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

Main Circuit Diagram_Frame B

Fig. 5-5: Main circuit terminals frame B

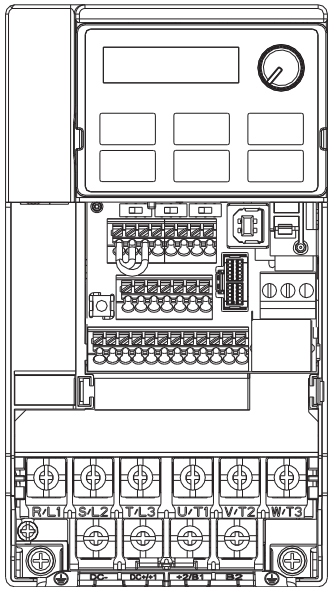
NOTE One-phase model with no T/L3 terminal

Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 020-21MS3-F	12 AWG [3.3 mm²]	14 AWG [2.1 mm²]	M4	15 kg-cm [13.0 lb-in.] [1.47 Nm]
VD i 037-21MS3-F				
VD i 075-21MS3-N				
VD i 075-21MS3-F				
VD i 150-23MS3-N				
VD i 037-43MS3-F				
VD i 075-43MS3-F				
VD i 150-43MS3-N				
VD i 150-43MS3-F				

Tab. 5-4: Usable wirings for main circuit terminals frame B

- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on a temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Frame C



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

Main Circuit Diagram_Frame C

Fig. 5-6: Main circuit terminals frame C

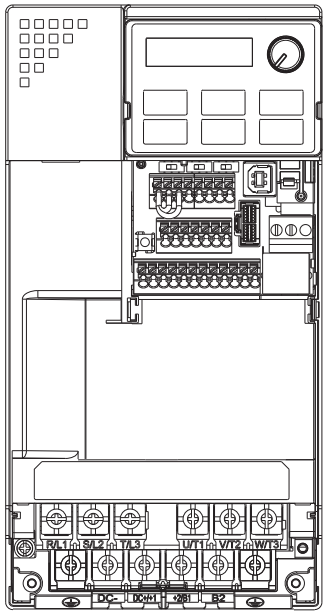
NOTE One-phase model with no T/L3 terminal

Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 075-11MS3-N	8 AWG [8.4 mm²]	10 AWG [5.3 mm²]	M4	20 kg-cm [17.4 lb-in.] [1.96 Nm]
VD i 150-21MS3-N				
VD i 150-21MS3-F				
VD i 220-21MS3-N		8 AWG [8.4 mm²]		
VD i 220-21MS3-F				
VD i 220-23MS3-N		12 AWG [3.3 mm²]		
VD i 400-23MS3-N		10 AWG [5.3 mm²]		
VD i 220-43MS3-N		14 AWG [2.1 mm²]		
VD i 220-43MS3-F				
VD i 400-3MS3-N				
VD i 400-3MS3-F				

Tab. 5-5: Usable wirings for main circuit terminals frame C

- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Frame D



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

Main Circuit Diagram_Frame D

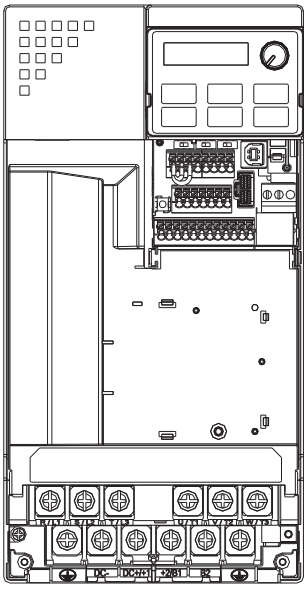
Fig. 5-7: Main circuit terminals frame D

Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 550-23MS3-N	8 AWG [8.4 mm²]	8 AWG [8.4 mm²]	M4	20 kg-cm [17.4 lb-in.] [1.96 Nm]
VD i 550-3MS3-N		10 AWG [5,3 mm²]		
VD i 550-3MS3-F				
VD i 750-43MS3-N				
VD i 750-43MS3-F				

Tab. 5-6: Usable wirings for main circuit terminals frame D

- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Frame E



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

Main Circuit Diagram_Frame E

Fig. 5-8: Main circuit terminals frame E

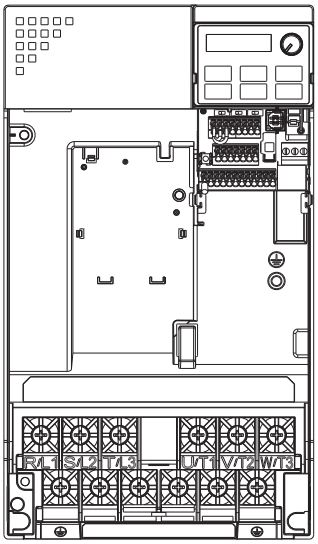
Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 750-23MS3-N	6 AWG [13.3 mm²]	6 AWG [13.3 mm²]	M5	25 kg-cm [21.7 lb-in.] [2.45 Nm]
VD i 1100-23MS3-N①	4 AWG [21.2 mm²]	4 AWG [21.2 mm²]		
VD i 1100-43MS3-N	6 AWG [13.3 mm²]	8 AWG [8.4 mm²]		
VD i 1100-43MS3-F				
VD i 1500-43MS3-N				
VD i 1500-43MS3-F				

Tab. 5-7: Usable wirings for main circuit terminals frame E

① These drives must be wired with the specified ring terminal dimensions.

- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

Frame F



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

Main Circuit Diagram_Frame F

Fig. 5-9: Main circuit terminals frame F

Models	Max. wire gauge	Min. wire gauge	Screw	Torque (±10%)
VD i 1500-23MS3-N	2 AWG [33.6 mm²]	2 AWG [33.6 mm²]	M6	40 kg-cm [34.7 lb-in.] [3.92 Nm]
VD i 1850-43MS3-N		6 AWG [13.3 mm²]		
VD i 1850-43MS3-F				
VD i 2200-43MS3-N		4 AWG [21.2 mm²]		
VD i 2200-43MS3-F				

Tab. 5-8: Usable wirings for main circuit terminals frame F

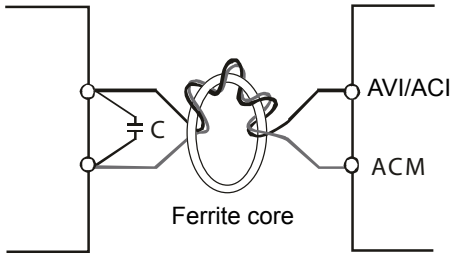
- If you install at Ta 45 °C above environment, select copper wire with voltage rating of 600 V and temperature resistance of 90 °C or above.
- If you install at Ta 45 °C environment, select copper wire with voltage rating of 600 V and temperature resistance of 75 °C or 90 °C.
- For UL installation compliance, use copper wires when installing. The wire gauge is based on temperature resistance of 75 °C, in accordance with UL requirements and recommendations. Do not reduce the wire gauge when using high-temperature resistant wires.

6 Control terminals

CAUTION:

Analog input terminals (AVI, ACI, ACM)

- Analog input signals are easily affected by external noise. Use shielded wiring and keep it as short as possible (<20 m) with proper grounding. If the noise is inductive, connecting the shield to terminal ACM can bring improvement.
- When using analog input signal in the circuit, twisted pair is suggested to use for dealing with weak signal.
- If the analog input signals are affected by noise from the drive, please connect a capacitor and ferrite core as indicated in the following diagram:

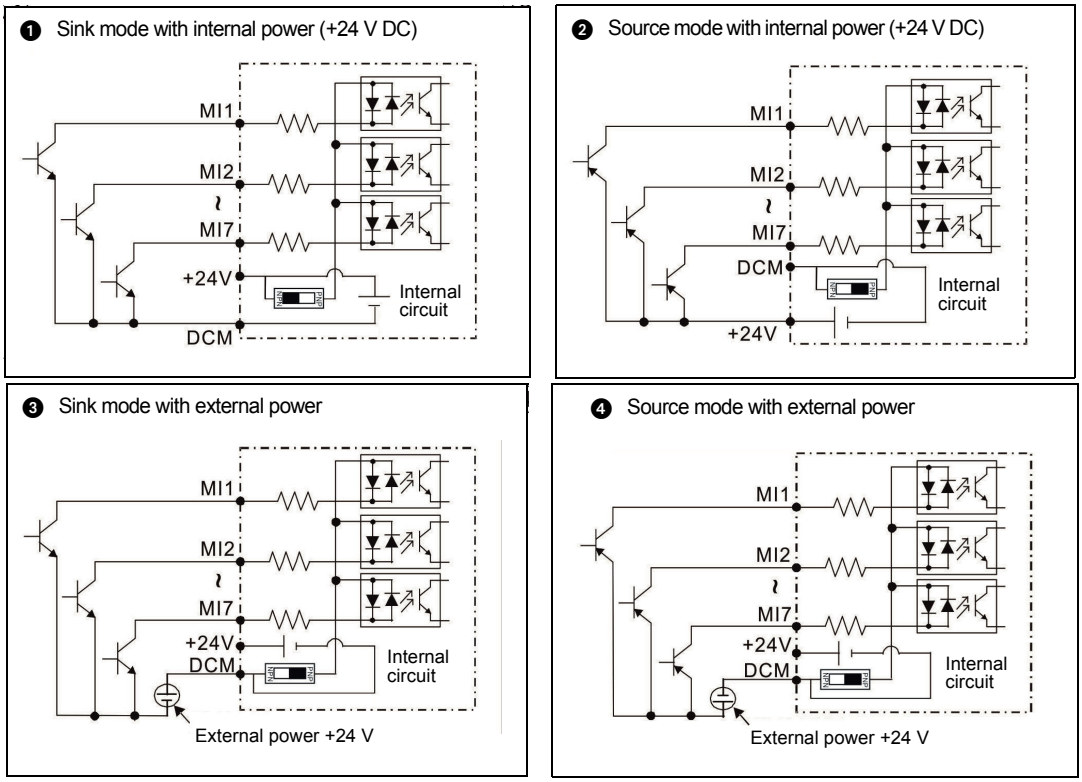


Wind each wire 3 times or more around the core.

Ferrite core

CAUTION:

Contact input terminals (MI1–MI7, DCM, +24 V)



■ When the photo coupler is using the internal power supply, the switch connection for Sink and Source modes are as shown in the picture above: MI-DCM: Sink mode, MI-+24 V: Source mode.

Transistor output terminals (MO1, MO2, MCM)

■ Make sure to connect the digital outputs to the correct polarity. See the wiring diagram when connecting a relay to the digital output, connect a surge absorber across the coil, and check the polarity.

Control terminal specifications

Wire gauge: 20–18 AWG
[0.519–0.82 mm^2]

RELAY terminal specifications

Wire gauge: 24–16 AWG [0.205–1.3 mm^2];
Torque: 5 kg-cm / [4.3 lb-in.] / [0.49 Nm]

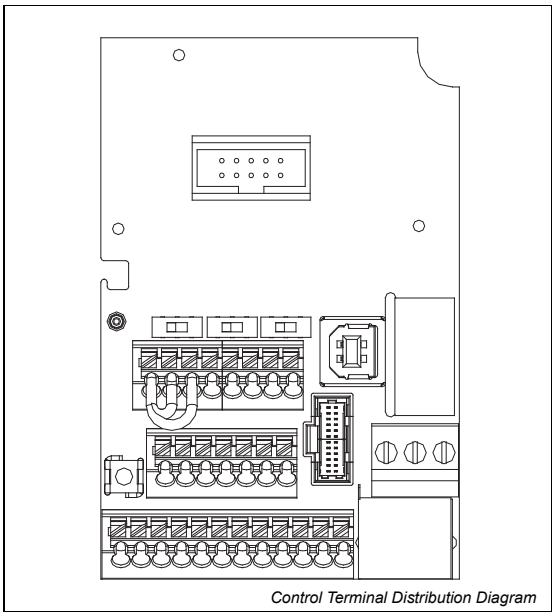


Fig. 6-1: Control terminal distribution diagram

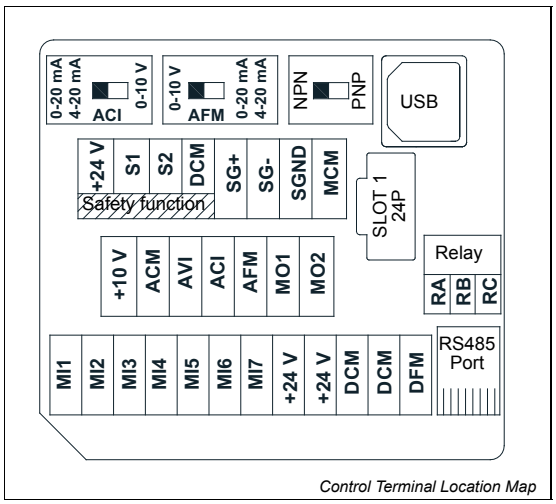


Fig. 6-2: Control terminal location map

Wiring precautions:

- The default condition is +24 V/S1/S2 shorted by jumper, as shown in the figure above. Refer to chapter 4 “Wiring” for more details.
- The RELAY terminal uses the PCB terminal block:
  - Tighten the wiring with a 3.5 mm (wide) x 0.6 mm (thick) slotted screwdriver.
  - The ideal length of stripped wire at the connection side is 6–7 mm.
  - When wiring bare wires, make sure they are perfectly arranged to go through the wiring holes.
- The control terminal uses a spring clamp terminal block:
  - Tighten the wiring with a 2.5 mm (wide) x 0.4 mm (thick) slotted screwdriver.
  - The ideal length of stripped wire at the connection side is 9 mm.
  - When wiring bare wires, make sure they are perfectly arranged to go through the wiring holes.

Wiring specifications of control terminals	Wire gauge (AWG)	
	Min. wire gauge	Max. wire gauge
Conductor cross section solid wire	20 AWG [0.519 mm²]	18 AWG [0.82 mm²]
Conductor cross section stranded wire		
Stranded with ferrules with plastic sleeves		20 AWG [0.519 mm²]

Tab. 6-1: Wiring specifications

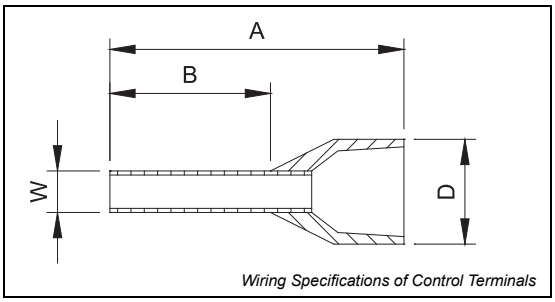
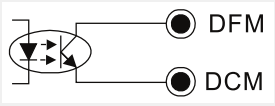
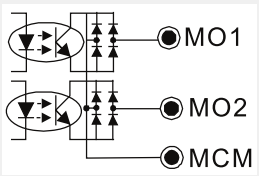


Fig. 6-3: Ferrule: Type: AI 0,5 - 8 WH, Manufacturer: PHOENIX CONTACT

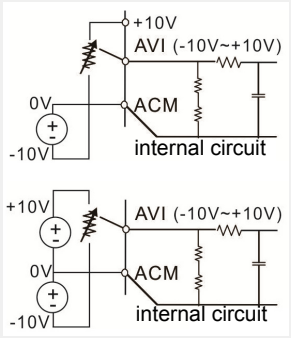
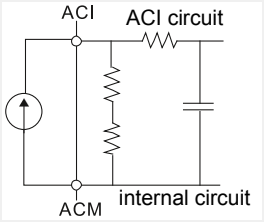
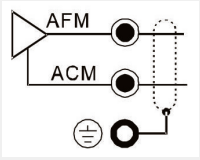
Unit: mm

A	B	D (MAX)	W
14	8	3.5	1.4

Tab. 6-2: Dimensions of ferrule

Terminals	Terminal function	Default (NPN mode)
+24 V	Digital control signal common (source)	+24 V ±10% 100 mA
MI1 – MI7	Multi-function input 1–7	Refer to Pr.02-01–02-07 to program the multi-function inputs MI1–MI7. Source mode ON: the activation current is 3.3 mA ≥11 V DC OFF: cut-off voltage ≤5 V DC Sink mode ON: the activation current is 3.3 mA ≤13 V DC OFF: cut-off voltage ≥19 V DC ■ When Pr.02-00 = 0, MI1 and MI2 can be programmed. ■ When Pr.02-00 ≠ 0, the function of MI1 and MI2 is according to Pr.02-00 setting. ■ When Pr.02-07 = 0, MI7 is pulse input with maximum frequency 33 kHz (See Pr.10-00, Pr.10-02, Pr.10-16).
DFM	Digital frequency meter  *DFM grafic tab*	DFM is a pulse-signal output; Duty-cycle: 50% Min. load impedance R_L: 1 kΩ/100 pf Maximum current: 30 mA Maximum capacitive load: 100 pF Maximum voltage: 30 V DC ± 1% (when 30 V DC/30 mA/R_L = 100 pf) Max. output frequency: 33 kHz Internal current limiting resistor R: ≥1 KΩ Output load impedance R_L Capacitive load ≤ 100 pf Resistive load ≥ 1 kΩ resistance determines the output voltage value. DFM-DCM voltage = external voltage (R_L/(R_L+R))
DCM	Digital frequency signal common (sink)	
MO1	Multi-function output 1 (photo coupler)	Programmable open-collector outputs, see Pr.02-16 and Pr.02-17.  *MO1-MO2 grafic tab*
MO2	Multi-function output 2 (photo coupler)	
MCM	Multi-function output common	Max. 48 V DC, 50 mA
RA	Multi-function relay output 1 (N.O. a)	Programmable relay output, see Pr.02-13. Resistive load 3 A (N.O.)/3 A (N.C.) 250 V AC 5 A (N.O.)/3 A (N.C.) 30 V DC Inductive load (COS 0.4) 1.2 A (N.O.)/1.2 A (N.C.) 250 V AC 2.0 A (N.O.)/1.2 A (N.C.) 30 V DC Various kinds of monitor signals output, e.g.: operation, frequency reached, overload indication etc.
RB	Multi-function relay output 1 (N.C. b)	
RC	Multi-function relay common (relay)	
+10 V	Potentiometer power supply	+10.5 ±0.5 V DC/20 mA

Tab. 6-3: Description of the control terminals (1)

Terminals	Terminal function	Default (NPN mode)
AVI	Analog voltage input  *AVI grafic tab*	Programmable analog input, see Pr.03-00. Impedance: 20 kΩ Range 0–maximum output frequency (Pr.01-00): 0–10 V/-10–10 V Range switching according to Pr.03-00, Pr.03-28.
ACI	Analog current input  *ACI grafic tab*	Programmable analog input, see Pr.03-01. Impedance: 250 Ω Range 0–maximum output frequency (Pr.01-00): 0–20 mA/4–20 mA/0–10 V Range switching according to Pr.03-01, Pr.03-29.
AFM	Multi-function analog voltage output  *AFM grafic tab*	Switch: the AFM default is 0–10 V (voltage mode). Use the switch and Pr.03-31 to change to current mode (0–20 mA/4–20 mA). You must follow the indication on the back side of the front cover or page 6-1 of this quick reference guide when using the switch. **Voltage mode** Range: 0–10 V (Pr.03-31 = 0) corresponding to the maximum operating range of the control object Maximum output current: 2 mA Maximum load: 5 kΩ **Current mode** Range: 0–20 mA (Pr.03-31 = 1)/4–20 mA (Pr.03-31 = 2) corresponding to the maximum operating range of the control object Maximum load: 500 Ω
ACM	Analog signal common	Common for analog terminals
S1, S2	Default: S1/S2 shorted for +24 V Rated voltage: 24 V DC ±10%; Maximum voltage: 30 V DC ±10% Activation current: 6.67 mA ±10%	
DCM	**STO activation mode** Input voltage level: S1-DCM > 0 V DC or S2-DCM <5 V DC STO response time ≤20 ms. S1/S2 operates until the AC motor drive stops outputting current. **STO cut-off mode** Input voltage level: S1-DCM >11 V DC and S2-DCM <30 V DC Power removal safety function according to EN 954-1 and IEC/EN 61508 Note: refer to chapter 12 “Safe Torque Off function” for more information.	
SG+	Modbus® RS485 Note: refer to section 9.10 “09: Communication parameters” for more information.	
SG-		
SGND		
RJ-45	PIN 1, 2, 6: Reserved PIN 3, 7: SGND PIN 4: SG- PIN 5: SG+ PIN 8: +10 V supply (provide Versi-KP-LED power supply)	

Tab. 6-3: Description of the control terminals (2)

7 Specifications

7.1 115 V series

115 V series one-phase (without built-in filter)

Model VD i □-11MS3-N			020	037	075
Applicable motor output (kW)			0.2	0.4	0.75
Applicable motor output (HP)			0.25	0.5	1
Output	Heavy duty	Rated output capacity (kVA)	0.6	1.0	1.8
		Rated output current (A)	1.6	2.5	4.8
		Carrier frequency (kHz)	2–15 (Default: 4)		
	Normal duty	Rated output capacity (kVA)	0.7	1.0	2.1
		Rated output current (A)	1.8	2.7	5.5
		Carrier frequency (kHz)	2–15 (Default: 4)		
Input	Rated input current (A)	Heavy duty	6.0	9.4	18
		Normal duty	6.8	10.1	20.6
	Rated voltage/frequency		One-phase 100–120 V AC (-15–10 %), 50/60 Hz		
	Mains input voltage range (V AC)		85–132 V AC		
	Mains frequency range (Hz)		47–63 Hz		
Frame size			A1	A3	C1
Weight (kg)			0.65	0.74	1.24
Cooling method			Convective cooling		Fan cooling
EMC filter			Optional		
IP rating			IP20		

Tab. 7-1: Specifications 115 V series one-phase (without filter)

NOTE

- The value of the carrier frequency is set in the factory. To increase the carrier frequency, decrease the current. Please contact your supplier for more information about the derating curves.
- When the load is a shock or impact load, use a higher level model.

7.2 230 V series

230 V series one-phase (without built-in filter)

Model VD i □-21MS3-N				020	037	075	150	220
Applicable motor output (kW)				0.2	0.4	0.75	1.5	2.2
Applicable motor output (HP)				0.25	0.5	1	2	3
Output	Heavy duty	Rated output capacity (kVA)		0.6	1.1	1.8	2.9	4.2
		Rated output current (A)		1.6	2.8	4.8	7.5	11
		Carrier frequency (kHz)		2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)		0.7	1.2	1.9	3.2	4.8
		Rated output current (A)		1.8	3.2	5	8.5	12.5
		Carrier frequency (kHz)		2–15 (Default: 4)				
Input	Rated input current (A)		Heavy duty	3.4	5.9	10.1	15.8	23.1
			Normal duty	3.8	6.7	10.5	17.9	26.35
	Rated voltage/frequency			One-phase 200–240 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)			170–264 VAC				
	Mains frequency range (Hz)			47–63 Hz				
Frame				A1	A3	B2	C1	
AC drive weight (kg)				0.65	0.76	0.95	1.24	
Cooling method				Convective cooling			Fan cooling	
EMC filter				Optional				
IP rating				IP20				

Tab. 7-2: Specifications 230 V series one-phase (without built-in filter)

230 V series one-phase (with built-in filter)

Model VD i □-21MS3-F				020	037	075	150	220
Applicable motor output (kW)				0.2	0.4	0.75	1.5	2.2
Applicable motor output (HP)				0.25	0.5	1	2	3
Output	Heavy duty	Rated output capacity (kVA)		0.6	1.1	1.8	2.9	4.2
		Rated output current (A)		1.6	2.8	4.8	7.5	11
		Carrier frequency (kHz)		2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)		0.7	1.2	1.9	3.2	4.8
		Rated output current (A)		1.8	3.2	5	8.5	12.5
		Carrier frequency (kHz)		2–15 (Default: 4)				
Input	Rated input current (A)		Heavy duty	3.4	5.9	10.1	15.8	23.1
			Normal duty	3.8	6.7	10.5	17.9	26.35
	Rated voltage/frequency			One-phase 200–240 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)			170–264 VAC				
	Mains frequency range (Hz)			47–63 Hz				
Frame				B3			C2	
AC drive weight (kg)				1.32			1.8	
Cooling method				Convec-tive cooling	Fan cooling			
EMC filter				Built-in				
IP rating				IP20				

Tab. 7-3: Specifications 230 V series one-phase (with built-in filter)

NOTE

- The value of the carrier frequency is set in the factory. To increase the carrier frequency, decrease the current. Please contact your supplier for more information about the derating curves.
- When the load is a shock or impact load, use a higher level model.

230 V series three-phase (without built-in filter)

Model VD i □-23MS3-N				020	037	075	150	220
Applicable motor output (kW)				0.2	0.4	0.75	1.5	2.2
Applicable motor output (HP)				0.25	0.5	1	2	3
Output	Heavy duty	Rated output capacity (kVA)		0.6	1.1	1.8	2.9	4.2
		Rated output current (A)		1.6	2.8	4.8	7.5	11
		Carrier frequency (kHz)		2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)		0.7	1.2	1.9	3.2	4.8
		Rated output current (A)		1.8	3.2	5	8.5	12.5
		Carrier frequency (kHz)		2–15 (Default: 4)				
Input	Rated input current (A)		Heavy duty	1.9	3.4	5.8	9	13.2
			Normal duty	2	3.8	6	9.6	15
	Rated voltage/frequency			Three-phase 200–240 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)			170–264 VAC				
	Mains frequency range (Hz)			47–63 Hz				
Frame				A1	A2	A5	B1	C1
AC drive weight (kg)				0.65	0.68	0.81	1.05	1.24
Cooling method				Convective cooling			Fan cooling	
EMC filter				Optional				
IP rating				IP20				

Tab. 7-4: Specifications 230 V series three-phase (without built-in filter) (1)

Model VD i □-23MS3-N				400	550	750	1100	1500
Applicable motor output (kW)				3.7	5.5	7.5	11	15
Applicable motor output (HP)				5	7.5	10	15.2	20
Output	Heavy duty	Rated output capacity (kVA)		6.5	9.5	12.6	18.7	24.8
		Rated output current (A)		17	25	33	49	65
		Carrier frequency (kHz)		2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)		7.4	10.3	13.7	19.4	26.3
		Rated output current (A)		19.5	27	36	51	69
		Carrier frequency (kHz)		2–15 (Default: 4)				
Input	Rated input current (A)		Heavy duty	20.4	30	39.6	58.8	78
			Normal duty	23.4	32.4	43.2	61.2	82.8
	Rated voltage/frequency			Three-phase 200–240 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)			170–264 VAC				
	Mains frequency range (Hz)			47–63 Hz				
Frame				C1	D1	E1		F1
AC drive weight (kg)				1.24	2.07	3.97		6.25
Cooling method				Fan cooling				
EMC filter				Optional				
IP rating				IP20				

Tab. 7-5: Specifications 230 V series three-phase (without built-in filter) (2)

NOTE

- The value of the carrier frequency is set in the factory. To increase the carrier frequency, decrease the current. Please contact your supplier for more information about the derating curves.
- When the load is a shock or impact load, use a higher level model.

7.3 460 V series

460 V series three-phase (without built-in filter)

Model VD i □-43MS3-N			037	075	150	220	400
Applicable motor output (kW)			0.4	0.75	1.5	2.2	3.7
Applicable motor output (HP)			0.5	1	2	3	5
Output	Heavy duty	Rated output capacity (kVA)	1.1	2.1	3.2	4.2	6.9
		Rated output current (A)	1.5	2.7	4.2	5.5	9
		Carrier frequency (kHz)	2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)	1.4	2.3	3.5	5	8
		Rated output current (A)	1.8	3	4.6	6.5	10.5
		Carrier frequency (kHz)	2–15 (Default: 4)				
Input	Rated input current (A)	Heavy duty	2.1	3.7	5.8	6.1	9.9
		Normal duty	2.5	4.2	6.4	7.2	11.6
	Rated voltage/frequency		Three-phase 380–480 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)		342–528 V AC				
	Mains frequency range (Hz)		47–63 Hz				
Frame			A4	A5	B1	C1	
AC drive weight (kg)			0.76	0.81	1.05	1.24	
Cooling method			Convective cooling		Fan cooling		
EMC filter			Optional				
IP rating			IP20				

Tab. 7-6: Specifications 460 V series three-phase (without built-in filter) (1)

Model VD i □-43MS3-N			550	750	1100	1500	1850	2200
Applicable motor output (kW)			5.5	7.5	11	15	18.5	22
Applicable motor output (HP)			7.5	10	15	20	25	30
Output	Heavy duty	Rated output capacity (kVA)	9.9	13	19.1	24.4	29	34.3
		Rated output current (A)	13	17	25	32	38	45
		Carrier frequency (kHz)	2–15 (Default: 4)					
	Normal duty	Rated output capacity (kVA)	12	15.6	21.3	27.4	31.6	37.3
		Rated output current (A)	15.7	20.5	28	36	41.5	49
		Carrier frequency (kHz)	2–15 (Default: 4)					
Input	Rated input current (A)	Heavy duty	14.3	18.7	27.5	35.2	41.8	49.5
		Normal duty	17.3	22.6	30.8	39.6	45.7	53.9
	Rated voltage/frequency		Three-phase 380–480 V AC (-15–10 %), 50/60 Hz					
	Mains input voltage range (V AC)		342–528 V AC					
	Mains frequency range (Hz)		47–63 Hz					
Frame			D1		E1		F1	
AC drive weight (kg)			2.91		5.15		8.50	
Cooling method			Fan cooling					
EMC filter			Optional					
IP rating			IP20					

Tab. 7-7: Specifications 460 V series three-phase (without built-in filter) (2)

NOTE

- The value of the carrier frequency is set in the factory. To increase the carrier frequency, decrease the current. Please contact your supplier for more information about the derating curves.
- When the load is a shock or impact load, use a higher level model.

460 V series three-phase (with built-in filter)

Model VD i □-43MS3-F				037	075	150	220	400
Applicable motor output (kW)				0.4	0.75	1.5	2.2	3.7
Applicable motor output (HP)				0.5	1	2	3	5
Output	Heavy duty	Rated output capacity (kVA)		1.1	2.1	3.2	4.2	6.9
		Rated output current (A)		1.5	2.7	4.2	5.5	9
		Carrier frequency (kHz)		2–15 (Default: 4)				
	Normal duty	Rated output capacity (kVA)		1.4	2.3	3.5	5	8
		Rated output current (A)		1.8	3	4.6	6.5	10.5
		Carrier frequency (kHz)		2–15 (Default: 4)				
Input	Rated input current (A)		Heavy duty	2.1	3.7	5.8	6.1	9.9
			Normal duty	2.5	4.2	6.4	7.2	11.6
	Rated voltage/frequency			Three-phase 380–480 V AC (-15–10 %), 50/60 Hz				
	Mains input voltage range (V AC)			342–528 V AC				
	Mains frequency range (Hz)			47–63 Hz				
Frame				B3			C2	
AC drive weight (kg)				1.32			1.80	
Cooling method				Fan cooling				
EMC filter				Built-in				
IP rating				IP20				

Tab. 7-8: Specifications 460 V series three-phase (with built-in filter) (1)

Model VD i □-43MS3-F				550	750	1100	1500	1850	2200
Applicable motor output (kW)				5.5	7.5	11	15	18.5	22
Applicable motor output (HP)				7.5	10	15	20	25	30
Output	Heavy duty	Rated output capacity (kVA)		9.9	13	19.1	24.4	29	34.3
		Rated output current (A)		13	17	25	32	38	45
		Carrier frequency (kHz)		2–15 (Default: 4)					
	Normal duty	Rated output capacity (kVA)		12	15.6	21.3	27.4	31.6	37.3
		Rated output current (A)		15.7	20.5	28	36	41.5	49
		Carrier frequency (kHz)		2–15 (Default: 4)					
Input	Rated input current (A)		Heavy duty	14.3	18.7	27.5	35.2	41.8	49.5
			Normal duty	17.3	22.6	30.8	39.6	45.7	53.9
	Rated voltage/frequency			Three-phase 380–480 V AC (-15–10 %), 50/60 Hz					
	Mains input voltage range (V AC)			342–528 V AC					
	Mains frequency range (Hz)			47–63 Hz					
Frame				D2		E2		F2	
AC drive weight (kg)				2.07		3.97		6.25	
Cooling method				Fan cooling					
EMC filter				Built-in					
IP rating				IP20					

Tab. 7-9: Specifications 460 V series three-phase (with built-in filter) (2)

NOTE

- The value of the carrier frequency is set in the factory. To increase the carrier frequency, decrease the current. Please contact your supplier for more information about the derating curves.
- When the load is a shock or impact load, use a higher level model.

7.4 General specifications

Control characteristics	Control method	V/F, SVC
	Applied motor	IM (Induction Motor), Simple PM motor control (IPM and SPM)
	Starting torque ①	150%/3 Hz (V/f, SVC control for IM, Heavy duty) 100%/(1/20 of motor rated frequency) (SVC control for PM, Heavy duty)
	Speed control range ①	1:50 (V/f, SVC control for IM, Heavy duty) 1:20 (SVC control for PM, Heavy duty)
	Max. output frequency	0.00–599.00 Hz
	Overload capability	Normal duty: 120% 60 sec., 150% 3 sec. Heavy duty: 150% 60 sec., 200% 3 sec.
	Frequency setting signal	0–10 V/-10–10 V 4–20 mA/0–10 V 1 channel pulse input (33 kHz), 1 channel pulse output (33 kHz)
	Main function	Multiple motor switching (maximum four independent motor parameter settings), Fast start-up, Deceleration Energy Back (DEB) function, Wobble frequency function, Fast deceleration function, Master and auxiliary frequency source selectable, Momentary power loss ride thru, Speed search, Over-torque detection, 16-step speed (including master speed), Accel./decal. time switch, S-curve accel./decal., three-wire sequence, JOG frequency, Frequency upper/lower limit settings, DC injection braking at start and stop, PID control, Built-in PLC (2000 steps), Simple positioning function.
	Application macro	Built-in application parameter groups (selected by industry) and user-defined application parameter groups.
Protection characteristics	Motor protection	Over-current, Over-voltage, Over-temperature, Phase loss.
	Stall prevention	Stall prevention during acceleration, deceleration and running (independent settings)
Accessory	Communication cards	DeviceNet®, EtherNet/IP, Profibus DP, Modbus®/TCP, CANopen®
	External DC power supply	EMM-BPS01 (24 VDC power supply card)
Certifications		UL, CE, C-Tick, TÜV (SIL 2), RoHS, REACH

Tab. 7-10: General specifications of MS3 series drives

① Control accuracy may vary depending on the environment, application conditions, different motors or encoders. For details, contact our company or your local distributor.

7.5 Environment for operation, storage and transportation

DO NOT expose the AC motor drive to bad environmental conditions, such as dust, direct sunlight, corrosive/ inflammable gasses, humidity, liquid, or vibration. The salt in the air must be less than 0.01 mg/cm² every year.				
Environment	Installation location	IEC 60364-1/IEC 60664-1 pollution degree 2, indoor use only		
	Surrounding temperature	Operation	IP20/UL Open Type	-20–50 °C -20–60 °C with derating
			IP40/NEMA 1/UL Type 1	-20–40 °C -20–50 °C with derating
			Installed side by side	
		Storage	-40–85 °C	
		Transportation	-20–70 °C	
		Non-condensing, non-freezing		
	Relative humidity	Operation	Maximum 90%	
		Storage/ Transportation	Maximum 95%	
		No condense water		
	Air pressure	Operation	86–106 kPa	
		Storage/ Transportation	70–106 kPa	
	Pollution level	IEC 60721-3-3		
		Operation	Class 3C2; Class 3S2	
		Storage	Class 2C2; Class 2S2	
		Transportation	Class 1C2; Class 1S2	
		Concentrate prohibited		
	Altitude	<1000 m (>1000 m with derating)		
Package drop	Storage	ISTA procedure 1A (according to weight) IEC 60068-2-31		
	Transportation			
Vibration	Operating	IEC 60068-2-6: 2–13.2 Hz: 1 mm, peak-peak 13.2–55 Hz: 0.7–2.0 G 55–512 Hz: 2.0 G		
	Non-operating	2.5 G peak 5 Hz–2 kHz: 0.015" maximum displacement		
Impact	Operating	IEC/EN 60068-2-27: 15 G, 11 ms		
	Non-operating	30 G		

Tab. 7-11: Ambient conditions

7.6 Derating for ambient temperature and altitude

Derating for ambient temperature

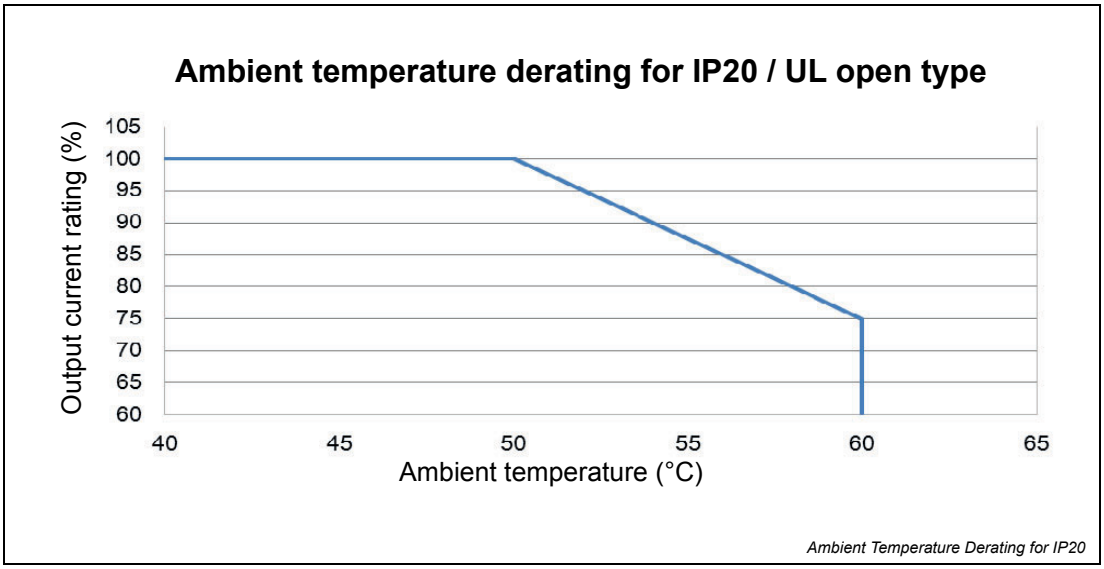


Fig. 7-1: Derating for ambient temperature (IP20)

At the rated current the ambient temperature is -10–50 °C.
Over 50 °C decrease the rated current 2.5 %/°C up to 60 °C.

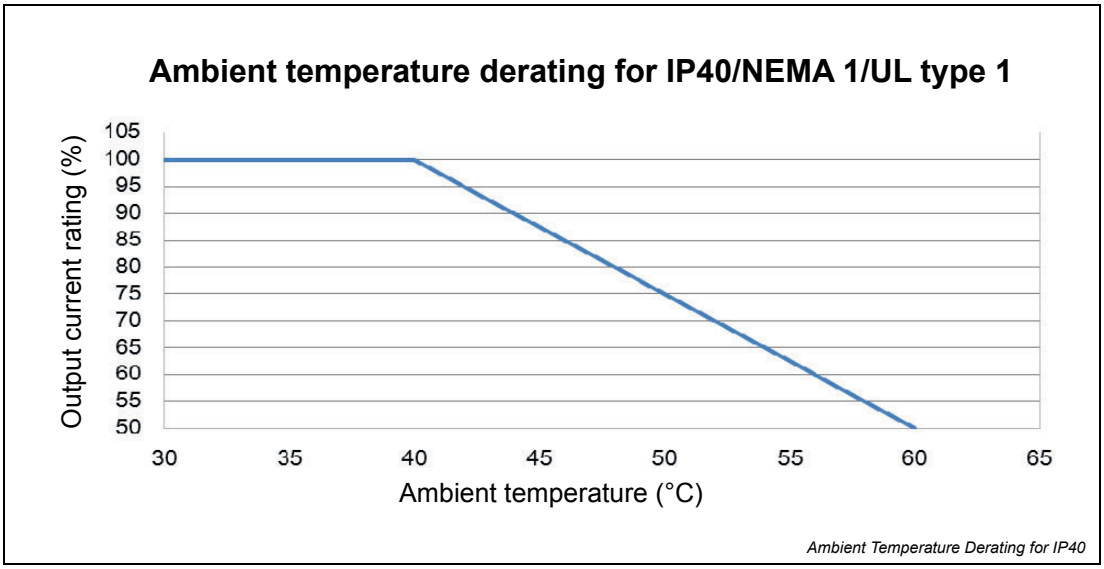


Fig. 7-2: Derating for ambient temperature (IP40)

At the rated current the ambient temperature is -10–40 °C.
Over 40 °C decrease the rated current 2.5 %/°C up to 60 °C.

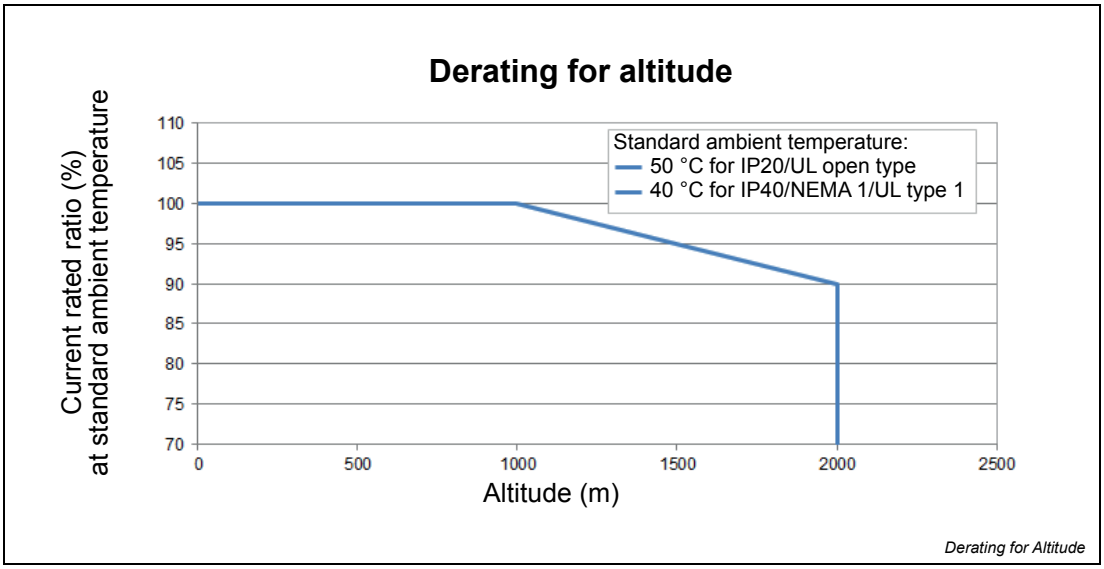


Fig. 7-3: Derating for altitude

For IP20/UL open type

Current derating at ambient temperature				
Ambient temperature		40 °C	45 °C	50 °C
Operating altitude above sea level (m)	0–1000	100%		
	1001–1500	100%		95%
	1501–2000	100%	95%	90%

Tab. 7-12: Current derating at ambient temperature for IP20/UL open type

For IP40/NEMA1/UL type 1

Current derating at ambient temperature				
Ambient temperature		30 °C	35 °C	40 °C
Operating altitude above sea level (m)	0–1000	100%		
	1001–1500	100%		95%
	1501–2000	100%	95%	90%

Tab. 7-13: Current derating at ambient temperature for IP40/NEMA1/UL type 1

Operating conditions	Ambient temperature limits
For IP20/UL open type	When the AC motor drive is operating at the rated current, the ambient temperature must be between -20–50 °C. When the temperature is over 50 °C, for every increase by 1 °C, decrease the rated current 2.5%. The maximum allowable temperature is 60 °C.
For IP40/NEMA1/UL type 1	When the AC motor drive is operating at the rated current, the ambient temperature must be between -20–40 °C. When the temperature is over 40 °C, for every increase by 1 °C, decrease the rated current 2.5%. The maximum allowable temperature is 60 °C
High altitude	If the AC motor drive is installed at an altitude of 0–1000 m, follow normal operation restrictions. If it is installed at an altitude of 1000–2000 m, decrease the rated current by 1% or lower the temperature 0.5 °C for every 100 m increase in altitude. The maximum altitude for corner grounded is 2000 m. Contact Peter Electronic for more information if you need to use this motor drive at an altitude of 2000 m or higher.

Tab. 7-14: Operating conditions

8 Digital keypad

8.1 Versi-KP-LED keyboard panel

Versi-KP-LED digital keypad

❶ Status display area
Respectively diplays the operation status of the drive, Operate, Stop, PLC, Forward, Reverse etc.

❷ Main display area
Display frequency, Current, Voltage, Steering, User-defined units, Abnormality etc.

❸ Frequency setting knob (potentiometer)
This knob can be set as main frequency input.

❹ UP key
It is used to change the set value and parameters.

❺ LEFT/DOWN key
It is used to change the set value and parameters (use left key by long pressing MODE key).

❻ Start operation key
It can make the drive operate

❼ Stop/reset key
It can make the drive stop operation & reset abnormality

❽ Selection key of display screen
Press to display items which successive changes for selection

❾ Parameter data setting key
Read the parameters to change the setting of the drive

8.1.1 Descriptions of keypad functions

Displayed items	Descriptions
	Displays the present frequency setting for the drive.
	Displays the actual output frequency to the motor.
	Displays the user-defined output of a physical quantity. This example is for parameter Pr.00-04 = 30 (user-defined output).
	Displays the load current.
	Forward command
	Reverse command
	Displays the count value.
	Displays a parameter item.
	Displays a parameter value.
	Displays an external fault.
	Displays the data that has been accepted and automatically stored in the internal memory.
	Displays the data set that is not accepted or has exceeded the value.

Tab. 8-1: Descriptions of keypad functions

8.1.2 Keypad operation process

A. Main page selection

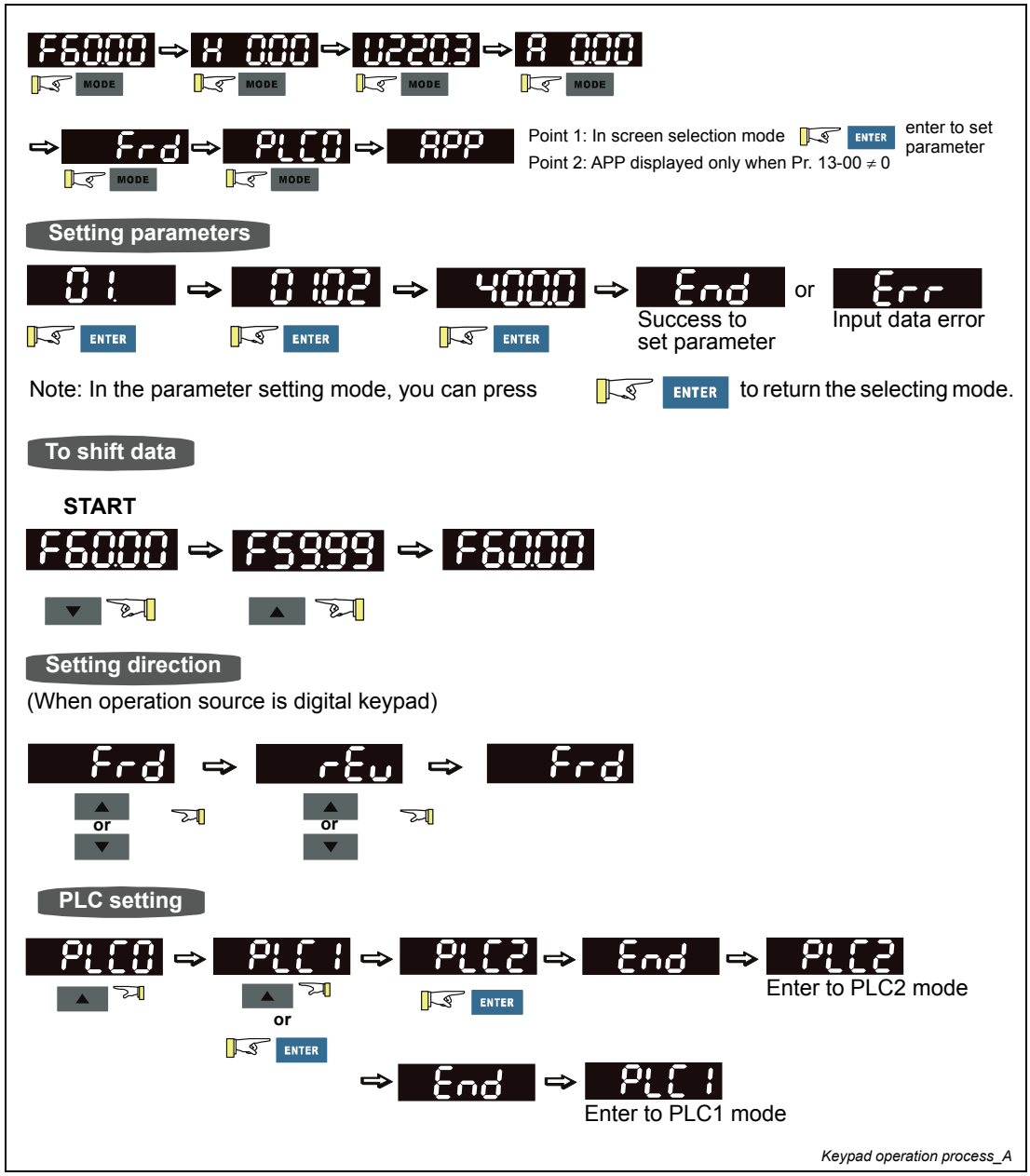


Fig. 1-1: Main page selection

B. F page (Frequency command setting page)

General mode 1

(maximum operation frequency Pr.01-00 is 2 digits; for example, Pr.01-00 = 60.00 Hz)

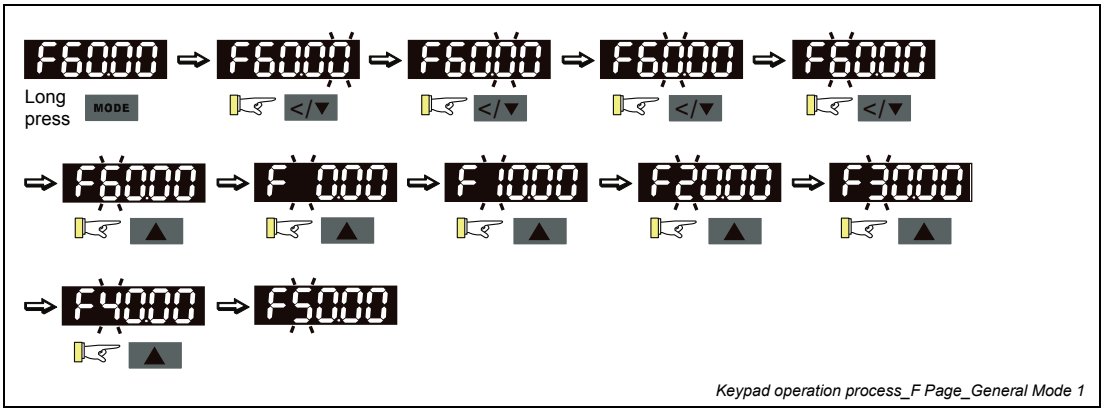


Fig. 1-2: F page (General mode 1)

General mode 2

(maximum operation frequency Pr.01-00 is 3 digits; for example, Pr.01-00 = 599.0 Hz)

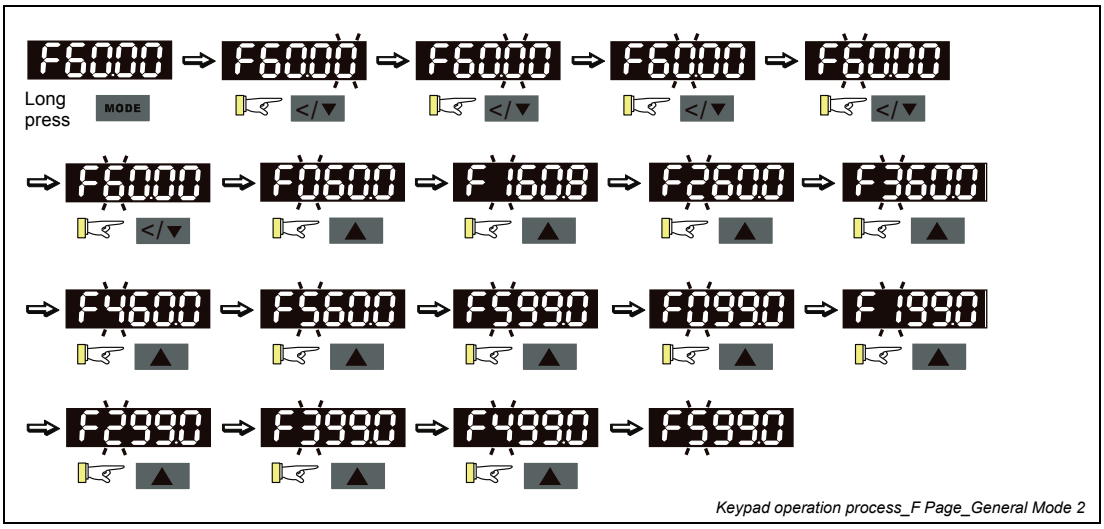
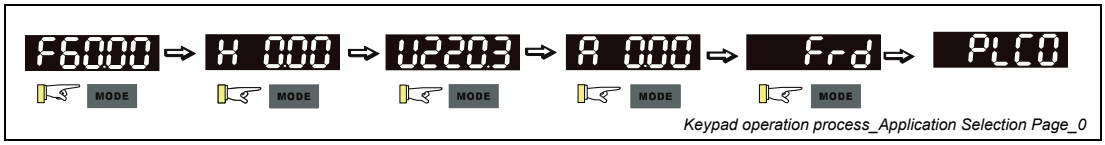


Fig. 1-3: F page (General mode 2)

C. Application selection page

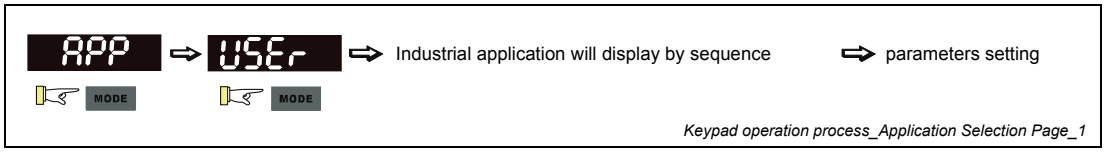
The application selection page displays “APP”, but does not show the APP page when Pr.13-00 = 0.

The description of Pr.13-00 setting is as follows:
Pr.13-00 = 0
The application selection is inactive and does not show on the display.



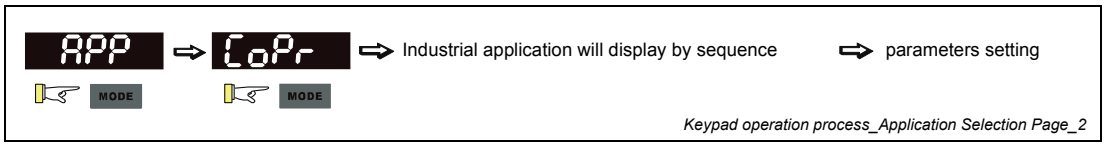
Keypad operation process_Application Selection Page_0

Pr.13-00 = 1 specifies a user-defined application, and the keypad displays “USER”.



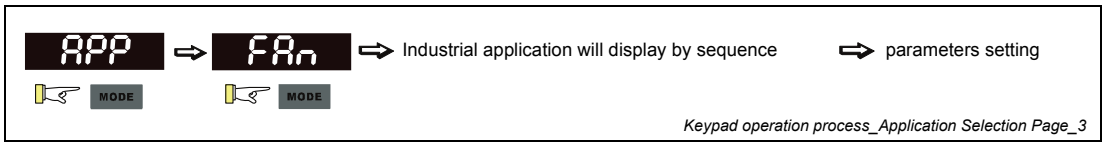
Keypad operation process_Application Selection Page_1

Pr.13-00 = 2 specifies the compressor application, and the keypad displays “CoPr”.



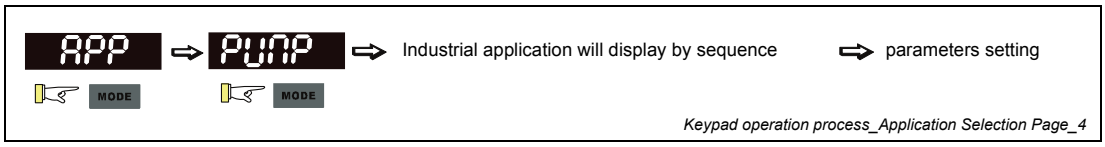
Keypad operation process_Application Selection Page_2

Pr.13-00 = 3 specifies the fan application, and the keypad displays “FAN”.



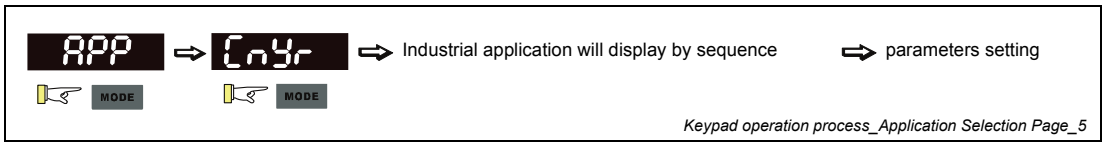
Keypad operation process_Application Selection Page_3

Pr.13-00 = 4 specifies the pump application, and the keypad displays “PUMP”.



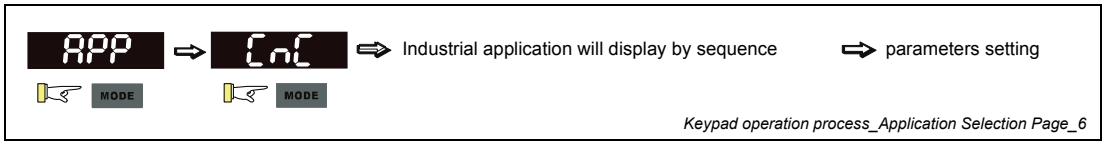
Keypad operation process_Application Selection Page_4

Pr.13-00 = 5 specifies the conveyor application, and the keypad displays “CnYr”.



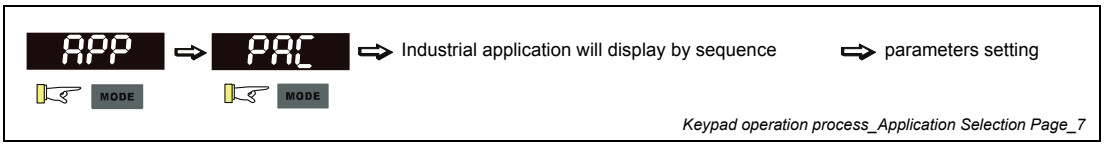
Keypad operation process_Application Selection Page_5

Pr.13-00 = 6 specifies the machine tool application, and the keypad displays “CNC”.

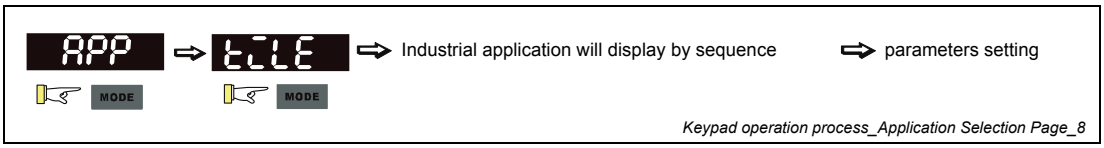


Keypad operation process_Application Selection Page_6

Pr.13-00 = 7 specifies the packing application, and the keypad displays “PAC”.



Pr.13-00 = 8 specifies the textile application, and the keypad displays “TILE”.



When Pr.13-00 is not 0, the corresponding parameters appear in the APP page according to the setting for Pr.13-00. In each selected application, you can view the parameters by pressing ENTER button. If Pr.13-00 = 1 and you do not set any parameters in Pr.13-01–13-50, you cannot enter the sub-layer of the USER page. The parameter settings in the APP page are the same as those in other parameter groups: use up and left/down key to set the parameter’s value.

Follow the process below to set the user-defined application selection (Pr.13-00 = 1).

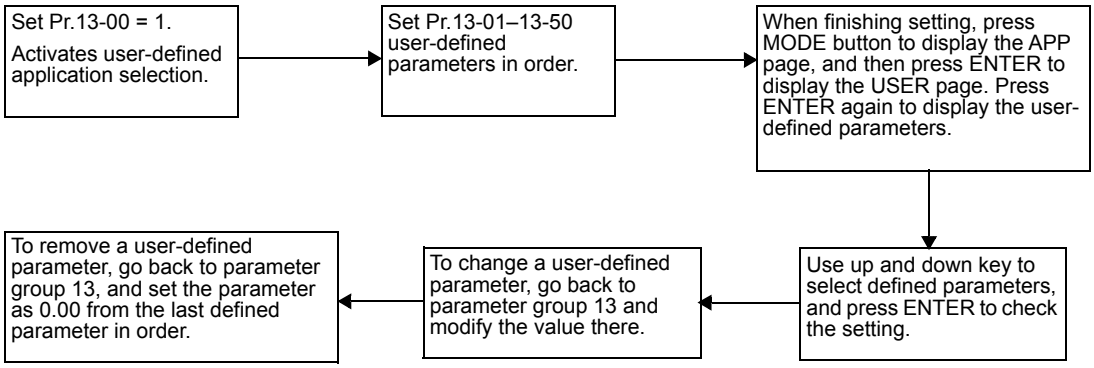


Fig. 1-4: Setting the user-defined application selection

① Activate the application selection by setting Pr.13-00.

② After setting Pr.13-00 = 1, you can enter the definitions for Pr.13-01–50.

③ The default setting for Pr.13-01–50 is P 0.00. Press ENTER to set the corresponding parameters for Pr.13-01–50 in sequence.

④ Setting the corresponding parameters for Pr.13-01–50 is the same as those in other parameter groups: use up and left/down key to select and set the parameter’s value.

NOTES

- You cannot set values for read-only parameters.
- You must set Pr.13-01, 02……50 in sequence, or the display shows “Err”.

⑤ To change the corresponding parameters, go back to Pr.13-01–50 to modify.

⑥ After setting, to remove a set parameter, set from the last parameter (set to 0.00) first, or the display shows “Err”. For example, if there are 5 user-defined parameters (Pr.13-01, 13-02…13-05), to remove Pr.13-02, you must remove Pr.13-05 first, then 13-04, then 13-03, and then 13-02.

⑦ When you finish the setting, press MODE to go back to the APP page, and then press ENTER again. The Keypad displays “USER”. After you press ENTER again, the corresponding parameter that you set appears.

Follow the process below to set specific application selection (Pr.13-00 = 2–8).

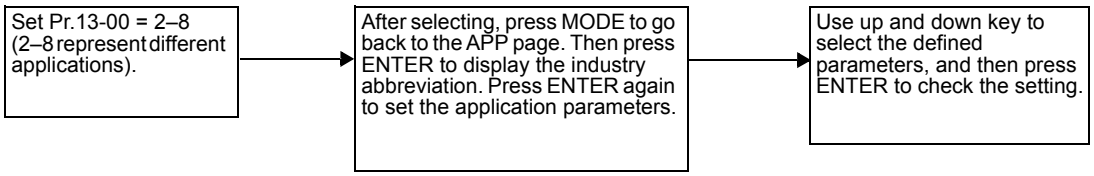


Fig. 1-5: Setting specific application selection

D. Parameter setting

How to enable/disable left shift key function?

- Enable left shift key function: Press MODE for > 2 seconds until the last digit starts blinking.
- Disable left shift key function: Press MODE for > 2 seconds until the last digit stops blinking.

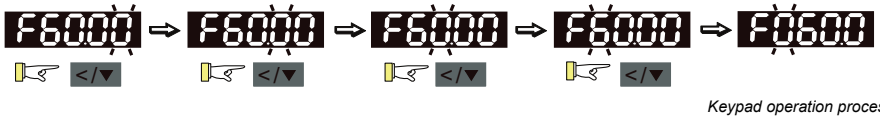
The left shift key function only works for changing parameters, not when going to a different parameter.

D-1 Unsigned parameter

(Parameter setting range ≥ 0; for example: Pr.01-00)

- Without using the left shift key: use up and left/down key to select and adjust the parameters.
- Using the left shift key: After you press the left shift key, the last digit starts to blink. Press the left shift key to move the blinking cursor to the digit to adjust, and increase the value by pressing the UP key. The value goes back to 0 after 9.
- Press left/down key to shift the blinking cursor one digit to the left.
- After you finish setting the parameter, the left shift key function is not disabled automatically until you disable it manually.

For example: the default setting for Pr.01-00 is 60.00. Pressing the MODE key for > 2 seconds enables the left shift function. The procedure for pressing the LEFT/DOWN key shows as follows:



Keypad operation process_Parameter setting_D-1

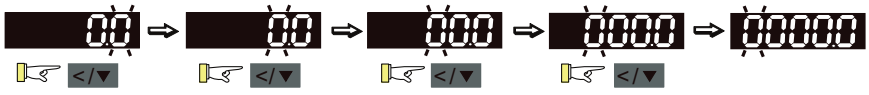
The upper limit for Pr.01-00 is 599.00. If you set a value greater than 599.00, “Err” appears after you press ENTER, and then the keypad shows the upper limit (599.00) for a second to remind you of the incorrect setting. The setting value remains as the original set value and the cursor returns to the last digit.

D-2 Signed parameter setting status 1

(Parameter setting range has no or one decimal place; for example: Pr.03-03)

- Without using the left shift key: use up and left/down key to select and adjust the parameters.
- Using the left shift key: After you press the left shift key, the last digit starts to blink. Press the left shift key to move the blinking cursor to the digit to adjust, and increase the value by pressing the UP key. The value goes back to 0 after 9.
- Press left/down key to shift the blinking cursor one digit to the left. When you shift to the first digit and press the UP key, the digit “0” changes to “-” (minus).
- After you finish setting the parameter, the left shift key function is not disabled automatically until you disable it manually.

For example: the default setting for Pr.03-03 is 0.0. Pressing the MODE key for > 2 seconds enables the left shift function. The procedure for pressing the LEFT/DOWN key shows as follows:



Keypad operation process_Parameter setting_D-2

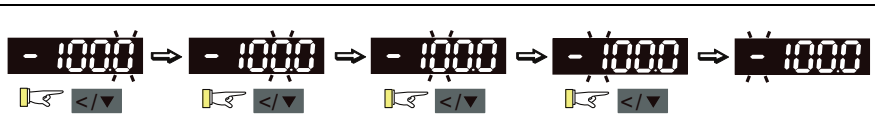
The upper limit for Pr.03-03 is 100.0 and lower limit is -100.0. If the value is more than 100.0 or less than -100.0, “Err” appears after you press ENTER, and then the keypad shows the upper limit (100.0) or lower limit (-100.0) for a second to remind you of the incorrect setting. The setting value remains as the original set value, and the cursor returns to the last digit.

D-3 Signed parameter setting status 2

(The parameter setting range has two decimal places; for example: Pr.03-74)

- Without using the left shift key: use up and left/down key to select and adjust the parameters.
- Using the left shift key: After pressing the left shift key, the last digit starts to blink. Press the left shift key to move the blinking cursor to the digit to adjust, and increase the value by pressing the UP key. The value goes back to 0 after 9.
- Press the left/down key to shift the blinking cursor one digit to the left. When you shift to the first digit and press the UP key, the digit “0” changes to “-” (minus).
- For parameters in two decimals and a positive/negative setting range, values >99.99 or <-99.99 show in one decimal, for example 100.0 or -100.0.
- After you finish setting the parameter, the left shift key function is not disabled automatically until you disable it manually.

For example: the default setting for Pr.03-74 is -100.0. Pressing the MODE key for > 2 seconds enables the left shift function. The procedure for pressing the LEFT/DOWN key shows as follows:

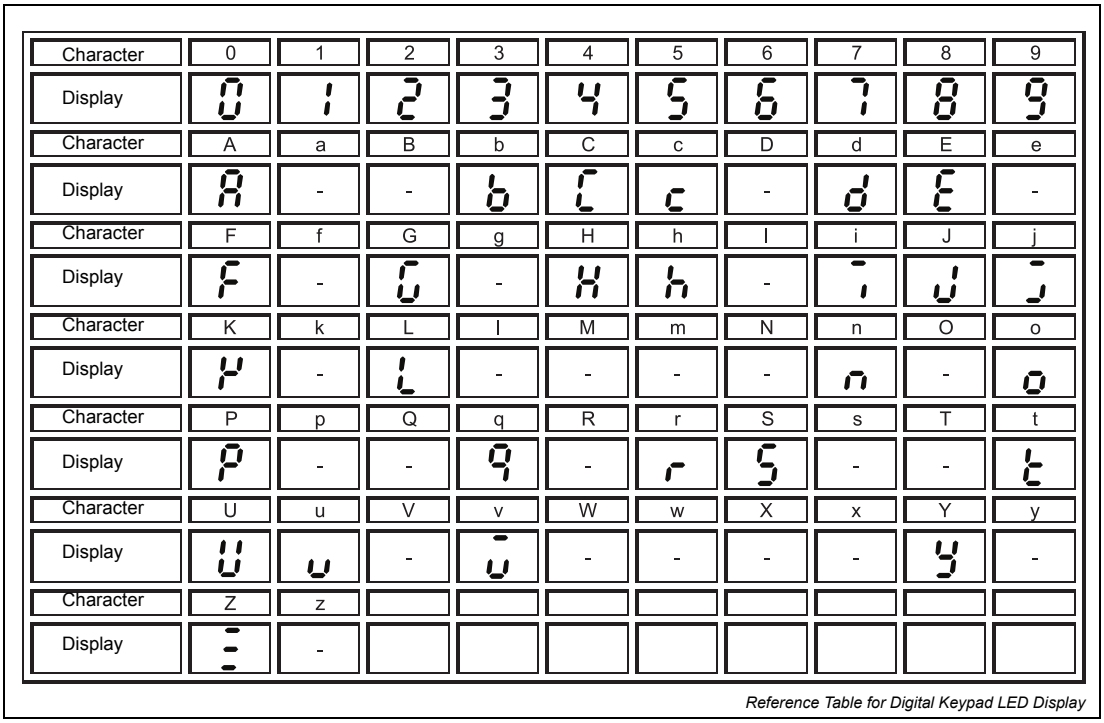


Keypad operation process_Parameter setting_D-3

If you increase the parameter, the display shows -99.99.

The upper limit for Pr.03-74 is 100.00 and lower limit is -100.00. If you set a value of more than 100.0 or less than -100.0, “Err” appears after you press ENTER, and then the keypad shows the upper limit (100.0) or lower limit (-100.0) (only one decimal) for a second to remind you of the incorrect setting. The setting value remains as the original set value. The cursor returns to the last digit.

Reference table for the 7-segment digital keypad LED display



Tab. 8-2: Reference table

9 Summary of parameter settings

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

NOTE Parameters marked with ↗ can be set during operation.

9.1 00: Drive parameters

	Pr.	Explanation	Settings	Default
	00-00	Identity code of the AC motor drive	102: 110 V, one-phase, 0.2 kW/0.25 HP 103: 110 V, one-phase, 0.4 kW/0.5 HP 104: 110 V, one-phase, 0.75 kW/1 HP 302: 230 V, one-phase, 0.2 kW/0.25 HP 303: 230 V, one-phase, 0.4 kW/0.5 HP 304: 230 V, one-phase, 0.75 kW/1 HP 305: 230 V, one-phase, 1.5 kW/2 HP 306: 230 V, one-phase, 2.2 kW/3 HP 202: 230 V, three-phase, 0.2 kW/0.25 HP 203: 230 V, three-phase, 0.4 kW/0.5 HP 204: 230 V, three-phase, 0.75 kW/1 HP 205: 230 V, three-phase, 1.5 kW/2 HP 206: 230 V, three-phase, 2.2 kW/3 HP 207: 230 V, three-phase, 4 kW/5 HP 208: 230 V, three-phase, 5.5 kW/7.5 HP 209: 230 V, three-phase, 7.5 kW/10 HP 210: 230 V, three-phase, 11 kW/15 HP 211: 230 V, three-phase, 15 kW/20 HP 403: 460 V, three-phase, 0.4 kW/0.5 HP 404: 460 V, three-phase, 0.75 kW/1 HP 405: 460 V, three-phase, 1.5 kW/2 HP 406: 460 V, three-phase, 2.2 kW/3 HP 407: 460 V, three-phase, 4 kW/5 HP 408: 460 V, three-phase, 5.5 kW/7.5 HP 409: 460 V, three-phase, 7.5 kW/10 HP 410: 460 V, three-phase, 11 kW/15 HP 411: 460 V, three-phase, 15 kW/20 HP 412: 460 V, three-phase, 18.5 kW/25 HP 413: 460 V, three-phase, 22 kW/30 HP	Read only
	00-01	Display AC motor drive rated current	Display by models	Read only
	00-02	Parameter reset	0: No function 1: Parameter write protect 5: Reset kWh display to 0 6: Reset PLC 7: Reset CANopen® index (slave) 8: Keypad does not respond 9: Reset all parameters to defaults with base frequency at 50 Hz 10: Reset all parameters to defaults with base frequency at 60 Hz 11: Reset all parameters to defaults with base frequency at 50 Hz (keep the user-defined parameter values Pr.13-01–Pr.13-50) 12: Reset all parameters to defaults with base frequency at 60 Hz (keep the user-defined parameter values Pr.13-01–Pr.13-50)	0
↗	00-03	Start-up display selection	0: F (frequency command) 1: H (output frequency) 2: U (user-defined, see Pr.00-04) 3: A (output current)	0

Tab. 9-1: Drive parameters (1)

	Pr.	Explanation	Settings	Default
↗	00-04	Content of multi-function display (user-defined)	0: Output current (A) (unit: Amps) 1: Counter value (c) (unit: CNT) 2: Actual output frequency (H) (unit: Hz) 3: DC BUS voltage (v) (unit: V DC) 4: Output voltage of U, V, W (E) (unit: V AC) 5: Output power angle of U, V, W (n) (unit: deg) 6: Output power of U, V, W in kW (P) (unit: kW) 7: Actual motor speed (r) (unit: rpm) 10: PID feedback (b) (unit: %) 11: Signal value of AVI analog input terminal (1.) (unit: %) 12: Signal value of ACI analog input terminal (2.) (unit: %) 14: Temperature of IGBT (i.) (unit: °C) 16: Digital input status (ON/OFF) (i) 17: Digital output status (ON/OFF) (o) 18: Multi-step execution speed (S) 19: CPU pin status of digital input (d) 20: CPU pin status of digital output (0.) 22: Pulse input frequency (S.) 23: Pulse input position (q.) 25: Overload count (0.00–100.00%) (o.) (unit: %) 26: Ground Fault GFF (G.) (unit: %) 27: DC BUS voltage ripple (r.) (unit: V DC) 28: PLC register data D1043 (C) 30: User defined output (U) 31: Pr.00-05 user gain (K) 35: Control mode: 0 = speed control mode (SPD) 36: Present operating carrier frequency of drive (J.) (unit: Hz) 38: Drive status (6.) 41: kWh (J) (unit: kWh) 42: PID target value (h.) (unit: %) 43: PID offset (o.) (unit: %) 44: PID output frequency (b.) (unit: Hz) 46: Auxiliary frequency value (U.) (unit: Hz) 47: Master frequency value (A) (unit: Hz) 48: Frequency value after addition and subtraction of auxiliary and master frequency (L.) (unit: Hz)	3
↗	00-05	Coefficient gain in actual output frequency	0.00–160.00	1.00
	00-06	Software version	Read only	#.#
↗	00-07	Parameter protection password input	0–65535 0–3 (number of password attempts allowed)	0
↗	00-08	Parameter protection password setting	0–65535 0: No password protection/password is entered incorrectly (Pr.00-07) 1: Password has been set	0
	00-10	Control mode	0: Speed mode	0
	00-11	Speed control mode	0: VF (IM V/F control) 1: VFPG (IM V/F control + encoder) 2: SVC (Pr.05-33 set as IM or PM)	0
	00-16	Load selection	0: Normal load 1: Heavy load	1
	00-17	Carrier frequency	Normal load: 2–15 kHz	4
			Heavy load: 2–15 kHz	4
	00-19	PLC command mask	bit 0: Control command forced by PLC control bit 1: Frequency command forced by PLC control	Read only

Tab. 9-1: Drive parameters (2)

	Pr.	Explanation	Settings	Default
↗	00-20	Master frequency command source (AUTO)	0: Digital keypad 1: RS485 serial communication 2: External analog input (refer to Pr.03-00) 3: External UP/DOWN terminal 4: Pulse input without direction command (refer to Pr.10-16 without direction) 6: CANopen® communication card 7: Digital keypad dial 8: Communication card (does not include CANopen® card) **NOTE:** It is valid only when using with external multi-function input terminal (MI) setting as 42 or with Versi-KP-LCD.	0
↗	00-21	Operation command source (AUTO)	0: Digital keypad 1: External terminals 2: RS485 communication input 3: CANopen® communication card 5: Communication card (does not include CANopen® card) **NOTE:** It is valid only when using with external multi-function input terminal (MI) setting as 42 or with Versi-KP-LCD.	0
↗	00-22	Stop method	0: Ramp to stop 1: Coast to stop	0
↗	00-23	Motor direction control	0: Enable forward/reverse 1: Disable reverse 2: Disable forward	0
	00-24	Digital operator (keypad) frequency command memory	Read only	Read only

Tab. 9-1: Drive parameters (3)

	Pr.	Explanation	Settings	Default
↗	00-25	User-defined characteristics	bit 0–3: user-defined decimal places 0000h–0000b: no decimal place 0001h–0001b: one decimal place 0002h–0010b: two decimal places 0003h–0011b: three decimal places 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: lb/s 00Dxh: lb/m 00Exh: lb/h 00Fxh: ft/s 010xh: ft/m 011xh: m 012xh: ft 013xh: °C 014xh: °F 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	0
	00-26	Max. user-defined value	0: Disabled 0–65535 (when Pr. 00-25 is set to no decimal place) 0.0–6553.5 (when Pr. 00-25 is set to one decimal place) 0.00–655.35 (when Pr. 00-25 is set to two decimal places) 0.000–65.535 (when Pr. 00-25 is set to three decimal places)	0
	00-27	User-defined value	Read only	Read only
	00-29	LOCAL/REMOTE mode	0: Standard HOA function 1: When switching between local and remote, the drive stops. 2: When switching between local and remote, the drive runs with REMOTE settings for frequency and operating status. 3: When switching between local and remote, the drive runs with LOCAL settings for frequency and operating status. 4: When switching between local and remote, the drive runs with LOCAL settings when switched to Local and runs with REMOTE settings when switched to Remote for frequency and operating status.	0

Tab. 9-1: Drive parameters (4)

	Pr.	Explanation	Settings	Default
↗	00-30	Master frequency command source (HAND)	0: Digital keypad 1: RS485 communication input 2: External analog input (refer to Pr.03-00) 3: External UP/DOWN terminal 4: Pulse input without direction command (refer to Pr.10-16 without direction) 6: CANopen® communication card 7: Digital keypad dial 8: Communication card (does not include CANopen® card) **NOTE:** It is valid only when using with external multi-function input terminal (MI) setting as 41 or with Versi-KP-LCD.	0
↗	00-31	Operation command source (HAND)	0: Digital keypad 1: External terminals 2: RS485 communication input Keypad STOP disabled. 3: CANopen® communication card 5: Communication card (does not include CANopen® card) **NOTE:** It is valid only when using with external multi-function input terminal (MI) setting as 41 or with Versi-KP-LCD.	0
↗	00-32	Digital keypad STOP function	0: STOP key disabled 1: STOP key enabled	0
	00-35	Auxiliary frequency source	0: Master and auxiliary frequency function disabled 1: Digital keypad 2: RS485 communication input 3: Analog input 4: External UP/DOWN key input 5: Pulse input with steering command (refer to Pr.10-16) 6: CANopen® communication card 8: Communication card	0
	00-36	Master and auxiliary frequency command selection	0: Master + auxiliary frequency 1: Master - auxiliary frequency 2: Auxiliary - master frequency	0
	00-47	Output phase order selection	0: Standard 1: Exchange the rotation direction	0
↗	00-48	Display filter time (current)	0.001–65.535 s	0.100
↗	00-49	Display filter time (keypad)	0.001–65.535 s	0.100
	00-50	Software version (date)	Read only	#####

Tab. 9-1: Drive parameters (5)

9.2 01: Basic parameters

	Pr.	Explanation	Settings	Default
	01-00	Max. operation frequency of motor 1	0.00–599.00 Hz	60.00/ 50.00
	01-01	Output frequency of motor 1	0.00–599.00 Hz	60.00/ 50.00
	01-02	Output voltage of motor 1	110 V/230 V series: 0.0–255.0 V 460 V series: 0.0–510.0 V	220.0 440.0
	01-03	Mid-point frequency 1 of motor 1	0.00–599.00 Hz	3.00
✓	01-04	Mid-point voltage 1 of motor 1	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	11.0 22.0
	01-05	Mid-point frequency 2 of motor 1	0.00–599.00 Hz	0.50
✓	01-06	Mid-point voltage 2 of motor 1	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	2.0 4.0
	01-07	Min. output frequency of motor 1	0.00–599.00 Hz	0.00
✓	01-08	Min. output voltage of motor 1	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	0.0 0.0
	01-09	Start-up frequency	0.00–599.00 Hz	0.50
✓	01-10	Output frequency upper limit	0.00–599.00 Hz	599.00
✓	01-11	Output frequency lower limit	0.00–599.00 Hz	0.00
✓	01-12	Acceleration time 1	Pr.01-45 = 0: 0.00–600.00 s Pr.01-45 = 1: 0.00–6000.0 s	10.00 10.0
✓	01-13	Deceleration time 1		
✓	01-14	Acceleration time 2		
✓	01-15	Deceleration time 2		
✓	01-16	Acceleration time 3		
✓	01-17	Deceleration time 3		
✓	01-18	Acceleration time 4		
✓	01-19	Deceleration time 4		
✓	01-20	JOG acceleration time		
✓	01-21	JOG deceleration time		
✓	01-22	JOG frequency	0.00–599.00 Hz	6.00
✓	01-23	$1^{st}/4^{th}$ acceleration/ deceleration frequency	0.00–599.00 Hz	0.00
✓	01-24	S-curve acceleration begin time 1	Pr.01-45 = 0: 0.00–25.00 s Pr.01-45 = 1: 0.0–250.0 s	0.20 0.2
✓	01-25	S-curve acceleration arrival time 2		
✓	01-26	S-curve deceleration begin time 1		
✓	01-27	S-curve deceleration arrival time 2		
	01-28	Skip frequency 1 (upper limit)	0.00–599.00 Hz	0.00
	01-29	Skip frequency 1 (lower limit)		
	01-30	Skip frequency 2 (upper limit)		
	01-31	Skip frequency 2 (lower limit)		
	01-32	Skip frequency 3 (upper limit)		
	01-33	Skip frequency 3 (lower limit)		
	01-34	Zero-speed mode	0: Waiting for output 1: Zero-speed operation 2: Fmin (refer to Pr.01-07 and Pr.01-41)	0

Tab. 9-2: Basic parameters (1)

	Pr.	Explanation	Settings	Default
	01-35	Output frequency of motor 2	0.00–599.00 Hz	60.00/ 50.00
	01-36	Output voltage of motor 2	110 V/230 V series: 0.0–255.0 V 460 V series: 0.0–510.0 V	220.0 440.0
	01-37	Mid-point frequency 1 of motor 2	0.00–599.00 Hz	3.00
↗	01-38	Mid-point voltage 1 of motor 2	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	11.0 22.0
	01-39	Mid-point frequency 2 of motor 2	0.00–599.00 Hz	0.50
↗	01-40	Mid-point voltage 2 of motor 2	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	2.0 4.0
	01-41	Min. output frequency of motor 2	0.00–599.00 Hz	0.00
↗	01-42	Min. output voltage of motor 2	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	0.0 0.0
	01-43	V/F curve selection	0: V/F curve determined by Pr. 01-00 to Pr. 01-08 1: 1.5th V/F curve 2: 2nd V/F curve	0
	01-44	Auto acceleration/decelera-tion setting	0: Linear acceleration/deceleration 1: Auto-acceleration, linear deceleration 2: Linear acceleration, auto-deceleration 3: Auto-acceleration and auto-deceleration 4: Linear, stall prevention by auto-acceleration and deceleration (limited by Pr.01-12–Pr.01-21)	0
↗	01-45	Time unit for acceleration/ deceleration and S-curve	0: Unit: 0.01 s 1: Unit: 0.1 s	0
	01-46	CANopen® quick stop time	Pr. 01-45 = 0: 0.00–600.00 s Pr. 01-45 = 1: 0.0–6000.0 s	1.00
↗	01-49	Deceleration method	0: Normal deceleration 1: Over fluxing deceleration 2: Traction energy control	0
	01-52	Max. operation frequency of motor 2	0.00–599.00 Hz	60.00/ 50.00
	01-53	Max. operation frequency of motor 3	0.00–599.00 Hz	60.00/ 50.00
	01-54	Output frequency of motor 3	0.00–599.00 Hz	60.00/ 50.00
	01-55	Output voltage of motor 3	110 V/230 V series: 0.0–255.0 V 460 V series: 0.0–510.0 V	220.0 440.0
	01-56	Mid-point frequency 1 of motor 3	0.00–599.00 Hz	3.00
	01-57	Mid-point voltage 1 of motor 3	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	11.0 22.0
↗	01-58	Mid-point frequency 2 of motor 3	0.00–599.00 Hz	0.50
	1-59	Mid-point voltage 2 of motor 3	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	2.0 4.0
↗	01-60	Min. output frequency of motor 3	0.00–599.00 Hz	0.00
	01-61	Min. output voltage of motor 3	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	0.0 0.0
↗	01-62	Max. operation frequency of motor 4	0.00–599.00 Hz	60.00/ 50.00
	01-63	Output frequency of motor 4	0.00–599.00 Hz	60.00/ 50.00
	1-64	Output voltage of motor 4	110 V/230 V series: 0.0–255.0 V 460 V series: 0.0–510.0 V	220.0 440.0

Tab. 9-2: Basic parameters (2)

	Pr.	Explanation	Settings	Default
	01-65	Mid-point frequency 1 of motor 4	0.00–599.00 Hz	3.00
	01-66	Mid-point voltage 1 of motor 4	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	11.0 22.0
↗	01-67	Mid-point frequency 2 of motor 4	0.00–599.00 Hz	0.50
	01-68	Mid-point voltage 2 of motor 4	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	2.0 4.0
↗	01-69	Min. output frequency of motor 4	0.00–599.00 Hz	0.00
	01-70	Min. output voltage of motor 4	110 V/230 V series: 0.0–240.0 V 460 V series: 0.0–480.0 V	0.0 0.0

Tab. 9-2: Basic parameters (3)

9.3 02: Digital input/output parameters

Pr.	Explanation	Settings	Default
02-00	Two-wire/three-wire operation control	0: No function 1: Two-wire mode 1, power on for operation control (M1: FWD/STOP, M2: REV/STOP) 2: Two-wire mode 2, power on for operation control (M1: RUN/STOP, M2: REV/FWD) 3: Three-wire, power on for operation control (M1: RUN, M2: REV/FWD, M3: STOP) 4: Two-wire mode 1, quick start (M1: FWD/STOP, M2: REV/STOP) 5: Two-wire mode 2, quick start (M1: RUN/STOP, M2: REV/FWD) 6: Three-wire, quick start (M1: RUN, M2: REV/FWD, M3: STOP) **CAUTION:** In the quick start function, the output terminal remains in a ready state and the drive responds to the command immediately. In the quick start function, the output terminal potentially has a higher voltage.	1

Tab. 9-3: Digital input/output parameters (1)

	Pr.	Explanation	Settings	Default
	02-01	Multi-function input command 1 (MI1)	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 operation (by Versi-KP-LCD or external control) 7: Acceleration/deceleration speed inhibit 8: 1st and 2nd acceleration/deceleration time selection 9: 3rd and 4th acceleration/deceleration time selection 10: EF Input (Pr.07-20) 11: Base Block (B.B.) input from external 12: Output stop 13: Cancel the setting for auto-acceleration/ auto-deceleration time 15: Rotating speed command from AVI 16: Rotating speed command from ACI 18: Forced to stop (Pr.07-20) 19: Digital up command 20: Digital down command 21: PID function disabled 22: Clear the counter 23: Input the counter value (MI6) 24: FWD JOG command 25: REV JOG command 28: Emergency stop (EF1) 29: Signal confirmation for Y-connection 30: Signal confirmation for Δ-connection 38: Disable EEPROM write function 40: Force coasting to stop 41: HAND switch 42: AUTO switch 48: Mechanical gear ratio switch 49: Enable drive 50: Master dEb input 51: Selection for PLC mode bit 0 52: Selection for PLC mode bit 1 53: Trigger CANopen quick stop 56: Local/Remote selection 70: Force auxiliary frequency return to 0 71: Disable PID function, force PID output return to 0 72: Disable PID function, retain the output value before it is disabled 73: Force PID integral gain return to 0, disable integral 74: Reverse PID feedback 81: Simple positioning zero point position signal input 82: OOB loading balance detection 83: Multi-motors (IM) selection bit 0 84: Multi-motors (IM) selection bit 1	0
	02-02	Multi-function input command 2 (MI2)		0
	02-03	Multi-function input command 3 (MI3)		1
	02-04	Multi-function input command 4 (MI4)		2
	02-05	Multi-function input command 5 (MI5)		3
	02-06	Multi-function input command 6 (MI6)		4
	02-07	Multi-function input command 7 (MI7)		0
↗	02-09	UP/DOWN key mode	0: UP/DOWN by the acceleration/deceleration time 1: UP/DOWN constant speed (Pr.02-10) 2: Pulse signal (Pr.02-10) 3: External terminals UP/DOWN mode	0
↗	02-10	Constant speed; acceleration/ deceleration speed of UP/ DOWN Key	0.001–1.000 Hz/ms	0.001
↗	02-11	Multi-function input response time	0.000–30.000 s	0.005

Tab. 9-3: Digital input/output parameters (2)

	Pr.	Explanation	Settings	Default
↗	02-12	Multi-function input mode selection	0000h–FFFFh (0: N.O.; 1: N.C.)	0000h
↗	02-13	Multi-function output 1 (RY1)	0: No function 1: Indication during RUN 2: Operation speed reached 3: Desired frequency reached 1 (Pr.02-22) 4: Desired frequency reached 2 (Pr.02-24) 5: Zero speed (Frequency command) 6: Zero speed, includes 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 13: Overheat warning (Pr.06-15) 14: Software brake signal indicator (Pr.07-00) 15: PID feedback error 16: Slip error (oSL) 17: Count value reached, does not return to 0 (Pr.02-20) 18: Count value reached, returns to 0 (Pr.02-19) 19: External interrupt B.B. input (Base Block) 20: Warning output 21: Over-voltage 22: Over-current stall prevention 23: Over-voltage stall prevention 24: Operation source 25: Forward command 26: Reverse command 29: Output when frequency ≥ Pr.02-34 30: Output when frequency < Pr.02-34 31: Y-connection for the motor coil 32: Δ-connection for the motor coil 33: Zero speed (actual output frequency) 34: Zero speed includes 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) 40: Speed reached (including STOP) 42: Crane function 43: Actual motor speed output < Pr.02-47 44: Low current output (use with Pr.06-71–06-73) 45: UVW output electromagnetic valve ON/OFF switch 46: Master dEb output 50: Output control for CANopen® 52: Output control for communication cards 66: SO output logic A 67: Analog input level reached 68: SO output logic B 73: Over-torque 3 74: Over-torque 4	11
↗	02-16	Multi-function output 2 (MO1)		0
↗	02-17	Multi-function output 3 (MO2)		0
↗	02-18	Multi-function output direction	0000h–FFFFh (0: N.O.; 1: N.C.)	0000h
↗	02-19	Terminal counting value reached (returns to 0)	0–65500	0
↗	02-20	Preliminary counting value reached (does not return to 0)	0–65500	0
↗	02-21	Digital output gain (DFM)	1–55	1

Tab. 9-3: Digital input/output parameters (3)

	Pr.	Explanation	Settings	Default
✓	02-22	Desired frequency reached 1	0.00–599.00 Hz	60.00/ 50.00
✓	02-23	Width of the desired frequency reached 1	0.00–599.00 Hz	2.00
✓	02-24	Desired frequency reached 2	0.00–599.00 Hz	60.00/ 50.00
✓	02-25	Width of the desired frequency reached 2	0.00–599.00 Hz	2.00
✓	02-34	Output frequency setting for multi-function output terminal	0.00–599.00 Hz	0.00
✓	02-35	External operation control selection after reset and activate	0: Disable 1: Drive runs if the RUN command remains after reset or reboot	0
✓	02-47	Motor zero-speed level	0–65535 rpm	0
	02-50	Display the multi-function input terminal status	Monitor the status of multi-function input terminals	Read only
	02-51	Display the multi-function output terminal status	Monitor the status of multi-function output terminals	Read only
	02-52	Display the external multi-function input terminals used by the PLC	Monitor the status of PLC input terminals	Read only
	02-53	Display the external multi-function output terminals used by the PLC	Monitor the status of PLC output terminals	Read only
	02-54	Display the frequency command executed by the external terminal	Read only	Read only
	02-58	Multi-function output terminal: function 42: brake frequency checking point	0.00–599.00 Hz	0.00
	02-78	Motor deceleration ratio	4.0–1000.0	200.0
	02-79	Automatic positioning angle setting	0.0–6480.0	180.0
✓	02-80	Automatic positioning deceleration time	0.00 Disable the function 0.01–100.00 sec.	0.00
✓	02-81	EF active when terminal count value reached	0: Terminal count value reached, no EF displays continues to operate) 1: Terminal count value reached, EF is active	0
✓	02-82	Initial frequency command (F) mode after stop	0: By current frequency command 1: By zero frequency command 2: Refer to Pr.02-83 to set up	0
✓	02-83	Initial frequency command (F) after stop	0.00–599.0 Hz	60.00

Tab. 9-3: Digital input/output parameters (4)

9.4 03: Analog input/output parameters

	Pr.	Explanation	Settings	Default
✓	03-00	Analog input selection (AVI)	0: No function 1: Frequency command 4: PID target value 5: PID feedback signal 6: PTC thermistor input value 11: PT100 thermistor input value 12: Auxiliary frequency input 13: PID compensation value	1
✓	03-01	Analog input selection (ACI)		0
✓	03-03	Analog input bias (AVI)	-100.0–100.0%	0
✓	03-04	Analog input bias (ACI)	-100.0–100.0%	0
✓	03-07	Positive/negative bias mode (AVI)	0: No bias 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	0
✓	03-08	Positive/negative bias mode (ACI)		
✓	03-10	Reverse setting when analog signal input is negative frequency	0: Negative frequency input is not allowed. The digital keypad or external terminal controls the forward and reverse direction. 1: Negative frequency input is allowed. Positive frequency = run in forward direction; negative frequency = run in reverse direction. The digital keypad or external terminal control cannot switch the running direction.	0
✓	03-11	Analog input gain 1 (AVI)	-500.0–500.0%	100.0
✓	03-12	Analog input gain 2 (ACI)	-500.0–500.0%	100.0
✓	03-15	Analog input filter time (AVI)	0.00–20.00 s	0.01
✓	03-16	Analog input filter time (ACI)	0.00–20.00 s	0.01
✓	03-18	Analog input addition function	0: Disable (AVI, ACI) 1: Enable (excludes analog extension card)	0
✓	03-19	Signal loss selection for analog input 4–20 mA	0: Disable 1: Continue operation at the last frequency 2: Decelerate to 0 Hz 3: Stop immediately and display “ACE”	0
✓	03-20	Multi-function output (AFM)	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor speed (Hz) 3: Output current (rms) 4: Output voltage 5: DC Bus voltage 6: Power factor 7: Power 9: AVI 10: ACI 12: Iq current command 13: Iq feedback value 14: Id current 15: Id feedback value 16: Vq-axis voltage command 17: Vd-axis voltage command 19: PG2 frequency command 20: CANopen® analog output 21: RS485 analog output 22: Communication card analog output 23: Constant voltage output	0
✓	03-21	Analog output gain (AFM)	0–500.0%	100.0
✓	03-22	Analog output in REV direction (AFM)	0: Absolute value of output voltage 1: Reverse output 0 V; forward output 0–10 V 2: Reverse output 5–0 V; forward output 5–10 V	0
✓	03-27	AFM output bias	-100.00–100.00%	0.00
✓	03-28	AVI terminal input selection	0: 0–10 V 3: -10–10 V (Pr.03-69–Pr.03-74 is valid)	0

Tab. 9-4: Analog input/output parameters (1)

	Pr.	Explanation	Settings	Default
✓	03-29	ACI terminal input selection	0: 4–20 mA 1: 0–10 V 2: 0–20 mA	0
✓	03-30	Display the analog output terminals used by the PLC	Monitor the status of PLC analog output terminals bit 1: AFM bit 2: AO10 bit 3: AO11	Read only
✓	03-31	AFM output selection	0: 0–10 V output 1: 0–20 mA output 2: 4–20 mA output	0
✓	03-32	AFM DC output setting level	0.00–100.00 %	0.00
✓	03-35	AFM filter output time	0.00–20.00 s	0.01
✓	03-39	VR input selection	0: Disable 1: Frequency command	1
✓	03-40	VR input bias	-100.0–100.0 %	0.0
✓	03-41	VR positive/negative bias	0: No bias 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: Bias serves as the center	0
✓	03-42	VR gain	-500.0–500.0 %	100.0
✓	03-43	VR filter time	0–2.00 s	0.01
✓	03-44	Multi-function MO output by AI level source	0: AVI1 1: ACI	0
✓	03-45	AI upper level 1	-100.00–100.00 %	50
✓	03-46	AI lower level 2	-100.00–100.00 %	10
✓	03-50	Analog input curve selection	0: Regular curve 1: Three-point curve of AVI (& AI10) 2: Three-point curve of ACI (& AI11) 3: Three-point curve of AVI & ACI (& AI10 & AI11) (AI10, AI11 are valid when extension card is installed)	0
✓	03-57	ACI lowest point	Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 ≠ 1, 0.00–20.00 mA	4.00
✓	03-58	ACI proportional lowest point	0.00–100.00 %	0.00
✓	03-59	ACI mid point	Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 ≠ 1, 0.00–20.00 mA	12.00
✓	03-60	ACI proportional mid point	0.00–100.00 %	50.00
✓	03-61	ACI highest point	Pr.03-29 = 1, 0.00–10.00 V Pr.03-29 ≠ 1, 0.00–20.00 mA	20.00
✓	03-62	ACI proportional highest point	0.00–100.00 %	100.00
✓	03-63	AVI voltage lowest point	0.00–10.00 V	0.00
✓	03-64	AVI voltage proportional lowest point	-100.00–100.00 %	0.00
✓	03-65	AVI voltage mid point	0.00–10.00 V	5.00
✓	03-66	AVI voltage proportional mid point	-100.00–100.00 %	50.00
✓	03-67	AVI voltage highest point	0.00–10.00 V	10.00
✓	03-68	AVI voltage proportional highest point	-100.00–100.00 %	100.00
	03-69	Negative AVI voltage lowest point	0.00– -10.00 V (valid when Pr.03-28 sets as -10–10 V)	0.00
✓	03-70	Negative AVI voltage proportional lowest point	-100.00–100.00 % (valid when Pr.03-28 sets as -10–10 V)	0.00
✓	03-71	Negative AVI voltage mid-point	0.00– -10.00 V (valid when Pr.03-28 sets as -10–10 V)	-5.00

Tab. 9-4: Analog input/output parameters (2)

	Pr.	Explanation	Settings	Default
↗	03-72	Negative AVI voltage proportional mid-point	-100.00–100.00% (valid when Pr.03-28 sets as -10–10 V)	-50.00
↗	03-73	Negative AVI voltage highest point	0.00– -10.00 V (valid when Pr.03-28 sets as -10–10 V)	-10.00
↗	03-74	Negative AVI voltage proportional highest point	-100.00–100.00% (valid when Pr.03-28 sets as -10–10 V)	-100.00

Tab. 9-4: Analog input/output parameters (3)

9.5 04: Multi-step speed parameters

	Pr.	Explanation	Settings	Default
↗	04-00	1st step speed frequency	0.00–599.00 Hz	0.00
↗	04-01	2nd step speed frequency		
↗	04-02	3rd step speed frequency		
↗	04-03	4th step speed frequency		
↗	04-04	5th step speed frequency		
↗	04-05	6th step speed frequency		
↗	04-06	7th step speed frequency		
↗	04-07	8th step speed frequency		
↗	04-08	9th step speed frequency		
↗	04-09	10th step speed frequency		
↗	04-10	11th step speed frequency		
↗	04-11	12th step speed frequency		
↗	04-12	13th step speed frequency		
↗	04-13	14th step speed frequency		
↗	04-14	15th step speed frequency		
↗	04-50	PLC buffer 0	0–65535	0
↗	04-51	PLC buffer 1		
↗	04-52	PLC buffer 2		
↗	04-53	PLC buffer 3		
↗	04-54	PLC buffer 4		
↗	04-55	PLC buffer 5		
↗	04-56	PLC buffer 6		
↗	04-57	PLC buffer 7		
↗	04-58	PLC buffer 8		
↗	04-59	PLC buffer 9		
↗	04-60	PLC buffer 10		
↗	04-61	PLC buffer 11		
↗	04-62	PLC buffer 12		
↗	04-63	PLC buffer 13		
↗	04-64	PLC buffer 14		
↗	04-65	PLC buffer 15		
↗	04-66	PLC buffer 16		
↗	04-67	PLC buffer 17		
↗	04-68	PLC buffer 18		
↗	04-69	PLC buffer 19		

Tab. 9-5: Multi-step speed parameters

9.6 05: Motor parameters

	Pr.	Explanation	Settings	Default
	05-00	Motor parameter auto-tuning	0: No function 1: Dynamic test for induction motor (IM) 2: Static test for induction motor (IM) 13: High frequency stall test for PM synchr. motor	0
	05-01	Full-load current for induction motor 1 (A)	10–120 % of the drive's rated current	#.##
✓	05-02	Rated power for induction motor 1 (kW)	0–655.35 kW	#.##
✓	05-03	Rated speed for induction motor 1 (rpm)	0–65535 rpm 1710 (60 Hz, 4 poles); 1410 (50 Hz, 4 poles)	1710
	05-04	Number of poles for induction motor 1	2–20	4
	05-05	No-load current for induction motor 1 (A)	0.00–Pr.05-01 default	#.##
	05-06	Stator resistance (Rs) for induction motor 1	0.000–65.535 Ω	#.###
	05-07	Rotor resistance (Rr) for induction motor 1	0.000–65.535 Ω	#.###
	05-08	Magnetizing inductance (Lm) for induction motor 1	0.0–6553.5 mH	#.#
	05-09	Stator inductance (Lx) for induction motor 1	0.0–6553.5 mH	#.#
	05-13	Full-load current for induction motor 2 (A)	10–120 % of the drive's rated current	#.##
✓	05-14	Rated power for induction motor 2 (kW)	0.00–655.35 kW	#.##
✓	05-15	Rated speed for induction motor 2 (rpm)	0–65535 rpm 1710 (60 Hz, 4 poles); 1410 (50 Hz, 4 poles)	1710
	05-16	Number of poles for induction motor 2	2–20	4
	05-17	No-load current for induction motor 2 (A)	0.00–Pr.05-13 default	#.##
	05-18	Stator resistance (Rs) for induction motor 2	0.000–65.535 Ω	#.###
	05-19	Rotor resistance (Rr) for induction motor 2	0.000–65.535 Ω	#.###
	05-20	Magnetizing inductance (Lm) for induction motor 2	0.0–6553.5 mH	#.#
	05-21	Stator inductance (Lx) for induction motor 2	0.0–6553.5 mH	#.#
	05-22	Multi-motors (induction) selection	1: Motor 1 2: Motor 2 3: Motor 3 (VF or SVC control mode only) 4: Motor 4 (VF or SVC control mode only)	1
	05-23	Frequency for Y-connection/ Δ-connection switch for induction motor	0.00–599.00 Hz	60.00
✓	05-24	Y-connection/Δ-connection switch for an induction motor	0: Disabled 1: Enabled	0
✓	05-25	Delay time for Y-connection/ Δ-connection switch for an induction motor	0.000–60.000 s	0.200
	05-26	Accumulated Watt-second for a motor in low word (W-sec.)	Read only	#.#
	05-27	Accumulated Watt-second for a motor in high word (W-sec.)	Read only	#.#
	05-28	Accumulated Watt-hour for a motor (W-hour)	Read only	#.#
	05-29	Accumulated Watt-hour for a motor in low word (kW-hour)	Read only	#.#

Tab. 9-6: Motor parameters (1)

	Pr.	Explanation	Settings	Default
	05-30	Accumulated Watt-hour for a motor in high word (kW-hour)	Read only	#.#
	05-31	Accumulated motor operation time (minutes)	0–1439 min.	0
	05-32	Accumulated motor operation time (days)	0–65535 days	0
	05-33	Induction motor or permanent magnet synchronous motor selection	0: Induction motor 1: SPM 2: IPM	0
	05-34	Full-load current for a permanent magnet synchronous motor	0–120% of the drive's rated current	#.#
	05-35	Rated power for a permanent magnet synchronous motor	0.00–655.35 kW	#.##
	05-36	Rated speed for a permanent magnet synchronous motor	0–65535 rpm	2000
	05-37	Number of poles for a permanent magnet synchronous motor	0–65535	10
	05-39	Stator resistance for a permanent magnet synchronous motor	0.000–65.535 kΩ	0.000
	05-40	Permanent magnet synchronous motor Ld	0.00–655.35 mH	0.00
	05-41	Permanent magnet synchronous motor Lq	0.00–655.35 mH	0.00
	05-43	Ke parameter for a permanent magnet synchronous motor	0.0–6553.5 (Unit: V/1000 rpm)	0.0
	05-64	Full-load current for induction motor 3 (A)	10–120% of the drive's rated current	#.##
↗	05-65	Rated power for induction motor 3 (kW)	0.00–655.35 kW	#.##
↗	05-66	Rated speed for induction motor 3 (rpm)	0–65535 rpm 1710 (60 Hz, 4 poles); 1410 (50 Hz, 4 poles)	1710
	05-67	Number of poles for induction motor 3	2–20	4
	05-68	No-load current for induction motor 3 (A)	0.00–Pr.05-64 default	#.##
	05-69	Stator resistance (Rs) for induction motor 3	0.000–65.535 Ω	#.###
	05-70	Full-load current for induction motor 4 (A)	10–120% of the drive's rated current	#.##
↗	05-71	Rated power for induction motor 4 (kW)	0.00–655.35 kW	#.##
↗	05-72	Rated speed for induction motor 4 (rpm)	0–65535 rpm 1710 (60 Hz, 4 poles); 1410 (50 Hz, 4 poles)	1710
	05-73	Number of poles for induction motor 4	2–20	4
	05-74	No-load current for induction motor 4 (A)	0.00–Pr.05-70 default	#.##
	05-75	Stator resistance (Rs) for induction motor 4	0.000–65.535 Ω	#.###

Tab. 9-6: Motor parameters (2)

9.7 06: Protection parameters <1>

	Pr.	Explanation	Settings	Default
↗	06-00	Low voltage level	115 V/230 V: 150.0–220.0 V DC 460 V: 300.0–440.0 V DC	180.0 360.0
↗	06-01	Over-voltage stall prevention	0: Disabled 110 V/230 V: 0.0–450.0 V DC 460 V: 0.0–900.0 V DC	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	Normal load: 0–150% (100% corresponds to the rated current of the drive) Heavy load: 0–200% (100% corresponds to the rated current of the drive)	120 180
↗	06-04	Over-current stall prevention during operation	Normal load: 0–150% (100% = drive rated current) Heavy load: 0–200% (100% = drive rated current)	120 180
↗	06-05	Acceleration/deceleration time selection for stall prevention at constant speed	0: By current acceleration/deceleration time 1: By 1st acceleration/deceleration time 2: By 2nd acceleration/deceleration time 3: By 3rd acceleration/deceleration time 4: By 4th acceleration/deceleration time 5: By Auto-acceleration/auto-deceleration	0
↗	06-06	Over-torque detection selection (motor 1)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after over-torque detection during RUN	0
↗	06-07	Over-torque detection level (motor 1)	10–250% (100% corresponds to the rated current of the drive)	120
↗	06-08	Over-torque detection time (motor 1)	0.0–60.0 s	0.1
↗	06-09	Over-torque detection selection (motor 2)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after over-torque detection during RUN	0
↗	06-10	Over-torque detection level (motor 2)	10–250% (100% corresponds to the rated current of the drive)	120
↗	06-11	Over-torque detection time (motor 2)	0.0–60.0 s	0.1
↗	06-13	Electronic thermal relay selection (motor 1)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disabled	2
↗	06-14	Electronic thermal relay action time (motor 1)	30.0–600.0 s	60.0
↗	06-15	Temperature level over-heat (OH) warning	0.0–110.0 °C	105.0
↗	06-16	Stall prevention limit level	0–100% (refer to Pr.06-03, Pr.06-04)	100

Tab. 9-7: Protection parameters <1> (1)

Pr.	Explanation	Settings	Default
06-17	Fault record 1	0: No fault record	0
06-18	Fault record 2	1: Over-current during acceleration (ocA)	0
06-19	Fault record 3	2: Over-current during deceleration (ocd)	0
06-20	Fault record 4	3: Over-current during constant speed (ocn)	0
06-21	Fault record 5	4: Ground fault (GFF)	0
06-22	Fault record 6	6: Over-current at stop (ocS)	0
	Fault record 7 (Pr.14-70) Fault record 8 (Pr.14-71) Fault record 9 (Pr.14-72) Fault record 10 (Pr.14-73)	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: Low-voltage at stop (LvS) 15: Phase loss protection (OrP) 16: IGBT overheat (oH1) 18: TH1 open: IGBT overheat protection error(tH1o) 21: Drive overload (oL) 22: Electronic thermal relay protection 1 (EoL1) 23: Electronic thermal relay protection 2 (EoL2) 24: Motor PTC overheat (oH3) 26: Over-torque 1 (ot1) 27: Over-torque 2 (ot2) 28: Low current (uC) 31: Memory read-out error (cF2) 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) 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) 48: Analog current input loss (ACI) 49: External fault input (EF) 50: Emergency stop (EF1) 51: External Base Block (B.B.) 52: Password error (Pcod) 54: Communication error (CE1) 55: Communication error (CE2) 56: Communication error (CE3) 57: Communication error (CE4) 58: Communication time-out (CE10) 61: Y-/Δ-connection switch error (ydc) 62: Deceleration energy backup error (dEb) 63: Slip error (oSL) 72: Channel 1 (S1–DCM) safety loop error (STL1) 76: Safe Torque Off (STo) 77: Channel 2 (S2–DCM) safety loop error (STL2) 78: Internal loop error (STL3) 79: U-phase over-current before run (Aoc) 80: V-phase over-current before run (boc) 81: W-phase over-current before run (coc) 82: U-phase output phase loss (oPL1) 83: V-phase output phase loss (oPL2) 84: W-phase output phase loss (oPL3) 87: Drive overload in low frequency (oL3) 89: Initial rotor position detection error (roPd)	

Tab. 9-7: Protection parameters <1> (2)

	Pr.	Explanation	Settings	Default
			101: CANopen® software disconnect 1 (CGdE) 102: CANopen® software disconnect 2 (CHbE) 104: CANopen® hardware disconnect (CbFE) 105: CANopen® index setting error (CIdE) 106: CANopen® station number setting error (CAdE) 107: CANopen® memory error (CFrE) 121: Internal communication error (CP20) 123: Internal communication error (CP22) 124: Internal communication error (CP30) 126: Internal communication error (CP32) 127: Software version error (CP33) 128: Over-torque 3 (ot3) 129: Over-torque 4 (ot4) 134: Electronic thermal relay 3 protection (EoL3) 135: Electronic thermal relay 4 protection (EoL4) 140: GFF detected when power on (Hd6) 141: GFF occurs before run (b4GFF) 142: Auto-tuning error 1 (DC test stage) (AUE1) 143: Auto-tuning error 2 (High frequency test stage) (AUE2) 144: Auto-tuning error 3 (Rotary test stage) (AUE3)	
✓	06-23	Fault output option 1	0–65535 (Please contact your supplier for more information about the bit table for fault codes.)	0
✓	06-24	Fault output option 2		
✓	06-25	Fault output option 3		
✓	06-26	Fault output option 4		
✓	06-27	Electronic thermal relay selection 2 (motor 2)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disabled	2
✓	06-28	Electronic thermal relay action time 2 (motor 2)	30.0–600.0 s	60.0
✓	06-29	PTC detection selection	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning	0
✓	06-30	PTC level	0.0–100.0%	50.0
✓	06-31	Frequency command for malfunction	0.00–599.00 Hz	Read only
	06-32	Output frequency at malfunction	0.00–599.00 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 A	Read only
	06-36	IGBT temperature at malfunction	0.0–6553.5 °C	Read only
	06-37	Capacitance temperature at malfunction	0.0–6553.5 °C	Read only
	06-38	Motor speed in rpm at malfunction	0–65535 rpm	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
✓	06-44	STO Alarm latch	0: STO Alarm latch 1: STO Alarm no latch	0
✓	06-45	Output phase loss detection action (OPHL)	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning	3

Tab. 9-7: Protection parameters <1> (3)

	Pr.	Explanation	Settings	Default
✓	06-46	Detection time for output phase loss	0.000–65.535 s	0.500
✓	06-47	Current detection level for output phase loss	0.00–100.00%	1.00
✓	06-48	DC brake time for output phase loss	0.000–65.535 s	0.000
✓	06-49	LvX auto reset	0: Disabled 1: Enabled	0
✓	06-53	Detected input phase loss action (OrP)	0: Warn and ramp to stop 1: Warn and coast to stop	0
✓	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 voltage level 1	0.000–10.000 V	5.000
✓	06-57	PT100 voltage level 2	0.000–10.000 V	7.000
✓	06-58	PT100 level 1 frequency protection	0.00–599.00 Hz	0.00
✓	06-59	Delay time for activating PT100 level 1 frequency protection	0–6000 s	60
✓	06-60	Software detection GFF current level	0.0–6553.5%	60.0
✓	06-61	Software detection GFF filter time	0.00–655.35 s	0.10
	06-63	Operation time of fault record 1 (days)	0–65535 days	Read only
	06-64	Operation time of fault record 1 (minutes)	0–1439 min	Read only
	06-65	Operation time of fault record 2 (days)	0–65535 days	Read only
	06-66	Operation time of fault record 2 (minutes)	0–1439 min.	Read only
	06-67	Operation time of fault record 3 (days)	0–65535 days	Read only
	06-68	Operation time of fault record 3 (minutes)	0–1439 min	Read only
	06-69	Operation time of fault record 4 (days)	0–65535 days	Read only
	06-70	Operation time of fault record 4 (minutes)	0–1439 min	Read only
✓	06-71	Low current setting level	0.0–100.0%	0.0
✓	06-72	Low current detection time	0.00–360.00 s	0.00
✓	06-73	Low current action	0: No function 1: Warn and coast to stop 2: Warn and ramp to stop by 2nd deceleration time 3: Warn and continue operation	0
	06-90	Operation time of fault record 5 (days)	0–65535 days	Read only
	06-91	Operation time of fault record 5 (minutes)	0–1439 min	Read only
	06-92	Operation time of fault record 6 (days)	0–65535 days	Read only
	06-93	Operation time of fault record 6 (minutes)	0–1439 min	Read only

Tab. 9-7: Protection parameters <1> (4)

9.8 07: Special parameters

	Pr.	Explanation	Settings	Default
✓	07-00	Software brake level	115 V/230 V: 350.0–450.0 V DC 460 V: 700.0–900.0 V DC	370.0 740.0
✓	07-01	DC brake current level	0–100%	0
✓	07-02	DC brake time at start-up	0.0–60.0 s	0.0
✓	07-03	DC brake time at stop	0.0–60.0 s	0.0
✓	07-04	DC brake frequency at start-up	0.00–599.00 Hz	0.00
✓	07-05	Voltage increasing gain	1–200%	100
✓	07-06	Restart after momentary power loss	0: Stop operation 1: Speed tracking by the speed before the power loss 2: Speed tracking by the minimum output frequency	0
✓	07-07	Allowed power loss duration	0.0–20.0 s	2.0
✓	07-08	Base block time	0.1–5.0 s	0.5
✓	07-09	Current limit of speed tracking	20–200%	100
✓	07-10	Restart after fault action	0: Stop operation 1: Speed tracking by current speed 2: Speed tracking by minimum output frequency	0
✓	07-11	Number of times of auto-restart after fault	0–10	0
✓	07-12	Speed tracking during start-up	0: Disabled 1: Speed tracking by maximum output frequency 2: Speed tracking by motor frequency at start 3: Speed tracking by minimum output frequency	0
✓	07-13	dEb function selection	0: Disabled 1: dEb with auto-acceleration/auto-deceleration, the drive does not output the frequency after the power is restored. 2: dEb with auto-acceleration/auto-deceleration, the drive outputs the frequency after the power is restored.	0
✓	07-15	Dwell time at acceleration	0.00–600.00 s	0.00
✓	07-16	Dwell frequency at acceleration	0.00–599.00 Hz	0.00
✓	07-17	Dwell time at deceleration	0.00–600.00 s	0.00
✓	07-18	Dwell frequency at deceleration	0.00–599.00 Hz	0.00
✓	07-19	Fan cooling control	0: Fan always ON 1: Fan is OFF after the AC motor drive stops for one minute. 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 temperature reaches around 60°C.	3
✓	07-20	Deceleration of emergency or forced stop	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 6: Automatic deceleration	0
✓	07-21	Automatic energy-saving setting	0: Disable 1: Enable	0
✓	07-22	Energy-saving gain	10–1000%	100
✓	07-23	Automatic voltage regulation (AVR) function	0: Enable AVR 1: Disable AVR 2: Disable AVR during deceleration	0

Tab. 9-8: Special parameters (1)

	Pr.	Explanation	Settings	Default
↗	07-24	Torque command filter time (V/F and SVC control mode)	0.001–10.000 s	0.050
↗	07-25	Slip compensation filter time (V/F and SVC control mode)	0.001–10.000 s	0.100
↗	07-26	Torque compensation gain	IM: 0–10 (when Pr.05-33 = 0) PM: 0–5000 (when Pr.05-33 = 1 or 2)	1
↗	07-27	Slip compensation gain (V/F and SVC control mode)	0.00–10.00 (default value is 1 in SVC mode)	0.00
↗	07-29	Slip deviation level	0.0–100.0 % 0: No detection	0
↗	07-30	Slip deviation detection time	0.0–10.0 s	1.0
↗	07-31	Slip deviation action	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: No warning	0
↗	07-32	Motor shock compensation factor	0–10000	1000
↗	07-33	Auto-restart interval of fault	0.0–6000.0 s	60.0
	07-46	OOB sampling time	0.1–120.0 s	1.0
	07-47	Number of OOB sampling times	00–32	20
	07-48	OOB average sampling angle	Read only	#.#
↗	07-62	dEb gain	0–65535	8000
↗	07-71	Torque compensation gain (motor 2)	IM: 0–10 (when Pr.05-33 = 0) PM: 0–5000 (when Pr.05-33 = 1 or 2)	1
↗	07-72	Slip compensation gain (motor 2)	0.00–10.00 (default value is 1 in SVC mode)	0.00
↗	07-73	Torque compensation gain (motor 3)	IM: 0–10 (when Pr.05-33 = 0) PM: 0–5000 (when Pr.05-33 = 1 or 2)	1
↗	07-74	Slip compensation gain (motor 3)	0.00–10.00 (default value is 1 in SVC mode)	0.00
↗	07-75	Torque compensation gain (motor 4)	IM: 0–10 (when Pr.05-33 = 0) PM: 0–5000 (when Pr.05-33 = 1 or 2)	1
↗	07-76	Slip compensation gain (motor 4)	0.00–10.00 (default value is 1 in SVC mode)	0.00

Tab. 9-8: Special parameters (2)

9.9 08: High-function PID parameters

	Pr.	Explanation	Settings	Default
✓	08-00	Terminal selection of PID feedback	0: No function 1: Negative PID feedback: by analog input (Pr.03-00) 2: Negative PID feedback: by PG card pulse input, without direction (Pr.10-16) 4: Positive PID feedback: by analog input (Pr.03-00) 5: Positive PID feedback: by PG card pulse input, without direction (Pr.10-16) 7: Negative PID feedback: by communication protocol 8: Positive PID feedback: by communication protocol	0
✓	08-01	Proportional gain (P)	0.0–500.0	1.0
✓	08-02	Integral time (I)	0.00–100.00 s	1.00
✓	08-03	Differential time (D)	0.00–1.00 s	0.00
✓	08-04	Upper limit of integral control	0.0–100.0%	100.0
✓	08-05	PID output command limit (positive limit)	0.0–100.0%	100.0
✓	08-06	PID feedback value by communication protocol	-200.00–200.00%	0.00
✓	08-07	PID delay time	0.0–2.5 s	0.0
✓	08-08	Feedback signal detection time	0.0–3600.0 s	0.0
✓	08-09	Feedback signal fault treatment	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop 3: Warn and operate at last frequency	0
✓	08-10	Sleep frequency	0.00–599.00 Hz	0.00
✓	08-11	Wake-up frequency	0.00–599.00 Hz	0.00
✓	08-12	Sleep time	0.0–6000.0 s	0.0
✓	08-13	PID deviation level	1.0–50.0%	10.0
✓	08-14	PID deviation time	0.1–300.0 s	5.0
✓	08-15	PID feedback filter time	0.1–300.0 s	5.0
✓	08-16	PID compensation selection	0: Parameter setting 1: Analog input.	0
✓	08-17	PID compensation	-100.0–100.0%	0
	08-18	Sleep mode function setting	0: Refer to PID output command 1: Refer to PID feedback signal	0
✓	08-19	Wake-up 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 cannot be changed	0
	08-22	Wake-up delay time	0.00–600.00 s	0.00
✓	08-23	PID control flag	bit 0 = 1: PID running in reverse follows the setting for Pr.00-23. bit 0 = 0: PID running in reverse refers to PID's calculated value. bit 1 = 1: PID Kp gain is 2 decimal places bit 1 = 0: PID Kp gain is 1 decimal place	2
✓	08-26	PID output command limit (reverse limit)	0.0–100.0%	100.0
✓	08-27	PID command acceleration/ deceleration time	0.00–655.35 sec.	0.00
✓	08-29	Frequency base corresponding to 100.00% PID	0: PID control output 100.00% corresponding to maximum operation frequency (Pr.01-00) 1: PID control output 100.00% corresponding to the input value of the auxiliary frequency	0

Tab. 9-9: High-function PID parameters

9.10 09: Communication parameters

	Pr.	Explanation	Settings	Default
↗	09-00	Communication address	1–254	1
↗	09-01	COM1 transmission speed	4.8–115.2 Kbps	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 s	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
↗	09-09	Communication response delay time	0.0–200.0 ms	2.0
	09-10	Communication main frequency	0.00–599.00 Hz	60.00
↗	09-11	Block transfer 1	0–65535	0
↗	09-12	Block transfer 2		
↗	09-13	Block transfer 3		
↗	09-14	Block transfer 4		
↗	09-15	Block transfer 5		
↗	09-16	Block transfer 6		
↗	09-17	Block transfer 7		
↗	09-18	Block transfer 8		
↗	09-19	Block transfer 9		
↗	09-20	Block transfer 10		
↗	09-21	Block transfer 11		
↗	09-22	Block transfer 12		
↗	09-23	Block transfer 13		
↗	09-24	Block transfer 14		
↗	09-25	Block transfer 15		
↗	09-26	Block transfer 16		
	09-30	Communication decoding method	0: Decoding method 1 1: Decoding method 2	1
↗	09-33	PLC command force to 0	0–65535	0
	09-35	PLC address	1–254	2
	09-36	CANopen® slave address	0: Disabled 0–127	0

Tab. 9-10: Communication parameters (1)

	Pr.	Explanation	Settings	Default
	09-37	CANopen® speed	0: 1 Mbps 1: 500 Kbps 2: 250 Kbps 3: 125 Kbps 4: 100 Kbps (Peter Electronic only) 5: 50 Kbps	0
	09-39	CANopen® warning record	bit 0: CANopen® software disconnection 1 (CANopen® guarding time-out) bit 1: CANopen® software disconnection 2 (CANopen® heartbeat time-out) bit 3: CANopen® SDO time-out bit 4: CANopen® SDO buffer overflow bit 5: CANopen® hardware disconnection warning (CANopen® bus off) bit 6: Error protocol for CANopen®	0
	09-40	CANopen® decoding method	0: Peter Electronic 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: Error reaction activated state 14: Error state	Read only
	09-43	CANopen® reset index	bit 0: CANopen® reset, internal address 20XX is 0 bit 1: CANopen® reset, internal address 264X is 0 bit 2: CANopen® reset, internal address 26AX is 0 bit 3: CANopen® reset, internal address 60XX is 0	65535
	09-60	Communication card identifications	0: No communication card 1: DeviceNet® slave 2: Profibus DP slave 3: CANopen® slave 4: Modbus®/TCP slave 5: EtherNet/IP slave 10: Backup power supply	##
	09-61	Communication card firmware version	Read only	##
	09-62	Product code	Read only	##
	09-63	Error code	Read only	##
↗	09-70	Communication card address	DeviceNet®: 0–63 Profibus DP: 1–125	1
↗	09-71	DeviceNet® speed setting	• Standard DeviceNet®: 0: 125 Kbps 1: 250 Kbps 2: 500 Kbps 3: 1 Mbps (Peter Electronic only) • Non standard DeviceNet®: (Peter Electronic only) 0: 10 Kbps 1: 20 Kbps 2: 50 Kbps 3: 100 Kbps 4: 125 Kbps 5: 250 Kbps 6: 500 Kbps 7: 800 Kbps 8: 1 Mbps	2

Tab. 9-10: Communication parameters (2)

	Pr.	Explanation	Settings	Default
↗	09-72	Other DeviceNet® speed settings	0: Disable In this mode, baud rate can only be 125 Kbps, 250 Kbps, 500 Kbps, or 1 Mbps in standard DeviceNet® speed. 1: Enable In this mode, DeviceNet® baud rate can only be same as that for CANopen® (0–8).	0
↗	09-75	Communication card IP configuration	0: Static IP 1: Dynamic IP (DHCP)	0
↗	09-76	Communication card IP address 1	0–255	0
↗	09-77	Communication card IP address 2		
↗	09-78	Communication card IP address 3		
↗	09-79	Communication card IP address 4		
↗	09-80	Communication card address mask 1		
↗	09-81	Communication card address mask 2		
↗	09-82	Communication card address mask 3		
↗	09-83	Communication card address mask 4		
↗	09-84	Communication card gateway address 1		
↗	09-85	Communication card gateway address 2		
↗	09-86	Communication card gateway address 3		
↗	09-87	Communication card gateway address 4		
↗	09-88	Communication card password (low word)	0–99	0
↗	09-89	Communication card password (high word)	0–99	0
↗	09-90	Reset communication card	0: Disabled 1: Reset, return to default	0
↗	09-91	Additional settings for communication card	bit 0: Enable IP filter bit 1: Enable internet parameters (1 bit). When IP address is set, this bit is enabled. After updating the communication card parameters, this bit changes to disabled. bit 2: Enable login password (1 bit). When entering the login password, this bit is enabled. After updating the communication card parameters, this bit changes to disabled.	0
	09-92	Communication card status	bit 0: Enable password When the communication card is set with a password, this bit is enabled. When the password is cleared, this bit is disabled.	0

Tab. 9-10: Communication parameters (3)

9.11 10: Speed feedback control parameters

	Pr.	Explanation	Settings	Default
	10-00	Encoder type selection	0: Disabled 5: Pulse input (MI7)	0
	10-01	Encoder pulse per revolution	1–20000	600
	10-02	Encoder input type setting	0: Disable 5: Single-phase input (MI7)	0
✓	10-04	Electrical gear at load side A1	1–65535	100
✓	10-05	Electrical gear at motor side B1		
✓	10-06	Electrical gear at load side A2		
✓	10-07	Electrical gear at motor side B2		
✓	10-08	Encoder feedback fault treatment	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop	2
✓	10-09	Encoder feedback fault detection time	0: Disabled 0.0–10.0 sec.	1.0
✓	10-10	Encoder stall level	0: No function 0–120%	115
✓	10-11	Encoder stall detection time	0.0–2.0 s	0.1
✓	10-12	Encoder stall action	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop	2
✓	10-13	Encoder slip range	0: No function 0–50%	50
✓	10-14	Detection time of encoder slip	0.0–10.0 s	0.5
✓	10-15	Encoder stall and slip error action	0: Warn and continue operation 1: Warn and ramp to stop 2: Warn and coast to stop	2
✓	10-16	Pulse input type setting	0: Disabled 5: Single-phase input (MI7)	0
✓	10-17	Electrical gear A	1–65535	100
✓	10-18	Electrical gear B	1–65535	100
✓	10-21	PG2 pulse input speed command filter time	0.000–65.535 sec.	0.100
	10-22	PG2 pulse input speed command mode	0: Electronic frequency 1: Mechanical frequency (based on pole pair)	0
✓	10-29	Top limit of frequency deviation	0.00–100.00 Hz	20.00
✓	10-31	I/F mode, current command	0–150% rated current of the motor	40
✓	10-32	PM FOC sensorless speed estimator bandwidth	0.00–600.00 Hz	5.00
✓	10-34	PM sensorless speed estimator low-pass filter gain	0.00–655.35	1.00
✓	10-39	Frequency point to switch from I/F mode to PM sensorless mode	0.00–599.00 Hz	20.00
✓	10-40	Frequency point to switch from PM sensorless mode to I/F mode	0.00–599.00 Hz	20.00
✓	10-42	Initial angle detection pulse value	0.0–3.0	1.0
✓	10-49	Zero voltage time during start-up	00.000–60.000 s	00.000
✓	10-51	Injection frequency	0–1200 Hz	500
✓	10-52	Injection magnitude	0.0–200.0 V	15.0/30.0

Tab. 9-11: Speed feedback control parameters (1)

	Pr.	Explanation	Settings	Default
↗	10-53	Position detection method	0: Disabled 1: Internal 1/4 rated current attracting the rotor to zero degrees 2: High frequency injection 3: Pulse injection	0

Tab. 9-11: Speed feedback control parameters (2)

9.12 11: Advanced parameters

	Pr.	Explanation	Settings	Default
	11-00	System control	bit 3: Dead time compensation closed bit 7: Save or does not save the frequency	0
↗	11-06	ASR1 gain	0–40 Hz (IM)/1–100 Hz (PM)	10
↗	11-07	ASR1 integral time	0.000–10.000 s	0.100
	11-41	PWM mode selection	0: Two-phase 2: Space vector	2
↗	11-42	System control flag	0000–FFFFh	0000

Tab. 9-12: Advanced parameters

9.13 13: Macro/User-defined Macro

Pr.	Explanation	Settings	Default
13-00	Application selection	00: Disabled 01: User parameter 02: Compressor 03: Fan 04: Pump 05: Conveyor 06: Machine tool 07: Packing 08: Textiles	00
13-01 – 13-50	Application parameters (user-defined)		

Tab. 9-13: Industry application parameters

9.14 14: Protection parameters <2>

	Pr.	Explanation	Settings	Default
	14-50	Output frequency at malfunction 2	0.00–599.00 Hz	Read only
	14-51	DC voltage at malfunction 2	0.0–6553.5 V	Read only
	14-52	Output current at malfunction 2	0.00–655.35 A	Read only
	14-53	IGBT temperature at malfunction 2	-3276.7–3276.7 °C	Read only
	14-54	Output frequency at malfunction 3	0.00–599.00 Hz	Read only
	14-55	DC voltage at malfunction 3	0.0–6553.5 V	Read only
	14-56	Output current at malfunction 3	0.00–655.35 A	Read only
	14-57	IGBT temperature at malfunction 3	-3276.7–3276.7 °C	Read only
	14-58	Output frequency at malfunction 4	0.00–599.00 Hz	Read only
	14-59	DC voltage at malfunction 4	0.0–6553.5 V	Read only
	14-60	Output current at malfunction 4	0.00–655.35 A	Read only
	14-61	IGBT temperature at malfunction 4	-3276.7–3276.7 °C	Read only
	14-62	Output frequency at malfunction 5	0.00–599.00 Hz	Read only
	14-63	DC voltage at malfunction 5	0.0–6553.5 V	Read only
	14-64	Output current at malfunction 5	0.00–655.35 A	Read only
	14-65	IGBT temperature at malfunction 5	-3276.7–3276.7 °C	Read only
	14-66	Output frequency at malfunction 6	0.00–599.00 Hz	Read only
	14-67	DC voltage at malfunction 6	0.0–6553.5 V	Read only
	14-68	Output current at malfunction 6	0.00–655.35 A	Read only
	14-69	IGBT temperature at malfunction 6	-3276.7–3276.7 °C	Read only
	14-70	Fault record 7	Refer to fault record Pr.06-17–Pr.06-22	0
	14-71	Fault record 8		
	14-72	Fault record 9		
	14-73	Fault record 10		
↗	14-74	Over-torque detection action (motor 3)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after over-torque detection during RUN	0
↗	14-75	Over-torque detection level (motor 3)	10–250% (100% corresponds the rated current of the drive)	120
↗	14-76	Over-torque detection time (motor 3)	0.0–60.0 s	0.1

Tab. 9-14: Protection parameters <2> (1)

	Pr.	Explanation	Settings	Default
↗	14-77	Over-torque detection action (motor 4)	0: No function 1: Continue operation after over-torque detection during constant speed operation 2: Stop after over-torque detection during constant speed operation 3: Continue operation after over-torque detection during RUN 4: Stop after over-torque detection during RUN	0
↗	14-78	Over-torque detection level (motor 4)	10–250% (100% corresponds the rated current of the drive)	120
↗	14-79	Over-torque detection time (motor 4)	0.0–60.0 s	0.1
↗	14-80	Electronic thermal relay selection (motor 3)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disable	2
↗	14-81	Electronic thermal relay action time (motor 3)	30.0–600.0 s	60.0
↗	14-82	Electronic thermal relay selection (motor 4)	0: Inverter motor (with external forced cooling) 1: Standard motor (motor with fan on the shaft) 2: Disable	2
↗	14-83	Electronic thermal relay action time (motor 4)	30.0–600.0 s	60.0

Tab. 9-14: Protection parameters <2> (2)

10 Warning codes

Versi-KP-LED digital keypad

Versi-KP-LED digital keypad_o-Nr

ID no.	Display	Descriptions
1	CE 1	Modbus® function code error (illegal function code) **Corrective actions** ■ Check if the function code is correct (Function code must be 03, 06, 10, 63).
2	CE2	Modbus® data address error (illegal data address (00 H to 254 H)) **Corrective actions** ■ Check if the communication address is correct.
3	CE3	Modbus® data error (illegal data value) **Corrective actions** ■ Check if the data value exceeds the maximum or minimum value.
4	CE4	Modbus® communication error (data is written to read-only address) **Corrective actions** ■ Check if the communication address is correct.
5	CE 10	Modbus® transmission time-out
6	CP 10	Keypad transmission time-out
7	SE 1	Keypad COPY error 1 Keypad simulation error: includes communication delays, communication error (keypad received error FF86) and parameter value error.
8	SE2	Keypad COPY error 2 Keypad simulation done: parameter write error.

Tab. 10-1: Warning codes (1)

ID no.	Display	Descriptions
9	oH1	IGBT is overheated above protection level 1–10 HP: 90 °C **Corrective actions** ■ Ensure that the ambient temperature falls within the specified temperature range. ■ Make sure the ventilation holes are not obstructed. ■ Remove any foreign objects from the heat sink and check for possible dirt in the heat sink. ■ Check the fan and clean it. ■ Provide enough space for adequate ventilation.
11	PId	PID feedback loss
12	AnL	ACI signal loss when Pr.03-19 is set to 1 or 2.
13	uC	Low current
15	PGFb	PG feedback error
16	PGL	PG feedback loss
17	oSPd	Over-speed warning
18	dAuE	Over-speed deviation warning
20	ot1	When the output current exceeds the over-torque detection level (Pr.06-07 or Pr.06-10) and also exceeds Pr.06-08 or Pr.06-11; when Pr.06-06 or Pr.06-09 is set as 1 or 3, the keypad displays a warning without an error record; when Pr.06-06 or 06-09 is set as 2 or 4, it displays an error, stops running and displays an error record. **Corrective actions** ■ Check if the motor is overloaded. ■ Verify that the motor rated current in Pr.05-01 is correct. ■ Increase the motor capacity.
21	ot2	
22	oH3	Motor over-heating
24	oSL	Over-slip
25	tUn	Auto-tuning processing
28	oPHL	Output phase loss
30	SE3	Keypad COPY error 3 Keypad copy between different power range drives
31	ot3	Over-torque motor warning 3

Tab. 10-1: Warning codes (2)

ID no.	Display	Descriptions
32	oL4	Over-torque motor warning 4
36	CGdn	CANopen® guarding time-out 1
37	CHbn	CANopen® heartbeat time-out 2
39	CbFn	CANopen® bus off
40	CIdn	CANopen® index error
41	CAdn	CANopen® station address error
42	CFrn	CANopen® memory error
43	CSdn	CANopen® SDO transmission time-out
44	CSbn	CANopen® SDO received register overflow
45	CbLn	CANopen® boot up fault
46	CPLn	CANopen® protocol format error
50	PLod	PLC download error, opposite data defect.
51	PLSu	PLC download and save error
52	PLdA	Data error during PLC operation
53	PLFn	PLC download function code error
54	PLor	PLC register overflow
55	PLFF	PLC operation function code error
56	PLSn	PLC checksum error
57	PLEd	PLC end command is missing.

Tab. 10-1: Warning codes (3)

ID no.	Display	Descriptions
58	PLCr	PLC MCR command error
59	PLdF	PLC download failure
60	PLSF	PLC scan time failure
73	ECbF	Bus-off detected
74	ECnP	No network power
75	ECFF	Default setting error
76	ECiF	Serious internal error
78	ECPP	Profibus parameter data error
79	ECPC	Profibus configuration data error
80	ECEF	EtherNet link failure
81	ECto	Communication time-out for communication card and drive
82	ECCS	Checksum error for communication card and drive
83	ECrF	Communication card returned to default setting
84	ECo0	Modbus®/TCP exceeds maximum communication value.
85	ECo1	EtherNet/IP exceeds maximum communication value.
86	ECiP	IP failure
87	EC3F	Mail failure
88	ECbY	Communication card is busy.
90	CPLP	Copy PLC: password error

Tab. 10-1: Warning codes (4)

ID no.	Display	Descriptions
91	CPL0	Copy PLC: read mode error
92	CPL1	Copy PLC: write mode error
93	CPLv	Copy PLC: version error
94	CPLS	Copy PLC: capacity size error
95	CPLF	Copy PLC: you must disable the PLC function.
96	CPLt	Copy PLC: time-out

Tab. 10-1: Warning codes (5)

11 Error codes

Versi-KP-LED digital keypad

Versi-KP-LED digital keypad_o-Nr

* Refer to settings for Pr.06-17–Pr.06-22 and Pr.14-70–Pr.14-73.

ID no.*	Display	Descriptions
1	ocA	Over-current during acceleration (output current exceeds triple the rated current during acceleration). **Corrective actions** ■ Short-circuit at motor output: check for possible poor insulation at the output. ■ Acceleration time is too short: increase acceleration time. ■ AC motor drive output power is too low: replace the AC motor drive with a higher power model.
2	ocd	Over-current during deceleration (output current exceeds triple the rated current during deceleration). **Corrective actions** ■ Short-circuit at motor output: check for possible poor insulation at the output. ■ Deceleration time is too short: increase the deceleration time. ■ AC motor drive output power is too low: replace the AC motor drive with a higher power model.
3	ocn	Over-current during steady operation (output current exceeds triple the rated current during constant speed). **Corrective actions** ■ Short-circuit at motor output: check for possible poor insulation at the output. ■ AC motor drive output power is too low: replace the AC motor drive with a higher power model.

Tab. 11-1: Error codes (1)

ID no.*	Display	Descriptions
4	GFF	Ground fault. When one of the output terminal(s) is grounded, the short circuit current is more than 50% of the AC motor drive rated current. **NOTE:** The short circuit protection is provided for the AC motor drive protection, not to protect you. **Corrective actions** ■ Check the wiring connections between the AC motor drive and the motor for possible short circuits, as well as the connections to ground. ■ Check whether the IGBT power module is damaged. ■ Check for possible poor insulation at the output.
6	ocS	Over-current at stop. Hardware failure in current detection. **Corrective actions** ■ Return the unit to the factory.
7	ouA	DC BUS over-voltage during acceleration (230 V: 450 V DC; 460 V: 900 V DC) **Corrective actions** ■ Check if the input voltage spiked above the rated AC motor drive input voltage range. ■ Check for possible voltage transients. ■ If the DC BUS is over-voltage due to the regenerative voltage, increase the acceleration time or add an optional brake resistor.
8	oud	DC BUS over-voltage during deceleration (230 V: 450 V DC; 460 V: 900 V DC) **Corrective actions** ■ Check if the input voltage spiked above the rated AC motor drive input voltage range. ■ Check for possible voltage transients. ■ If the DC BUS is over-voltage due to regenerative voltage, increase the deceleration time or add an optional brake resistor.
9	oun	DC BUS over-voltage at constant speed (230 V: 450 V DC; 460 V: 900 V DC) **Corrective actions** ■ Check if the input voltage spiked above the rated AC motor drive input voltage range. ■ Check for possible voltage transients.
10	ouS	Over-voltage at stop. Hardware failure in voltage detection. **Corrective actions** ■ Check if the input voltage spiked above the rated AC motor drive input voltage range. ■ Check for possible voltage transients.
11	LuA	DC BUS voltage is less than Pr.06-00 during acceleration. **Corrective actions** ■ Check if the input voltage is normal. ■ Check for possible sudden changes in load. ■ Check the setting of Pr.06-00.
12	Lud	DC BUS voltage is less than Pr.06-00 during deceleration. **Corrective actions** ■ Check if the input voltage is normal. ■ Check for possible sudden changes in load. ■ Check the setting of Pr.06-00.

Tab. 11-1: Error codes (2)

ID no.*	Display	Descriptions
13	LUn	DC BUS voltage is less than Pr.06-00 at constant speed. **Corrective actions** ■ Check if the input voltage is normal. ■ Check for possible sudden changes in load. ■ Check the setting of Pr.06-00.
14	LUS	DC BUS voltage is less than Pr.06-00 at stop. **Corrective actions** ■ Check if the input voltage is normal. ■ Check for possible sudden changes in load. ■ Check the setting of Pr.06-00.
15	orP	Phase loss protection **Corrective actions** ■ Check if there is any phase loss in the three-phase model or in the one-phase input application.
16	oH1	IGBT is overheated above the protection level. **Corrective actions** ■ Ensure that the ambient temperature falls within the specified temperature range. ■ Make sure the ventilation holes are not obstructed. ■ Remove any foreign objects from the heat sink and check for possible dirt in the heat sink. ■ Check the fan and clean it. ■ Provide enough space for adequate ventilation.
18	tH1o	IGBT Hardware Error **Corrective actions** ■ Return the unit to the factory.
21	oL	Overload; the AC motor drive detects excessive drive output current. **Corrective actions** ■ Check if the motor is overloaded. ■ Change to the next power level with a higher value for the AC motor drive model.
22	EoL1	Electronic thermal relay 1 protection **Corrective actions** ■ Check the setting of the electronic thermal relay (Pr.06-14). ■ Change to the next power level with a higher value for the AC motor drive model.
23	EoL2	Electronic thermal relay 2 protection **Corrective actions** ■ Check the setting of the electronic thermal relay (Pr.06-28). ■ Change to the next power level with a higher value for the AC motor drive model.
24	oH3	Motor overheating: the AC motor drive internal temperature exceeds the setting for Pr.06-30 (PTC level) **Corrective actions** ■ Make sure the motor is not obstructed. ■ Ensure that the ambient temperature falls within the specified temperature range. ■ Change to a higher power motor.

Tab. 11-1: Error codes (3)

ID no.*	Display	Descriptions
26	ot1	When the output current exceeds the over-torque detection level (Pr.06-07 or Pr.06-10) and also exceeds Pr.06-08 or Pr.06-11; and when Pr.06-06 or Pr.06-09 is set as 1 or 3, the keypad displays a warning without an error record; when Pr.06-06 or 06-09 is set as 2 or 4, it displays an error, stops running, and displays an error record. **Corrective actions** ■ Check if the motor is overloaded. ■ Verify that the motor rated current in Pr.05-01 is correct. ■ Increase the motor capacity.
27	ot2	
28	uC	Low current detection **Corrective actions** ■ Check Pr.06-71, Pr.06-72, Pr.06-73.
31	cF2	Cannot read internal EEPROM. **Corrective actions** ■ Press the RESET key to reset to the default. ■ If the fault code still displays on the keypad, return the unit to the factory.
33	cd1	U-phase current error **Corrective actions** ■ Cycle the power to the drive. ■ If the fault code still displays on the keypad, return the unit to the factory.
34	cd2	V-phase current error **Corrective actions** ■ Cycle the power to the drive. ■ If the fault code still displays on the keypad, return the unit to the factory.
35	cd3	W-phase current error **Corrective actions** ■ Cycle the power to the drive. ■ If the fault code still displays on the keypad, return the unit to the factory
36	Hd0	CC (current clamp) hardware error **Corrective actions** ■ Cycle the power. ■ If the fault code still displays on the keypad, return the unit to the factory.
37	Hd1	OC hardware error **Corrective actions** ■ Cycle the power. ■ If the fault code still displays on the keypad, return the unit to the factory.
40	AUE	Motor parameters auto-tuning error **Corrective actions** ■ Verify that the motor wiring is correct. ■ Verify that the motor capacity and parameters are correct. ■ Try auto-tuning again.
41	AFE	PID loss (ACI) **Corrective actions** ■ Check the wiring for the PID feedback. ■ Check the settings for the PID parameters.

Tab. 11-1: Error codes (4)

ID no.*	Display	Descriptions
42	PGF1	PG feedback error **Corrective actions** ■ Check if the setting of the encoder parameter is correct when the drive is in PG feedback close-loop control.
43	PGF2	PG feedback loss **Corrective actions** ■ Check the wiring for the PG feedback.
44	PGF3	PG feedback stall **Corrective actions** ■ Check the wiring for the PG feedback. ■ Check if the setting for the PI gain and acceleration or deceleration is suitable. ■ Return the unit to the factory.
45	PGF4	PG slip error **Corrective actions** ■ Check the wiring for the PG feedback. ■ Check if the setting for the PI gain and acceleration or deceleration is suitable. ■ Return the unit to the factory.
48	ACE	ACI loss **Corrective actions** ■ Check the wiring for ACI. ■ Check if the ACI signal is less than 4 mA.
49	EF	External Fault: when the multi-function input terminal (EF) is active, the AC motor drive stops output. **Corrective actions** ■ Press the RESET key after you clear the fault.
50	EF1	Emergency stop: when the multi-function input terminal (EF1) is active, the AC motor drive stops output. **Corrective actions** ■ Press the RESET key after you clear the fault.
51	bb	External Base Block: when the multi-function input terminal (B.B.) is active, the AC motor drive stops output. **Corrective actions** ■ Deactivate the external input terminal (B.B.) to operate the AC motor drive again.
52	Pcod	Keypad is locked after you enter the wrong password three times. **Corrective actions** ■ Refer to Pr.00-07 and Pr.00-08. ■ Cycle the power, and then enter the correct password.
54	CE1	Modbus® function code error (illegal function code) **Corrective actions** ■ Check if the function code is correct (function code must be 03, 06, 10, 63).
55	CE2	Modbus® data address error (illegal data address 00 H–254 H) **Corrective actions** ■ Check if the data address is correct.
56	CE3	Modbus® data error (illegal data value) **Corrective actions** ■ Check if the data value exceeds the maximum or minimum value.

Tab. 11-1: Error codes (5)

ID no.*	Display	Descriptions
57	CE4	Modbus® communication error (data is written to read-only address) **Corrective actions** ■ Check if the communication address is correct.
58	CE10	Modbus® transmission time-out **Corrective actions** ■ Check if the host controller transmits the communication command within the setting time (Pr.09-03). ■ Check the communication wiring and grounding. Use a 90-degree wiring layout or separation from main circuit to prevent interference. ■ Check that the setting for Pr.09-02 is the same as the host controller. ■ Check the condition of the communication cable or replace with a new cable.
61	ydc	Y-connection/Δ-connection switch error **Corrective actions** ■ Check the wiring of the Y-connection/Δ-connection. ■ Check the parameter settings.
62	dEb	Pr.07-13 is not set to 0 and there is a momentary power off or power cut. The keypad displays dEb during acceleration or deceleration to stop. **Corrective actions** ■ Set Pr.07-13 to 0. ■ Check if the input power is stable.
63	oSL	Motor slip exceeds Pr.07-29 setting and exceeds Pr.07-30 time setting. **Corrective actions** ■ Check if the motor parameter is correct and decrease the load if overloaded. ■ Check the settings for Pr.07-29 and Pr.07-30.
72	STL1	S1–DCM internal loop detection error **Corrective actions** ■ Check the wiring of the S1 terminal. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of the S1 and +24 V terminals. ■ After you make sure all the wiring is correct, if STL1 fault still exists after cycling the power, please contact Peter Electronic.
76	STo	Safe Torque Off function active **Corrective actions** ■ Check the wiring of the S1 and S2 terminals. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of the S1/S2 and +24 V terminals. ■ After you make sure all the wiring is correct, if STO fault still exists after cycling the power, please contact Peter Electronic.

Tab. 11-1: Error codes (6)

ID no.*	Display	Descriptions
77		S2–DCM internal loop detection error **Corrective actions** ■ Check the wiring of the S2 terminal. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of the S2 and +24 V terminals. ■ After you make sure all the wiring is correct, if STL2 fault still exists after cycling the power, please contact Peter Electronic.
78		S1–DCM & S2–DCM internal loop detection error **Corrective actions** ■ After you make sure all the wiring is correct, if STL3 fault still exists after cycling the power, please contact Peter Electronic.
79		U-phase short circuit
80		V-phase short circuit
81		W-phase short circuit
82		Output phase loss 1 (Phase U) Output phase loss 2 (Phase V) Output phase loss 3 (Phase W) **Corrective actions** ■ Check the motor internal wiring and change the motor if there is still an error. ■ Check the cable condition. ■ Choose a three-phase motor, and make sure the capacity of drive and motor match. ■ Check the control board cable. ■ Verify that the three-phase current is balanced. If it is balanced and the OPL fault still exists, return the unit to the factory.
83		
84		
87		Over-load protection at low frequency
89		Initial rotor position detection error **Corrective actions** ■ Check the UVW output cable condition. ■ Check if the motor internal coil is broken. ■ Verify that the drive UVW output is normal.
101		CANopen® guarding error **Corrective actions** ■ Increase the guarding time (Index 100C). ■ Check the communication wiring and grounding. Use a 90-degree wiring layout or separation from the main circuit to prevent interference. ■ Make sure the communication wiring is serial. ■ Use a dedicated CANopen® cable and install a terminating resistor. ■ Check the condition of the communication cable or replace with a new cable.

Tab. 11-1: Error codes (7)

ID no.*	Display	Descriptions
102	CHbE	CANopen® heartbeat error **Corrective actions** ■ Increase the Heartbeat time (Index 1016). ■ Check the communication wiring and grounding. Use a 90-degree wiring layout or separation from the main circuit to prevent interference. ■ Make sure the communication wiring is serial. ■ Use a dedicated CANopen® cable and install a terminating resistor. ■ Check the condition of the communication cable or replace with a new cable.
104	CbFE	CANopen® bus off error **Corrective actions** ■ Re-install the CANopen® card. ■ Check the communication wiring and grounding. Use a 90-degree wiring layout or separation from the main circuit to prevent interference. ■ Make sure the communication wiring is serial. ■ Use a dedicated CANopen® cable and install terminating resistor. ■ Check the condition of the communication cable or replace with a new cable.
105	CIdE	CANopen® index error **Corrective actions** ■ Reset the CANopen® index (Pr.00-02 = 7).
106	CAdE	CANopen® station address error **Corrective actions** ■ Disable CANopen® (Pr.09-36 = 0). ■ Reset the CANopen® setting (Pr.00-02 = 7). ■ Reset the station address (Pr.09-36).
107	CFrE	CANopen® memory error **Corrective actions** ■ Disable CANopen® (Pr.09-36 = 0). ■ Reset the CANopen® setting (Pr.00-02 = 7). ■ Reset the station address (Pr.09-36).
121	CP20	Internal communication error **Corrective actions** ■ If the fault still appears after pressing RESET, return the unit to the factory.
123	CP22	Internal communication error **Corrective actions** ■ If the fault still appears after pressing RESET, return the unit to the factory.
124	CP30	Internal communication error **Corrective actions** ■ If the fault still appears after pressing RESET, return the unit to the factory.
126	CP32	Internal communication error **Corrective actions** ■ If the fault still appears after pressing RESET, return the unit to the factory.

Tab. 11-1: Error codes (8)

ID no.*	Display	Descriptions
127	CP33	Software version error
128	ot3	Over-torque fault 3
129	ot4	Over-torque fault 4
134	EoL3	Electronic thermal relay 3 protection
135	EoL4	Electronic thermal relay 4 protection
140	Hd6	GFF detected at power on
141	b4GFF	GFF occurs before running
142	AuE1	Auto-tune error 1 (in DC test stage)
143	AuE2	Auto-tune error 2 (high frequency test stage)
144	AuE3	Auto-tune error 3 (rotary test stage)

Tab. 11-1: Error codes (9)

12 Safe Torque Off function

12.1 Basic function description

The MS3 series provides a Safe Torque Off (STO) function. The MS3 series uses dual-channel S1 and S2 signal inputs to turn off IGBT switching, further preventing the generation of motor torque in order to achieve a safe stop. Refer to fig. 12-1 for the Safe Torque Off function circuit diagram.

The MS3 Safe Torque Off function meets the following international standards:

- ISO 13849-1: 2015 Category 3 PL d
- IEC 61508 SIL2
- EN 62061 SIL CL 2
- EN 60204-1 Category 0

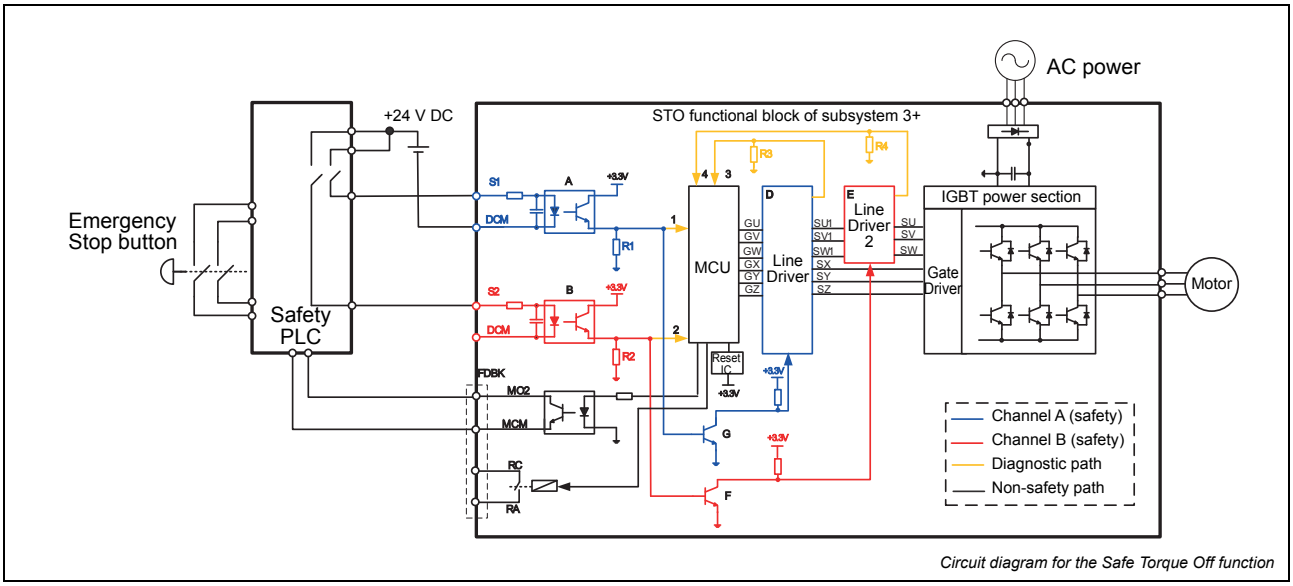


Fig. 12-1: The circuit diagram for the Safe Torque Off function

12.2 Safe Torque Off terminal function description

Tab. 12-1 describes the STO (Safe Torque Off) related terminal functions.

Terminals	Terminal function	Descriptions
+24 V	When the STO function is not used, you can disable the STO function by shorting S1 and S2 with + 24 V.	Output voltage range: +24 V ± 10 % Output voltage capacity: 100 mA
S1	Signal input for STO function channel 1	**S1–DCM/S2–DCM** Rated input voltage: +24 V DC ± 10 %; maximum input voltage: +30 V DC ± 10 % Rated input current: 6.67 mA ± 10 % **STO activation mode** Inp ut voltage level: 0 V DC < S1–DCM and S2–DCM <5 V DC STO response time: ≤20 ms (time required for S1/S2 to operate until the drive stops outputting) **STO cut-off mode** Input voltage level: 11 V DC < S1–DCM and S2–DCM < 30 V DC
S2	Signal input for STO function channel 2	
DCM	Reference ground for S1 and S2 signal	

Tab. 12-1: STO terminal function description

Tab. 12-2 describes the action logic and keypad display after the S1/S2 signal input.

Signal	Status			
S1–DCM	ON	ON	OFF	OFF
S2–DCM	ON	OFF	ON	OFF
Drive output	Ready to output	STL2 mode (torque output off)	STL1 mode (torque output off)	STO mode (torque output off)
Error displayed on keypad	No error displayed	STL2	STL1	STO

Tab. 12-2: Action logic and keypad display description

- STO means channel 1 and 2 operate simultaneously and enter Safe Torque Off.
- STL1 means channel 1 operates.
- STL2 means channel 2 operates.
- STL3 means there is an error detected in the internal loop of channel 1 or channel 2.
- S1–DCM/S2–DCM ON: means S1–DCM/S2–DCM inputs a power supply >11 V DC.
- S1–DCM/S2–DCM OFF: means S1–DCM/S2–DCM inputs a power supply <5 V DC.

12.3 Wiring diagram

Fig. 12-2 shows the internal circuit diagram of the safe control loop.

The terminals of the safe control loop + 24V-S1-S2 are short-circuited together with jumper wire at the factory, as shown in fig. 12-2.

12.3.1 Safe control loop wiring diagram

The safe control loop wiring diagram is as follows:

① Remove the jumper wire from +24V-S1-S2.

② The wiring is shown in fig. 12-3. Normally, you must close the ESTOP contact switch, so the drive can output without displaying an error.

③ In STO mode, the switch ESTOP is turned on. The drive stops outputting and the keypad displays STO.

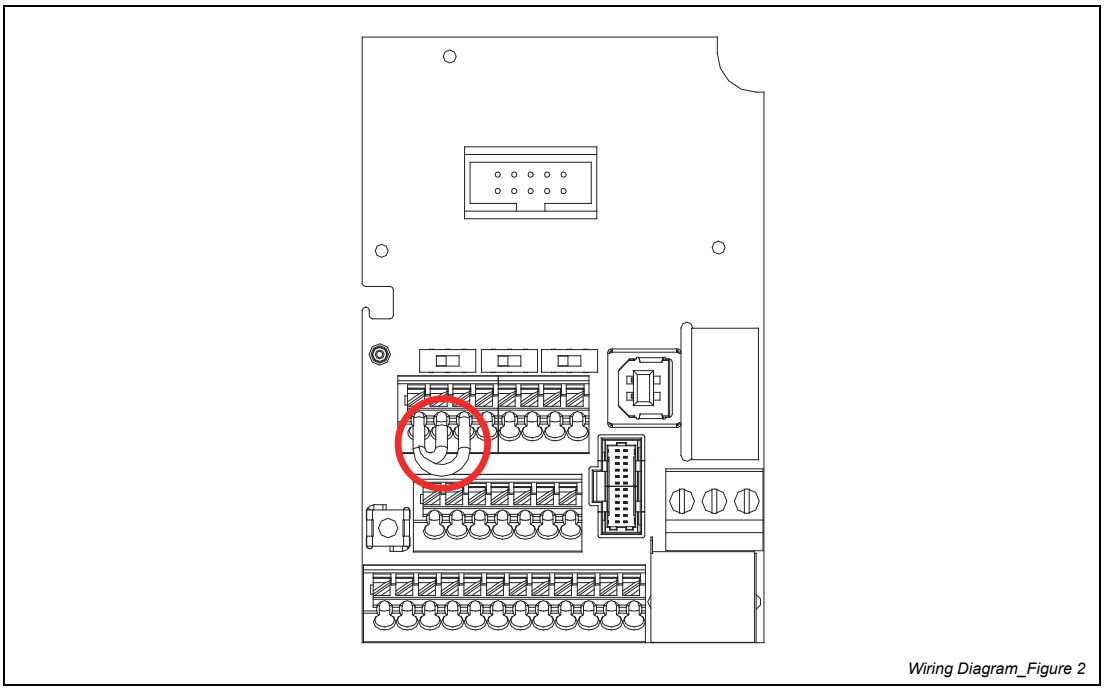


Fig. 12-2: The internal circuit diagram of the safe control loop

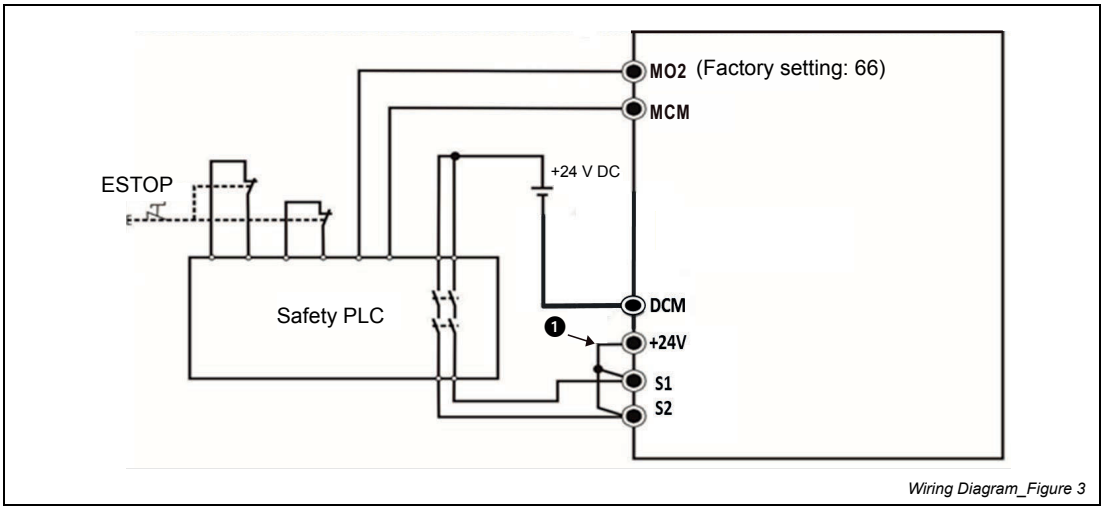


Fig. 12-3: Wiring

NOTE

❶ is factory jumper wire shorting +24V-S1-S2. To use the Safety function, remove this jumper wire. To disable the Safety function, short-circuit +24V-S1-S2 with a jumper wire.

12.4 Failure rate of the drive safety function

Refer to tab. 12-3 for the relevant safe loop parameters.

Item	Definition	Standard	Performance
SFF	Safe failure fraction	IEC 61508	S1–DCM = 88.35% S2–DCM = 88.2%
HFT (Type A subsystem)	Hardware fault tolerance	IEC 61508	1
SIL	Safety integrity level	IEC 61508	SIL 2
		IEC 62061	SILCL 2
PFH	Average frequency of dangerous failure [h-1]	IEC 61508	1.36×10^{-9}
PFD_{av}	Probability of dangerous failure on demand	IEC 61508	5.99×10^{-6}
PTI	Proof test interval	IEC 61508	1 year
Category	Category	ISO 13849-1	Category 3
PL	Performance level	ISO 13849-1	d
$MTTF_d$	Mean time to dangerous failure	ISO 13849-1	High
DC	Diagnostic coverage	ISO 13849-1	Low

Tab. 12-3: Relevant safe loop parameters

12.5 Reset the parameter settings

Use Pr.06-44 to specify the reset method when an STO alarm occurs.

06-44 STO latch selection

Default: 0

Settings	0: STO latch
	1: STO no latch

- 0: STO alarm latch; after you clear the cause of the STO alarm, use a Reset command to clear the STO alarm.
- 1: STO alarm no latch; after you clear the cause of the STO alarm, the STO alarm clears automatically.
- All of STL1–STL3 errors are “STO alarm latch” mode (in STL1–STL3 mode, the Pr.06-44 function is not effective).

12.6 Timing diagram description

The following timing diagrams show the status of relevant signals under different conditions.

12.6.1 Normal operation status

As shown in fig. 12-4, when S1–DCM and S2–DCM is ON (STO function is not required), the drive executes Operating or Output Stop according to RUN command.

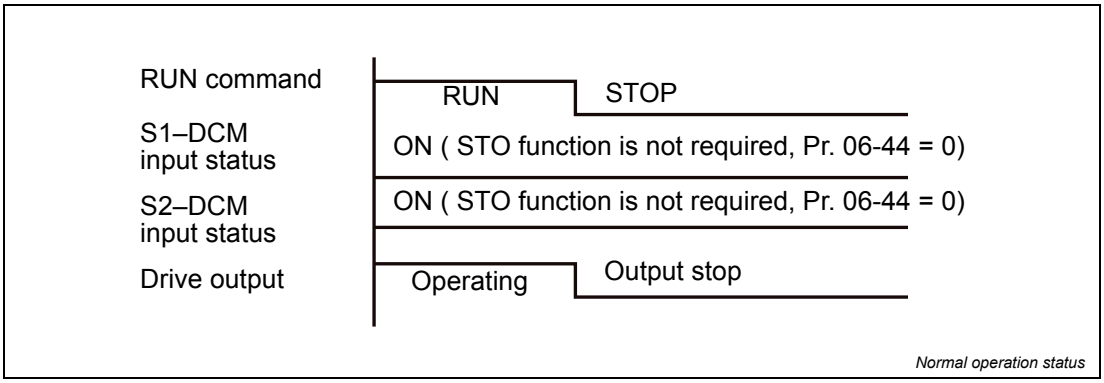


Fig. 12-4: Signal course at normal operation

12.6.2 STO, Pr. 06-44 = 0, Pr. 02-35 = 0 (external control operation after reset/ power on, 0 = not valid)

As shown in fig. 12-5, when both S1–DCM and S2–DCM are OFF during operation (STO function is required), the drive stops outputting when it enters safe mode regardless of whether the RUN command is in ON or OFF status.

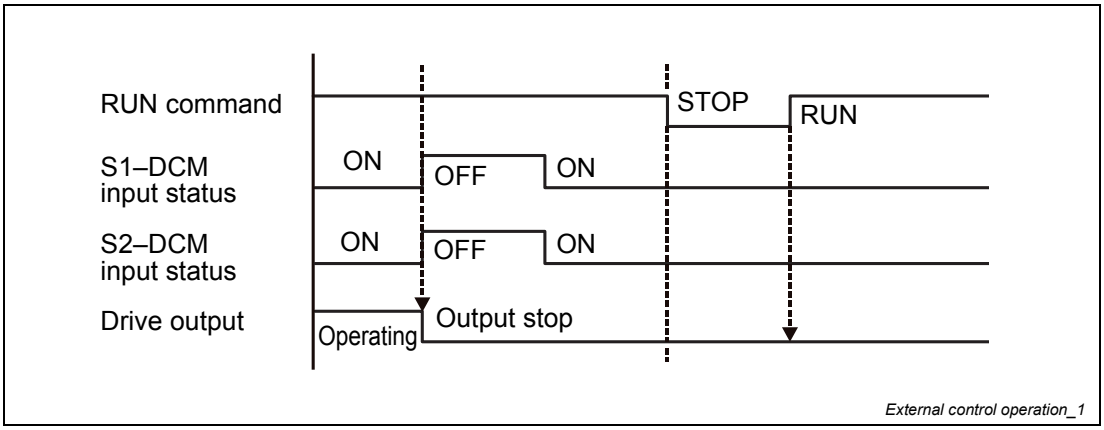


Fig. 12-5: Signal course when enabling S1-DCM and S2-DCM

12.6.3 STO, Pr. 06-44 = 0, Pr. 02-35 = 1 (external control operation after reset/ power on, 1 = the drive executes RUN if the command remains after reset)

As shown in fig. 12-6, the action is the same as in fig. 12-5; however, because Pr.02-35 = 1, if the RUN command remains after reset, the drive immediately executes the RUN command again.

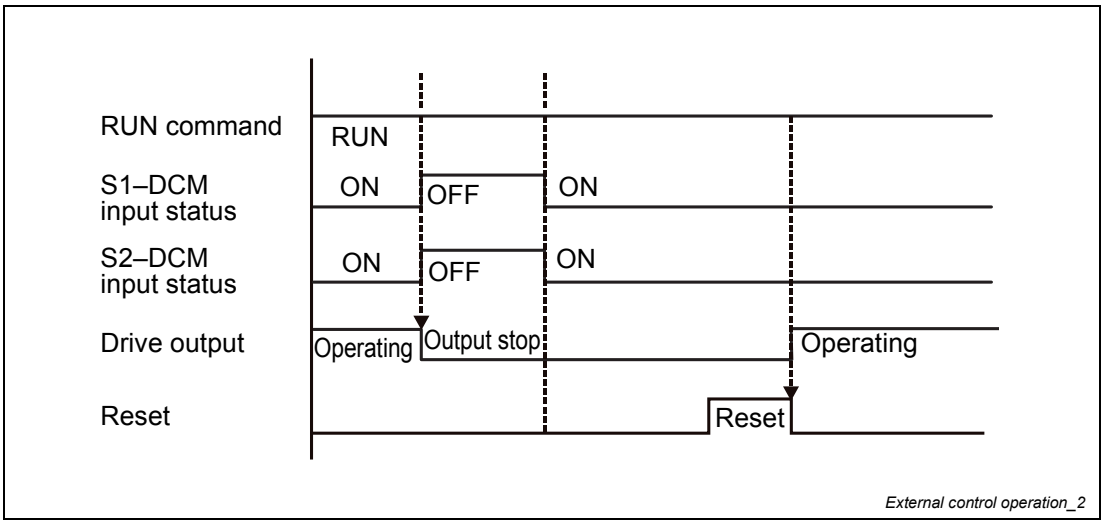


Fig. 12-6: Signal course when enabling S1-DCM, S2-DCM with Pr. 02-35 = 1

12.6.4 STO, Pr. 06-44 = 1

As shown in fig. 12-7, when both of S1–DCM and S2–DCM are OFF during operation (STO function is required), the drive stops outputting. When the S1/S2 status is restored (ON), the STO alarm clears automatically. The drive outputs when the RUN command is executed again.

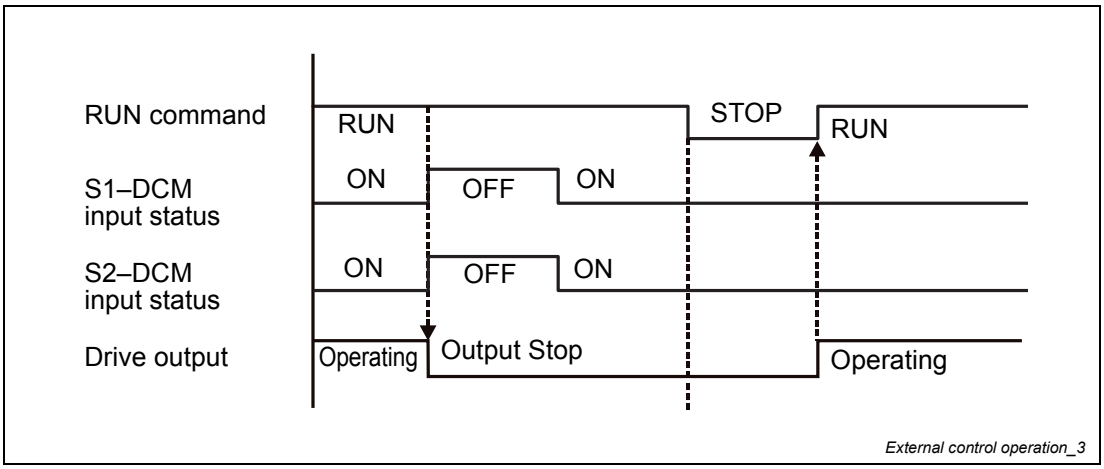


Fig. 12-7: Signal course when enabling S1-DCM, S2-DCM with Pr. 06-44 = 1

12.6.5 STL1, Pr.06-44 = 0 or 1

As shown in fig. 12-8, when S1–DCM is OFF during operation (STO function is required) and S2–DCM is ON (STO function is not required), the drive stops outputting and the keypad shows the STL1 error. However, you cannot reset the STL1 error even if the S1 status is restored (ON) regardless of the parameter setting. You must cycle the power to reset and to restore the drive to the normal standby state.

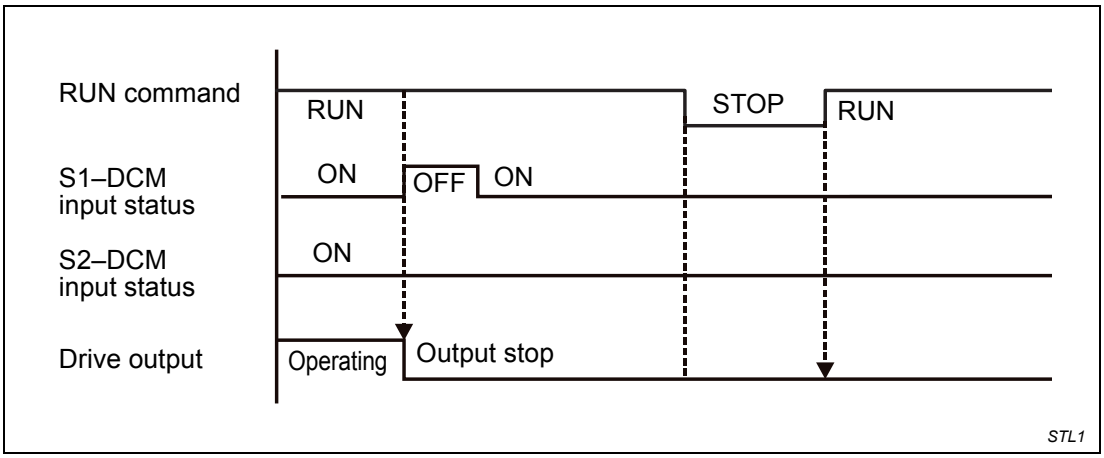


Fig. 12-8: Signal course when enabling STL1

12.6.6 STL2, Pr.06-44 = 0 or 1

As shown in fig. 12-9, when S1–DCM is ON during operation (STO function is not required) and S2–DCM is OFF (STO function is required), the drive stops outputting and the keypad shows the STL2 error. However, you cannot reset the STL2 error even if the S2 status is restored (ON) regardless of the parameter setting. You must cycle the power to reset and to restore the drive to the normal standby state.

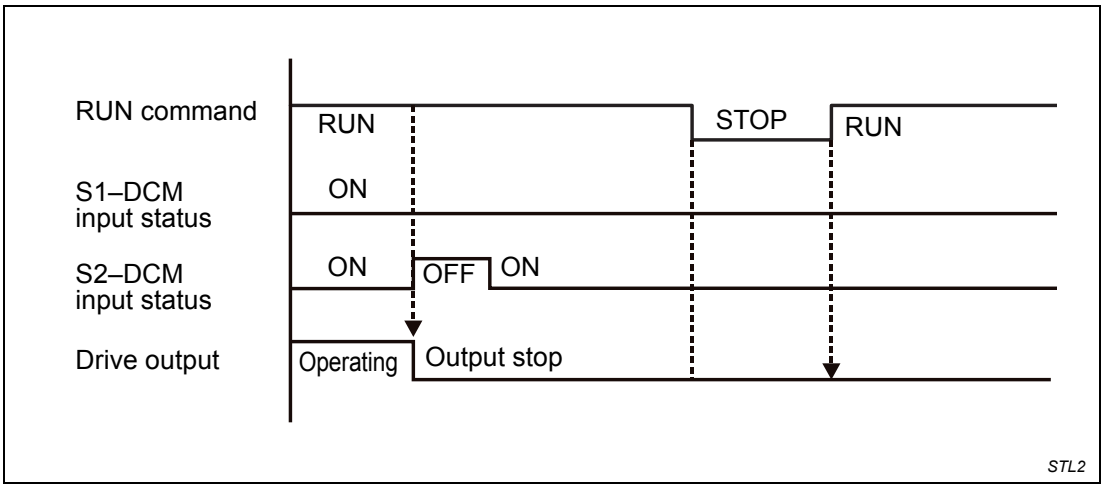


Fig. 12-9: Signal course when enabling STL2

12.7 Error code and troubleshooting instructions

12.7.1 Error code description

Refer to Pr.06-17–Pr.06-22 for the fault record; the relevant STO error code is 72/76/77/78. The definition is as follows and in tab. 12-4.

06-17	Fault record 1
06-18	Fault record 2
06-19	Fault record 3
06-20	Fault record 4
06-21	Fault record 5
06-22	Fault record 6

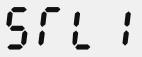
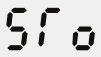
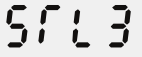
Settings	72: Channel 1 (S1–DCM) safety loop error (STL1)
	76: STO (Safe Torque Off)
	77: Channel 2 (S2–DCM) safety loop error (STL2)
	78: Internal loop error (STL3)

Error code	Name	Description
76 (STO)	Safe Torque Off	Safe Torque Off function active
72 (STL1)	Channel 1 (S1–DCM) safety loop error	S1–DCM internal loop detection error
77 (STL2)	Channel 2 (S2–DCM) safety loop error	S2–DCM internal loop detection error
78 (STL3)	Internal loop error	S1–DCM and S2–DCM internal loop detection error

Tab. 12-4: Error code description

12.7.2 Troubleshooting instructions

Refer to the following instructions for troubleshooting when STO/STL1/STL2/STL3 appear on the keypad. Refer to chapter 11 “Error codes”.

ID no.	Versi-KP-LED Keypad displays	Descriptions
72		S1–DCM internal loop detection error **Corrective actions** ■ Check the wiring of the S1 terminal. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of the S1 and +24 V terminals. ■ After you make sure all the wiring is correct, if STL1 fault still exists after cycling the power, please contact Peter Electronic.
76		Safe Torque Off function active **Corrective actions** ■ Check the wiring of the S1 and S2 terminals. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of S1/S2 and +24 V terminals. ■ After you make sure all the wiring is correct, if STO fault still exists after cycling the power, please contact Peter Electronic.
77		S2–DCM internal loop detection error. **Corrective actions** ■ Check the wiring of the S2 terminal. ■ Reset the emergency switch (ON: activated) and cycle the power. ■ Check that the input voltage maintains at least 11 V. ■ Check the wiring of the S2 and +24 V terminals. ■ After you make sure all the wiring is correct, if STL2 fault still exists after cycling the power, please contact Peter Electronic.
78		S1–DCM & S2–DCM internal loop detection error. **Corrective actions** ■ After you make sure all the wiring is correct, if STL3 fault still exists after cycling the power, please contact Peter Electronic.

Tab. 12-5: Troubleshooting instructions

12.8 Test and fault confirmation

After wiring the STO circuit in accordance with section 4.2 “System wiring diagram”, follow the steps below to verify that the STO and related detection functions are working normally.

① When the drive is powered on, make sure that the S1–DCM and S2–DCM voltage falls between 11–30 V DC. At this time, the drive should enter Standby mode and wait for RUN command. There is no error displayed on the keypad.

② Press RUN on the keypad and use the emergency button or other method to make the S1–DCM and S2–DCM voltage fall between 0–5 V DC. At the same time, after the output frequency is reached, the drive should enter Torque Stop mode STO and stop outputting voltage. The keypad displays the STO error, and the response time of the S1 and S2 signals to cause the drive to stop outputting voltage should be ≤20 ms. Then restore the S1–DCM and S2–DCM voltage to 11–30 V DC, and press RESET on the keypad to clear the STO error. The drive should enter Standby mode and wait for RUN command.

③ Press RUN on the keypad and use the emergency button or other method to make the S1–DCM voltage fall between 0–5 V DC, and the S2–DCM voltage remain between 11–30 V DC after the output frequency is reached. At this time, the drive should enter Torque Stop mode STL1 and stop outputting voltage. The keypad displays the STL1 error, and the response time of S1 signals to cause the drive to stop outputting voltage should be ≤20 ms. Then restore the S1–DCM voltage to 11–30 V DC. However, pressing RESET button on the keypad cannot clear the STL1 error. You must cycle the power to the drive. Make sure that the S1–DCM and S2–DCM voltage falls between 11–30 V DC and then cycle the power to the drive, then the STL1 error is cleared. The drive should enter Standby mode and wait for RUN command.

④ Press RUN on the keypad and use the emergency button or other method to make the S2–DCM voltage fall between 0–5 V DC, and the S1–DCM voltage remain between 11–30 V DC after the output frequency is reached. At this time, the drive should enter Torque Stop mode STL2 and stop outputting voltage. The keypad displays the STL2 error, and the response time of the S2 signals to cause the drive to stop outputting voltage should be ≤20 ms. Then restore the S2–DCM voltage to 11–30 V DC. However, pressing RESET button on the keypad cannot clear the STL2 error. You must cycle the power to the drive. Make sure that the S1–DCM and S2–DCM voltage falls between 11–30 V DC and then cycle the power to the drive, then the STL2 error is cleared. The drive should enter Standby mode and wait for RUN command.

⑤ If you can conduct these four steps normally in sequence with no other error, then the Safe Torque Off function loop is normal, as shown in tab. 12-6. However, if a situation that differs from these four steps, or if STL3 occurs, then the Safe Torque Off function loop is not working normally. Please refer to section 12.7 “Error code and troubleshooting instructions”.

Signal	Status			
S1–DCM	ON	ON	OFF	OFF
S2–DCM	ON	OFF	ON	OFF
Drive output	Ready to output	STL2 mode (torque output off)	STL1 mode (torque output off)	STO mode (torque output off)
Error displayed on keypad	No error displayed	STL2	STL1	STO
Response time	N/A	≤20 ms		
RESET mechanism	N/A	Cycle power to the drive		Press RESET directly

Tab. 12-6: Action logic and keypad display description

- STO means channel 1 and 2 operate simultaneously and enter Safe Torque Off.
- STL1 means channel 1 operates.
- STL2 means channel 2 operates.
- STL3 means there is an error detected in the internal loop of channel 1 or channel 2.
- S1–DCM/S2–DCM ON: means S1–DCM/S2–DCM inputs a power supply >11 V DC.
- S1–DCM/S2–DCM OFF: means S1–DCM/S2–DCM inputs a power supply <5 V DC.

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