INSTRUCTION MANUAL

TECO INVERTER

TECO INVERTER

E710 Series

Table of Contents

Chapter 1 Safety Precautions

1.1 Before supplying the power

Warning

- The terminals of the main circuit need to be wired correctly; the single-phase (R/L1 and S/L2)/three-phase (R/L1, S/L2, T/L3) are the power input terminals, and absolutely must not be mixed with U/T1, V/T2 and W/T3. When they are mixed, supplying power will damage the inverter.

Caution

- The power voltage used must be the same specifications as the input voltage of the inverter.

When moving the inverter, do not lift it by the front cover directly. The inverter should be moved by moving it from the body of the inverter itself to prevent the front cover from calling off, and causing the inverter to fall and resulting in personnel injuries or inverter damages.

- Please install the inverter on metal or other non-combustible materials; do not install in on or near flammable materials to prevent fires from occurring.
- If multiple inverters are placed in the same control plan, please install additional cooling fans to keep the temperature within the control panel below 40°C (under 50°C if there is no dust-proof covers) to prevent overheating or fire.
- Please disassemble or install the operator after switching off the power, and operate and fix the operator in place by following the diagram to prevent poor contact and causing the operator to malfunction or do not display.

Warning

- This product complies with the IEC 61800-3 restricted area usage level. When this product is used under certain environments, it may cause electromagnetic interference; therefore, please perform appropriate testing and make sure to ground it properly before use.
- Motor over-temperature protection function is provided.

Caution

- The installation and usage of the product must be performed by professional electricians with proper qualifications.
- The installation of the product must be performed with fixed wiring methods.

1.2 Wiring

Warning

- Before implementing any inverter installation or wiring, please make sure to switch off the master power to prevent electric shocks and fires.

The wiring engineering personnel must have the relevant professional knowledge to prevent electric shocks and fires.

Make sure that the grounding wire is connected to earth properly. (220V class: The grounding impedance must be less than 100 ohms; 440V class: The grounding impedance must be less than 10 ohms). Please ground the inverter in accordance with the requirements of the EN61800-5-1 specifications. The cable size may need to reach at least 10mm2 (6AWG) in order to meet the standard for limiting leakage current.

- Make sure the ground the grounding terminal of the inverter properly. If it is not grounded correctly, please make sure to unplug the ground cable of the control board to prevent surges from damaging the electronic components.
- The RCD must meet the protection specifications of type-B leakage current.
- After wiring is complete, confirm that the emergency stop function is effective. (Wiring is the responsibility of the user)
- Please do not touch the input/output power cable directly, and prevent all wiring from coming in contact with the outer case of the inverter, as well as short-circuits.
- Do not perform Hipot test to the inverter as doing so can easily damage the semiconductor components.

Caution

- Confirm that the input master power complies with the inverter to prevent injuries or fires.
- Please connect the braking resistor and braking unit in accordance with the relevant wiring diagram, otherwise it may cause fire hazards.
- Please tighten the terminal screws in accordance with the specified torque to prevent fire hazards.
- Do not connect the input power to the output terminal of the inverter.
- Do not connect the electromagnetic contactors or magnetic switch contacts to the output terminal.
- Do not connect the power factor correction capacitors or LC/RC filters to the output circuit.
- Make sure that the interference generated by the inverter and motor will not affect the surrounding sensors or devices.

1.3 Before operation

Warning

- Please verify that the model capacity of the inverter and the model capacities set for the functional parameters 13-00 of the inverter are consistent before connecting the power.
- If the length of the cable between the inverter and motor is more than 25 meters, the carrier frequency (parameter 11-01) must be reduced or an output filter needs to be installed to suppress over-voltage or oscillation at the load side, in order to prevent motor damage.

1.4 Parameter setting

Caution

- Do not connect the motor to the load (mechanical equipment) when performing rotational automatic tuning.
- The motor will rotate when performing rotational automatic tuning; confirm the space around the motor to prevent causing danger.

1.5 Operate

Warning

- Please confirm that the front cover is installed before turning on the power.
- Do not connect or disconnect the motor unit while the inverter is operating, as this may cause an over-current trip; this may even damage the main circuit of the inverter in severe cases.
- Do not get close to the machine when reseting functions as the machine will restart after the malfunction is eliminated.
- Do not operate the machine while both hands are wet.
- Provide an independent emergency stop switch; this switch is activated when the function parameter is set (please refer to 11-55).
- Provide an independent external hardware emergency switch so that the inverter output can be shut down immediately in case of danger.
- Please make sure that the operation command is off before resetting warnings.
- If automatic restart (07-00) after power is restored is selected, the inverter will restart after power is restored.
- Please confirm the status of the surrounding systems and mechanical devices before performing automatic tuning to ensure personnel safety.
- Avoid touching the relevant terminals regardless of whether the inverter is operating or stopped to prevent danger.
- The fan may still rotate for a while even after the power is disconnected.

Caution

- Please do not touch the heating components such as the heat sink and brake resistor.
- The inverter can easily make the motor operate from low-speed to high-speed; please confirm the

allowable range of the motor and the machine.

- Please pay attention to the relevant settings when using brake modules and other compatible products.
- Please do not check the signals on the circuit boards while the inverter is operating.

Warning

Avoid electric shocks! The DC capacitor inside the inverter will completely discharge 5 minutes after the power is disconnected; please disassemble or conduct inspections 5 minutes after the power is disconnected.

1.6 While inspecting, maintaining and replacing

Warning

- Please confirm that the power is off and that the DC voltage is no more than 25 volts before performing maintenance or inspection.
- The inverter terminals contain high-voltage terminals; please do not touch them arbitrarily.
- Make sure to install the protective cover while the power is on; also, please make sure to disconnect the power through the breaker after the protective cover is removed.
- Please do not allow people other than the designated professionals to perform maintenance, inspection or replace components.

Caution

- The inverter should be used in environments with an ambient temperature between 14° ~ 104 (140)°F (-10 ~ +40 (60)°C) 95%RH without condensation, and make sure that are no water drips and metal dust in the surrounding environment.

1.7 Precautions when disposing the inverter

Caution

Please dispose of the inverter as industrial waste, and pay attention to the followings:

- The electrolytic capacitors on the main circuit and those on the printed circuit boards of the inverter may explode if incinerated.
- Toxic gases may be produced when the plastic components of the inverter, such as its casing, are incinerated.

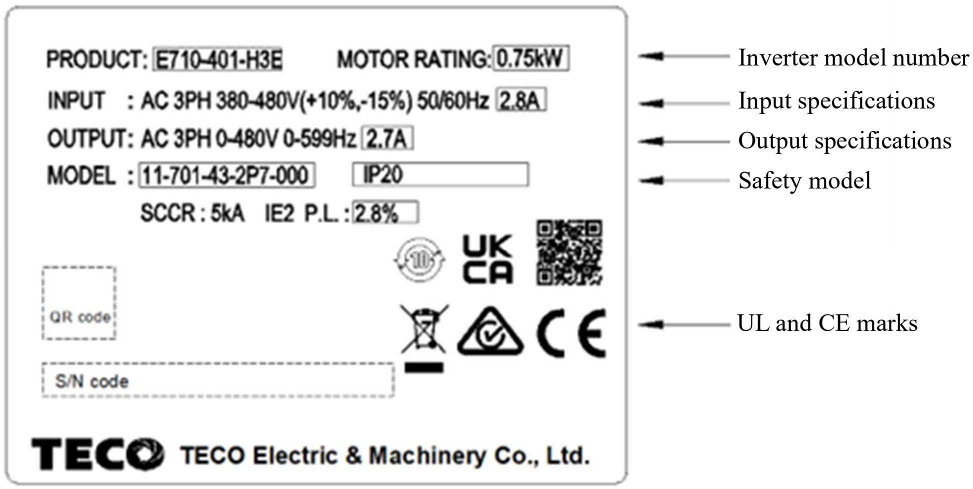
Devices that contain electronic components cannot be processed with daily garbage; they must be recycled separately with electrical and electronic waste in accordance with the local regulations in effect.

1.8 Exemption from warranty liability

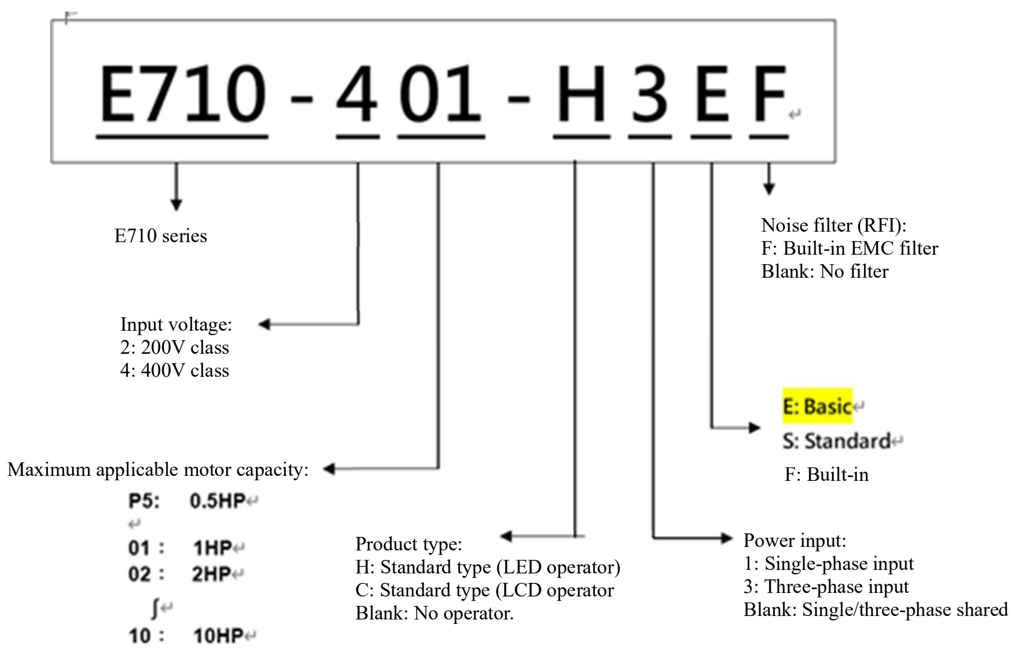
Our warranty does not cover losses of opportunities caused to your company or the customers of your company due to failure of our company’s product, damages caused by products not made by our company, or the compensation of other businesses regardless of whether it is still within the warranty period or not.

Chapter 2 Nameplate and model number

2.1 Inverter nameplate



2.2 Model No.



*The basic model is 2P5/201/401/402, *Standard is the remaining models

Models list:

Inverter model number (Standard model)	Applicable voltage (Vac)	Applicable frequency (Hz)	Horse power (HP)	Applicable motor (KW)	Filter Built-in	
					Included	Not included
E710-2P5-HE	1ph/3ph， 200~240V +10%/-15%	50/60Hz	0.5	0.4		◎
E710-201-HE			1	0.75		◎
E710-202-HS			2	1.5		◎
E710-203-HS			3	2.2		◎
E710-2P5-H1EF	1ph， 200~240V +10%/-15%		0.5	0.4	◎	
E710-201-H1EF			1	0.75	◎	
E710-202-H1SF			2	1.5	◎	
E710-203-H1SF			3	2.2	◎	
E710-205-H3S	3ph， 200~240V +10%/-15%		5	3.7		◎
E710-208-H3S			7.5	5.5		◎
E710-401-H3E	3ph， 380~480V +10%/-15%		1	0.75		◎
E710-402-H3E			2	1.5		◎
E710-403-H3S			3	2.2		◎
E710-405-H3S			5	3.7		◎
E710-408-H3S			7.5	5.5		◎
E710-410-H3S			10	7.5		◎
E710-401-H3EF	3ph， 380~480V +10%/-15%		1	0.75	◎	
E710-402-H3EF			2	1.5	◎	
E710-403-H3SF			3	2.2	◎	
E710-405-H3SF			5	3.7	◎	
E710-408-H3SF			7.5	5.5	◎	
E710-410-H3SF			10	7.5	◎	

Chapter 3 Ambient temperature and installation

3.1 Environment

The installation environment of the inverter has direct impact to the normal functioning and usage life of the inverter; therefore, the installation environment of the inverter must comply with the following conditions:

Protection		
Protection category	IP20 / NEMA 1	
Applicable environment		
Operating temperature	IP20 / UL OPEN TYPE：	NEMA 1 / UL TYPE 1：
	-10~50°C -10~60°C (must be used with reduced load)	-10~40°C -10~50°C (must be used with reduced load)
	When multiple inverters are installed in parallel in the panel, please pay attention to the placement to ensure proper heat dissipation	
Storage temperature	-20~70°C	
Humidity	5% to 95% relative humidity RH with no condensation or water droplets; non-condensing (In compliance with IEC60068-2-78 standards)	
Vibration	Maximum acceleration: 1.0G (9.8m/s^2), from 49.84 to 150 Hz Displacement amplitude: 0.3mm (peak value), between 10 to 49.84 Hz (In accordance with IEC60068-2-6 standards)	
Altitude	It can operate with full load under altitude 1000m or less, and the rated current needs to be reduced by 1% every 100m for altitudes 1000m and above, with a maximum limit of 3000m	

Installation location

The product must be installed in an environment that is easy to operate, and avoid being exposed to the following environments:

- Avoid direct sunlight exposure
- Prevent exposure to rain or humid environments
- Prevent exposure to oil mist and salt corrosion
- Prevent exposure to corrosive liquids and gases
- Prevent entering of dust, lint and metal particles
- Prevent electromagnetic interference (Welding machines or power machinery)
- Keep away from radioactive substances and flammable objects
- Prevent vibrations (punch press); if it cannot be prevented; if unavoidable, install vibration-absorbing pads to reduce the impact

Terminal screw torque

To comply with UL standards, when wiring the main circuit terminals, please use UL-approved copper wires (rated 75°C) and ring-type crimp terminals with the specifications shown in the table below (UL-compliant products). It is recommended to use the crimp terminals manufactured by NICHIFU Co., Ltd. as shown in the table below, and use the crimping tools recommended by the terminal manufacturer for crimping the terminals and insulating sleeves.

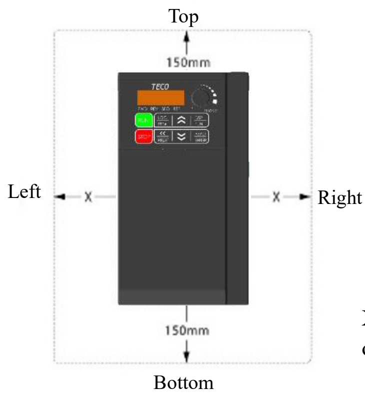
Cable size mm2 (AWG)	Terminal screw specifications	Ring-type crimp terminal model	Locking torque kgf.cm (in.lbs)	Insulating sleeve model	Crimping tool model
0.75 (18)	M3.5	R1.25-3.5	8.2 to 10 (7.1 to 8.7)	TIC 1.25	NH 1
	M4	R1.25-4	12.2 to 14 (10.4 to 12.1)	TIC 1.25	NH 1
1.25 (16)	M3.5	R1.25-3.5	8.2 to 10 (7.1 to 8.7)	TIC 1.25	NH 1
	M4	R1.25-4	12.2 to 14 (10.4 to 12.1)	TIC 1.25	NH 1
2 (14)	M3.5	R2-3.5	8.2 to 10 (7.1 to 8.7)	TIC 2	NH 1 / 9
	M4	R2-4	12.2 to 14 (10.4 to 12.1)	TIC 2	NH 1 / 9
	M5	R2-5	22.1 to 24 (17.7 to 20.8)	TIC 2	NH 1 / 9
	M6	R2-6	25.5 to 30.0 (22.1 to 26.0)	TIC 2	NH 1 / 9
3.5/5.5 (12/10)	M4	R5.5-4	12.2 to 14 (10.4 to 12.1)	TIC 3.5/5.5	NH 1 / 9
	M5	R5.5-5	20.4 to 24 (17.7 to 20.8)	TIC 3.5/5.5	NH 1 / 9
	M6	R5.5-6	25.5 to 30.0 (22.1 to 26.0)	TIC 3.5/5.5	NH 1 / 9
	M8	R5.5-8	61.2 to 66.0 (53.0 to 57.2)	TIC 3.5/5.5	NH 1 / 9
8 (8)	M4	R8-4	12.2 to 14 (10.4 to 12.1)	TIC 8	NOP 60
	M5	R8-5	20.4 to 24 (17.7 to 20.8)	TIC 8	NOP 60
	M6	R8-6	25.5 to 30.0 (22.1 to 26.0)	TIC 8	NOP 60
	M8	R8-8	61.2 to 66.0 (53.0 to 57.2)	TIC 8	NOP 60
14 (6)	M4	R14-4	12.2 to 14 (10.4 to 12.1)	TIC 14	NH 1 / 9
	M5	R14-5	20.4 to 24 (17.7 to 20.8)	TIC 14	NH 1 / 9
	M6	R14-6	25.5 to 30.0 (22.1 to 26.0)	TIC 14	NH 1 / 9
	M8	R14-8	61.2 to 66.0 (53.0 to 57.2)	TIC 14	NH 1 / 9
22 (4)	M6	R22-6	25.5 to 30.0 (22.1 to 26.0)	TIC 22	NOP 60/ 150H
	M8	R22-8	61.2 to 66.0 (53.0 to 57.2)	TIC 22	NOP 60/ 150H
30/38 (3 / 2)	M6	R38-6	25.5 to 30.0 (22.1 to 26.0)	TIC 38	NOP 60/ 150H
	M8	R38-8	61.2 to 66.0 (53.0 to 57.2)	TIC 38	NOP 60/ 150H
50 / 60 (1 / 1/ 0)	M8	R60-8	61.2 to 66.0 (53.0 to 57.2)	TIC 60	NOP 60/ 150H
	M10	R60-10	102 to 120 (88.5 to 104)	TIC 60	NOP 150H
70 (2/0)	M8	R70-8	61.2 to 66.0 (53.0 to 57.2)	TIC 60	NOP 150H
	M10	R70-10	102 to 120 (88.5 to 104)	TIC 60	NOP 150H
80 (3/0)	M10	R80-10	102 to 120 (88.5 to 104)	TIC 80	NOP 150H
	M16	R80-16	255 to 280 (221 to 243)	TIC 80	NOP 150H
100 (4/0)	M10	R100-10	102 to 120 (88.5 to 104)	TIC 100	NOP 150H
	M12	R100-12	143 to 157 (124 to 136)	TIC 100	NOP 150H
	M16	R80-16	255 to 280 (221 to 243)	TIC 80	NOP 150H

3.2 Installation

3.2.1 Installation space

(1)Please install the E710 inverter vertically and leave sufficient space to ensure cooling effects, as shown in Figure 3.1.

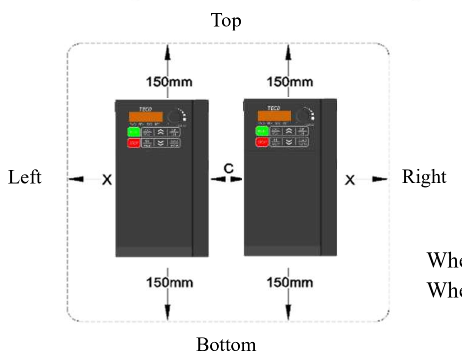
Avoid installing it up-side down or horizontally.



X=The inverter capacity is 7.5HP(and below), the minimum recommended width is 30mm

▲Figure 3.1 Installation space of E710

(2) The multiple inverters are installed in parallel, please make sure the follow the installation configuration in the figure below to ensure cooling effects.



When C≥30mm, the allowed maximum ambient temperature is 50°C.
When C=0mm, the allowed maximum ambient temperature is 40°C.

▲Figure 3.2 Installation space for multiple E710s installed in parallel

(3) The cooling fins of the heat sink may reach temperatures up to 90°C during inverter operation. Therefore, the mounting surface of the inverter must be made of materials capable of withstanding relatively high temperatures. When the inverter is operating inside a distribution box, the environment must be well-ventilated and the ambient temperature must not exceed +50°C.

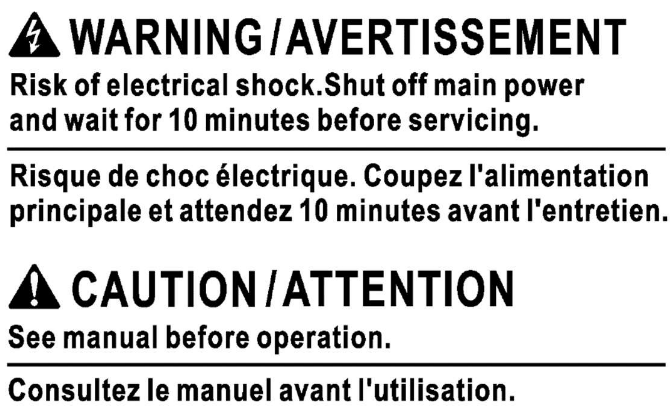
3.2.2 Appearance diagram and warning label information

Caution

The installation environment of the inverter has direct impact to the functions and usage life of the inverter; therefore, the installation environment must be considered when installing the E710 inverter:

- Ambient temperature: -10°C ~ +50°C (Models with the NEMA 1 panel installed externally: -10°C ~ +40°C)
- Prevent exposure to rain, humidity, or direct sunlight.
- Prevent exposure to corrosive liquids or gases, dust, and metal particles.
- Avoid locations with vibration or electromagnetic interference.
- If multiple inverters are installed within the same control panel, please add cooling fans to keep the ambient temperature around the inverters below 50°C.

Make sure to check the warning messages on the front outer cover of the inverter. Refer to Figure 3.2 below.



200V: 0.5-7.5HP/400V: 1-10HP

Figure 3.2 Warning labels

3.2.3 Disassembly and assembly of the product

Caution

The digital operator does not need to be disassembled when wiring the E710. Simply loosen the screws on the outer cover of the terminal, remove the outer cover of the terminal and then wire the terminals inside the inverter.

3.3 Wiring and precautions of inverter peripherals

Caution

1. Please do not touch the circuit or replace the components before the capacitors have completely discharged after disconnecting the input power.
2. Do not perform wiring or disassemble the connectors inside the inverter while power is supplied.
3. Never connect the inverter output terminals U, V and W to the AC power.
4. The grounding terminal E of the inverter must be grounded.
5. Make sure to disconnect the grounding cable of the control panel when the inverter is not grounded or connected to a floating grid.
6. Since semiconductor components can easily be damaged by high voltages, do not perform Hipot tests to the internal components of the E710 inverter.
7. The CMOS ICs on the inverter's control board are easily affected and damaged by static electricity. Please do not touch the control board.

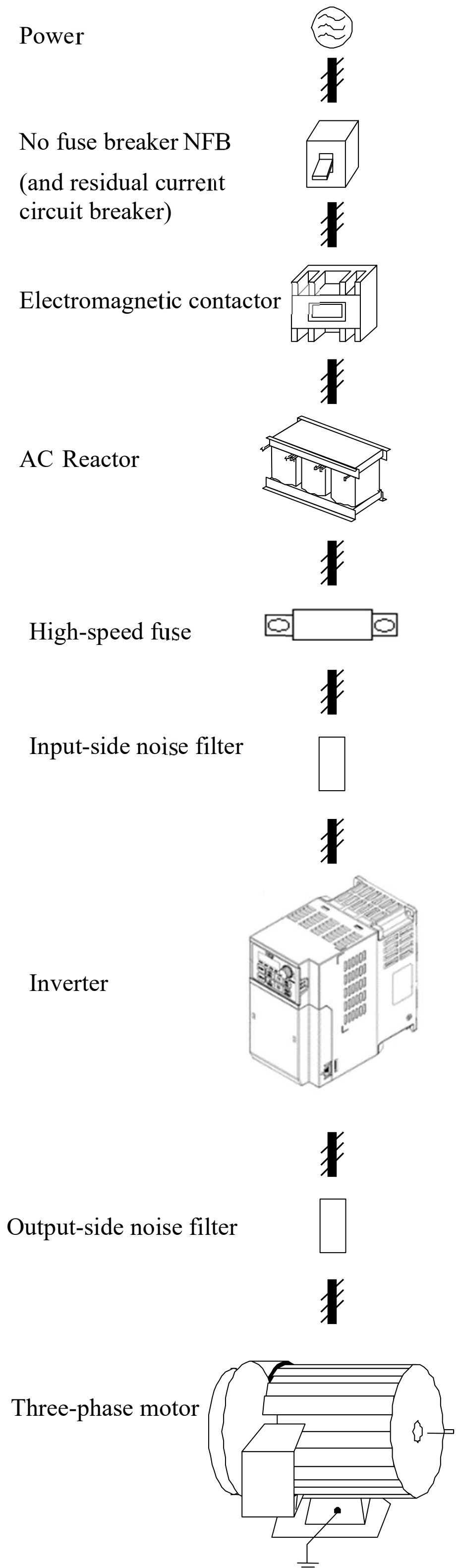
Caution

1. Please refer to **3.5.1** of Chapter Three and select appropriate cable diameters when wiring; when the wiring of the main circuit is long, consider the fact that voltage drop cannot exceed 2% of the rated voltage.
   passing through (A) × 10^{-3}
2. When the wiring between the inverter and motor is long, please reduce the carrier frequency appropriately (parameter 11-01) appropriately.

Caution

To ensure peripheral safety, it is recommended to install a high-speed fuse on the input side of the inverter, especially for high-power systems. Please refer to the descriptions in 6.4 of Chapter Six for the specifications of the high-speed fuse adopted.

3.3.1 Standard wiring example of E710 peripherals



■ Power
- Please confirm whether the voltage class is correct to avoid damaging the inverter.

■ No fuse breaker (NFB) and residual current circuit breaker
- Please refer to the user manual and select a NFB with appropriate rated current.
- Please do not use the NFB as the operate/stop control of the inverter.
- When installing a residual current circuit breaker for current leakage fault protection, select one with a sensitivity of 200 mA or higher and a trigger time of 0.1 seconds or longer (V-type) to prevent high frequency malfunctions.

■ Electromagnetic contactor
- An electromagnetic contactor is not required for general use; however, it is required for functions such as external sequential control or automatic restart after power failure.
- Please avoid using electromagnetic contactors to operate/stop the inverter directly whenever possible.

■ AC reactor
- An additional AC reactor can be installed to further improve the power factor or suppress external surges.

■ High-speed fuse
- To ensure the safety of peripherals, make sure to add an additional high-speed fuse. Please refer to the descriptions in the user manual for the fuse specifications.

■ Input-side noise filter
- A filter must be installed when there are inductive loads affecting the inverter. The inverter meets EN55011 Class A, EN 61800-3 category C2 when the TECO special filter is used.

■ Inverter
- There is no phase sequence distinction among the input terminals R, S, and T; they can be changed arbitrarily.
- Please ground the grounding terminal E properly.

■ Output-side noise filter
- Installing an additional dedicated noise filter on the output-side of the inverter can reduce radiation interference and induction noise.

■ Motor
- When one inverter is used to drive multiple motors, the rated current of the inverter must be greater than the total current when the motors operate simultaneously.
- The motor and inverter must be grounded separately.

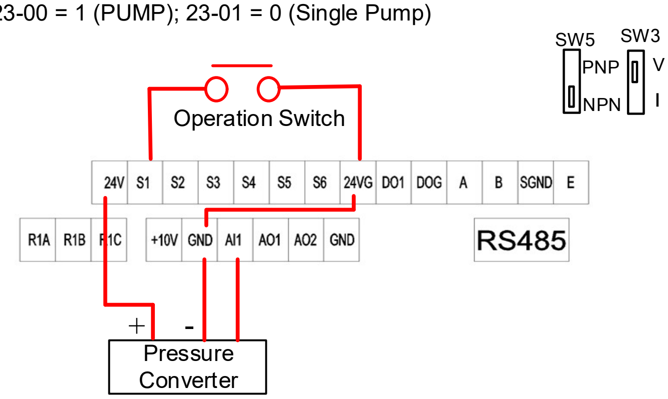
3.3.2 Pump wiring diagram

3.3.2.1 The wiring diagram of the pump voltage type pressure sensor is as follows: (Applicable to simple version E)

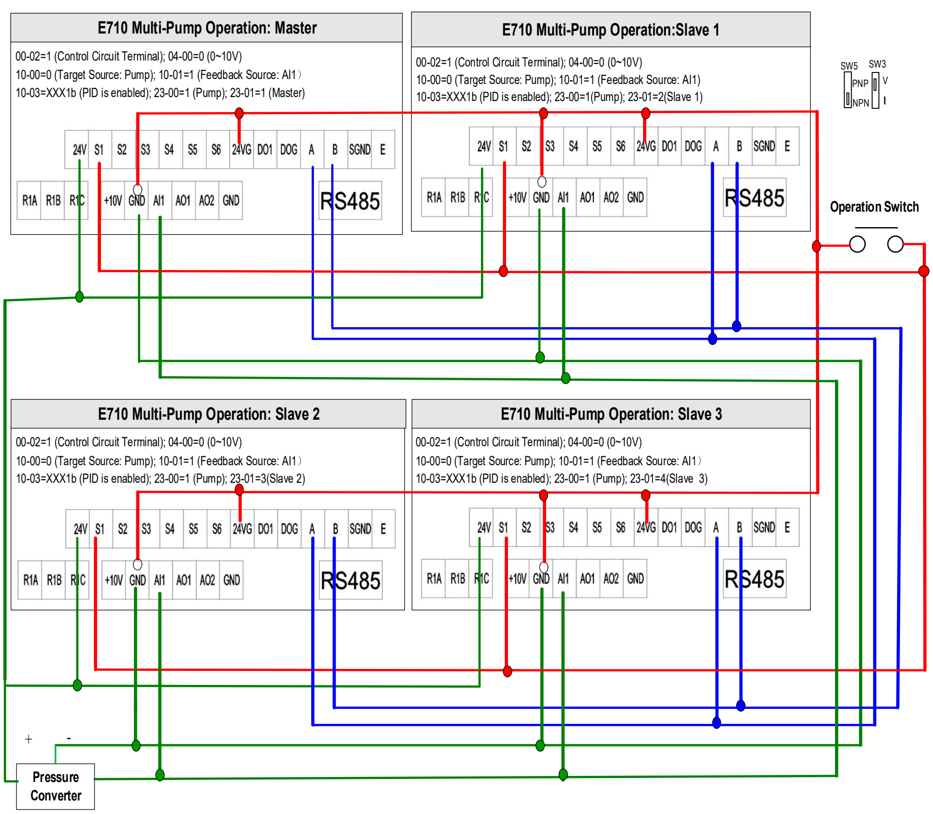
Single pump operation:

E710 Single Pump Operation

00-02 = 1 (Control Circuit Terminal)
04-00 = 0 (0~10V); 10-00=0 (Target Source: Pump)
10-01 = 1 (Feedback Source: AI1)
10-03 = XXX1B (PID is enabled)
23-00 = 1 (PUMP); 23-01 = 0 (Single Pump)

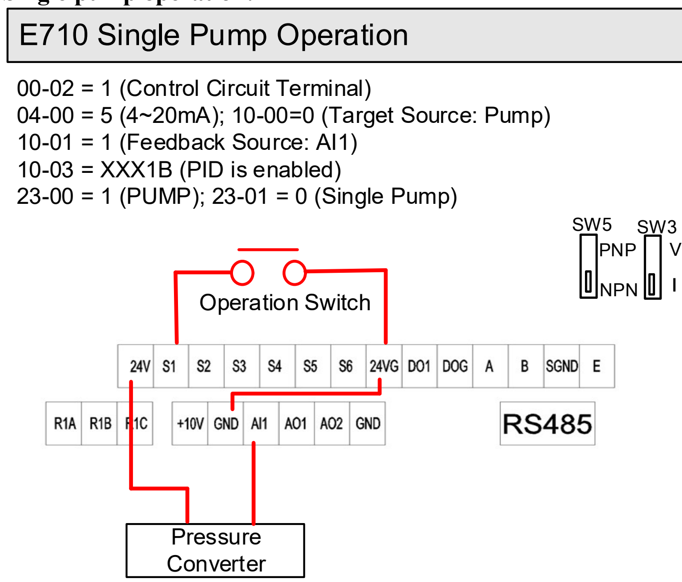


Multiple pump operation:

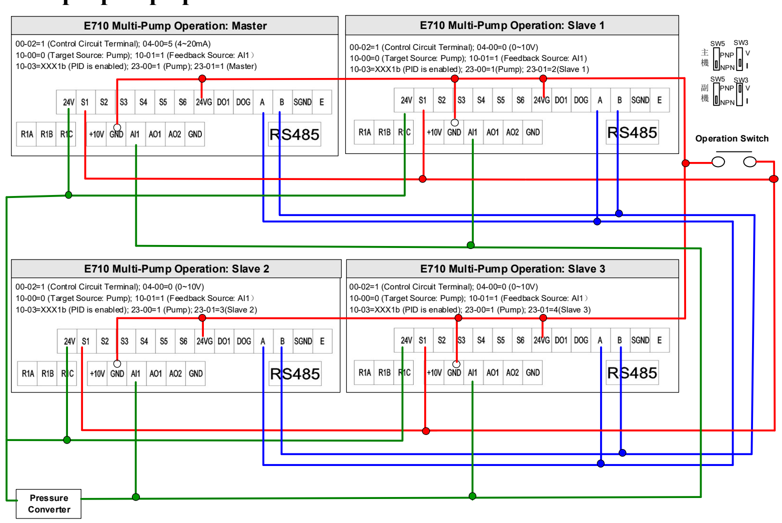


3.3.2.2 The wiring diagram of the pump current type pressure sensor is as follows: (Applicable to simple version E)

Single pump operation:



Multiple pump operation:



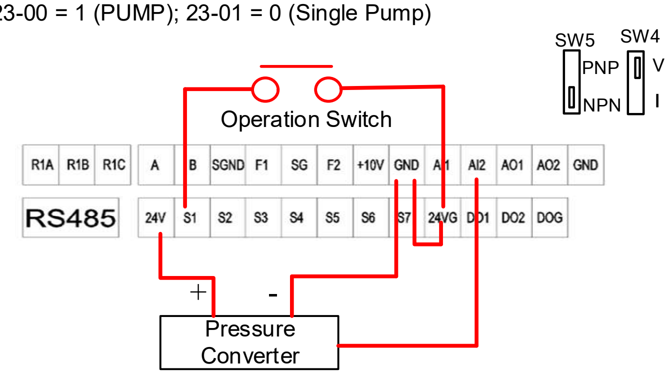
Note 1: The position of the flip switch must be correct (SW3 and SW5).
Note 2: The power must be disconnected and then reconnected after setting the master/slave machine.
Note 3: 24VG and GND need to be short-circuited
Note 4: Choose 09-01=3 (PUMP parallel communication) for multi-pump parallel communication mode, make sure that the 09-02 (baud rate setting) of the master and slave machines are consistent, and refer to the descriptions of the 23-31 (multi-pump parallel synchronization selection) parameters to perform parallel operation mode.
Note 5: Please note that the slave machine's 04-02 (AI1 gain) = 252.0%.04 - 03 (AI1 bias) = -25.0% (approximately ±5% adjustment) need to be adjusted when wiring the multi-pump current type pressure sensor.
Note 6: When operating multiple pumps, if any of the inverters do not supply power, the 24V of the inverter also needs to be disconnected from the other inverters to avoid impedance effects.

3.3.2.3 The wiring diagram of the pump voltage type pressure sensor is as follows: (Applicable to standard version S)

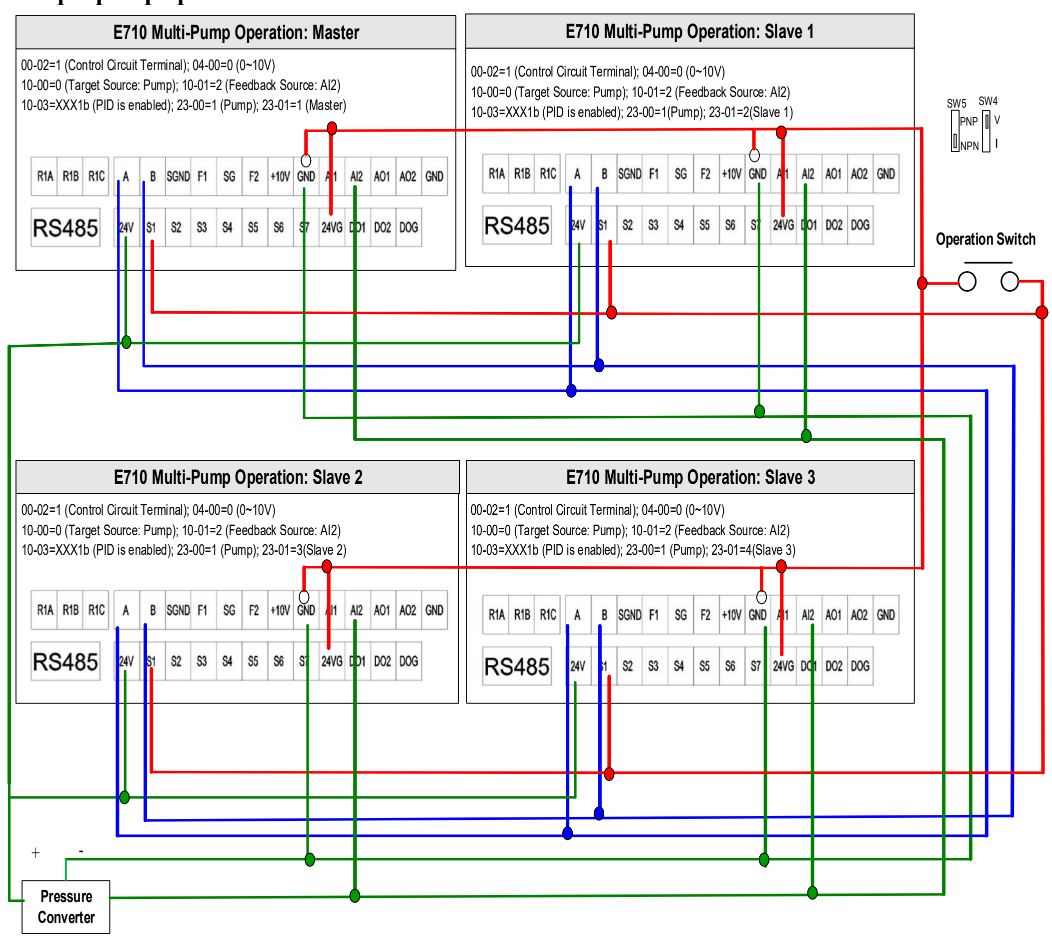
Single pump operation:

E710 Single Pump Operation

00-02 = 1 (Control Circuit Terminal)
04-00 = 0 (0~10V); 10-00=0 (Target Source: Pump)
10-01 = 2 (Feedback Source: AI2)
10-03 = XXX1B (PID is enabled)
23-00 = 1 (PUMP); 23-01 = 0 (Single Pump)



Multiple pump operation:

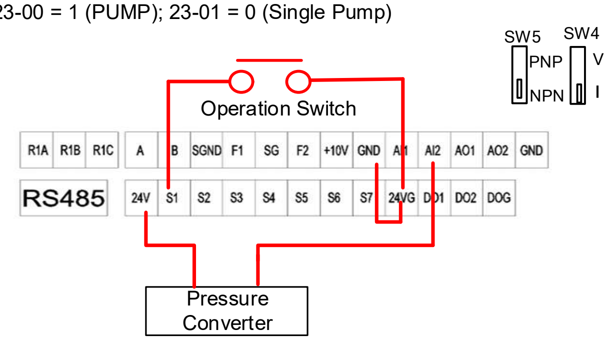


3.3.2.4 The wiring diagram of the pump current type pressure sensor is as follows: (Applicable to standard version S)

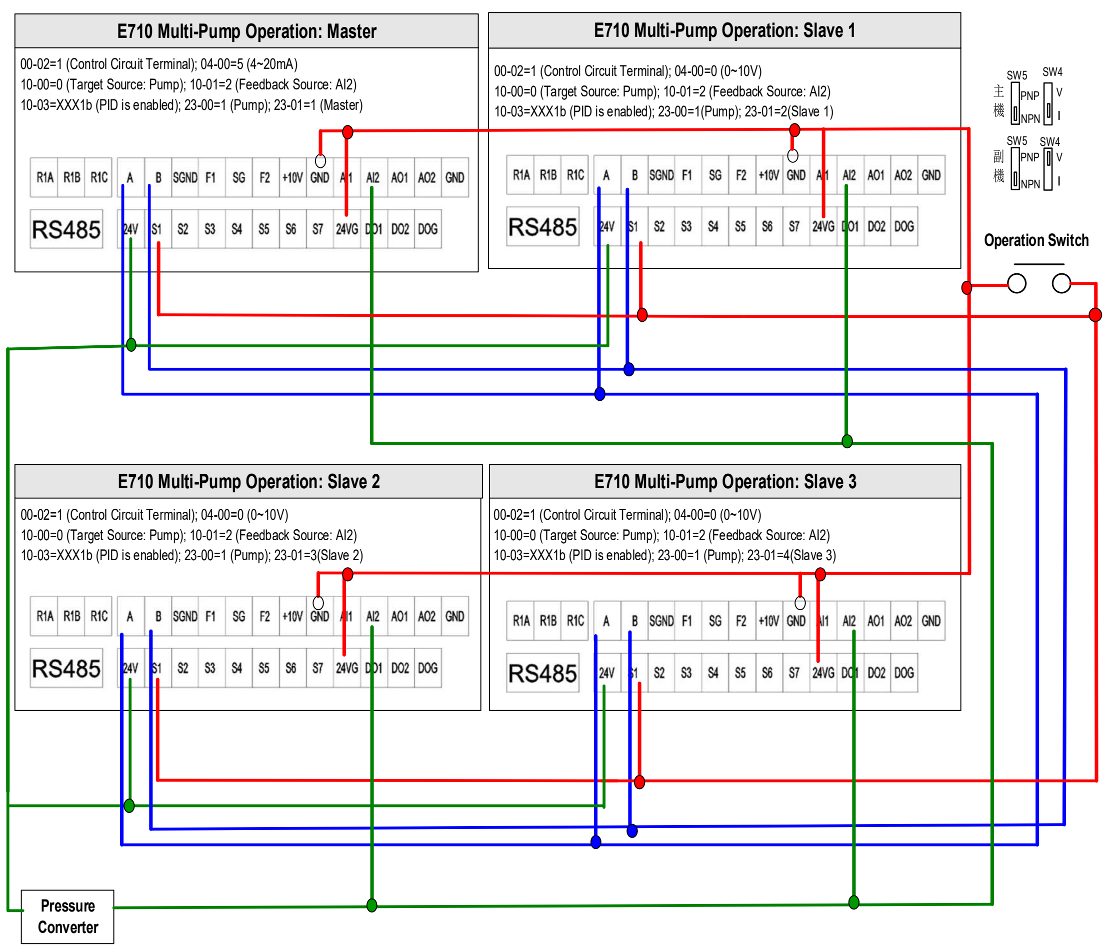
Single pump operation:

E710 Single Pump Operation

00-02 = 1 (Control Circuit Terminal)
04-00 = 5 (4~20mA); 10-00=0 (Target Source: Pump)
10-01 = 2 (Feedback Source: AI2)
10-03 = XXX1B (PID is enabled)
23-00 = 1 (PUMP); 23-01 = 0 (Single Pump)



Multiple pump operation:



Note 1: The position of the flip switch must be correct (SW4 and SW5).
Note 2: The power must be disconnected and then reconnected after setting the master/slave machine.

Note 3: 24VG and GND need to be short-circuited

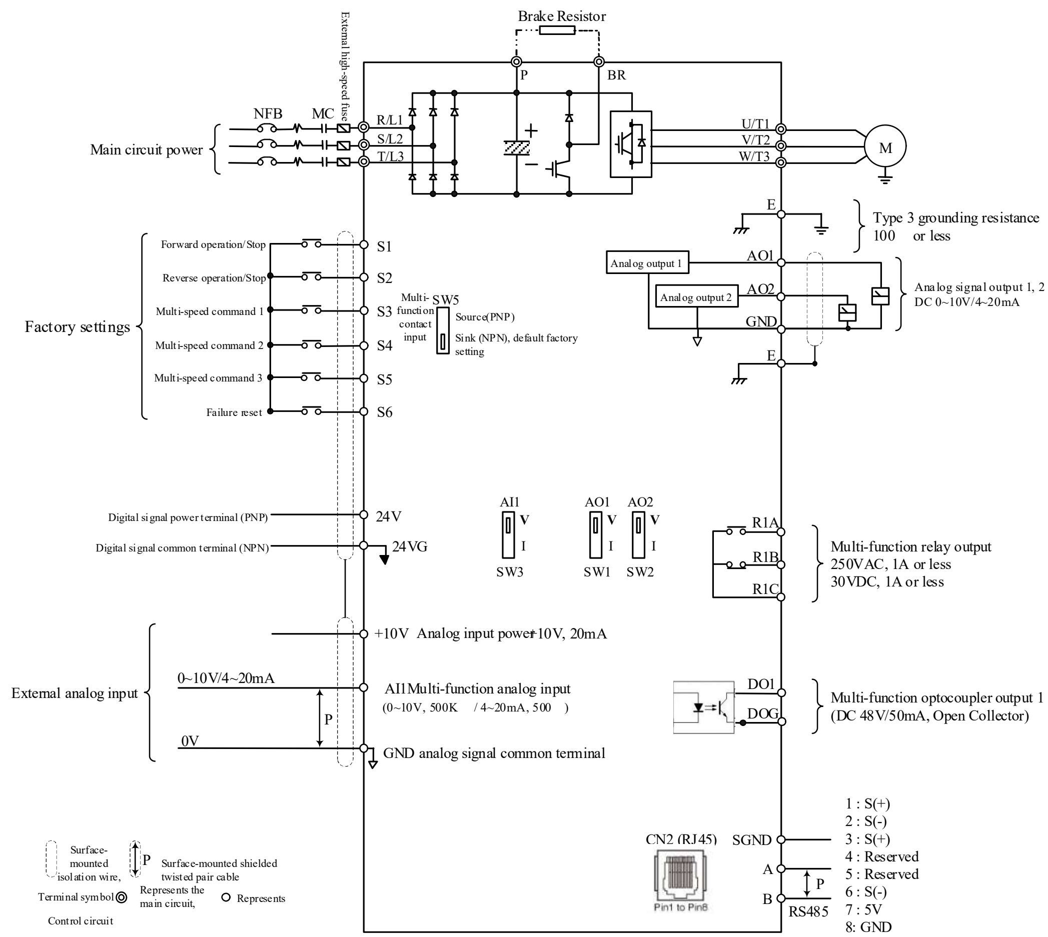
Note 4: Choose 09-01=3 (PUMP parallel communication) for multi-pump parallel communication mode, make sure that the 09-02 (baud rate setting) of the master and slave machines are consistent, and refer to the descriptions of the 23-31 (multi-pump parallel synchronization selection) parameters to perform parallel operation mode.

Note 5: Please note that the slave machine's 04-02 (AI1 gain) = 252.0%.04 - 03 (AI1 bias) = -25.0% (approximately ±5% adjustment) need to be adjusted when wiring the multi-pump current type pressure sensor.

Note 6: When operating multiple pumps, if any of the inverters do not supply power, the 24V of the inverter also needs to be disconnected from the other inverters to avoid impedance effects.

3.3.3 Wiring diagram (Applicable to simple version E)

The following is the wiring diagram of a simple model of the E710 inverter (◎represents the main circuit terminals, and ○ represents the control circuit terminals); the locations and symbols of the wiring terminal block may vary according to the different E710 models. Please refer to the contents in the later chapters for descriptions on the main circuit terminals and control circuit terminals.



Notes:

*1: The multi-function digital input contacts S1~S6 can be set to Source (PNP, with +24V common) or Sink (NPN, with 24VG common) through switch SW5.

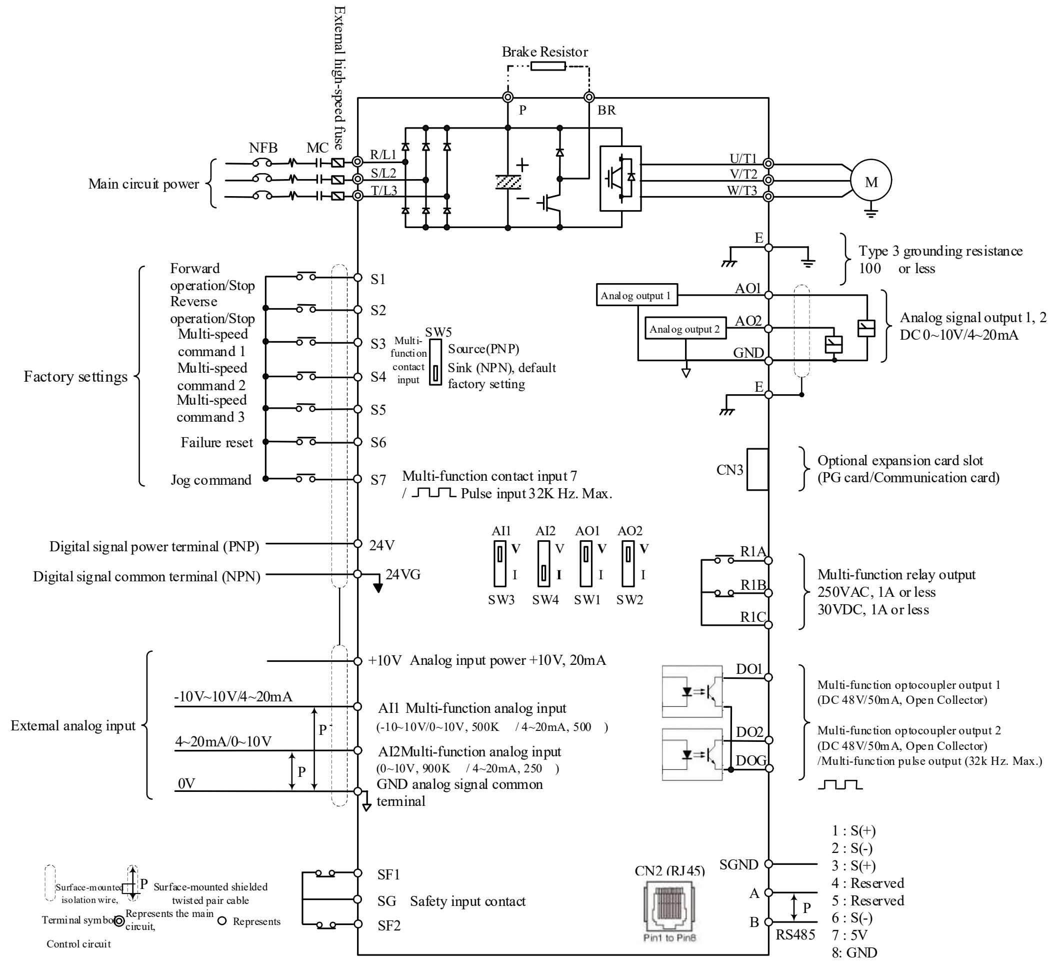
*2: The multi-function analog input AI1 can be set to voltage command input (0~10V) or current command input (4~20mA) through switch SW3 and be used with parameter 04-00 settings.

*3: When using open collector input mode, no external resistor is required because a built-in pull-up resistor is provided.

*4: AO1 preset 0~+10V output, AO2 preset 0~+10V output.

3.3.4 Wiring diagram (Applicable to standard version S)

The following is the wiring diagram of a standard model of the E710 inverter (◎represents the main circuit terminals, and ○ represents the control circuit terminals); the locations and symbols of the wiring terminal block may vary according to the different E710 models. Please refer to the contents in the later chapters for descriptions on the main circuit terminals and control circuit terminals.



Notes:

*1: The multi-function digital input contacts S1~S6 can be set to Source (PNP, with +24V common) or Sink (NPN, with 24VG common) through switch SW5.

*2: The multi-function analog input AI1/AI2 can be set to voltage command input (0~10V/-10~10V) or current command input (4~20mA) through switch SW3/SW4 and be used with parameter 04-00 settings.

*3: When using open collector input mode, no external resistor is required because a built-in pull-up resistor is provided.

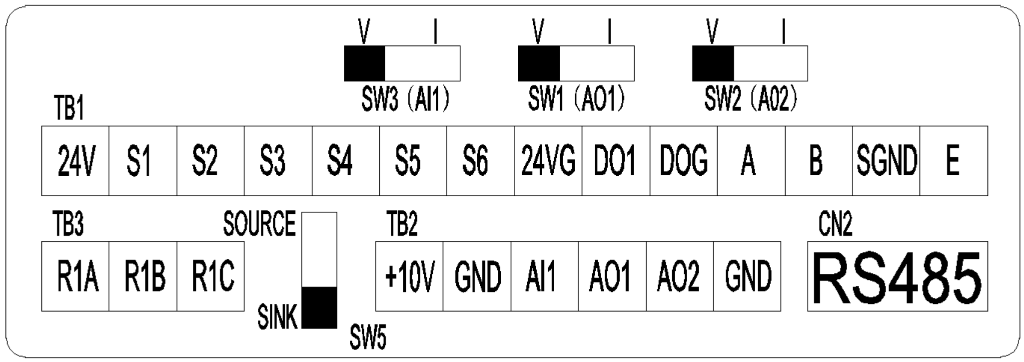
*4: The inverter will only output normally when the safety input contacts SF1 and SF2 are short-circuited to SG. When using safety input, make sure to remove the shorting cables between SF1-SG and SF2-SG.

*5: AO1 preset 0~+10V output, AO2 preset 0~+10V output.

*6:When DO2 uses the pulse out function, a pull-up resistor of 200 ohms is recommended

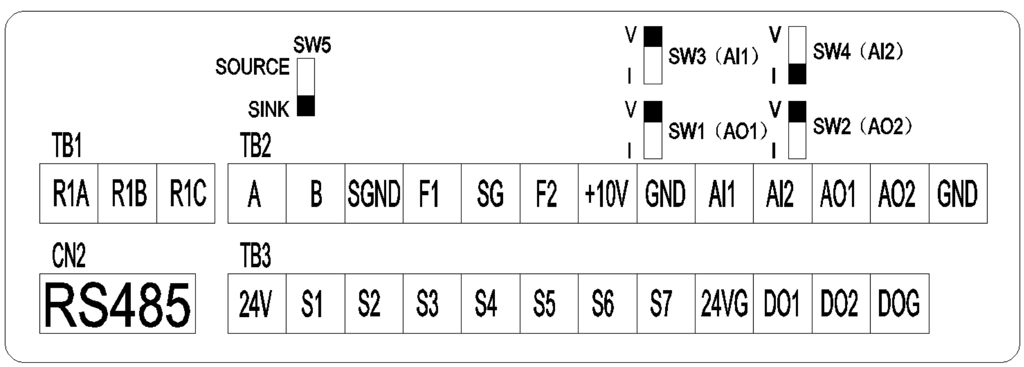
3.3.5 Description of control circuit terminals (applicable to simple version E)

220V: 0.5~1HP/440V: 1~2HP



3.3.6 Description of control circuit terminals (applicable to standard version S)

220V: 2~7.5HP/440V: 3~10HP



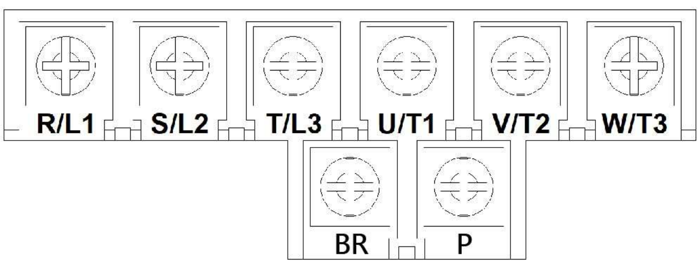
3.4 Description of terminal functions (applicable to simple version E)

Table 3.4.1 Definitions of main circuit terminals

Terminal mark	200V：0.5~7.5HP 400V：1~10HP
R/L1	Main circuit power input (single-phase input, only connects to R-S) The FILTER model is locked on the filter terminal block L1, L2, L3, (single-phase input, only connects to L1 and L3)
S/L2	
T/L3	
P	P-BR: External braking resistor
BR	
U/T1	Inverter output
V/T2	
W/T3	
E/PE/⏚	Grounding terminal (type-three grounding)

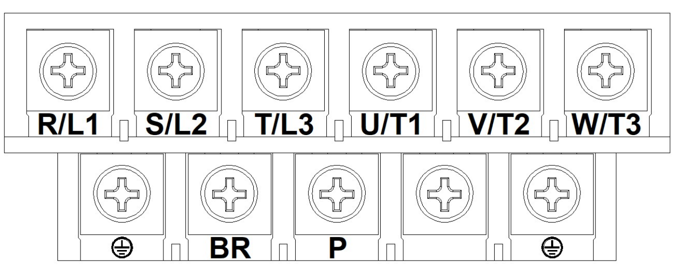
■ Main circuit terminal configuration

➢ 220V: 0.5~1HP/440V: 1~2HP



Terminal screw size
T
M3.5

➢ 220V: 2~7.5HP/440V: 3~10HP



Terminal screw size	
T	⏚
M4	M4

FILTER terminal block terminal configuration

220V: 0.5~3HP/440V: 1~10HP

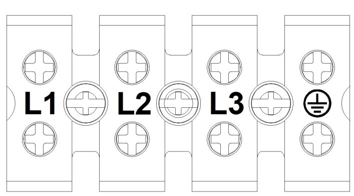


Table 3.4.2 Definitions of control circuit terminals (applicable to simple version E)

Type	Terminal	Terminal functions
Digital input signal	S1	Multi-function input terminal
	S2	Multi-function input terminal
	S3	Multi-function input terminal
	S4	Multi-function input terminal
	S5	Multi-function input terminal
	S6	Multi-function input terminal
24V power supply	24V	Common point of digital signal source
	24VG	Common point of digital signal sink

Type	Terminal	Terminal functions
Analog input signal	+10V	Speed setting power
	AI1	Multi-function analog input 1 can be switched between voltage or current input (0~10V)/(4-20mA)
	GND	Analog signal shared terminal
	E	Shielded cable connection terminal (earth)
Analog output signal	AO1	Multi-function analog output terminal can be switched between voltage or current output (0~10V output)/(4-20mA output)
	AO2	Multi-function analog output terminal can be switched between voltage or current output (0~10V output)/(4-20mA output)
	GND	Analog signal shared terminal
Digital output	D01	Multi-function (open-collector transistor) output
	DOG	Open collector transistor shared terminal
Relay output	R1A	Relay A contact (multi-function output terminal)
	R1B	Relay B contact (multi-function output terminal)
	R1C	Relay shared terminal
RS-485	A	RS485/MODBUS
	B	
	SGND	Signal ground

Table 3.4.3 Definitions of control circuit terminals (applicable to standard version S)

Type	Terminal	Terminal functions
Digital input Signal	S1	Multi-function input terminal
	S2	Multi-function input terminal
	S3	Multi-function input terminal
	S4	Multi-function input terminal
	S5	Multi-function input terminal
	S6	Multi-function input terminal
	S7	Multi-function input terminal/optional pulse input, BW 32KHz
24V Power supply	24V	Common point of digital signal source
	24VG	Common point of digital signal sink

Type	Terminal	Terminal functions
Analog input signal	+10V	Speed setting power
	AI1	Multi-function analog input 1 can be switched between voltage or current input (0~10V)/(4-20mA)
	AI2	Multi-function analog input 2 can be switched between voltage or current input (0~10V)/(4-20mA)
	GND	Analog signal shared terminal
Analog output signal	AO1	Multi-function analog output terminal can be switched between voltage or current output (0~10V output)/(4-20mA output)
	AO2	Multi-function analog output terminal can be switched between voltage or current output (0~10V output)/(4-20mA output)
	GND	Analog signal shared terminal
Digital output signal	DO1	Multi-function (open-collector transistor) output
	DO2	Multi-function (open collector transistor) output/switchable pulse output, BW 32KHz
	DOG	Open collector transistor shared terminal
Relay output	R1A	Relay A contact (multi-function output terminal)
	R1B	Relay B contact (multi-function output terminal)
	R1C	Relay shared terminal
Safety input	F1	On: Operates freely with safety input; Off: General operation
	F2	(Make sure to disconnect the short-circuit cable when stopping with an external safety switch)
	SG	Safety command shared terminal
RS-485	A	RS485/MODBUS
	B	
	SGND	Signal ground

Caution

- The maximum capacity of the terminal's +10V output current is 20mA.
- The multi-function analog outputs A01 and A02 are analog outputs exclusively for connecting to ammeters; please do not use them as analog output signals for feedback control, etc.
- The 24V and +10V power of the control panel are for internal control use only; do not connect them externally to other devices for power supply.

3.5 Appliances for wiring the main circuit and wiring precautions

3.5.1 Appliances for wiring the main circuit

A no fuse breaker must be installed between the AC power supply and the power input terminals R, S, T of E710, and an electromagnetic contactor (MC) is installed as needed. When a residual current circuit breaker is installed for leakage fault protection, to prevent the residual current circuit breaker from malfunctioning, select one with a sensitivity current of 200mA or higher and a trigger time of 0.1 seconds or more.

Wiring specifications

E710 model			Cable diameter AWG (mm^2)			No fuse breaker NFB*4	Electromagnetic contactor MC*4
Power	Applicable horse power (HP)*1	Rated current (A)	Main circuit *2	Grounding cable E (G)	Control terminal *3		
200V	0.5HP	2.8	14~12 (2～3.5)	14~12 (2～3.5)	24~16 (0.2～1.5)	TO-50EC(15A)	CU-11
	1HP	4.8					
	2HP	7.5	12~10 (3.5～5.3)	12~10 (3.5～5.3)		TO-50EC(20A)	CU-11
	3HP	11	10 (5.3)	10 (5.3)		TO-50EC(30A)	CU-11
	5HP	17	8 (8.4)	8 (8.4)		TO-50EC(30A)	CU-16
	7.5HP	25	8 (8.4)	8 (8.4)		TO-100S(50A)	CU-18
400V 3 Ø	1HP	2.7	14~12 (2～5.3)	14~12 (2～5.3)		TO-50EC(15A)	CU-11
	2HP	4.2	14~12 (2～5.3)	14~12 (2～5.3)		TO-50EC(15A)	CU-11
	3HP	5.5	14~10 (2～5.3)	14~10 (2～5.3)		TO-50EC(15A)	CU-11
	5HP	9	12~10 (3.5～5.3)	12~10 (3.5～5.3)		TO-50EC(15A)	CU-18
	7.5HP	13	10 (5.3)	10 (5.3)		TO-50EC(20A)	CU-18
	10HP	17	8 (8.4)	8 (8.4)		TO-50EC(30A)	CU-25

Pay attention to the following for external wiring:

(A) Control circuit wiring:

(1) The control circuit wiring (control terminal) must be wired separately from the main circuit wiring (R, S, T, U, V, W) and other power cables to avoid noise interference.

(2) The contact output terminals R1A, R1B, R1C must be wired separately from terminals ①~⑦, AO1, AO2, GND, DO1, DO2, DOG, +10V, -10V, AI1, AI2 and GND.

(3) To prevent noise interference, shielded twisted-pair cables with isolation must be used for the control circuit wiring. Please refer to the figure below; the wiring distance must not exceed 50m.

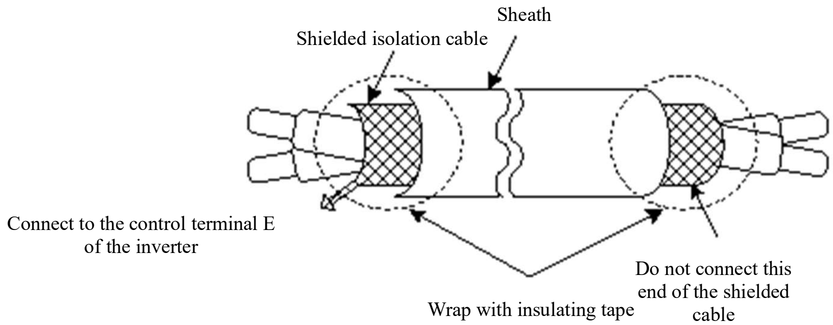
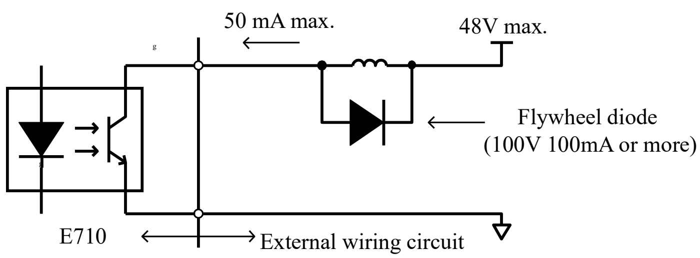


Figure 3.5 Handling condition of the shielded twisted pair cable

When connecting a multi-function photocoupler output to a relay, a flywheel diode must be connected in parallel across the relay coil, as shown in the figure below.

Figure 3.6 Connect the optical coupling output contact to the inductive load



(B) Main circuit wiring:

(1) Phase sequence does not need to be considered for the input powers R, S and T.

(2) The input power cannot be connected to output terminals U, V and W of the inverter.

(3) Connect the output terminals U, V and W of the inverter to the U, V and W terminals of the motor. If the forward command is executed on the inverter but the motor rotates in reverse, just swap any two of the U, V and W cables of the motor.

(4) Do not connect the capacitors used to improve the power factor or the LC and RC noise filters to the output terminal of the inverter.

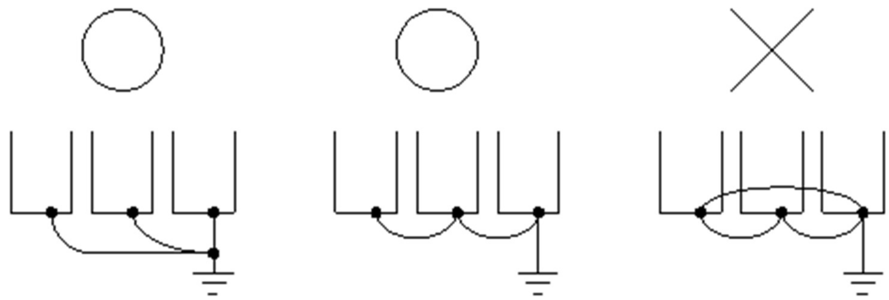
(C) Grounding cable:

(1) Ground the grounding terminal (E) with the type-three grounding method (connect to a grounding resistance less than 100Ω)

(2) The grounding cable of the inverter must not be grounded together with the electric welding machine, high horse power motor or other current loads; they must be grounded separately.

(3) The size of the grounding cable shall comply with the technical standards for electrical equipment, and try to make the grounding cable as short as possible.

(4) When multiple inverters are grounded together, please refer to the figure below and do not for one grounding circuit.



(a) Good (b) Good (c) Poor

Figure 3.7 Grounding method for multiple E710s

◎ When deciding the cable size and choosing the cable, consider the voltage drops caused by the cables. The formula for calculating voltage drop is as shown below; usually the voltage drop must be within 2% of the rated voltage

Voltage drop between cables (V) = $\sqrt{3}$ × cable impedance (Ω/km) × wiring distance (m) × current (A) ×10^{-3}

◎ Use AC reactor for series power coordination

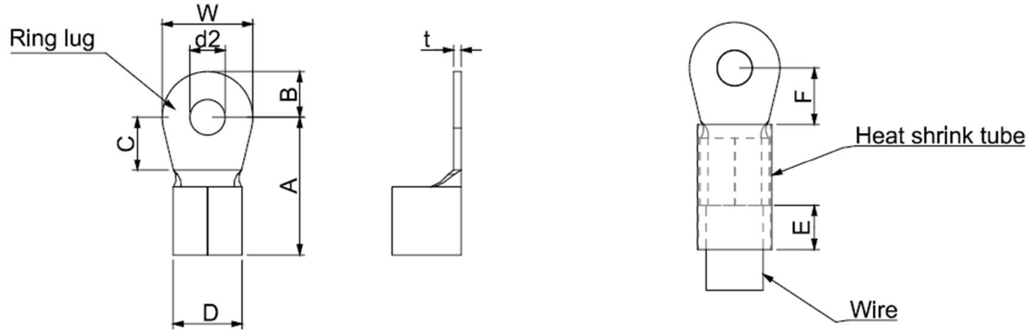
When the power capacity exceeds 600kVA, please connect an AC reactor in series on the input-side of the inverter. This AC reactor not only can be used for power coordination, it can also improve power factors.

◎ Wiring length between the inverter and motor

When the total wiring distance between the inverter and motor is long, because of the high frequency carrier frequency (the ON/OFF switching frequency of IGBT) of the inverter, the leakage current between the wiring and earth will increase and affect the inverter itself and other peripherals. Therefore, when the wiring distance between the inverter and motor is long, please reduce the carrier frequency appropriately as shown in the figure below.

Wiring distance between the inverter and motor	**＜30m**	**30m ~ 50m**	**50m ~100m**	**≧100m**
Allowable carrier frequency (the setting value of parameter 11-01)	16kHz(max)	10kHz(max)	5kHz(max)	2kHz(max)

3.5.2 Terminal specification recommendations



3.5.2.1 Main circuit

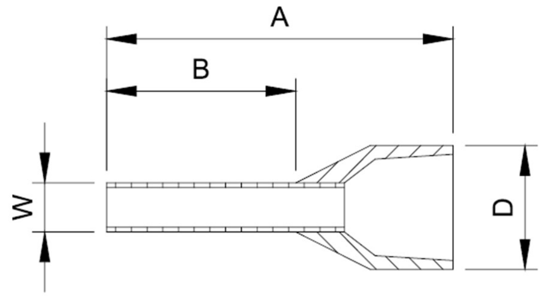
Ring terminal size chart

Recommended vendor for the table below - K.S.TERMINALS INC. The part numbers are for reference only, users may select any ring terminals that match the dimensions of each frame size.

Unit：mm

Frame number	*AWG	Kit P/N	A (MAX)	B (MAX)	C (MIN)	D (MAX)	d2 (MIN)	E (MIN)	F (MIN)	W (MAX)	t (MAX)
A	18	RNBS 1-3.7	9.8	3.2	4.8	4.1	3.7	13.0	4.2	6.6	0.8
	16	RNBS 2-3.7									
	14	RNBS 2-3.7									
B	18	RNBS1-4	12.1	3.6	6.1	5.6	4.3	13.0	4.5	7.2	1
	16	RNBS1-4									
	14	RNBS2-4									
	12	RNBS5-4									
C	14	RNBS2-4	17.8	5.0	6.1	7.2	4.3	13.0	5.5	10.5	1.2
	12	RNBS5-4									
	10	RNBS5-4									
	8	RNBS8-4									
D	10	RNBS5-4	17.8	5.0	6.1	7.2	4.3	13.0	5.5	10.5	1.2
	8	RNBS8-4									
E	6	RNB14-5	27.1	6.1	10.5	11.5	5.3	13.0	6.5	12.6	1.7
	4	RNBS22-5									
F	6	RNBS14-6	35.0	9.0	13.3	14.0	6.2	13.0	10.0	19.5	1.8
	4	RNBS22-6									
	2	RNBS38-6									

3.5.2.2 Control terminal and filter



Model input terminal

Recommended model or size table for control board crimping terminals Unit: mm

Cable diameter	Manufacturer	Manufacturer material number	A(MAX)	B(MAX)	D(MAX)	W(MAX)
0.2mm² (24AWG)	PHOENIX CONTACT	AI 0.25-8 YE	12.5	8	2.6	1.4
0.34mm² (22AWG)	PHOENIX CONTACT	AI 0.34-8 TQ	12.5	8	3.3	1.3
0.5mm² (20AWG)	PHOENIX CONTACT	AI 0.5-8 WH	14	8	3.5	1.4
Recommended specifications and model number of crimping tools CRIMPFOX 10S-1212045,Manufacturer:PHOENIX CONTACT DNT13-0101,Manufacturer:DINKLE						

Recommended model or size table for filter model input crimping terminals Unit: mm

Cable diameter	Manufacturer	Manufacturer material number	A(MAX)	B(MAX)	D(MAX)	W(MAX)
4mm² (12AWG)	PHOENIX CONTACT	AI 4-10 GY	17	10	4.8	2.8
6mm² (10AWG)	PHOENIX CONTACT	AI 6-12 YE	20	12	6.2	3.5
10mm² (8AWG)	PHOENIX CONTACT	AI 10-12 RD	22	12	7.5	4.6
Recommended specifications and model number of crimping tools CRIMPFOX 10S-1212045,Manufacturer:PHOENIX CONTACT DNT13-0101,Manufacturer:DINKLE						

3.6 Inverter specifications

- Basic specifications

(a) 200V class:

Model No.: E710-□□□	**2P5**	**201**	**202**	**203**	**205**	**208**
Horse power (HP)	**0.5**	**1**	**2**	**3**	**5**	**7.5**
Applicable motor capacity (kW)	**0.4**	**0.75**	**1.5**	**2.2**	**3.7**	**5.5**
Rated output current **(A)**	**2.8**	**4.8**	**7.5**	**11**	**17**	**25**
Rated capacity (kVA)	**1.2**	**1.7**	**2.9**	**4.0**	**6.7**	**9.9**
Input voltage range	Single/three-phase **200~240V (+10%-15%), 50/60HZ**					
Output voltage range	Three phase **0~240V**					
Input current (A)	**5.0/2.9**	**8.7/5.0**	**13.7/7.9**	**20.1/11.6**	**17.9**	**26.3**
Allowable momentary outage time (Sec)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Protection category	**IP20/NEMA1**					

(b) 400V class:

Model No.: E710-□□□	**401**	**402**	**403**	**405**	**408**	**410**
Horse power (HP)	**1**	**2**	**3**	**5**	**7.5**	**10**
Applicable motor capacity (kW)	**0.75**	**1.5**	**2.2**	**3.7**	**5.5**	**7.5**
Rated output current (A)	**2.7**	**4.2**	**5.5**	**9.0**	**13**	**17**
Rated capacity (kVA)	**1.7**	**2.9**	**4.0**	**6.7**	**9.9**	**13.3**
Input voltage range	**Three-phase 380~480V (+10%-15%), 50/60HZ**					
Output voltage range	**Three-phase 0~480V**					
Input current (A)	**2.8**	**4.4**	**5.8**	**9.5**	**13.7**	**17.9**
Allowable momentary outage time (Sec)	**1.5**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Protection category	**IP20/NEMA1**					

*1. Based on the TECO standard 4-pole induction motor.

*2. If the control mode is SLV and the maximum frequency (01-02) is set to greater than 80Hz, the carrier frequency range limit is 2~8KHz

The followings are the maximum frequencies under different control modes

Control mode	**Other settings**	**Maximum frequency**
V/F SLV2	The maximum frequency is set to 599Hz	599Hz
SLV	200V 0.5~7.5HP, 400V 1~10HP	150Hz
PMSLV	Unlimited	599Hz

▪ Product specifications (Applicable to simple version E)

Item		Basic specifications
Control method		IM: V/F 、SLV PM: SLV
Frequency	Frequency control range	**0.01 ~ 599Hz**
	Starting torque	**150%/3Hz (VF mode), 150% / 0.5Hz** (SLV mode)
	Frequency resolution	Digital **input: 0.01 Hz**
		Analog input: **0.06Hz/60Hz**
	Frequency setting	Panel: Use the ▲▼ keys on the panel to set the frequency, use the panel knob to set the frequency
		External terminals: ·**AI1, AI2 (0~10V / 2~10V / 0~20mA / 4~20mA)** Input **up/down** frequency setting
		Communication setting
	Frequency limit	Frequency upper and lower limit ·**3** skip frequencies can be set
	Speed accuracy	V/F :±**2~3%** SLV :± **1%**
Operate	Operation setting	Panel: **run, stop** button control
		External terminals: ·Multi-function operation mode operation **(2-wire/3-wire** control selection**)**, jog operation
		Communication operation
General controls	V/F curve setting	**18** fixed curves and **1** arbitrary curve
	Carrier frequency	**2~16KHz (factory default value: 4kHz)**
	Acceleration/deceleration control	**2**-stage acceleration/deceleration time can be set **(0.1~3600.0 Sec)** **4**-stage **S** curve can be set
	Multi-function input	There are **29** functions that can be set **(**Refer to the descriptions of group**3)**
	Multi-function output	There are **21** functions that can be set **(**Refer to the descriptions of group**3)**
	Multi-function simulated output	There are **5** functions that can be set **(**Refer to the descriptions of group**4)**
	Other functions	Overload detected, **16**-stage speed, automatic program function, acceleration/deceleration time switch, master/slave operation signal switching, master/slave frequency source switching, **PID** control, torque compensation, starting frequency, slip compensation and fault reset, etc.
Display	5-digit LED	Display: Parameter/parameter value/frequency/cable speed/DC voltage/output voltage/**PID** feedback/input and output terminal status/heatsink temperature/program version/fault record/etc.
	Status indicator	Indication: FWD, REV, SEQ, REF
Protection features	Overload protection	Electronic relay protection motor and inverter (150%/60s)
	Over voltage	**200V** class: DC voltage>**410V, 400V** class: DC voltage>**820V**
	Under-voltage	**200V** class: DC voltage <**190V, 400V**class: DC voltage <**380V**
	Momentary power interruption then start	Able to restart again within a short time after momentary power interruption
	Stall prevention	There is stall prevention protection during acceleration/deceleration/operation
	Output-end short circuit	Electronic circuit protection
	Grounding failure	Protection using current detector
	Other protection functions	Heatsink overheat protection, carrier frequency reduction with temperature decrease function, fault contact output, reverse limitation, direct start after boot up and fault reset restrictions, parameter locking, motor PTC overheat protection and other functions
Communication control		Standard built-in **RS485** communication **(Modbus)** for **1**to**1** or **1**to many control
Environment	Operating temperature	**IP20 type/NEMA 1:**

Item		Basic specifications
		Inside the distribution panel: -10~50° (no dust-proof sticker) (de-rating from 50, 50~60°C) 2% current needs to be reduced with every increase of 1°C) -10~40°C (with dust-proof sticker) **Parallel installation is -10~40°C**
	Storage temperature	**-20~70°C**
	Humidity	Under **95%** relative humidity RH, no condensation or water droplet (In compliance with IEC60068-2-78 standards)
	Vibration	**10Hz≦f≦57Hz: ±0.075mm Amplitude;** **57Hz≦f≦150Hz: 1.0G Acceleration: (in accordance with IEC60068-2-6 standards)**
	Protection category	**IP20/NEMA1**
	Pollution degree	**Level 2, after coating meets IEC 60721-3-3 Class 3C3.**
International certification		**UL, CE, RoHS, REACH, UKCA, cUL**

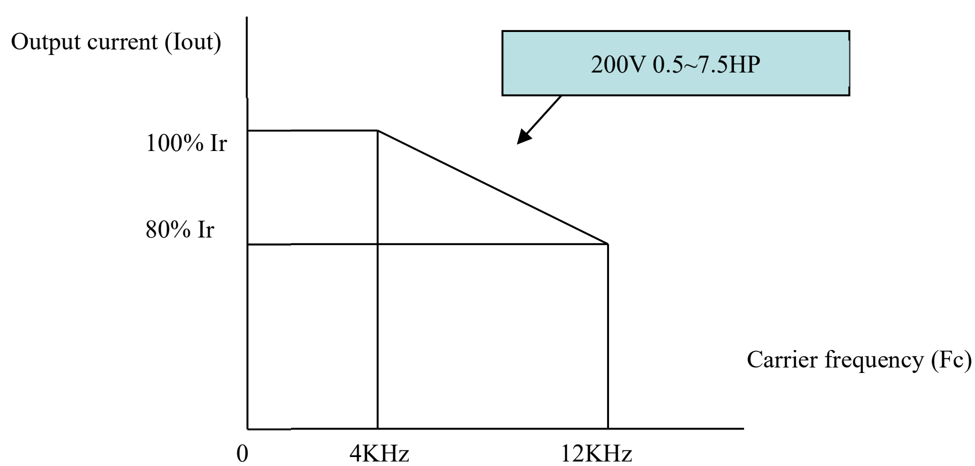
- **Product specifications (applicable to standard version S)**

Item		Basic specifications
Control method		IM: V/F, *V/F+PG, SLV, *SV, SLV2 PM: *SV, SLV SRM (only for special projects): PMA-SyRM-SLV, SyRM-SLV *IM/PM: V/F+PG, SV only for special projects
Frequency	**Frequency control range**	**0.01 ~ 599Hz**
	Starting torque	**150%/3Hz (VF mode), 150% / 0.5Hz** (SLV mode)
	Frequency resolution	Digital **input: 0.01 Hz**
		Analog input: **0.06Hz/60Hz**
	Frequency setting	Panel: Use the ▲▼ keys on the panel to set the frequency, use the panel knob to set the frequency
		External terminals: ·**AI1, AI2 (0~10V / 2~10V / 0~20mA / 4~20mA)** Input **up/down** frequency setting
		Communication setting
	Frequency limit	Frequency upper and lower limit ·**3** skip frequencies can be set
	Speed accuracy	V/F :±**2~3%** SLV :± **1%**
Operate	**Operation setting**	Panel: **run, stop** button control
		External terminals: ·Multi-function operation mode operation **(2-wire/3-wire** control selection), jog operation
		Communication operation
General controls	**V/F curve setting**	**18** fixed curves and **1** arbitrary curve
	Carrier frequency	**1. 2~16KHz (the factory default value is: 4kHz, 205/208/410 except for the carrier frequency of 2kHz)**
	Acceleration/deceleration control	**2**-stage acceleration/deceleration time can be set **(0.1~3600.0 Sec)** **4**-stage **S** curve can be set
	Multi-function input	There are **29** functions that can be set **(**Refer to the descriptions of group**3)**
	Multi-function output	There are **21** functions that can be set **(**Refer to the descriptions of group**3)**
	Multi-function simulated output	There are **5** functions that can be set **(**Refer to the descriptions of group**4)**
	Other functions	Overload detected, **16**-stage speed, automatic program function, acceleration/deceleration time switch, master/slave operation signal switching, master/slave frequency source switching, **PID** control, torque compensation, starting frequency, slip compensation and fault reset, etc.
Display	**5-digit LED**	Display: Parameter/parameter value/frequency/cable speed/DC voltage/output voltage/**PID** feedback/input and output terminal status/heatsink temperature/program version/fault record/etc.

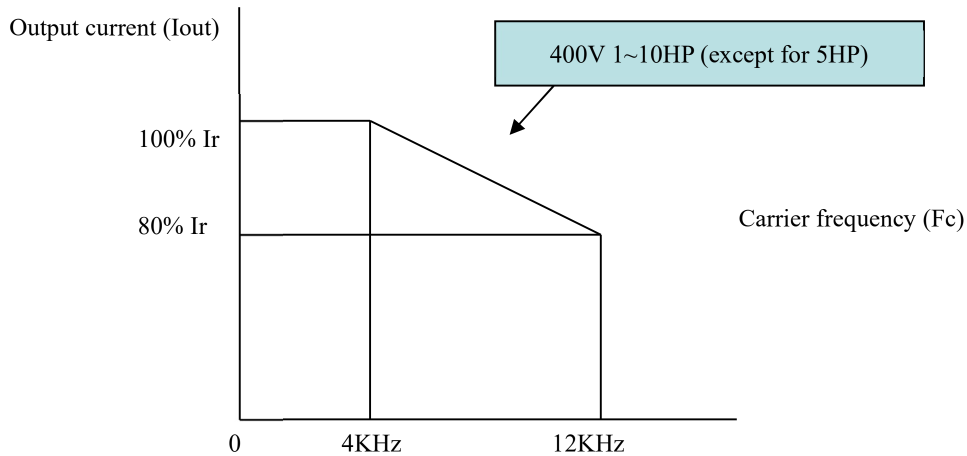
Item		Basic specifications
	Status indicator	Indication: FWD, REV, SEQ, REF
Protection features	**Overload protection**	Electronic relay protection motor and inverter (150%/60s)
	Over voltage	**200V** class: DC voltage>**410V, 400V** class: DC voltage>**820V**
	Under-voltage	**200V** class: DC voltage <**190V, 400V**class: DC voltage <**380V**
	Momentary power interruption then start	Able to restart again within a short time after momentary power interruption
	Stall prevention	There is stall prevention protection during acceleration/deceleration/operation
	Output-end short circuit	Electronic circuit protection
	STO function	Fast output cut-off protection
	Grounding failure	Protection using current detector
	Other protection functions	Heatsink overheat protection, carrier frequency reduction with temperature decrease function, fault contact output, reverse limitation, direct start after boot up and fault reset restrictions, parameter locking, motor PTC overheat protection and other functions
Communication control		Standard built-in **RS485** communication **(Modbus)** for **1**to**1** or **1**to many control
Environment	**Operating temperature**	**IP20 type/NEMA 1 inside the distribution panel:** **No dust-proof sticker:** -10~50°C / **with dust-proof sticker:** -10~40°C / **parallel installation:** -10~40°C *De-rating: When used between 50~60°C, reduce 2% current for every increase of 1°C.
	Storage temperature	**-20~70°C**
	Humidity	Under **95%** relative humidity RH, no condensation or water droplets (in compliance with IEC60068-2-78 standards)
	Vibration	**10Hz≦f≦57Hz：±0.075mm Amplitude；** **57Hz≦f≦150Hz: 1.0G Acceleration: (in accordance with IEC60068-2-6 standards)**
	Protection category	**IP20/NEMA1**
	Pollution degree	**Level 2, after coating meets IEC 60721-3-3 Class 3C3.**
International certification		**UL, CE, RoHS, REACH, UKCA, cUL**

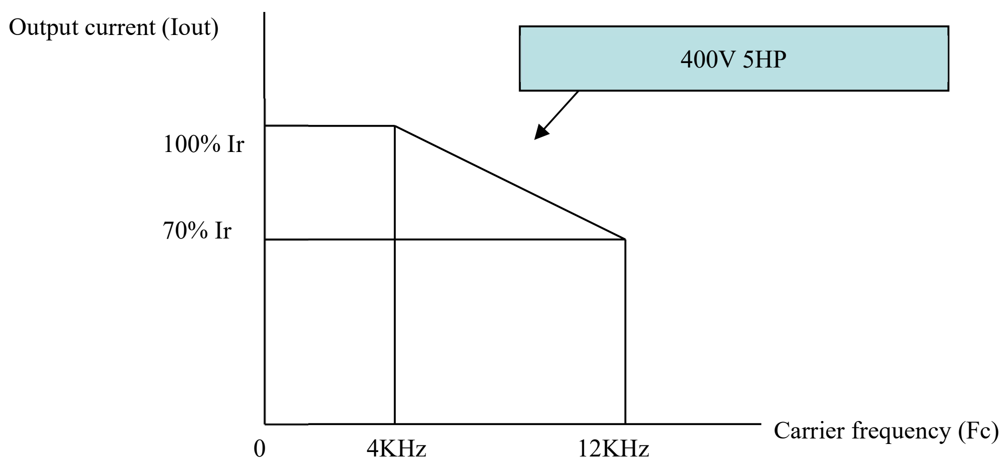
■ Derating curve according to the carrier size

(a) 200V models

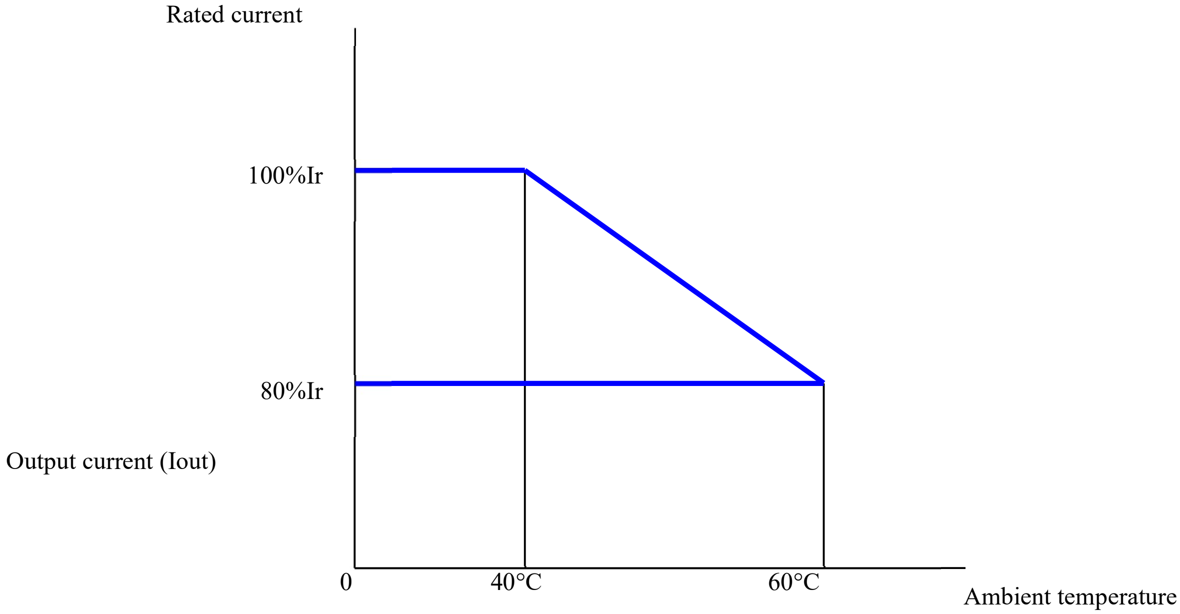


(b) 400V models





Based on the temperature derating curve*



***Users should adjust the load size appropriately according to the ambient temperature of the inverter to avoid damaging the inverter.**
***The carrier of models 205/208/410 is 2kHz, and the carrier of the remaining models is the default factory 4kHz.**

■ Instructions for activation of capacitors after long-term storage

After this product has been stored for long periods of time, to allow the inverter to operate normally, please activate the capacitors by following the storage conditions below:

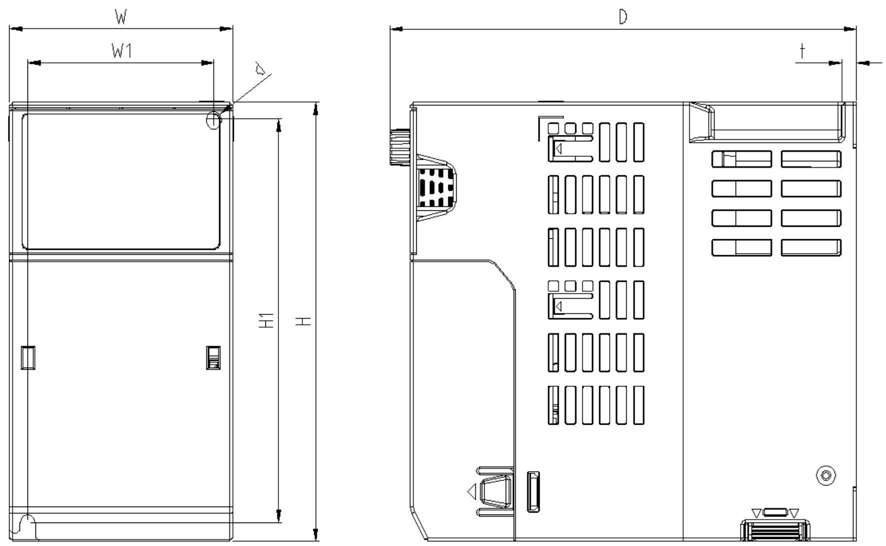
Inverter storage time	Capacitor activation process
≦1 year	Use when the inverter can supply power normally
1-2 years	Pre-charge the capacitors using 100% rated voltage (*1); the inverter can only be used normally after charging for 1 hour
≧2 years	I. Pre-charge the capacitors with 25% rated voltage for 30 minutes II. Pre-charge the capacitors with 50% rated voltage for 30 minutes III. Pre-charge the capacitors with 75% rated voltage for 30 minutes IV. Pre-charge the capacitors with 100% rated voltage for 210 minutes After completing the four steps mentioned above, then can the inverter be used normally

*1: The rated voltage value is in accordance with the value on the inverter label sticker

3.7 Dimensions diagram

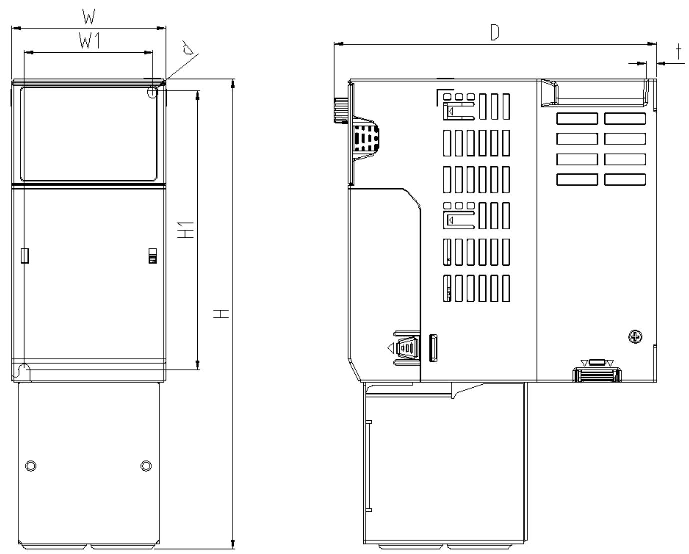
3.7.1 Standard type

(a) 220V : 0.5~1HP/440V : 1~2HP (IP20)



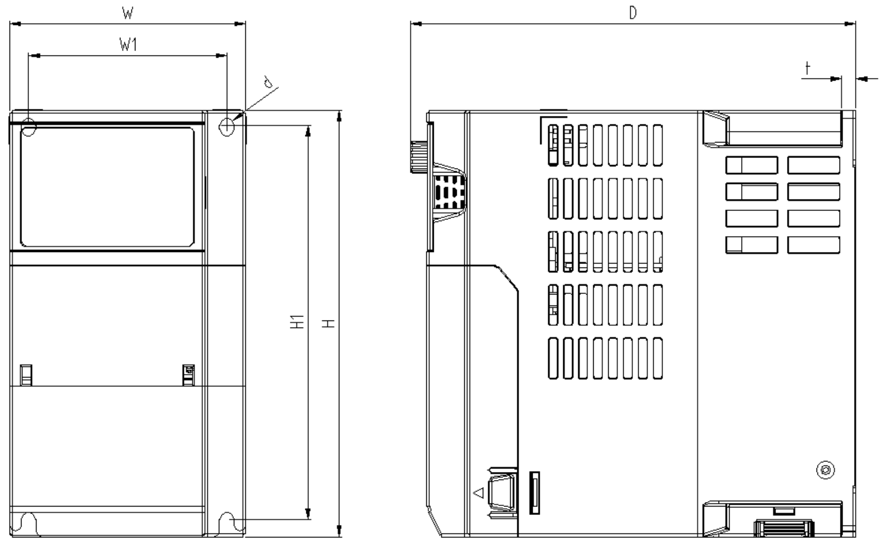
Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-2P5-HE	72	142	150	60	130.5	5	M4	1.2	
E710-201-HE	72	142	150	60	130.5	5	M4	1.2	
E710-401-H3E	72	142	150	60	130.5	5	M4	1.2	
E710-402-H3E	72	142	150	60	130.5	5	M4	1.2	

(b) 220V : 0.5~1HP/440V : 1~2HP (NEMA1)



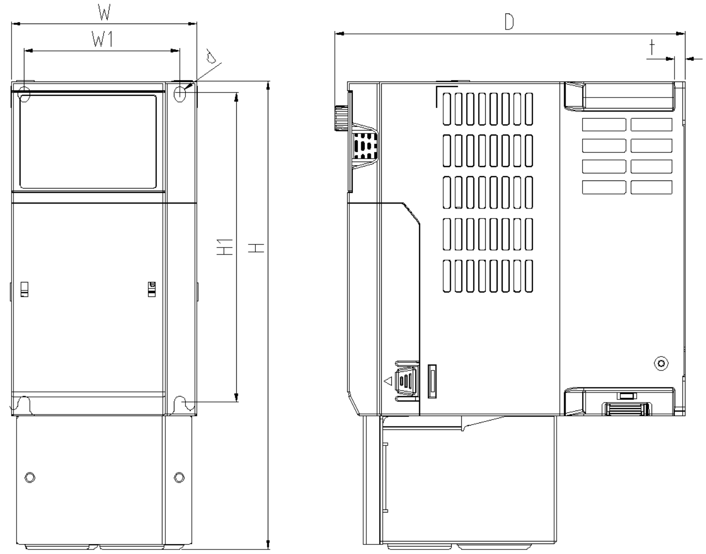
Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-2P5-HE	72	220	150	60	130.5	5	M4	1.5	
E710-201-HE	72	220	150	60	130.5	5	M4	1.5	
E710-401-H3E	72	220	150	60	130.5	5	M4	1.5	
E710-402-H3E	72	220	150	60	130.5	5	M4	1.5	

(c) 220V : 2~5HP/440V : 3~5HP (IP20)



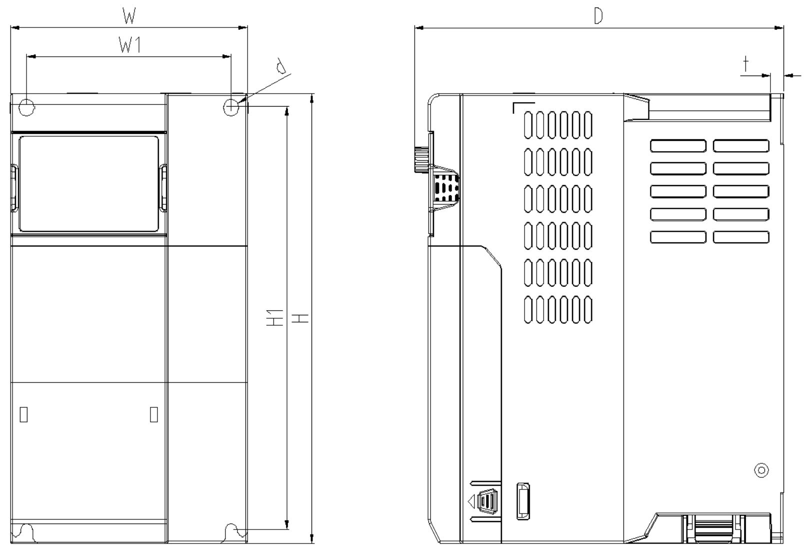
Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-202-HS	87	157	164	73	145	5	M4	1.6	
E710-203-HS	87	157	164	73	145	5	M4	1.6	
E710-205-H3S	87	157	164	73	145	5	M4	1.6	
E710-403-H3S	87	157	164	73	145	5	M4	1.6	
E710-405-H3S	87	157	164	73	145	5	M4	1.6	

(d) 220V : 2~5HP/440V : 3~5HP (NEMA1)



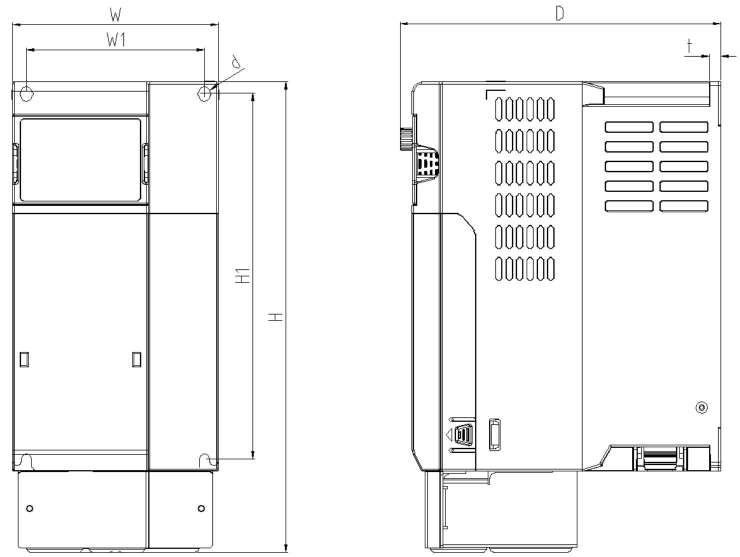
Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-202-HS	87	220	164	73	145	5	M4	2.0	
E710-203-HS	87	220	164	73	145	5	M4	2.0	
E710-205-H3S	87	220	164	73	145	5	M4	2.0	
E710-403-H3S	87	220	164	73	145	5	M4	2.0	
E710-405-H3S	87	220	164	73	145	5	M4	2.0	

(e) 220V : 7.5HP/440V :7.5-10HP (IP00)



Inverter model number	Dimensions (mm)								
	W	**H**	**D**	**W1**	**H1**	**t**	**d**	**Net weight (kg)**	**Remarks**
E710-208-H3S	**109**	**207**	**169**	**94**	**194.5**	**6**	**M4**	**2.3**	
E710-408-H3S	**109**	**207**	**169**	**94**	**194.5**	**6**	**M4**	**2.3**	
E710-410-H3S	**109**	**207**	**169**	**94**	**194.5**	**6**	**M4**	**2.3**	

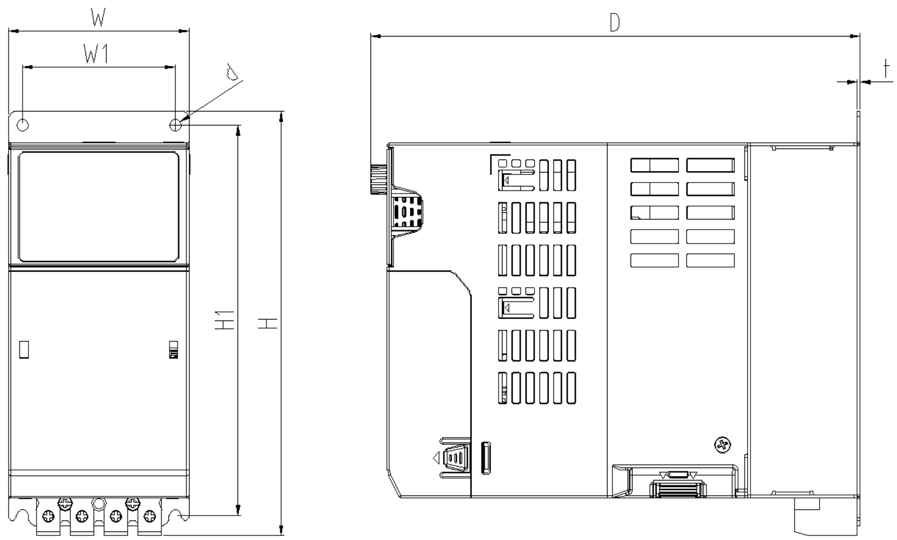
(f) 220V : 7.5HP/440V : 7.5-10HP (NEMA1)



Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-208-H3S	109	250	169	94	194.5	6	M4	2.3	
E710-408-H3S	109	250	169	94	194.5	6	M4	2.3	
E710-410-H3S	109	250	169	94	194.5	6	M4	2.3	

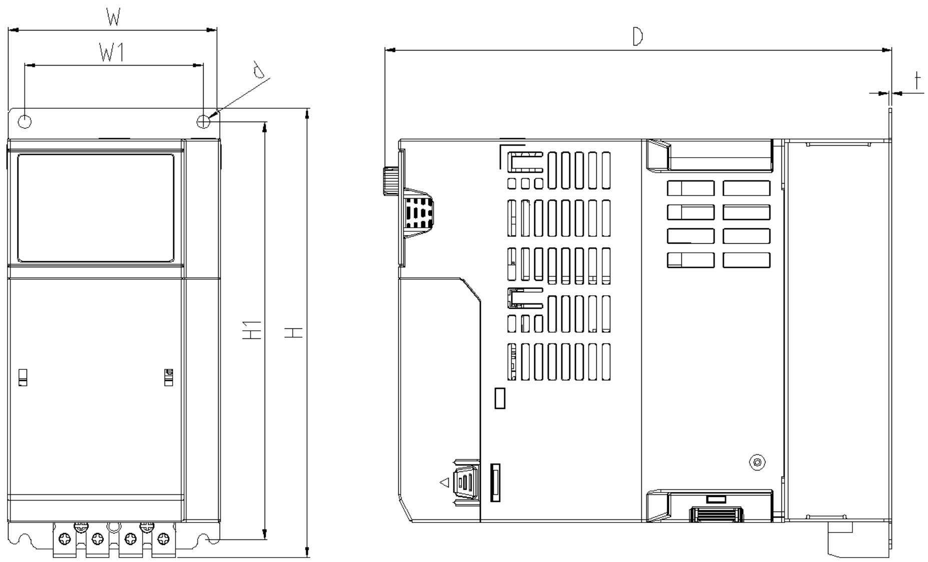
3.7.2 Built-in filter type (220V 0.5~3HP, 440V 1~10HP)

(a)220V : 2P5~201HP/440V : 401~402HP



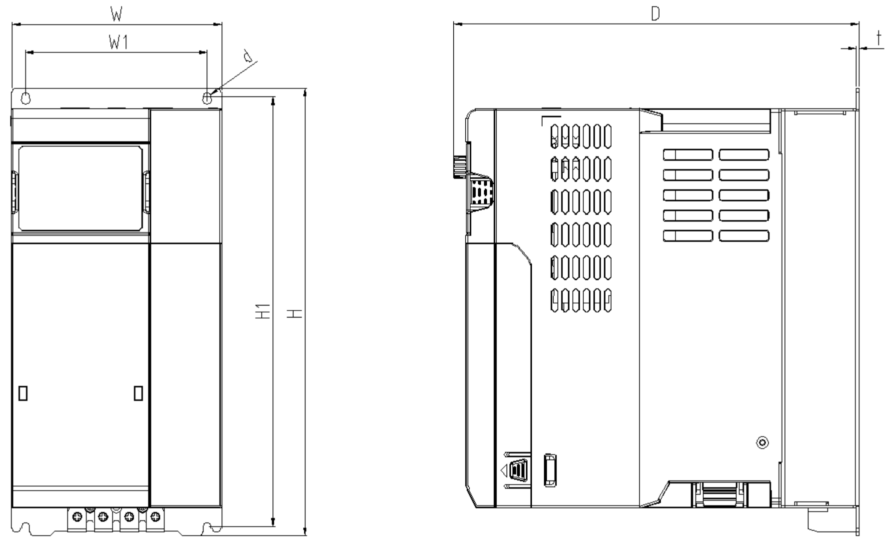
Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-2P5-H1EF	72	169.5	195.5	60	156	1.2	M4	1.9	
E710-201-H1EF	72	169.5	195.5	60	156	1.2	M4	1.9	
E710-401-H3EF	72	169.5	195.5	60	156	1.2	M4	1.9	
E710-402-H3EF	72	169.5	195.5	60	156	1.2	M4	1.9	

(b)220V : 202~203HP/440V : 403~405HP



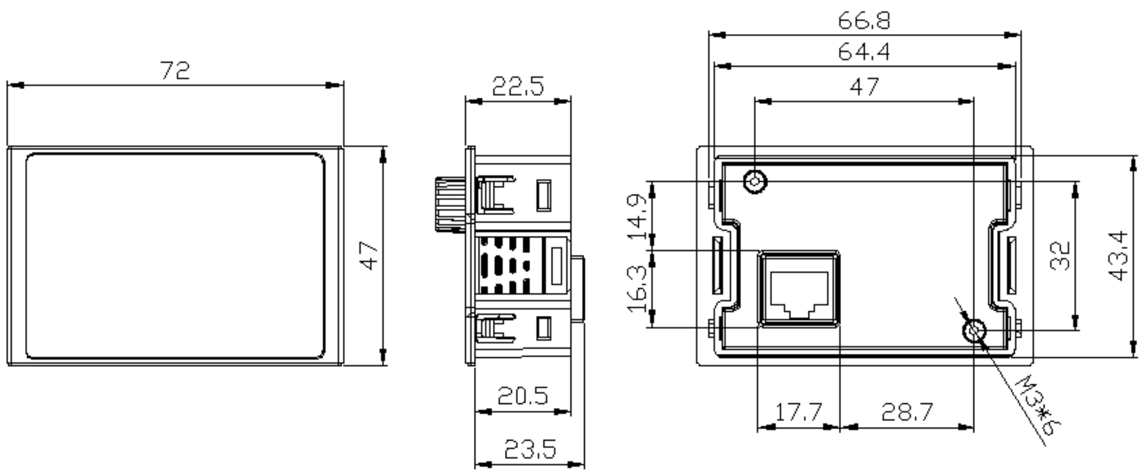
Inverter model number	Dimensions (mm)								
	W	**H**	**D**	**W1**	**H1**	**t**	**d**	**Net weight (kg)**	**Remarks**
E710-202-H1SF	**87**	**184**	**207**	**73**	**171**	**1.2**	**M4**	**2.4**	
E710-203-H1SF	**87**	**184**	**207**	**73**	**171**	**1.2**	**M4**	**2.4**	
E710-403-H3SF	**87**	**184**	**207**	**73**	**171**	**1.2**	**M4**	**2.4**	
E710-405-H3SF	**87**	**184**	**207**	**73**	**171**	**1.2**	**M4**	**2.4**	

(c) 440V: 7.5-10HP

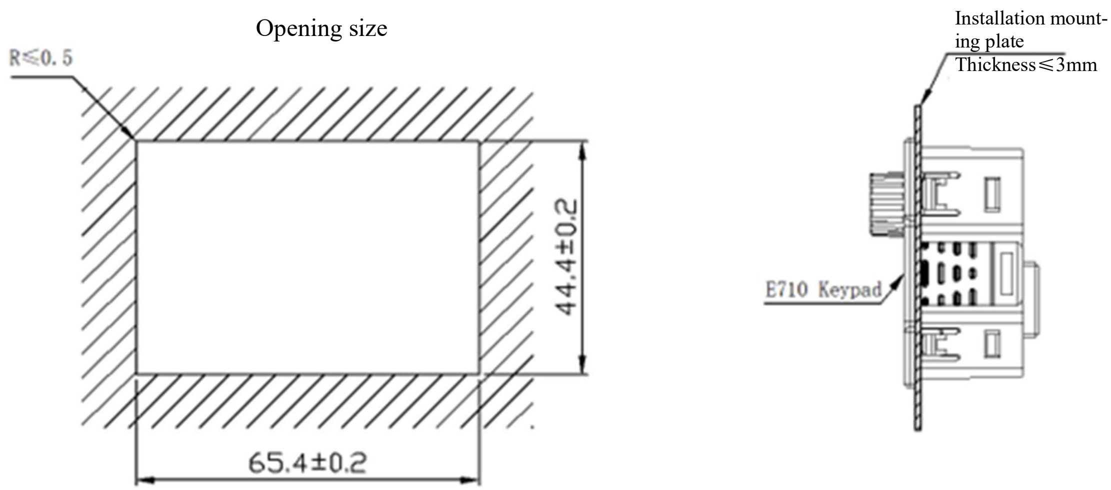


Inverter model number	Dimensions (mm)								
	W	H	D	W1	H1	t	d	Net weight (kg)	Remarks
E710-408-H3SF	**109**	**232**	**210**	**94**	**222.5**	**1.2**	**M4**	**3.6**	
E710-410-H3SF	**109**	**232**	**210**	**94**	**222.5**	**1.2**	**M4**	**3.6**	

3.7.3 KEYPAD dimensions diagram

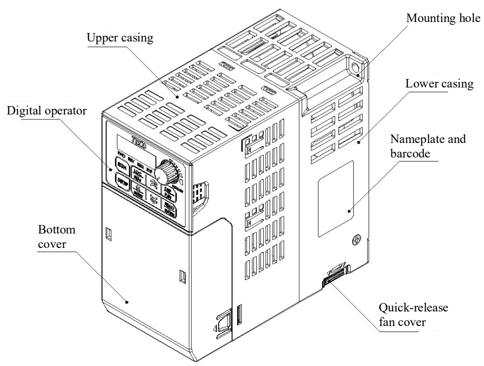


KeyPad panel external connection dimensions diagram

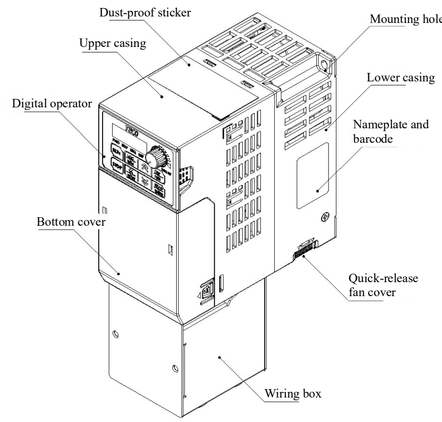


3.8 The appearance and component names of the E710 inverter

(a) 220V : 0.5~1HP/440V : 1~2HP

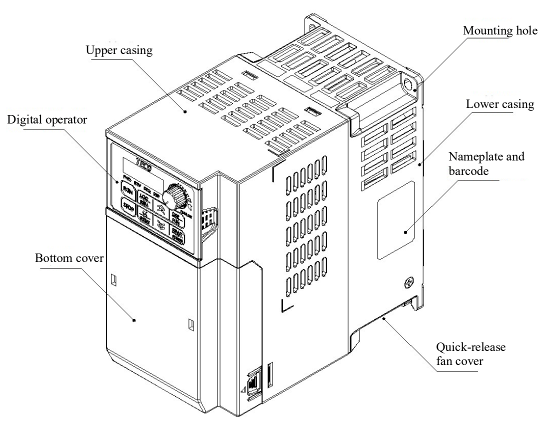


(wall-mounted type, IEC IP00)

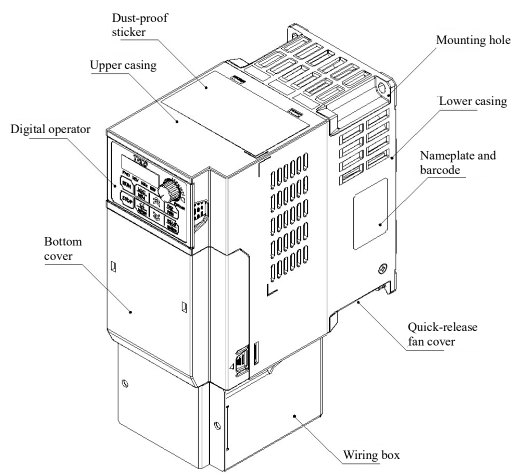


(Wall-mounted type, IEC IP20,NEMA1)

(b) 220V : 2~5HP/440V : 3~5HP

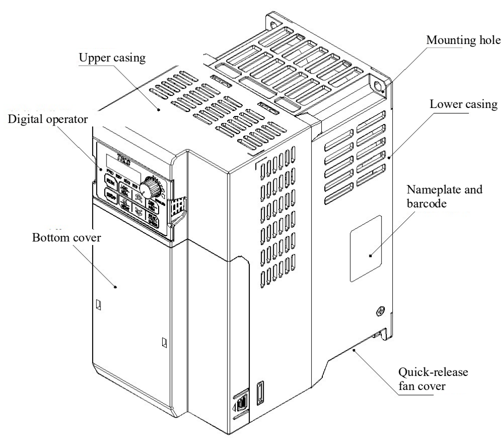


(wall-mounted type, IEC IP00)

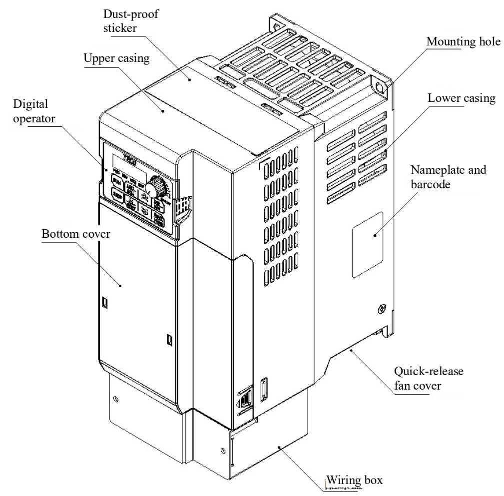


(Wall-mounted type, IEC IP20,NEMA1)

(c) 220V : 7.5HP/440V : 7.5~10HP



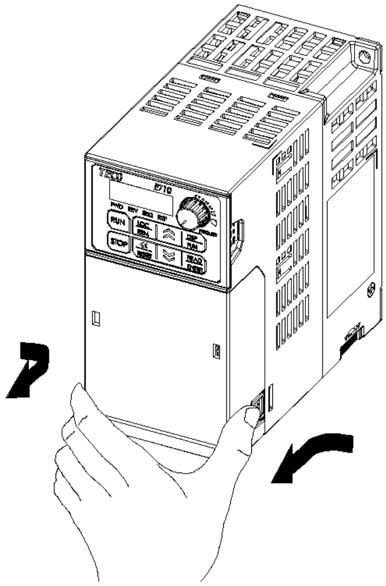
(wall-mounted type, IEC IP00)



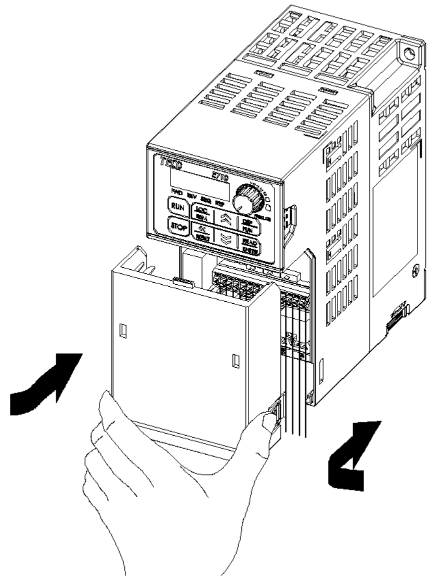
(Wall-mounted type, IEC IP20,NEMA1)

3.9 Disassembling steps of the E710 model

(a) 200V 0.5~1HP/400V 1~2HP

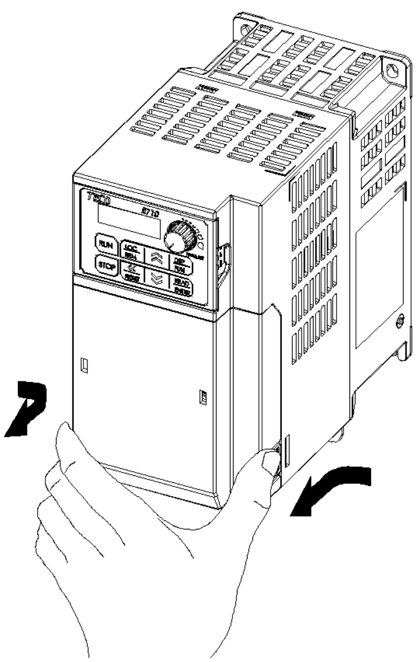


Step One: Remove the bottom cover

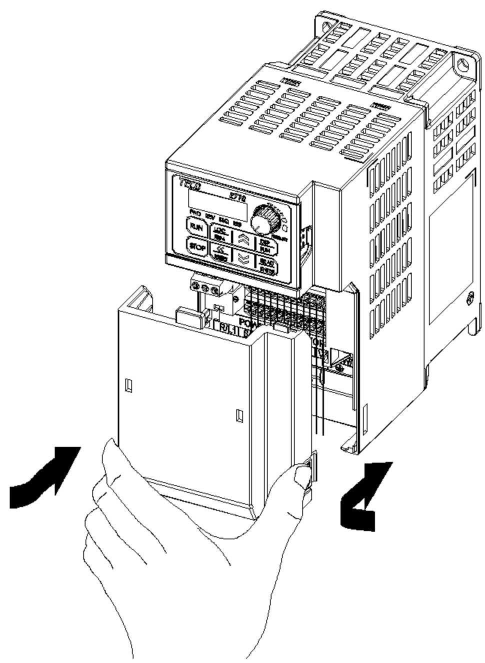


Step Two: Assembling the wiring and reinstall

(b) 200V 2~7.5HP/400V 3~10HP



Step One: Remove the bottom cover



Step Two: Assembling the wiring and reinstall

Chapter 4 Software index

4.1 Panel use

4.1.1 Descriptions of panel functions

Type	Name	Function
Display	Main display area	Displays the frequency, parameters, voltage, current, temperature and abnormalities, etc.
	LED status display	**FWD:** When the inverter is in forward status, this indicator lights up. (It will flash during downtime and will remain constantly on while operating) **REV:** When the inverter is in reverse status, this indicator lights up. (It will flash during downtime and will remain constantly on while operating) **SEQ:** When the command source of the inverter operations is set to external control, this indicator will light up. **REF:** When the command source of the inverter frequency is set to external control, this indicator will light up.
Buttons (8 buttons)	RUN button	**RUN** button: Inverter operation.
	STOP button	**STOP** button: Inverter stops operating.
	button	Used for frequency and parameter setting.
	button	Used for frequency and parameter setting.
	FWD/REV button (LED type)	Switching button for setting the motor operation direction; when the FWD display light is on, it means the motor is rotating forward, and when the REV display light is on, it means the motor is rotating in reverse.
	DSP/FUN button	Switches the display screen, it cycles according to the frequency screen →function menu→ monitor parameters→ frequency screen.
	<</RESET button	**"<<"** Move left button: Used to change parameters or parameter values. RESET button: It changes to the reset button when faults are detected.
	READ/ENTER button	This button switches and enters functions, sets internal values, modifies parameter settings, and confirms the input.
Panel knob VR	FREQ.SET	When 00-05=8, the panel knob can be used to adjust and set the frequency.

4.1.2 Show description

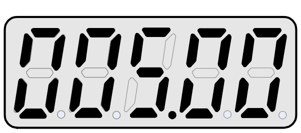
Digits and letter display

Actual	LED display	Actual	LED display	Actual	LED display	Actual	LED display
0		A		L		Y	
1		B		n		-	
2		C		o		°	
3		D		P		_	
4		E		q		.	
5		F		r			
6		G		S			
7		H		t			
8		I		u			
9		J		V			

Description of the seven-stage monitor display

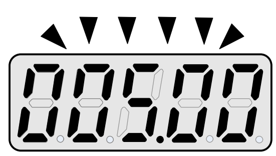
Actual output frequency

LED lights up

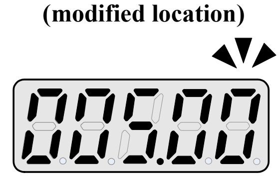


Frequency command display mode

All LED flashes



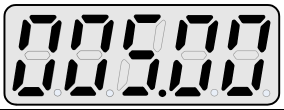
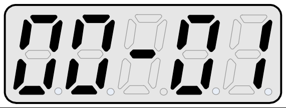
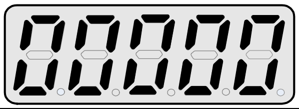
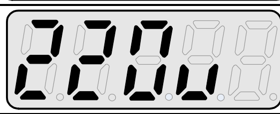
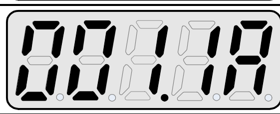
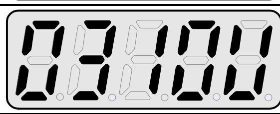
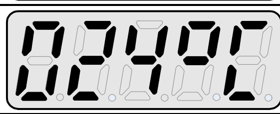
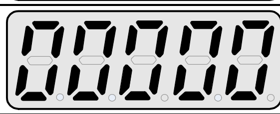
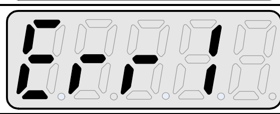
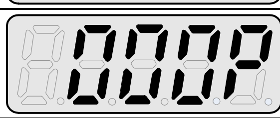
Frequency command modification mode
The selected position flashes (modified location)



Under shutdown status: The seven-stage monitor displays the set frequency, and all of the LEDs flashes. If the **UP/DOWN** buttons are operated at this time, it will enter the frequency command modification mode, and the flashing position will change in accordance with the **<</RESET button**. Press the **READ/ENTER button** to write the frequency command and switch to frequency display mode status, or do not press the **READ/ENTER button** for five seconds under frequency modification mode to switch back to the frequency display mode.

Under operation status: The seven-stage monitor displays the actual output frequency, and the LED lights remain constantly on. If the **UP/DOWN** buttons are operated at this time, it will enter the frequency command modification mode, and its flashing position will change in accordance with the **<</RESET button**. If the inverter is under operation process, press the **READ/ENTER button** to write the frequency command and then switch to the actual output frequency mode status.

LED digital tube display

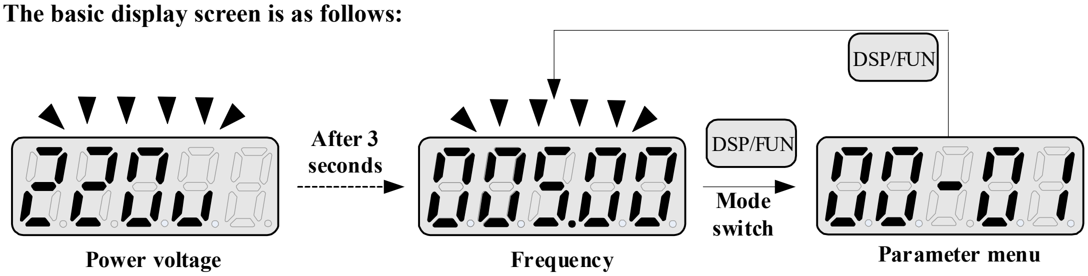
Seven-stage monitor screen display	Description
	**1.** Displays the set frequency during shutdown **2.** Displays the actual output frequency during operation
	Displays the parameter code
	Displays the parameter setting value
	Displays the input voltage
	Displays the inverter current
	Displays the inverter **DC Bus** voltage
	Displays the temperature
	Displays the **PID** feedback value; the displayed number of digits is set through 12-01.
	Abnormality display, refer to Chapter **5** Troubleshooting and Maintenance
	Displays the **AI1**input/Displays the **AI2**input**(0~100%)**

Description of indicator light illumination and flashing

	Indicator lights up		Indicator flashes	
	Labels in the manual		Labels in the manual	
Failure signal display light (only for LCD models)	FAULT	Lights up when failure signals occur		
Forward indicator	FWD	Lights up during forward operations	FWD	Flashes when there is no operation for the forward command
Reverse indicator	REV	Lights up during reverse operation	REV	Flashes when there is no operation for the reverse command
External control operation command indicator	SEQ	Lights up when the operation command is set as external control		
External control frequency command indicator	REF	Lights up when the frequency command is set as external control		
Operation indicator (only for LCD models)	RUN	Lights up under operation status	RUN	Flashes during the shutdown process
Shutdown indicator (only for LCD models)	STOP	Lights up under shutdown status	STOP	Flashes during the DC braking process

4.1.3 Functional structure of the LED seven-stage display screen

The basic display screen is as follows:

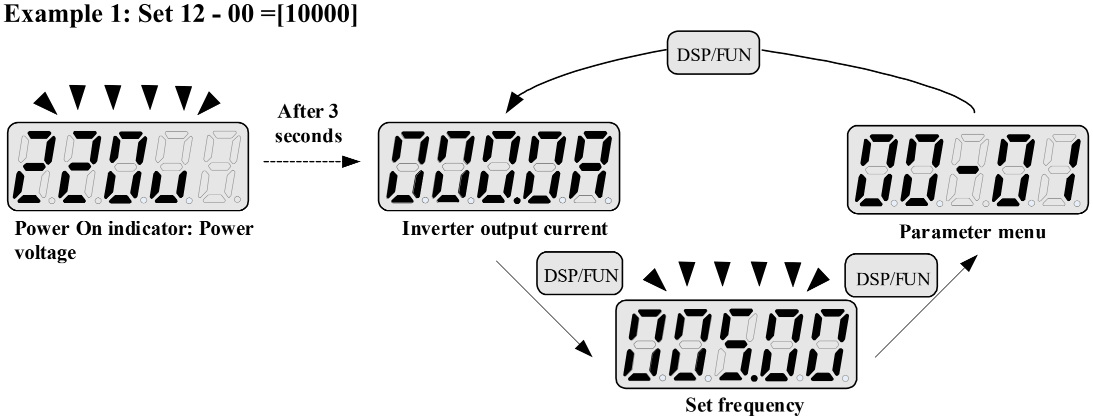


The display screen with user settings is as follows:

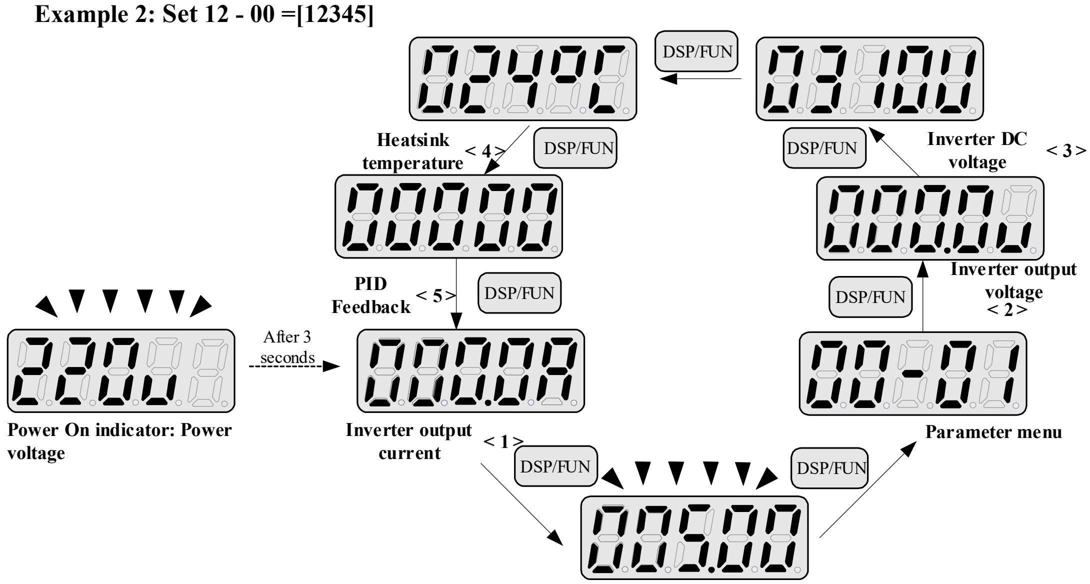
12- 00	Display screen selection
Scope	**0 0 0 0 0** **Highest digit** **Lowest digit** From the highest digit to the lowest digit, the range set for each of them is **0~7:** **[0]**Do not display screen **[1]**Inverter output current **[2]**Inverter output voltage **[3]**Inverter DC voltage **[4]**Temperature **[5]PID** Feedback **[6]AI1** value **[7]AI2** value

The highest digit of **12- 00** represents the default boot-up screen, and the remaining digits represents the display screen set by the user.

Example 1: Set 12 - 00 =[10000]

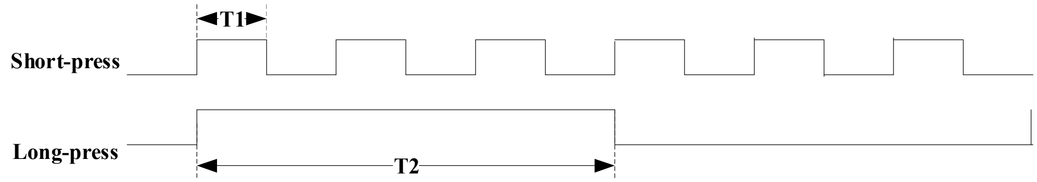


Example 2: Set 12 - 00 =[12345]



Description of special buttons

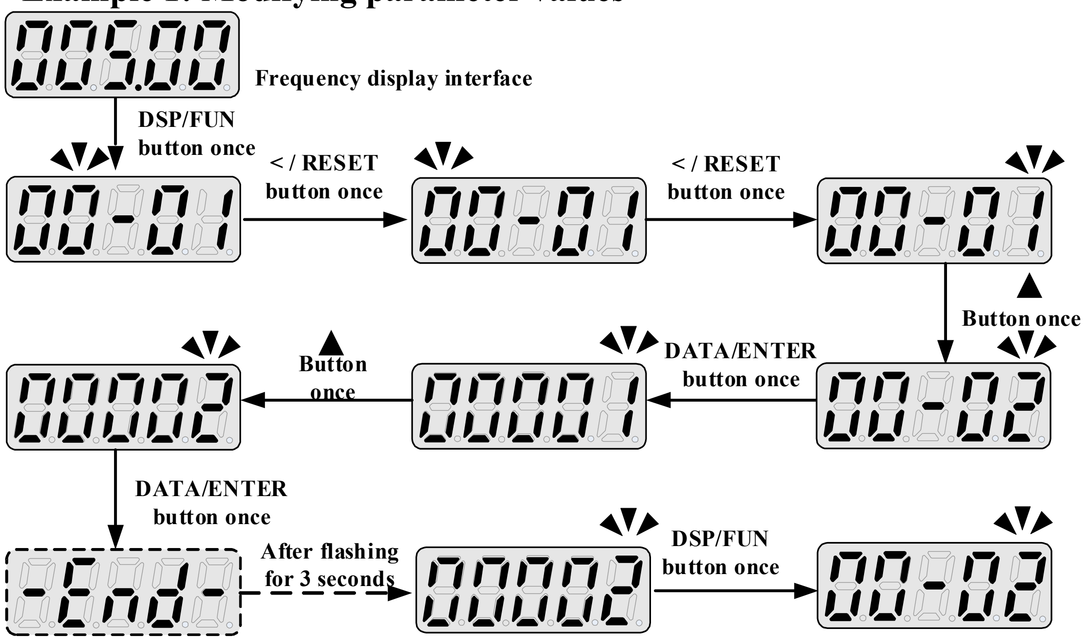
1, “▲ button”/ “▼ button”:



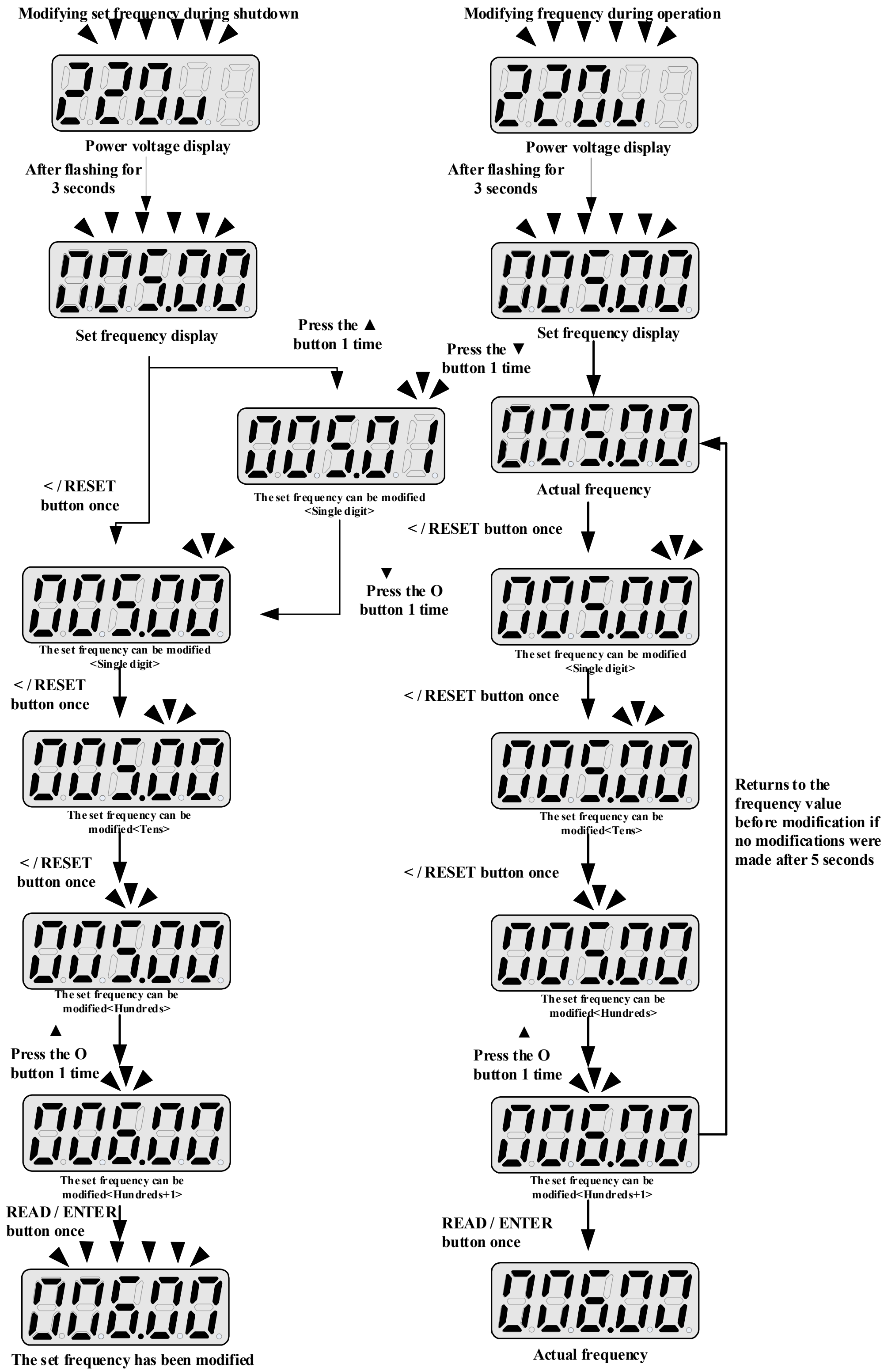
Selects the digit position with short presses, and only changes the unit digit; changes the selected digit continuously when long pressed.

4.1.4 Examples of button panel operations

Example 1: Modifying parameter values

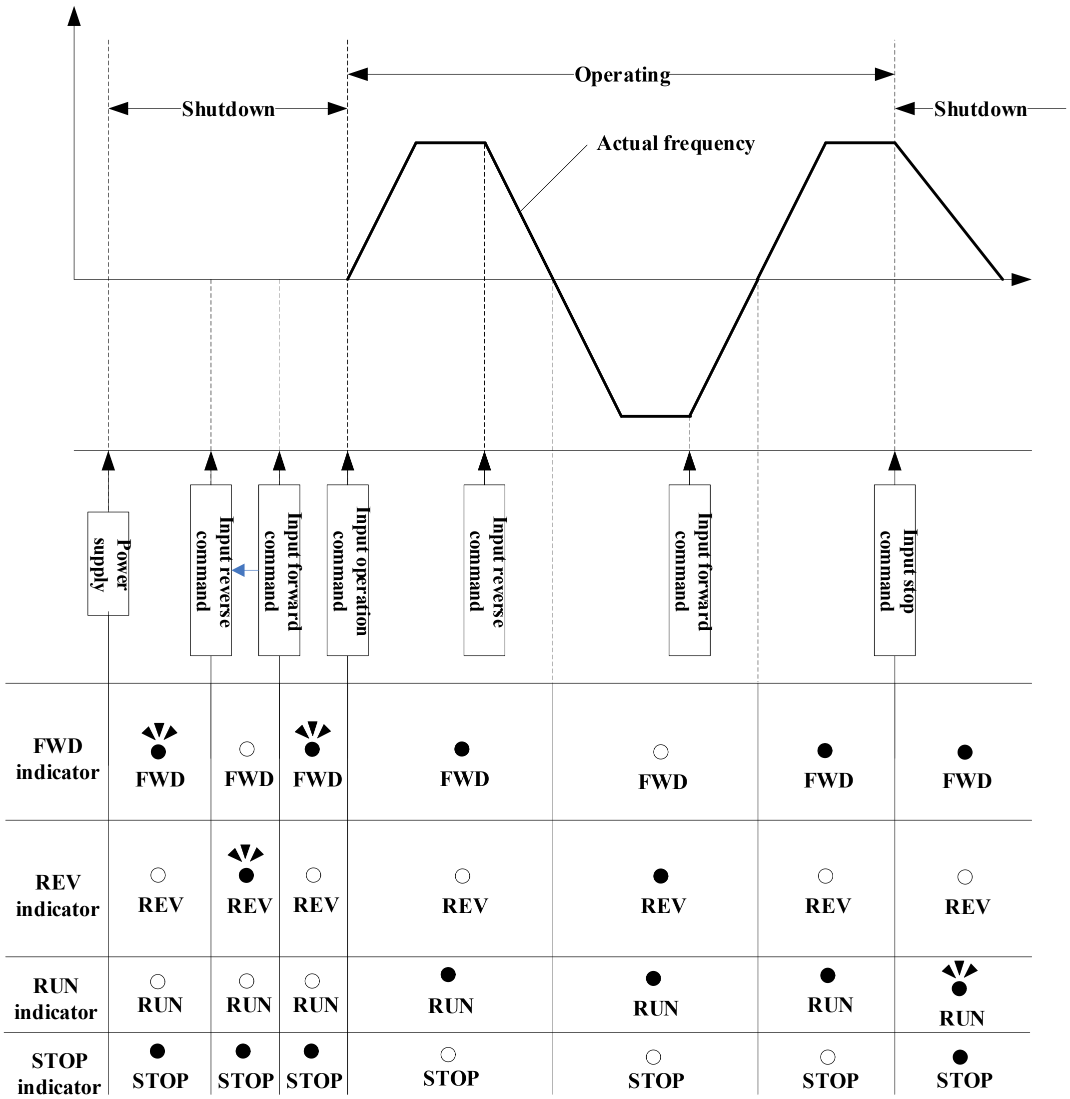


Example 2: Modifying frequency directly from the panel during shutdown/operation



Note: When modifying the frequency on the panel directly during shutdown, when the "▲ button" is used to increase the frequency and exceeded the upper limit of the frequency, it will change to the lower limit of the frequency, and when using the "▼ button" to reduce the frequency, if the frequency goes lower than the lower limit of the frequency, it will change to the upper limit of the frequency.

4.1.5 Description of operation statuses



* The RUN/STOP indicator is only available on LCD models

4.1.6 Appearance of the digital operator

LCD digital operator

The digital operator (JN5-OP-F02) is equipped with internal memory that can be used to upload parameter settings from the digital operator to the inverter, or download parameter settings from the inverter to the digital operator. Descriptions of the name and functions of the JN5-OP-F02 LCD digital operator is as shown below.

Driving mode indicator

- **•FAULT:** Lights up when faults or warnings occur.
- **•FWD:** Lights up when forward operation command is entered.
- **•REV:** Lights up when reverse operation command is entered.
- **•SEQ:** Lights up when the start operation command is issued from the control circuit or the RS-485 communication command (REMOTE mode).
- **•REF:** Lights up when the start frequency command is issued from the control circuit terminal or the RS-485 communication command (RE-MOTE mode).

LCD screen (maximum 8 rows * 25 letters)

- •Displays the monitor data, parameters and settings
- •Mode display (displays at the top-left of the LCD screen)
  - **Monitor:** Displays in driving mode
  - **Group:** Displays in all group setting mode
  - **PARA:** Displays in group parameter setting mode
  - **Edit:** Displays in edit mode or automatic tuning mode

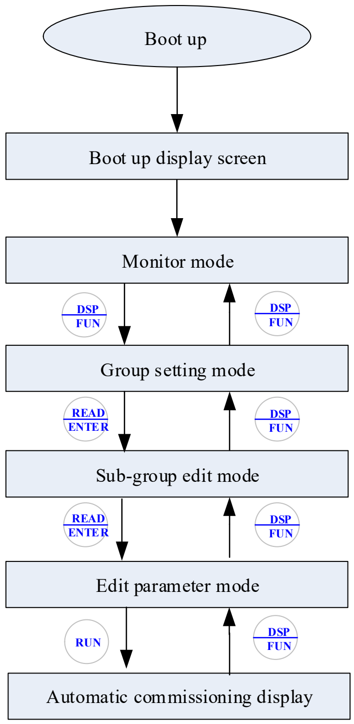
Figure 4.1.6.2 LCD digital operator

LOC/REM button (LCD model): Switches the frequency and operation command source REMOTE mode: Set according to the parameters, controlled by the control circuit terminal, communication or other methods according to parameter settings; local mode: controlled from the operator. Fixed at REMOTE mode after power is supplied; if the LOC/REM button is pressed while the inverter stopped, it can switch between LOCAL mode and REMOTE mode. Parameters 11-79 can determine whether the LOC/REM function is enabled.

4.1.7 Display method

■ **Operation method**

The parameters of E710 are modularized to make the browsing and setting of these parameters easier. The inverter has four operation modes; press the DSP/FUN button during power on to display the operation mode. Pressing the DSP/FUN button repeatedly allows browsing of these four operation modes, and when the READ/ENTER button is pressed, the operation mode required can be selected. (Refer to Figure 4.1.7.1)



. Inverter can operate in this mode.
. Displays status, failure message or real-time tracking.

. Inverter can edit groups in this mode.
. Sets or reads frequently used/customized parameters.

. Inverter can edit sub-group parameters in this mode.
. Sets or reads all group parameters.

. Inverter can edit parameters in this mode.
. Adjusts motor parameters automatically.
*Make sure to execute automatic adjustment of motor parameters before executing vector control (Sensorless vector control or current vector control).
*Inverter will not display automatic adjustment mode options while operating or when failures occur.

Figure 4.1.7.1 Operation mode structure

Note: Pressing and holding down the decrease or increase button will perform automatic increase (decrease) to make it easier to browse operation modes, parameter groups or parameter tables.

4.1.8 Monitor mode

When the inverter is operating in drive mode, the output frequency command, output current and voltage can be displayed in drive mode. Fault messages can also be displayed. The main operation method of drive mode is as shown in Figure 4.1.8.1 below.

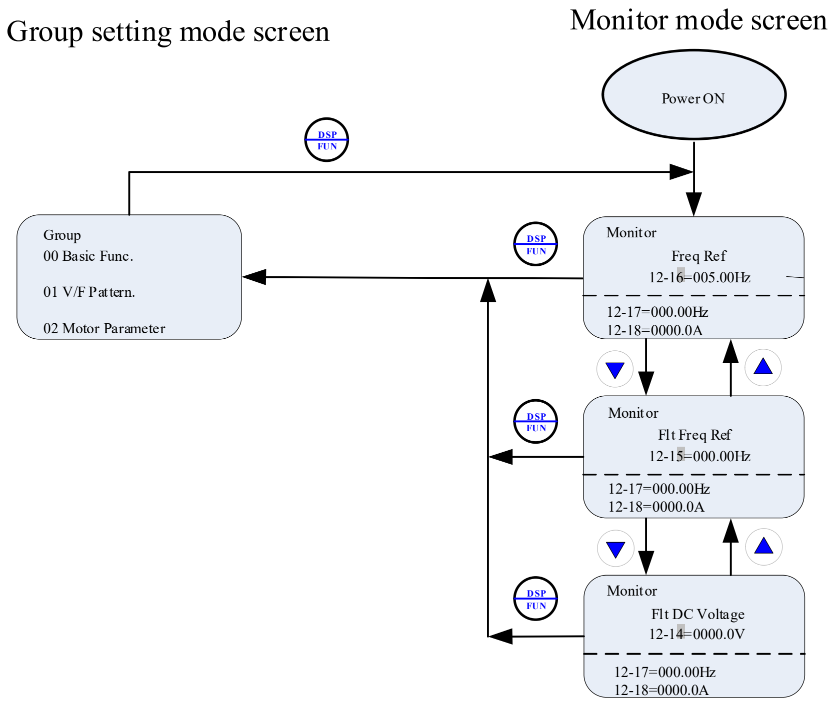


Figure 4.1.8.1 Operation method of monitor mode

4.1.9 Advanced setting

Advanced setting includes Group, sub-group (PARA) and parameter setting (Edit) modes; all inverter parameters can be browsed and changed. The main operation method of advanced setting is as shown in Figure 4.1.9.1 below.

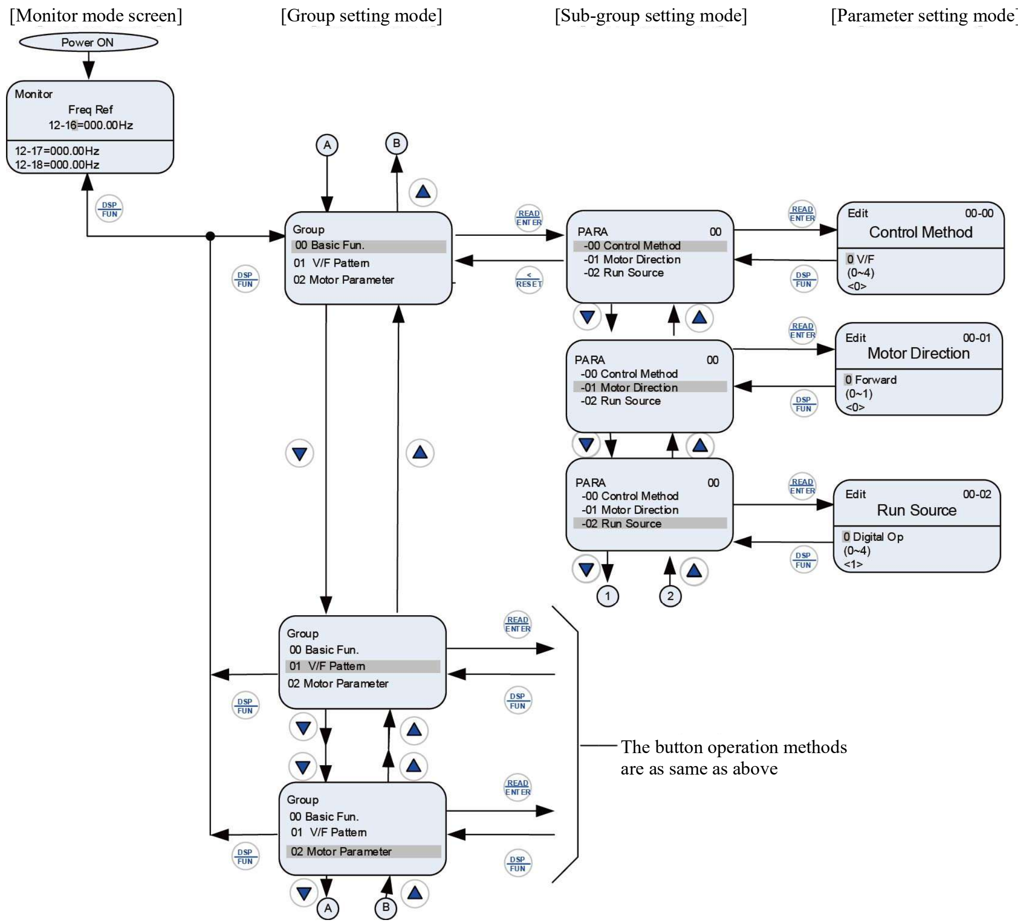


Figure 4.1.9.1 Operation method of advanced setting

Note -

1. Use the increase/decrease button, jog/move left button or RESET/< move button to set the parameters in the data setting (browsing) screen.
   The parameters will be saved when the READ/ENTER button is pressed, and the screen will return to the previous sub-menu screen when the DSP/FUN button is pressed.
2. Use the increase and decrease buttons to browse the various mode screens in advanced setting. For example, when the DSP/FUN button is pressed in parameter setting mode, the screen will return to the previous sub-group setting mode screen. When the DSP/FUN button is pressed on the sub-group setting mode screen, the screen will return to the previous group setting mode screen.
3. Please refer to Chapter 4 (Parameters) for detailed **advanced setting** parameter display screen.
4. Data setting/browsing screen

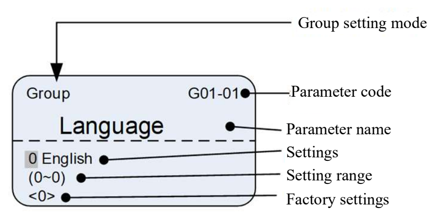


Figure 4.1.9.2 Group setting mode screen

** Use the increase/decrease and (or) RIGHT (LEFT) moving key to change and select the parameter (cursor flashes) and change its setting value.
Press the READ/ENTER button to save the setting value. The cursor will start flashing again after a few seconds.

4.1.10 Automatic tuning display

The main operations of the automatic tuning mode is as shown in Figure 4.1.10.1 below.

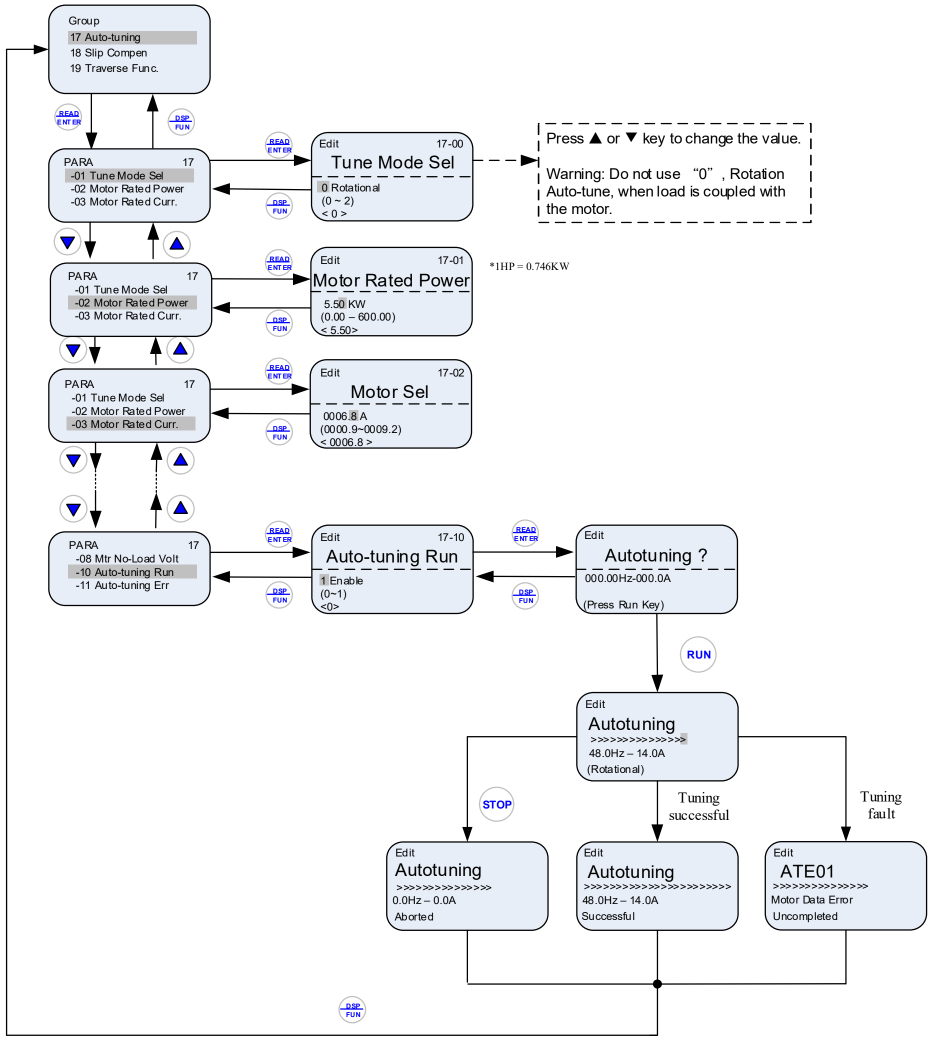


Figure 4.1.10.1 Operation instructions for automatic tuning

Note:

1. Use the increase and decrease buttons to browse the automatic tuning parameter table. According to the different control methods, specific parameters cannot be set. (Refer to automatic tuning 17 group parameters).
2. After entering the rated output power (17-01), rated current (17-02), rated voltage (17-03), rated frequency (17-04), rated speed (17-05), number of motor poles (17-06) and selecting motor **automatic tuning mode** (17-00), enter (17-10) and select OK, then press the RUN button to perform automatic tuning. When automatic tuning has been executed correctly, the calculated motor parameter will be saved in parameter group 02 (motor parameters).
3. (a) In rotational automatic tuning (17-00=0), "Rotational" will be displayed, and the motor will operate during automatic tuning. Before executing this function, make sure that the motor can operate safely first.
   (b) During stationary automatic tuning (17-00=1), "Stationary" will be displayed and the motor will not operate.
   (c) During stationary automatic tuning (17-00=2), "R1 Tuning" will be displayed and the motor will not operate.
   (d) During automatic tuning, the RUN LED light (at the top-left of the RUN button) will light up.
   (e) During automatic tuning, the ">>>" signal represents the automatic tuning process.
4. During automatic tuning, pressing the STOP button will stop the automatic tuning process. Make sure to use the STOP button on the digital operator to stop the automatic tuning process.
5. When automatic tuning malfunctions, the digital operator will display the malfunction message and incomplete message. The RUN LED light will stop, and the motor will operate freely until it stops.
   (Refer to Chapter 5.4 automatic tuning malfunctions) Press the RESET button to clear the malfunction screen, and it will return to the mode screen.
6. After automatic tuning is completed, the RUN LED light will go off. Press the DSP/FUN button to return to the mode screen, then perform the next operation. The complete automatic tuning operation takes approximately 50 seconds.

4.2 Parameters list

Parameter group	Name
Group 00	**Basic function group**
Group 01	**V/F control function group**
Group 02	**IM motor parameter group**
Group 03	**External terminal digital input/output function group**
Group 04	**External terminal analog input/output function group**
Group 05	**Multi-speed function group**
Group 06	**Automatic operation function group**
Group 07	**Operation stop function group**
Group 08	**Protection function group**
Group 09	**Communication function group**
Group 10	**PID function group**
Group 11	**Auxiliary function group**
Group 12	**Monitor function group**
Group 13	**Maintenance function group**
Group 14	**PLC setting group**
Group 15	**PLC monitor group**
Group 16	**LCD function group**
Group 17	**Automatic tuning function group**
Group 18	**Slip compensation function group**
Group 19	**Frequency skipping function group**
Group 20	**Speed control function group**
Group 21	**Torque and position control function group**
Group 22	**PM motor group**
Group 23	**Pump and HVAC group**

Parameter attributes		
***1**	Modifiable parameters during operation	
***2**	Reserved	
***3**	When resetting to factory settings, the value of this parameter (value set by user) will not be restored to the factory default value	
***4**	The parameter is read-only and cannot be modified	
***5**	The parameter will only be displayed when it needs to be used with the optional card.	
***6**	Only displayed when the LED digital operator is used	
***7**	Only displayed when the LCD digital operator is used	
***8**	Its setting value will change according to the setting of 13-08	
***9**	Reserved	
***10**	Parameter opened after installing the I/O expansion card (the I/O card is still in development)	

Group 00 basic function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
00-00	Motor control mode	0: V/F 1: Reserved 2: SLV 3: Reserved 4: Reserved 5: PMSLV 6: SLV2	0	-	O	O	O	O	O	O	O	*3
00-01	Motor rotation direction	0: Forward 1: Reverse	0	-	O	O	O	O	O	O	O	*1
00-02	Primary operation command source Select	0: Button panel 1: External control 2: Communication control 3: PLC 4: RTC ~~(in-development~~)only for special projects	0	-	O	O	O	O	O	O	O	
00-03	Secondary operation command source selection	0: Button panel 1: External control 2: Communication control 3: PLC 4: RTC ~~(in-development~~)only for special projects	0 (Note 4)	-	O	O	O	O	O	O	O	
00-04	Language selection	0: English 1: Simplified Chinese 2: Traditional Chinese 3: Turkish	0	-	O	O	O	O	O	O	O	*7
00-05	Primary frequency command source selection	0: Button panel 1: External control (analog AI1) 2: Terminal UP/DOWN 3: Communication control 4: Pulse input 5: Reserved 6: RTC (in development) 7: AI2 auxiliary frequency 8: Panel knob VR 9: Handwheel frequency (in development)	1	-	O	O	O	O	O	O	O	
00-06	Secondary frequency command source selection	0: Button panel 1: External control (analog AI1) 2: Terminal UP/DOWN 3: Communication control 4: Pulse input 5: Reserved 6: RTC (in development) 7: AI2 auxiliary frequency 8: Panel knob VR	0 (Note 4)	-	O	O	O	O	O	O	O	
00-07	Frequency source combination mode selection	0: Primary frequency source 1: Primary frequency source + secondary frequency source	0	-	O	O	O	O	O	O	O	

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
00-08	Communication frequency command	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
00-09	Frequency command memory mode	0: Do not memorize communication frequency command before power failure (00-08) 1: Memorize communication frequency command before power failure (00-08)	0	-	O	O	O	O	O	-		
00-10	Minimum frequency detection action	0: Warning will pop up when lower than the minimum frequency 1: Operate with minimum frequency when lower than minimum frequency 2: No stp0 warning, output frequency command 3: No stp0 warning, lower than minimum frequency output 0	0	-	O	O	O	O	O	O	O	~~Note 1~~
00-11	PID frequency lower limit selection	0: PID sleep limit frequency lower limit 1: PID sleep limit 0Hz	0	-	O	O	O	O	O	O	O	
00-12	Frequency upper limit	0.1~109.0	100.0	%	O	O	O	O	O	O	O	
00-13	Frequency lower limit	0.0~109.0	0.0	%	O	O	O	O	O	O	O	
00-14	Acceleration time 1	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-15	Deceleration time 1	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-16	Acceleration time 2	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-17	Deceleration time 2	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-18	Jog frequency****	0.00~599.00	6.00	Hz	O	O	O	O	O	O	O	*1
00-19	Jog acceleration time	0.1~0600.0	*	s	O	O	O	O	O	O	O	*1
00-20	Jog deceleration time	0.1~0600.0	*	s	O	O	O	O	O	O	O	*1
00-21	Acceleration time 3	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-22	Deceleration time 3	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-23	Acceleration time 4	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-24	Deceleration time 4	0.1~6000.0	*	s	O	O	O	O	O	O	O	*1
00-25	Acceleration/deceleration switching frequency	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
00-26	Emergency stop time	0.1~6000.0	5.0	s	O	O	O	O	O	O	O	
00-27	Reserved											
00-28	Primary frequency command characteristic selection	0: Positive characteristic (0~10V/4~20mA corresponds to 0~100%) 1: Negative characteristic (0~10V/4~20mA corresponds to 100~0%)	0	-	O	O	O	O	O	O	O	
00-29	Zero-speed operation selection	0: Operate according to frequency command 1: Stop 2: Operate according to minimum frequency 3: Zero-speed operation	0	-	X	X	X	O	O	X	X	
00-30	Reserved											
00-31	Reserved											

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects) V/F	 V/F +PG	 SLV	 SV	 PM SV	 PM SLV	 SLV2	Attribute
00-32	Application adjustment**	0: Universal 1: Reserved 2: Conveyor-specific parameters 3: Exhaust fan-specific parameters 4: Reserved 5: Air compressor-specific parameters 6: Hoist-specific (for lifting and lowering) parameters 7: Crane-specific (for lateral movement) parameters 8: Handwheel-specific parameters (Note 4) 9: EVERISING sawing machine-specific parameters 10: Punch press-specific parameters 11: Textile machine-specific parameters	0	-	O	O	O	O	O	O	O	
00-33	Change parameters (for LCD use only)	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	*7
00-34	Multi-function terminal operation mode selection	0: Forward /stop-reverse /stop 1: Operate/stop-reverse /forward 2: 3-wire operation/stop	0	-	O	O	O	O	O	O	O	
00-35	Reserved											
00-36	Reserved											
00-37	Reserved											
00-38	Reserved											
00-39	Reserved											
00-40	Reserved											
00-41	User parameter 0	Select 13-06 = 1 to enable user parameter Setting range: 00-01 ~ 22-31, however, excluding 00-41~00-56 and group 17 (for LCD use only)	00-41	-	O	O	O	O	O	O	O	*7
00-42	User parameter 1		00-42	-	O	O	O	O	O	O	O	*7
00-43	User parameter 2		00-43	-	O	O	O	O	O	O	O	*7
00-44	User parameter 3		00-44	-	O	O	O	O	O	O	O	*7
00-45	User parameter 4		00-45	-	O	O	O	O	O	O	O	*7
00-46	User parameter 5		00-46	-	O	O	O	O	O	O	O	*7
00-47	User parameter 6		00-47	-	O	O	O	O	O	O	O	*7
00-48	User parameter 7		00-48	-	O	O	O	O	O	O	O	*7
00-49	User parameter 8		00-49	-	O	O	O	O	O	O	O	*7
00-50	User parameter 9		00-50	-	O	O	O	O	O	O	O	*7
00-51	User parameter 10		00-51	-	O	O	O	O	O	O	O	*7
00-52	User parameter 11		00-52	-	O	O	O	O	O	O	O	*7
00-53	User parameter 12		00-53	-	O	O	O	O	O	O	O	*7
00-54	User parameter 13		00-54	-	O	O	O	O	O	O	O	*7
00-55	User parameter 14		00-55	-	O	O	O	O	O	O	O	*7
00-56	User parameter 15		00-56	-	O	O	O	O	O	O	O	*7
00-57	SV high-speed mode	0: SV high-speed mode 1 1: SV high-speed mode 2	0	-	X	X	X	O	X	X	X	
00-63	Frequency upper and lower limit setting selection	0: Percentage 1: Frequency	0	-	O	O	O	O	O	O	O	

* : Description of reference attachment one (acceleration/deceleration time initial value)
** : Before setting the parameter 00-32 application adjustment, please perform 13-08 initialization setting first.
Warning: If parameter 00-32 (application adjustment) is set, then the input/output terminal setting function will change automatically according to the setting value. Before trial run, please confirm the input/output signal of the inverter and the external sequence control first. Failure to confirm may result in personal accidents.

Group 01 V/F control function group												
Code	**Parameter name**	**Scope**	**Factory settings**	**Unit**	**Control mode * (V/F+PG, SV, PMSV are only for special projects)**							**Attribute**
					V/F	**V/F +PG**	**SLV**	**SV**	**PM SV**	**PM SLV**	**SLV2**	
01-00	V/F curve selection	0~FF	F	-	O	O	X	X	X	X	O	*3
01-01	Reserved											
01-02	Motor 1 maximum output frequency	4.8~599.0	50.0/ 60.0	Hz	O	O	O	O	O	O	O	*8
01-03	Motor 1 maximum output voltage	200V: 0.1~255.0 400V: 0.2~510.0	- -	V	O	O	X	X	X	X	O	*8
01-04	Motor 1 intermediate output frequency 2	0.0~599.0	0.0	Hz	O	O	X	X	X	X	O	
01-05	Motor 1 intermediate output voltage 2	200V: 0.0~255.0 400V: 0.0~510.0	0.0	V	O	O	X	X	X	X	O	*8
01-06	Motor 1 intermediate output frequency 1	0.0~599.0	3.0	Hz	O	O	X	X	X	X	O	
01-07	Motor 1 intermediate output voltage 1	200V: 0.0~255.0 400V: 0.0~510.0	*	V	O	O	X	X	X	X	O	*8
01-08	Motor 1 minimum output frequency	0.0~599.0	VF:1.3/1.5 VF+PG:- SLV:0.5/0.6 SV:- PMSV:- PMSLV:0.8 SLV2: 1.3/1.5	Hz	O	O	O	O	O	O	O	
01-09	Motor 1 minimum output voltage	200V: 0.0~255.0 400V: 0.0~510.0	- -	V	O	O	X	X	X	X	O	*8
01-10	Torque compensation gain	0.0~2.0	0.5	-	O	O	X	X	X	X	O	*1
01-11	Torque compensation mode selection	0: Torque compensation mode 0 1: Torque compensation mode 1	0	-	O	O	X	X	X	X	X	
01-12	Motor 1 base frequency	4.8~599.0	50.0/ 60.0	Hz	O	O	O	O	O	O	O	*8
01-13	Motor 1 base output voltage	200V: 0.0~255.0 400V: 0.0~510.0	- -	V	O	O	X	X	X	X	O	*8
01-14	Input voltage setting	200V: 155.0~255.0 400V: 310.0~510.0	- -	V	O	O	O	O	O	O	O	*8
01-15	Torque compensation time	0~10000	200	ms	O	O	X	X	X	X	O	
01-16	Motor 2 maximum output frequency	4.8~599.0	50.0/ 60.0	Hz	O	X	X	X	X	X	X	*8
01-17	Motor 2 maximum output voltage	200V: 0.1~255.0 400V: 0.2~510.0	- -	V	O	X	X	X	X	X	X	*8
01-18	Motor 2 intermediate output frequency 2	0.0~599.0	0.0	Hz	O	X	X	X	X	X	X	
01-19	Motor 2 intermediate output voltage 2	200V: 0.0~255.0 400V: 0.0~510.0	0.0	V	O	X	X	X	X	X	X	
01-20	Motor 2 intermediate output frequency 1	0.0~599.0	-	Hz	O	X	X	X	X	X	X	
01-21	Motor 2 intermediate output voltage 1	200V: 0.0~255.0 400V: 0.0~510.0	KVA	V	O	X	X	X	X	X	X	
01-22	Motor 2 minimum output frequency	0.0~599.0	-	Hz	O	X	X	X	X	X	X	
01-23	Motor 2 minimum output voltage	200V: 0.0~255.0 400V: 0.0~510.0	KVA	V	O	X	X	X	X	X	X	
01-24	Motor 2 base frequency	4.8~599.0	50.0/ 60.0	Hz	O	X	X	X	X	X	X	*8
01-25	Motor 2 base output voltage	200V: 0.0~255.0	-	V	O	X	X	X	X	X	X	*8

Group 01 V/F control function group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)								Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2		
		400V: 0.0~510.0	-										
01-26	Motor 2 V/F curve selection	0~FF	F	-	O	X	X	X	X	X	X		*3

KVA: This parameter varies according to the different inverter capacities.

Group 02 IM motor parameter group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
02-00	Motor 1 no-load current	0.01~600.00	-	A	O	X	X	X	X	X	O	
02-01	Motor 1 rated current	25%~200% inverter rated current.	-	A	O	O	O	O	X	X	O	
02-02	Reserved											
02-03	Motor 1 rated rotation speed	0~60000	-	Rpm	O	O	O	O	X	X	O	
02-04	Motor 1 rated voltage	200V: 50.0~240.0 400V: 100.0~480.0	- -	V	O	O	O	O	X	X	O	*8
02-05	Motor 1 rated power	0.01~600.00	-	kW	O	O	O	O	X	X	O	
02-06	Motor 1 rated frequency	4.8~599.0	50.0/ 60.0	Hz	O	O	O	O	X	X	O	*8
02-07	Motor 1 number of poles	2~16 (even number)	4	-	O	O	O	O	X	X	O	
02-08	Reserved											
02-09	Motor 1 excitation current	15%~70% motor rated current	-	%	X	X	O	O	X	X	X	
02-10	Motor 1 magnetic core saturation factor 1	1~100	-	%	X	X	O	O	X	X	X	
02-11	Motor 1 magnetic core saturation factor 2	1~100	-	%	X	X	O	O	X	X	X	
02-12	Motor 1 magnetic core saturation factor 3	80~300	-	%	X	X	O	O	X	X	X	
02-13	Motor 1 magnetic core loss	0.0~15.0	-	%	O	O	X	X	X	X	O	
02-14	Reserved											
02-15	Motor 1 line-to-line resistance	0.001~60.000	-	Ω	O	O	O	O	X	X	O	
02-16	Motor 1 rotor resistance	0.001~60.000	-	Ω	X	X	O	X	X	X	X	
02-17	Motor 1 leakage inductance	0.01~200.00	-	mH	X	X	O	X	X	X	X	
02-18	Motor 1 mutual inductance	0.1~6553.4	-	mH	X	X	O	X	X	X	X	
02-19	Motor 1 no-load voltage	200V: 50~240 400V: 100~480	- -	V	X	X	O	O	X	X	X	
02-20	Motor 2 no-load current	0.01~600.00	-	A	O	X	X	X	X	X	X	
02-21	Motor 2 rated current	25%~200% inverter rated current	-	A	O	X	X	X	X	X	X	
02-22	Motor 2 rated rotation speed	0~60000	-	Rpm	O	X	X	X	X	X	X	
02-23	Motor 2 rated voltage	200V: 50.0~240.0 400V: 100.0~480.0	- -	V	O	X	X	X	X	X	X	*8
02-24	Motor 2 rated power	0.01~600.00	-	kW	O	X	X	X	X	X	X	
02-25	Motor 2 rated frequency	4.8~599.0	50.0/ 60.0	Hz	O	X	X	X	X	X	X	*8
02-26	Motor 2 number of poles	2~16 (even number)	4	-	O	X	X	X	X	X	X	
02-27 ~ 02-31	Reserved											
02-32	Motor 2 line-to-line resistance	0.001~60.000	-	Ω	O	X	X	X	X	X	X	
02-33	Motor 1 leakage inductance ratio	0.1~15.0	-	%	X	X	O	O	X	X	X	
02-34	Motor 1 slip frequency	0.10~20.00	-	Hz	X	X	O	O	X	X	X	
02-35	Reserved											
02-36	Reserved											
02-37	Motor mechanical loss	0.0~10.0	4.0	%	X	X	X	O	O	X	X	

Group 03 external terminal digital input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
03-00	Multi-function terminal S1 function setting	0: Two-wire forward /stop	0	-	O	O	O	O	O	O	O	
		1: Two-wire reverse rotation/stop			O	O	O	O	O	O	O	
		2: Multi-speed/location setting command 1			O	O	O	O	O	O	O	
		3: Multi-speed/location setting command 2			O	O	O	O	O	O	O	
		4: Multi-speed/location setting command 3			O	O	O	O	O	O	O	
		5: Multi-speed/location setting command 4			O	O	O	O	O	O	O	
		6: Jog forward command			O	O	O	O	O	O	O	
03-01	Multi-function terminal S2 function setting	7: Jog reverse rotation command	1	-	O	O	O	O	O	O	O	
		8: UP increase frequency command			O	O	O	O	O	O	O	
		9: DOWN decrease frequency command			O	O	O	O	O	O	O	
		10: Acceleration/deceleration time selection 1			O	O	O	O	O	O	O	
		11: Acceleration/deceleration prohibited			O	O	O	O	O	O	O	
		12: Primary/secondary operation switching function			O	O	O	O	O	O	O	
		13: Primary/secondary frequency switching function			O	O	O	O	O	O	O	
03-02	Multi-function terminal S3 function setting	14: Emergency stop (decelerate to zero and stop)	2	-	O	O	O	O	O	O	O	
		15: Cut-off stop (freely operate and stop)			O	O	O	O	O	O	O	
		16: PID function prohibited			O	O	O	O	O	O	O	
		17: Fault reset (RESET)			O	O	O	O	O	O	O	
		18: Reserved			-	-	-	-	-	-	-	
		19: Speed search 1 (from maximum frequency)			O	O	O	O	O	X	O	
		20: Manual energy-saving function			O	O	X	X	X	X	X	
03-03	Multi-function terminal S4 function setting	21: PID integral reset	3	-	O	O	O	O	O	O	O	
		22: Reserved			-	-	-	-	-	-	-	
		23: Reserved			-	-	-	-	-	-	-	
		24: PLC input			O	O	O	O	O	O	O	
		25: External fault			O	O	O	O	O	O	O	
		26: Three-wire forward /reverse			O	O	O	O	O	O	O	
		27: Local/remote selection			O	O	O	O	O	O	O	
03-04	Multi-function terminal S5 function setting	28: Remote mode selection	4	-	O	O	O	O	O	O	O	
		29: Jog frequency selection			O	O	O	O	O	O	O	
		30: Acceleration/deceleration time selection 2			O	O	O	O	O	O	O	
		31: Inverter overheat early warning			O	O	O	O	O	O	O	
		32: Synchronization command			O	O	O	O	O	O	O	
		33: DC brake			O	O	O	O	X	X	O	
		34: Speed search 2 (from frequency command)			O	O	O	O	O	X	O	
		35: Timer function input			O	O	O	O	O	O	O	
		36: PID soft start invalid			O	O	O	O	O	O	O	
03-05	Multi-function terminal S6 function setting	37: Frequency skipping operation	17	-	O	O	X	X	X	X	O	
		38: Frequency skipping upper offset			O	O	X	X	X	X	O	
		39: Frequency skipping lower offset			O	O	X	X	X	X	O	
		40: Motor 1/motor 2 switching			O	O	X	X	X	X	X	
		41: PID sleep			O	O	O	O	O	O	O	
		42: PG invalid			X	O	X	X	X	X	X	
		43: PG integral reset			X	O	X	O	O	X	X	

Group 03 external terminal digital input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	Attribute
03-06	Multi-function terminal S7 function setting (Frame1 no S7)	44: Speed/torque mode switching	Two-wire: 29 Three-wire: 26	-	X	X	X	O	O	X	X	
		45: Negative torque command			X	X	X	O	O	X	X	
		46: Zero-speed servo			X	X	X	O	O	X	X	
		47: Fire mode (forced operation mode)			O	O	O	O	O	O	O	
		48: KEB acceleration			O	O	X	X	X	X	O	
		49: Allow parameter writing			O	O	O	O	O	O	O	
		50: Direct operation protection after power is supplied (USP)			O	O	O	O	O	O	O	
03-07	Reserved	51: Multi-speed and multi-point positioning command switching	15	-	X	X	X	O	O	X	X	
		52: Position command enable			X	X	X	O	O	X	X	
		53: Two-wire self-holding (stop command)			O	O	O	O	O	O	O	
		54: Reserved			-	-	-	-	-	-	-	
		55: RTC time enable			O	O	O	O	O	O	O	~~Note 8~~
		56: RTC offset enable			O	O	O	O	O	O	O	~~Note 8~~
		57: Reserved			-	-	-	-	-	-	-	
		58: Safety function			O	O	O	O	O	O	O	
		59: Reserved			-	-	-	-	-	-	-	
		60: Reserved			-	-	-	-	-	-	-	
		61: Reserved			-	-	-	-	-	-	-	
		62: EPS input			O	O	O	O	O	O	O	
		63: Switch to second set of pressure Range error			O	O	O	O	O	O	O	
		64: Reserved			-	-	-	-	-	-	-	
		65: Short-circuit brake command			X	X	X	X	X	O	X	~~Note 1~~
		66: PID function prohibited 2			O	O	O	O	O	O	O	~~Note 4~~
		67: Handwheel mode switching			O	X	X	X	X	X	X	~~Note 4~~
		68: External fault 2			O	O	O	O	O	O	O	~~Note 4~~
		69: External overload			O	O	O	O	O	O	O	~~Note 4~~
		70: Jog frequency operation			O	O	O	O	O	O	O	
03-08	(S1~S7) DI scan time	0: Scan time 4ms 1: Scan time 8ms	1	-	O	O	O	O	O	O	O	
03-09	Multi-function terminal S1-S4 type selection	xxx0b: S1 A contact xxx1b:S1 B contact xx0xb: S2 A contact xx1xb:S2 B contact x0xxb: S3 A contact x1xxb:S3 B contact 0xxxb: S4 A contact 1xxxb:S4 B contact	0000b	-	O	O	O	O	O	O	O	
03-10	Multi-function terminal S5-S7 type selection	xxx0b: S5 A contact xxx1b:S5 B contact xx0xb: S6 A contact xx1xb:S6 B contact x0xxb: S7 A contact x1xxb:S7 B contact	0000b	-	O	O	O	O	O	O	O	
03-11	Relay (R1A-R1C) output	0: Operation duration	1 ~~(Note 4)~~	-	O	O	O	O	O	O	O	
		1: Fault indication			O	O	O	O	O	O	O	
		2: Frequency reached			O	O	O	O	O	O	O	
		3: Any frequency reached (03-13±03-14)			O	O	O	O	O	O	O	
		4: Frequency detection 1 (Output frequency≧ (03-13+03-14))			O	O	O	O	O	O	O	
		5: Frequency detection 2 (Output frequency≦ (03-13+03-14))			O	O	O	O	O	O	O	
		6: Automatic restart			O	O	O	O	O	O	O	
		7: Emergency stop			O	O	O	O	O	O	O	

Group 03 external terminal digital input/output function group

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects) V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	Attribute
		8: Reserved			-	-	-	-	-	-	-	
		9: Cut-off stop			O	O	O	O	O	O	O	
		10~11: Reserved			-	-	-	-	-	-	-	
		12: Over-torque detected			O	O	O	O	O	O	O	
		13: Current reached			O	O	O	O	O	O	O	
		14: Mechanical brake control (03-17~18)			O	O	O	O	O	O	O	
		15~17: Reserved			-	-	-	-	-	-	-	
		18: PLC status*			O	O	O	O	O	O	O	
		19: PLC control*			O	O	O	O	O	O	O	

Group 03 external terminal digital input/output function group

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects) V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	Attribute
		20: Zero speed			O	O	O	O	O	O	O	
		21: Inverter standby			O	O	O	O	O	O	O	
		22: Low voltage detected			O	O	O	O	O	O	O	
		23: Operation command source			O	O	O	O	O	O	O	
		24: Frequency command source			O	O	O	O	O	O	O	
		25: Low-torque detected			O	O	O	O	O	O	O	
		26: Frequency disconnected			O	O	O	O	O	O	O	
		27: Timer function output			O	O	O	O	O	O	O	
		28: Frequency skipping upper offset status			O	O	X	X	X	X	O	
		29: Frequency skipping operation active			O	O	X	X	X	X	O	
		30: Select motor 2			O	O	O	O	O	O	O	
		31: Zero-speed servo status (position mode)			X	X	X	O	O	X	X	
		32: Communication control			O	O	O	O	O	O	O	
03-12 (Note)	Optocoupler output (DO1-DOG)	33: RTC timer 1	0 ~~(Note 4)~~	-	O	O	O	O	O	O	O	~~Note 8~~
		34: RTC timer 2			O	O	O	O	O	O	O	~~Note 8~~
		35: RTC timer 3			O	O	O	O	O	O	O	~~Note 8~~
		36: RTC timer 4			O	O	O	O	O	O	O	~~Note 8~~
		37: PID feedback disconnection detection output			O	O	O	O	O	O	O	
		38: Brake release			X	X	O	O	O	X	X	
		39: Frequency detected 1 (for overhead crane use)			O	O	O	X	X	X	X	
		40: Frequency outputting			X	X	X	O	O	X	X	
		41: Position reached (position mode)			X	X	X	O	O	X	X	
		42: Overpressure			O	O	X	X	X	X	X	
		43: Underpressure			O	O	X	X	X	X	X	
		44: Pressure loss detection			O	O	X	X	X	X	X	
		45: PID sleep			O	O	O	O	O	O	O	
		46~49: Reserved			-	-	-	-	-	-	-	
		50: Frequency detection 3			O	O	O	O	O	O	O	

Group 03 external terminal digital input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects) V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	Attribute
		(Output frequency≧(03-44+03-45))										
		51: Frequency detection 4 (Output frequency≦(03-44+03-45))			O	O	O	O	O	O	O	
		52: Frequency detection 5 (Output frequency≧(03-46+03-47)			O	O	O	O	O	O	O	
		53: Frequency detection 6 (Output frequency≦03-46+03-47)			O	O	O	O	O	O	O	
		54: Short-circuit braking			O	O	O	O	O	O	O	~~Note 1~~
		57: Low current detected			X	X	X	X	X	O	X	~~Note 2~~
		58: Frequency deceleration detection			O	O	O	O	O	O	O	~~Note 4~~
		59: Over-temperature detected			O	O	O	O	O	O	O	~~Note 4~~
		60: Lifetime warning period			O	O	O	O	O	O	O	
03-13	Frequency detection threshold	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
03-14	Frequency detection width	0.1~25.5	2.0	Hz	O	O	O	O	O	O	O	
03-15	Current reached threshold	0.1~999.9	0.1	A	O	O	O	O	O	O	O	
03-16	Current reached detection delay time	0.1~10.0	0.1	s	O	O	O	O	O	O	O	
03-17	*Mechanical brake release threshold setting	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
03-18	*Mechanical brake action threshold setting	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
03-19	Relay and DO1 type selection	xxx0b: R1 A contact xxx1b: R1 B contact xx0xb: Optocoupler 1 A contact xx1xb: optocoupler 1 B contact	0000b	-	O	O	O	O	O	O	O	
03-20	Reserved											
03-21	Reserved											
03-22	Reserved											
03-23	Reserved											
03-24	Reserved											
03-25	Reserved											
03-26	Reserved											
03-27	UP/DOWN frequency hold selection	0: Hold UP/DOWN frequency when stopped 1: Clear UP/DOWN frequency when stopped 2: Allow frequency UP/DOWN when stopped 3: Update frequency while accelerating.	0	-	O	O	O	O	O	O	O	
03-28	Optocoupler output (DO2-DOG) (Frame1 no DO2)	The scope and definition are the same as 03-11, 03-12 (03-28 is set as 8 is the pulse output function)	0	-	O	O	O	O	O	O	O	
03-29	Optocoupler output type selection (DO2-DOG)	xx0xb: Optocoupler 2 A contact xx1xb: Optocoupler 2 B contact	0000b	-	O	O	O	O	O	O	O	
03-30	Pulse input selection	0: General pulse input 1: PWM method	0	-	O	O	O	O	O	O	O	
03-31	Pulse input scale	Set and adjust according to 03-30 03-30 set to 0: 50~32000Hz	1000	Hz	O	O	O	O	O	O	O	*1

Group 03 external terminal digital input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	Attribute
		03-30 set to 1:10~1000Hz										
03-32	Pulse input gain	0.0~1000.0	100	%	O	O	O	O	O	O	O	*1
03-33	Pulse input bias voltage	-100.0~100.0	0.0	%	O	O	O	O	O	O	O	*1
03-34	Pulse input filter time	0.00~2.00	0.1	Sec	O	O	O	O	O	O	O	*1
03-35	Pulse output function setting	1: Frequency command 2: Output frequency 3: Output frequency after soft start 4: Motor speed 5: PID feedback 6: PID input 7: PG output (must be used with PG card) *Only for special cases	2	-	O	O	O	O	O	O	O	*1
03-36	Pulse input scale	1~32000	1000	Hz	O	O	O	O	O	O	O	*1
03-37	Timer ON delay (DI/DO)	0.0~6000.0	0.0	s	O	O	O	O	O	O	O	
03-38	Timer OFF delay (DI/DO)	0.0~6000.0	0.0	s	O	O	O	O	O	O	O	
03-39	Reserved											
03-40	Up/Down frequency bandwidth setting	0.00~5.00	0.00	Hz	O	O	O	O	O	O	O	
03-41	Torque detection threshold	0~150	10	%	X	X	O	O	O	X	X	
03-42	Braking action delay out	0.00~65.00	0.00	s	X	X	O	O	O	X	X	
03-43	UP/DOWN acceleration/deceleration selection	**0:** Acceleration/deceleration time 1 **1:** Acceleration/deceleration time 2	0	-	O	O	O	O	O	O	O	
03-44	Frequency detection threshold 2	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
03-45	Frequency detection width 2	0.1~25.5	2.0	Hz	O	O	O	O	O	O	O	
03-46	Frequency detection threshold 3	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
03-47	Frequency detection width 3	0.1~25.5	2.0	Hz	O	O	O	O	O	O	O	
03-48	Low current detected threshold	0.0~999.9	0.1	A	O	O	O	O	O	O	O	~~Note 2~~
03-49	Low current detected delay time	0.00~655.34 (Note 4)	0.01	Sec	O	O	O	O	O	O	O	~~Note 2~~
03-50	Frequency detection threshold 4	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	~~Note 3~~
03-51	Frequency detection threshold 5	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	~~Note 3~~
03-52	Frequency detection threshold 6	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	~~Note 3~~
03-53	Current reached threshold 2	0.0~999.9	0	A	O	O	O	O	O	O	O	~~Note 4~~
03-54	Counter ON delay.	0~12	0	Hr	O	O	O	O	O	O	O	
03-55	Counter OFF delay.	0~12	0	Hr	O	O	O	O	O	O	O	
03-57	Emergency stop action setting	0: Automatically reset ES after stopped 1: ES reset command: DI	0	-	O	O	O	O	O	O	O	

Group 03 external terminal digital input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
03-58	Communication control S1~S4 type selection	xxx0b: S1 external input xxx1b: S1 communication control xx0xb: S2 external input xx1xb: S2 communication control x0xxb: S3 external input x1xxb: S3 communication control 0xxxb: S4 external input 1xxxb: S4 communication control	0000b	-	O	O	O	O	O	O	O	
03-59	Communication control S5~S7 type selection (Frame1 no S7)	xxx0b: S5 external input xxx1b: S5 communication control xx0xb: S6 external input xx1xb: S6 communication control x0xxb: S7 external input x1xxb: S7 communication control	0000b	-	O	O	O	O	O	O	O	

Group 04 external terminal analog input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribue
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
04-00	AI input signal type (Frame1 no AI2)	0: AI1:0~10V AI2: 0~10V	1	-	O	O	O	O	O	O	O	
		1: AI1:0~10V AI2: 4~20mA										
		2: Reserved										
		3: Reserved										
		4: AI1: 4~20mA AI2: 0~10V										*9
		5: AI1: 4~20mA AI2: 4~20mA										*9
04-01	AI1 signal scan filter time	0.00~2.00	0.03	s	O	O	O	O	O	O	O	
04-02	AI1 gain	0.0~1000.0	100.0	%	O	O	O	O	O	O	O	*1
04-03	AI1 bias voltage	-100.0~100.0	0	%	O	O	O	O	O	O	O	*1
04-04	AI negative characteristic	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	~~Note 4~~
04-05	AI2 function setting (Frame1 no AI2)	0: Auxiliary frequency	10	-	O	O	O	O	O	O	O	
		1: Frequency gain			O	O	O	O	O	O	O	
		2: Frequency bias voltage			O	O	O	O	O	O	O	
		3: Voltage bias voltage			O	O	X	X	O	O	O	
		4: Acceleration/deceleration shortening coefficient			O	O	O	O	O	O	O	
		5: DC brake current			O	O	O	O	X	X	O	
		6: Overtorque detection threshold			O	O	O	O	O	O	O	
		7: Stall threshold during operation			O	O	X	X	X	X	O	
		8: Frequency lower limit			O	O	O	O	O	O	O	
		9: Jump frequency 4			O	O	O	O	O	O	O	
		10: Add to AI1			O	O	O	O	O	O	O	
		11: Forward torque limit			X	X	O	O	O	O	X	
		12: Negative torque limit			X	X	O	O	O	O	X	
		13: Regenerative torque limit			X	X	O	O	O	O	X	
		14: Positive/negative torque limit			X	X	O	O	O	O	X	
		15: Torque command/torque limit			X	X	X	O	O	X	X	

Group 04 external terminal analog input/output function group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)								Attribue
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
		16: Torque command/torque compensation			X	X	O	O	O	X	X	
		17: PTC overheat protection			O	O	O	O	O	O	O	
04-06	AI2 signal scan filter time	0.00~2.00	0.03	s	O	O	O	O	O	O	O	
04-07	AI2 gain	0.0~1000.0	100.0	%	O	O	O	O	O	O	O	*1
04-08	AI2 bias voltage	-100.0~100.0	0	%	O	O	O	O	O	O	O	*1
04-09	Reserved												
04-10	Reserved												
04-11	AO1 function setting	0: Output frequency	0	-	O	O	O	O	O	O	O	
		1: Frequency command			O	O	O	O	O	O	O	
		2: Output voltage			O	O	O	O	O	O	O	
		3: DC voltage			O	O	O	O	O	O	O	
		4: Output current			O	O	O	O	O	O	O	
		5: Output power			O	O	O	O	O	O	O	
		6: Motor speed			O	O	O	O	O	O	O	
		7: Output power factor			O	O	O	O	O	O	O	
		8: AI1 input			O	O	O	O	O	O	O	
		9: AI2 input			O	O	O	O	O	O	O	
		10: Torque command			X	X	O	O	O	O	X	
		11: q-axis current (Frame2 and above reserved)			X	X	O	O	O	O	X	
		12: d-axis current (Frame2 and above reserved)			X	X	O	O	O	O	X	
		13: Speed deviation			X	X	X	O	O	X	X	
		14: Reserved			-	-	-	-	-	-	-	
		15: ASR output			X	O	X	O	O	X	X	
		16: Reserved			-	-	-	-	-	-	-	
		17: q-axis voltage (Frame2 and above reserved)			X	X	O	O	O	O	X	
		18: d-axis voltage (Frame2 and above reserved)			X	X	O	O	O	O	X	
		19~20: Reserved			-	-	-	-	-	-	-	
		21: PID input			O	O	O	O	O	O	O	
		22: PID output			O	O	O	O	O	O	O	
		23: PID target value			O	O	O	O	O	O	O	
		24: PID feedback value			O	O	O	O	O	O	O	
		25: Soft starter output frequency			O	O	O	O	O	O	O	
		26: PG feedback			X	O	X	O	O	X	X	
		27: Reserved			-	-	-	-	-	-	-	
		28: Communication control			O	O	O	O	O	O	O	
04-12	AO1 gain	0.0~1000.0	100.0	%	O	O	O	O	O	O	O	*1
04-13	AO1 bias voltage	-100.0~100.0	0	%	O	O	O	O	O	O	O	*1
04-14	Reserved												
04-15	Reserved												
04-16	AO2 function setting	The scope and definition are the same as 04-11	3	-	O	O	O	O	O	O	O	
04-17	AO2 gain	0.0~1000.0	100.0	%	O	O	O	O	O	O	O	*1
04-18	AO2 bias voltage	-100.0~100.0	0	%	O	O	O	O	O	-		*1
04-19	AO output signal type	0: AO1 0~10V AO2 0~10V	0	-	O	O	O	O	O	O	O	

Group 04 external terminal analog input/output function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribue
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
		1: AO1 0~10V AO2 4~20mA										
		2: AO1 4~20mA AO2 0~10V										*9
		3: AO1 4~20mA AO2 4~20mA										*9
04-20	AO signal scan filter time	0.00~0.50	0.00	s	O	O	O	O	O	O	O	*1
04-21	Reserved											
04-22	Reserved											
04-23	Reserved											
04-24	Frequency display filter	0.00~3.00	0.00	-	O	O	O	O	O	O	O	
04-25	AI1 filter parameter	0.00~3.00	0.00	-	O	O	O	O	O	O	O	
04-26	AI1 value average filter	0 ~255	0	-	O	O	O	O	O	O	O	
04-27	Output frequency display value average filter	0 ~255	0	-	O	O	O	O	O	O	O	

Group 05 multi-stage function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
05-00	Multi-speed acceleration/deceleration mode selection	0: Segment speed acceleration/deceleration time set by acceleration/deceleration time 1~4 1: Segment speed acceleration/deceleration time independent setting	0	-	O	O	O	O	O	O	O	
05-01	*Segment 0 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-02	*Segment 1 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-03	*Segment 2 speed frequency setting	0.00~599.00	10.00	Hz	O	O	O	O	O	O	O	*1
05-04	*Segment 3 speed frequency setting	0.00~599.00	20.00	Hz	O	O	O	O	O	O	O	*1
05-05	*Segment 4 speed frequency setting	0.00~599.00	30.00	Hz	O	O	O	O	O	O	O	*1
05-06	*Segment 5 speed frequency setting	0.00~599.00	40.00	Hz	O	O	O	O	O	O	O	*1
05-07	*Segment 6 speed frequency setting	0.00~599.00	50.00	Hz	O	O	O	O	O	O	O	*1
05-08	*Segment 7 speed frequency setting	0.00~599.00	50.00	Hz	O	O	O	O	O	O	O	*1
05-09	*Segment 8 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-10	*Segment 9 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-11	*Segment 10 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-12	*Segment 11 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-13	*Segment 12 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1

Group 05 multi-stage function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
05-14	*Segment 13 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-15	*Segment 14 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-16	*Segment 15 speed frequency setting	0.00~599.00	5.00	Hz	O	O	O	O	O	O	O	*1
05-17	Multi-speed 0 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-18	Multi-speed 0 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-19	Multi-speed 1 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-20	Multi-speed 1 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-21	Multi-speed 2 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-22	Multi-speed 2 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-23	Multi-speed 3 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-24	Multi-speed 3 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-25	Multi-speed 4 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-26	Multi-speed 4 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-27	Multi-speed 5 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-28	Multi-speed 5 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-29	Multi-speed 6 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-30	Multi-speed 6 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-31	Multi-speed 7 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-32	Multi-speed 7 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-33	Multi-speed 8 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-34	Multi-speed 8 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-35	Multi-speed 9 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-36	Multi-speed 9 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-37	Multi-speed 10 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-38	Multi-speed 10 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-39	Multi-speed 11 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-40	Multi-speed 11 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-41	Multi-speed 12 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-42	Multi-speed 12 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-43	Multi-speed 13 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-44	Multi-speed 13 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	

Group 05 multi-stage function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
05-45	Multi-speed 14 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-46	Multi-speed 14 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-47	Multi-speed 15 acceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	
05-48	Multi-speed 15 deceleration time setting	0.1~6000.0	10.0	s	O	O	O	O	O	O	O	

Group 06 automatic operation function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
06-00	Automatic operation mode selection	0: Invalid 1: Execute a single cycle of operation mode, then after stopped, it will continue to operate with the speed before stopping 2: Continuous cycle operation mode, after it stopped, it will continue to operate with the speed before stopping 3: After a single cycle ends, it will continue operating with the last segment of operation speed, then after it stopped, it will continue operating with the speed before it stopped 4: Execute a single cycle operation mode, after it stopped, it will start operating from the zero segment speed 5: Continuous cycle operation mode, after it stopped, it will start operating from the zero segment speed 6: After a single cycle ends, continue operating using the final segment of operation speed, then after it stops, start operating from the zero segment speed	0	-	O	O	O	X	X	X	O	
06-01	*Segment 1 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-02	*Segment 2 operation frequency setting	0.00~599.00	10.00	Hz	O	O	O	X	X	X	O	*1
06-03	*Segment 3 operation frequency setting	0.00~599.00	20.00	Hz	O	O	O	X	X	X	O	*1
06-04	*Segment 4 operation frequency setting	0.00~599.00	30.00	Hz	O	O	O	X	X	X	O	*1
06-05	*Segment 5 operation frequency setting	0.00~599.00	40.00	Hz	O	O	O	X	X	X	O	*1
06-06	*Segment 6 operation frequency setting	0.00~599.00	50.00	Hz	O	O	O	X	X	X	O	*1
06-07	*Segment 7 operation frequency setting	0.00~599.00	50.00	Hz	O	O	O	X	X	X	O	*1
06-08	*Segment 8 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-09	*Segment 9 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1

Group 06 automatic operation function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
06-10	*Segment 10 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-11	*Segment 11 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-12	*Segment 12 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-13	*Segment 13 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-14	*Segment 14 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-15	*Segment 15 operation frequency setting	0.00~599.00	5.00	Hz	O	O	O	X	X	X	O	*1
06-16	Segment 0 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-17	Segment 1 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-18	Segment 2 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-19	Segment 3 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-20	Segment 4 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-21	Segment 5 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-22	Segment 6 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-23	Segment 7 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-24	Segment 8 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-25	Segment 9 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-26	Segment 10 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-27	Segment 11 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-28	Segment 12 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-29	Segment 13 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-30	Segment 14 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-31	Segment 15 operation time setting	0.0~6000.0	0.0	s	O	O	O	X	X	X	O	*1
06-32	Segment 0 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O	
06-33	Segment 1 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O	
06-34	Segment 2 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O	
06-35	Segment 3 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O	
06-36	Segment 4 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O	
06-37	Segment 5 operation	0: Stop 1: Forward operation 2:	0	-	O	O	O	X	X	X	O	

Group 06 automatic operation function group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)								Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2		
	direction selection	Reverse											
06-38	Segment 6 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-39	Segment 7 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-40	Segment 8 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-41	Segment 9 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-42	Segment 10 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-43	Segment 11 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-44	Segment 12 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-45	Segment 13 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-46	Segment 14 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		
06-47	Segment 15 operation direction selection	0: Stop 1: Forward operation 2: Reverse	0	-	O	O	O	X	X	X	O		

Group 07 operation stop function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
07-00	Instantaneously stop and restart selection	0: Instantaneously stop and restart invalid 1: Instantaneously stop and restart effective	0	-	O	O	O	O	X	O	O	
07-01	Automatic reset restart time	0~7200	0	s	O	O	O	O	O	O	O	
07-02	Automatic reset restart count	0~10	0	-	O	O	O	O	O	O	O	
07-03	Reserved											
07-04	Start directly after power on	0: When the external operation command is valid, start directly after power is supplied 1: When external operation command is valid, do not start directly after power is supplied	1	-	O	O	O	O	O	O	O	
07-05	Start delay directly after power on	1.0~300.0	3.5	s	O	O	O	O	O	O	O	
07-06	Brake start frequency	0.0~10.0	0.5	Hz	O	O	O	O	O	O	O	
07-07	DC brake current threshold	0~100	50	%	O	O	O	X	X	O	O	
07-08	DC braking time during stop	0.00~100.00	0.50	s	O	O	O	O	O	O	O	
07-09	Stop mode selection	0: Decelerate to stop	0	-	O	O	O	O	O	O	O	
		1: Free-run stop							O	O		
		2: Full-range DC brake stop							X	X		
		3: Free-run stop with timer							O	O		
07-10	Reserved											
07-11	Reserved											
07-12	Reserved											
07-13	Low voltage detection threshold	200V models: 150~300	190	V	O	O	O	O	O	O	O	
		400V models: 250~600	380									
07-14	Pre-excitation time	0.00~10.00	2.00	s	X	X	O	X	X	X	X	
07-15	Pre-excitation threshold	50~200	100	%	X	X	O	X	X	X	X	
07-16	DC braking time during start	0.00~100.00	0.00	s	O	O	O	O	O	O	O	
07-17	Reserved											
07-18	Minimum cut-off time	0.1~5.0	-	Sec	O	O	O	O	X	O	O	
07-19	Direction seeking current	0~100	50	%	O	X	O	X	X	X	O	
07-20	Speed seeking current	0~100	20	%	O	X	O	X	X	X	O	
07-21	Speed seeking integral time	0.1~10.0	2.0	Sec	O	X	O	X	X	X	O	
07-22	Speed seeking delay time	0.0~20.0	0.2	Sec	O	O	O	O	O	X	O	
07-23	Voltage recovery time	0.1~5.0	2.0	Sec	O	O	O	X	X	X	O	
07-24	Reserved											
07-25	Low voltage detection time	0.00~1.00	0.02	Sec	O	O	O	O	O	O	O	
07-26	SLV selection of starting method after free-run stop	0: Speed seeking start 1: Normal start	0	-	X	X	O	X	X	X	X	
07-27	SLV start method selection after malfunction	0: Speed seeking start 1: Normal start	0	-	X	X	O	X	X	X	X	

Group 07 operation stop function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
07-28	Start method selection after cut-off	0: Speed seeking start 1: Normal start	0	-	O	X	O	X	X	X	O	
07-29	Operation command selection during DC braking	0: Not allowed to start during the process 1: Allowed to start during the process	0	-	O	O	X	X	X	X	X	
07-30	Low voltage threshold selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
07-31	*Low voltage operation frequency	0.00~599.00	10.00	Hz	X	X	X	O	O	X	X	
07-32	Speed seeking mode selection	0: Invalid 1: Mode1: Execute speed seeking once after power on 2: Mode2: Execute speed seeking every time	0	-	O	O	O	O	X	O	X	
07-33	Speed seeking start frequency selection	0: Motor maximum output frequency 1: Frequency command	0	-	O	O	O	O	X	X	X	
07-34	Short-circuit brake time while starting	0.00~100.00	0.00	Sec	X	X	X	X	X	O	X	~~Note 1~~
07-35	Short-circuit brake time while stopping	0.00~100.00	0.50	Sec	X	X	X	X	X	O	X	~~Note 1~~
07-36	Short-circuit brake current limit	0.0~200.0	100.0	%	X	X	X	X	X	O	X	~~Note 1~~
07-37 ~ 07-41	Reserved											
07-42	Voltage limit gain	0.0~50.0	0	%	X	X	O	O	X	X	X	~~Note 2~~
07-43	PM speed seeking short-circuit brake time	0.00~100.00	0.00	Sec	X	X	X	X	X	O	X	~~Note 3~~
07-44	PM speed seeking DC brake time	0.00~100.00	0.00	Sec	X	X	X	X	X	O	X	~~Note 3~~
07-45	STP2 function selection	0: Valid 1: Invalid	0	-	O	O	O	O	O	O	O	~~Note 4~~
07-46	DC injection current limit	0~150	100	%	O	X	X	X	X	X	X	~~Note 5~~
07-47	PM speed switching frequency mode	0: Invalid 1: Mode 1 2: Mode 2	0	-	X	X	X	X	X	O	X	~~Note 8~~

Note: 07-13 low voltage detection threshold 440V models need to select and set the 07-30 low voltage threshold as valid, and then adjust the lower limit to 250V.
This applies to elevator function with EPS system (Emergency power supply) use.

Group 08 protection function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
08-00	Stall prevention function	xxx0b: Stall prevention effective during acceleration xxx1b: Stall prevention ineffective during acceleration xx0xb: Stall prevention effective during deceleration xx1xb: Stall prevention ineffective during deceleration x0xxb: Stall prevention effective during operation x1xxb: Stall prevention ineffective during operation 0xxxb: Stall prevention during operation is in accordance with stage one deceleration time 1xxxb: Stall prevention during operation is in accordance with stage two deceleration time	0000b	-	O	O	O	O	O	O	O	
08-01	Acceleration stall prevention threshold	20~200	150	%	O	O	O	X	X	O	O	
08-02	Deceleration stall prevention threshold	200V: 330V~410V 400V: 660V~820V	385V 770V	V	O	O	O	O	X	O	O	
08-03	Stall prevention threshold during operation	30~200	160	%	O	O	X	X	X	X	O	
08-04	Reserved											
08-05	Motor overload (OL1) protection selection	xxx0b: Motor overload ineffective xxx1b: Motor overload effective xx0xb: Motor overload cold start xx1xb: Motor overload hot start x0xxb: Standard motor x1xxb: Variable frequency motor 0xxxb: Reserved 1xxxb: Reserved	0001b	-	O	O	O	O	O	O	O	
08-06	Overload (OL1) protection action start method	0: Stop output after overload protection 1: Continue operation after overload protection	0	-	O	O	O	O	O	O	O	
08-07	Motor overload (OL1) protection threshold	0: Motor overload (OL1) protection 0 1: Motor overload (OL1) protection 1 2: Motor overload (OL1) protection 2	0	-	O	O	O	O	O	O	O	~~Note 2~~
08-08	Automatic voltage regulation function (AVR)	0: Valid 1: Invalid	0	-	O	O	O	O	O	O	O	
08-09	Input phase loss protection selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
08-10	Output phase loss protection selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
08-11 08-12	Reserved											
08-13	Overtorque detection selection	0: Overtorque detection ineffective 1: Detection begins after	0	-	O	O	O	O	O	O	O	

Group 08 protection function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
		reaching set frequency 2: Detection during operation										
08-14	Overtorque action selection	0: Deceleration stop after detection 1: Display warning and continue operation after detection 2: Free-run stop after detection	0	-	O	O	O	O	O	O	O	
08-15	Overtorque detection threshold	0~300	150	%	O	O	O	O	O	O	O	
08-16	Overtorque detection time	0.0~10.0	0.1	Sec	O	O	O	O	O	O	O	
08-17	Undertorque detection selection	0: Undertorque detection ineffective 1: Detection begins after reaching set frequency 2: Detection during operation	0	-	O	O	O	O	O	O	O	
08-18	Undertorque action selection	0: Deceleration stop after detection 1: Display warning and continue operation after detection 2: Free-run stop after detection	0	-	O	O	O	O	O	O	O	
08-19	Undertorque detection threshold	0~300	30	%	O	O	O	O	O	O	O	
08-20	Undertorque detection time	0.0~10.0	0.1	Sec	O	O	O	O	O	O	O	
08-21	Acceleration stall prevention limit	1~100	50	%	O	O	O	X	X	O	O	
08-22	Operation stall detection time	2~100	100	ms	O	O	O	X	X	O	O	
08-23	Grounding failure (GF) selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
08-24	External fault operation selection	0: Decelerate to stop 1: Free-run stop 2: Continues operation	0	-	O	O	O	O	O	O	O	
08-25	External fault detection selection	0: Detection upon power-on 1: Detection active only during operation	0	-	O	O	O	O	O	O	O	
08-26 ~ 08-29	Reserved											
08-30	Safety function selection	0: Decelerate to stop 1: Free-run stop	0	-	O	O	O	O	O	O	O	
08-31 ~ 08-34	Reserved											
08-35	Motor overheat fault selection	0: Invalid 1: Decelerate to stop 2: Free-run stop 3: Continue operating	0	-	O	O	O	O	O	O	O	
08-36	PTC input filter time constant	0.00 ~ 5.00	2.00	Sec	O	O	O	O	O	O	O	
08-37	Fan control function	0: Start during operation 1: Always start 2: Start during high temperature (note)	~~0~~ 2		O	O	O	O	O	O	O	
08-38	Fan close delay time	0~600	60	sec	O	O	O	O	O	O	O	
08-39	Motor overheat	1~300	60	sec	O	O	O	O	O	O	O	

Group 08 protection function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
	protection delay time											
08-40	Motor 2 acceleration stall prevention threshold	20~200	150	%	O	O	X	X	X	X	O	
08-41	Motor 2 acceleration stall prevention limit	1~100	50	%	O	O	X	X	X	X	O	
08-42	PTC protection threshold	0.1~10.0V	0.7	V	O	O	O	O	O	O	O	
08-43	PTC reset threshold	0.1~10.0V	0.3	V	O	O	O	O	O	O	O	
08-44	PTC warning threshold	0.1~10.0V	0.5	V	O	O	O	O	O	O	O	
08-45	Reserved											
08-46	Over-temperature protection threshold	0~254	0	°C	O	O	O	O	O	O	O	
08-47	Over-temperature reset threshold	0~254	0	°C	O	O	O	O	O	O	O	
08-48	Fire mode selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
08-49	Fire mode digital input type	0: Power failure reset 1: Terminal removal reset	0	-	O	O	O	O	O	O	O	
08-50	Fire mode digital terminal status	XXX0B: S6 A contact XXX1B: S6 B contact	0000b	-	O	O	O	O	O	O	O	
08-51	Fire mode motor rotation speed selection	0: Fire mode operation 1: PID frequency command 2: AI2 frequency command	0	-	O	O	O	O	O	O	O	
08-52	Fire mode motor rotation speed	0~100.00	100.00	%	O	O	O	O	O	O	O	
08-53	Fire mode PID detection threshold	0~100	0	%	O	O	O	O	O	O	O	
08-54	Fire mode PID disconnection delay	0~10.0	1.0	s	O	O	O	O	O	O	O	
08-55	Fire mode PID disconnection action selection	0: Current speed 1: Fire mode speed (08-52) 2: Motor 1 maximum frequency (01-02)	1	-	O	O	O	O	O	O	O	
08-56	Fire mode AI2 type detection threshold	0.0~100.0	80.0	%	O	O	O	O	O	O	O	
08-57	Fire mode AI2 mode disconnection delay	0.0~10.0	1.0	s	O	O	O	O	O	O	O	
08-58	Fire mode AI2 mode disconnection action selection	0: Current speed 1: Fire mode speed (08-52) 2: Motor 1 maximum frequency (01-02)	1	-	O	O	O	O	O	O	O	
08-59	Fire mode motor direction	0: Forward 1: Reverse	0	-	O	O	O	O	O	O	O	
08-60	Fire mode password	0~65534	0	-	O	O	O	O	O	O	O	
08-61	Capacitor maintenance setting	0: Invalid 1: Valid	0	-								
08-64	Keypad selection	0:E710 Keypad 1:T310 Keypad 2:A510S Keypad	0	-	O	O	O	O	O	O	O	
08-65	Cooling fan maintenance setting	0~9999	0	-	O	O	O	O	O	O	O	
08-66	IGBT maintenance setting	0~150	0	-	O	O	O	O	O	O	O	

Note: 200V 50HP and above and 400V 100HP and above models do not have the option to start fan control when there is high temperature

<table>
<tr><th colspan="14">Group 09 communication function group</th></tr>
<tr><th rowspan="2">Code</th><th rowspan="2">Parameter name</th><th rowspan="2">Scope</th><th rowspan="2">Factory settings</th><th rowspan="2">Unit</th><th colspan="7">Control mode
* (V/F+PG, SV, PMSV are only for special projects)</th><th rowspan="2">Attribute</th></tr>
<tr><th>V/F</th><th>V/F +PG</th><th>SLV</th><th>SV</th><th>PM SV</th><th>PM SLV</th><th>SLV2</th></tr>
<tr><td>09-00</td><td>Inverter communication station</td><td>1~31</td><td>1</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-01</td><td>Communication mode selection</td><td>0: MODBUS
3: PUMP parallel communication</td><td>0</td><td></td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-02</td><td>Serial transmission speed setting (bps)</td><td>0:1200
1:2400
2:4800
3:9600
4:19200
5:38400</td><td>4</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-03</td><td>Stop bit selection</td><td>0: 1 Stop bit
1: 2 Stop bit</td><td>0</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-04</td><td>Parity bit selection</td><td>0: No parity
1: Even parity bit selection
2: Odd parity selection</td><td>0</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-05</td><td>Communication data bit selection</td><td>0: 8-bit data
1: 7-bit data</td><td>0</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-06</td><td>Communication abnormality detection time</td><td>0.0~25.5</td><td>0.0</td><td>S</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-07</td><td>Fault stop selection</td><td>0: Decelerates to stop using deceleration time 1 after communication failure
1: Free-run stop after communication failure
2: Decelerates to stop using deceleration time 2 after communication failure
3: Continues operation after communication failure</td><td>3</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-08</td><td>Communication fault tolerance count</td><td>1~20</td><td>1</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-09</td><td>Wait time</td><td>5~65</td><td>5</td><td>ms</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>*3</td></tr>
<tr><td>09-10</td><td colspan="13">Reserved</td></tr>
<tr><td>09-11</td><td>Bluetooth communication selection</td><td>0: Invalid
1: Valid</td><td>0</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td></td></tr>
<tr><td>09-15</td><td>Communication expansion card selection (Frame1 has no communication expansion card)</td><td>0: Invalid
1: Valid</td><td>0</td><td>-</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td>O</td><td></td></tr>
</table>

*3 09 group not affected by 13-08 initialization.

Group 10 PID function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
10-00	PID target value source setting	0: Assigned by PUMP function target (see Group 23) 1: Assigned via AI1 2: Assigned via AI2 3: Assigned via pulse input 4: Assigned via parameter 10-02 5: Reserved 6: Frequency command (00-05) 8: Assigned via panel VR	1	-	O	O	O	O	O	O	O	
10-01	PID feedback value source setting	1: Assigned via AI1 2: Assigned via AI2 3: Assigned via pulse input	2	-	O	O	O	O	O	O	O	
10-02	PID target value	0.00~100.00	0.00	%	O	O	O	O	O	O	O	*1
10-03	PID control mode	xxx0b: PID invalid xxx1b: PID valid xx0xb: PID positive characteristic xx1xb: PID negative characteristic x0xxb: PID error value D control x1xxb: PID feedback value D control 0xxxb: PID output 1xxxb: PID output + frequency command	0000b	-	O	O	O	O	O	O	O	
10-04	Feedback gain	0.01~10.00	1.00	-	O	O	O	O	O	O	O	*1
10-05	Proportional gain (P)	0.00~10.00	1.00	-	O	O	O	O	O	O	O	*1
10-06	Integral time (I)	0.00~100.00	1.00	s	O	O	O	O	O	O	O	*1
10-07	Derivative time (D)	0.00~10.00	0.00	s	O	O	O	O	O	O	O	*1
10-08	AI1 frequency limit	0.00~599.00	0	Hz	O	O	O	O	O	O	O	Note 2
10-09	PID bias voltage	-100.0~100.0	0	%	O	O	O	O	O	O	O	*1
10-10	PID output delay time	0.00~10.00	0.00	s	O	O	O	O	O	O	O	*1
10-11	PID feedback disconnection detection	0: Invalid 1: Warning 2: Failure	0	-	O	O	O	O	O	O	O	
10-12	PID feedback disconnection detection threshold	0~100	0	%	O	O	O	O	O	O	O	
10-13	PID feedback disconnection detection time	0.0~10.0	1.0	s	O	O	O	O	O	O	O	
10-14	PID integral limit	0.0~100.0	100.0	%	O	O	O	O	O	O	O	*1
10-15	PID change mode	0~2	0	-	O	O	O	O	O	O	O	~~Note 2~~
10-16	PID change scale	0~100	100	%	O	O	O	O	O	O	O	*1 ~~Note 2~~
10-17	*PID sleep start frequency	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
10-18	PID sleep delay time	0.0~255.5	0.0	s	O	O	O	O	O	O	O	
10-19	*PID wake-up start frequency	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
10-20	PID wake-up delay time	0.0~255.5	0.0	s	O	O	O	O	O	O	O	
10-21	Reserved											
10-22	PID1/PID2 frequency switching point	0.00~599.00	0.00	Hz	O	O	O	O	O	O	O	
10-23	PID output limit	0.00~100.0	100.0	%	O	O	O	O	O	O	O	*1
10-24	PID output gain	0.0~25.0	1.0	-	O	O	O	O	O	O	O	
10-25	PID reverse output	0: Reverse output not	0	-	O	O	O	O	O	O	O	

Group 10 PID function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
	selection	allowed 1: Reverse output allowed										
10-26	PID target acceleration/deceleration time	0.0~25.5	0.0	s	O	O	O	O	O	O	O	
10-27	PID feedback display bias voltage	0~9999	0	-	O	O	O	O	O	O	O	
10-28	Reserved											
10-29	PID sleep selection	0: Invalid 1: Valid 2: Set by DI	1	-	O	O	O	O	O	O	O	
10-30	PID target upper limit	0.0 ~ 100.0	100.0	%	O	O	O	O	O	O	O	
10-31	PID target lower limit	0.0 ~ 100.0	0.0	%	O	O	O	O	O	O	O	
10-32	Reserved											
10-33	PID feedback maximum value	1 ~ 10000	999	-	O	O	O	O	O	O	O	
10-34	PID decimal width	0 ~ 4	1		O	O	O	O	O	O	O	
10-35	PID unit	0：% 1：FPM 2：CFM 3：SPI 4：GPH 5：GPM 6：IN 7：FT 8：/s 9：/m 10：/h 11：°F 12：inW 13：HP 14：m/s 15：MPM 16：CMM 17：W 18：KW 19：m 20：°C 21：RPM 22：Bar 23：Pa 24：KPa	0		O	O	O	O	O	O	O	*7
10-36	PID2 proportional gain (P)	0.00~10.00	3.00	-	O	O	O	O	O	O	O	*1 ~~Note 2~~
10-37	PID2 integral time (I)	0.00~100.00	0.50	Sec	O	O	O	O	O	O	O	*1 ~~Note 2~~
10-38	PID2 derivative time (D)	0.00~10.00	0.00	Sec	O	O	O	O	O	O	O	*1 ~~Note 2~~
10-39	*PID disconnection output frequency setting	00.00~599.00	30.00	Hz	O	O	O	O	O	O	O	

Group 10 PID function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
10-40	PID forced sleep frequency operation selection	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	
10-41	PID mode switch	0: General PID 1:D-type PID	0	-	O	O	O	O	O	O	O	~~Note 2~~
10-42 ~ 10-46	Reserved											
10-47	Proportional gain 3 (P)	0.00~10.00	1.00		O	O	O	O	O	O	O	Note 4
10-48	Integral time 3 (I)	0.00~100.00	1.00	Sec	O	O	O	O	O	O	O	~~Note 4~~
10-49	Derivative time 3 (D)	0.00~10.00	0.00	Sec	O	O	O	O	O	O	O	~~Note 4~~

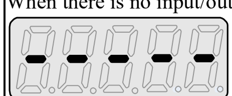
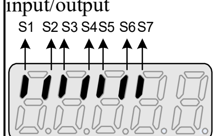
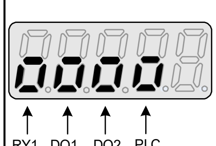
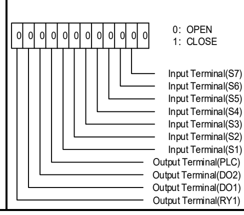
Group 11 auxiliary function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
11-00	Motor direction locking command	0: Allow forward and reverse rotation 1: Only allow forward 2: Only allow reverse rotation	0	-	O	O	O	O	O	O	O	
11-01	Carrier frequency	2~16: 2~16KHz	4	-	O	O	O	O	O	O	O	
11-02	Soft modulation selection	0: Invalid 1: Soft modulation 1 2: Soft modulation 2	0	-	O	O	O	O	O	O	O	
11-03	Automatic carrier reduction selection	0: Invalid 1: Valid	0	-	O	O	X	X	X	X	O	
11-04	Acceleration start S curve time setting	0.00~2.50	0.20	s	O	O	O	O	O	O	O	
11-05	Acceleration end S curve time setting	0.00~2.50	0.20	s	O	O	O	O	O	O	O	
11-06	Deceleration start S curve time setting	0.00~2.50	0.20	s	O	O	O	O	O	O	O	
11-07	Deceleration end S curve time setting	0.00~2.50	0.20	s	O	O	O	O	O	O	O	
11-08	Jump frequency 1	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
11-09	Jump frequency 2	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
11-10	Jump frequency 3	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
11-11	Jump frequency width	0.0~25.5	1.0	Hz	O	O	O	O	O	O	O	
11-12	Manual energy-saving gain	0~100	80	%	O	O	X	X	X	X	X	
11-13	Automatic return time	0~120	60	Sec	O	O	O	O	O	O	O	*1
11-14 ~ 11-17	Reserved											
11-18	Manual energy-saving frequency	0.0~599.0	0.00	Hz	O	O	X	X	X	X	X	
11-19	Automatic energy-saving function	0: Automatic energy-saving ineffective 1: Automatic energy-saving effective	0	-	O	X	X	X	X	X	X	
11-20	Automatic energy-saving filter time	0~200	140	ms	O	X	X	X	X	X	X	
11-21	Energy-saving adjustment voltage upper limit	0~100	100	%	O	X	X	X	X	X	X	
11-22	Energy-saving adjustment time	0~5000	20	ms	O	X	X	X	X	X	X	*1

Group 11 auxiliary function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
11-23	Energy-saving detection threshold	0~100	10	%	O	X	X	X	X	X	X	
11-24	Automatic energy-saving coefficient	0.00~655.34 (Note 4)	-	-	O	X	X	X	X	X	X	
11-25	Reserved											
11-26	Carrier frequency adjustment upper limit with output frequency (%)	10~100	80	%	X	X	X	X	X	O	X	
11-27	Carrier frequency adjustment lower limit with output frequency (%)	2~100	20	%	X	X	X	X	X	O	X	
11-28	Over-voltage prevention 2 frequency gain	1~200	100	%	O	O	X	X	X	X	X	
11-29	Automatic output frequency reduction selection	0: Invalid 1: Valid	0	-	O	X	X	X	X	X	O	
11-30	Variable carrier frequency maximum limit	2~16	-	KHz	O	O	X	X	X	X	O	
11-31	Variable carrier frequency minimum limit	1~16	-	KHz	O	O	X	X	X	X	O	
11-32	Variable carrier frequency gain	00~99	00	-	O	O	X	X	X	X	O	
11-33	DC voltage filter rise rate	0.1~10.0	0.1	Vdc	O	O	X	X	X	X	X	*1
11-34	DC voltage filter drop rate	0.1~10.0	5.0	Vdc	O	O	X	X	X	X	X	*1
11-35	DC voltage filter dead zone threshold	0.0~99.0	10.0	Vdc	O	O	X	X	X	X	X	*1
11-36	Over-voltage prevention frequency gain	0.000~1.000	0.050	-	O	O	X	X	X	X	X	*1
11-37	**Over-voltage prevention frequency limit	*0.00~599.00	5.00	Hz	O	O	X	X	X	X	X	
11-38	Over-voltage prevention deceleration start voltage	200V: 200~400V 400V: 400~800V	300 700	V	O	O	X	X	X	X	X	
11-39	Over-voltage prevention deceleration stop voltage	200V: 300~400V 400V: 600~800V	350 750	V	O	O	X	X	X	X	X	
11-40	Over-voltage prevention selection	0: Invalid 1: Over-voltage prevention mode 1 2: Over-voltage prevention mode 2 3: Over-voltage prevention mode 3 4: Over-voltage prevention mode 4	0	-	O	O	X	X	X	X	X	
11-41	Reference frequency loss detection selection	0: When reference frequency is lost, deceleration stops 1: When reference frequency is lost, operate according to the setting of 11-42	0	-	O	O	O	O	O	O	O	
11-42	Frequency command when the reference frequency is lost	0.0~100.0	80.0	%	O	O	O	O	O	O	O	
11-43	Lock frequency during startup	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
11-44	Start-Up Frequency	0.0~10.0	0.0	s	O	O	O	O	O	O	O	

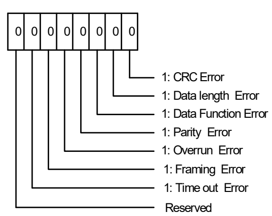
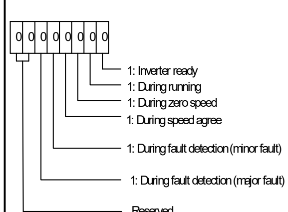
Group 11 auxiliary function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
	Hold Time											
11-45	Lock frequency when stopped	0.0~599.0	0.0	Hz	O	O	O	O	O	O	O	
11-46	Lock time of frequency when stopped	0.0~10.0	0.0	s	O	O	O	O	O	O	O	
11-47	KEB deceleration time	0.0~25.5	0.0	s	O	O	X	X	X	X	O	*1
11-48	KEB detection threshold	200V: 190~210 400V: 380~420	200 400	V	O	O	X	X	X	X	O	
11-49	Zero servo gain	0.01~5.00	1.00	-	X	X	X	O	O	X	X	
11-50	Zero servo count	0~4096	12	-	X	X	X	O	O	X	X	
11-51	Zero speed brake selection	0: Zero speed DC brake ineffective 1: Zero speed DC brake effective	0	-	O	X	X	X	X	X	O	
11-52	Droop control threshold	0.0~100.0%	0.0	%	X	X	O ~~(Note 4)~~	O	O	O ~~(Note 4)~~	X	*1
11-53	Droop control delay	0.01~2.00	0.2	s	X	X	O ~~(Note 4)~~	O	O	O ~~(Note 4)~~	X	*1
11-54	Cumulative energy initialization	0: Do not clear cumulative energy 1: Clear cumulative energy	0	-	O	O	O	O	O	O	O	*1
11-55	STOP button selection	0: When the operation command is not provided by the operator, the stop button is ineffective 1: When the operation command is not provided by the operator, the stop button is effective	1	-	O	O	O	O	O	O	O	
11-56	UP/DOWN selection	0: When the operator UP/DOWN is effective, ENTER must be pressed after modifying the frequency in order for it to become effective 1: When the operator UP/DOWN is effective, the frequency is effective immediately after it is modified	0	-	O	O	O	O	O	O	O	
11-57	Reserved											
11-58	Record reference frequency	0: Invalid 1: Valid	0	-	O	O	O	O	O	O	O	*1
11-59	Prevent oscillation gain	0.00~2.50	*		O	O	X	X	X	X	O	
11-60	Prevent oscillation upper limit	1~100	*	%	O	O	X	X	X	X	O	
11-61	Prevent oscillation time parameter	0~100	0		O	O	X	X	X	X	O	
11-62	Prevent oscillation selection	0: Mode 1 1: Mode 2 2: Mode 3	2	-	O	O	X	X	X	X	O	
11-63	Strong magnetic selection	0: Invalid 1: Valid	1	-	X	X	O	O	X	X	X	
11-64	Acceleration rate adjustment gain	0.1~10.0	1.0	-	O	X	X	X	X	X	O	
11-65	Target main circuit voltage	200V: 200V~400V 400V: 400V~800V	370 740	-	O	X	X	X	X	X	O	

Group 11 auxiliary function group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)								Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2		
11-66	Modulation mode switching starting frequency	6.00~60.00	20	Hz	O	O	O	O	X	O	O		*1 ~~Note 2~~
11-67	Soft modulation 2 detection range	0~12000	0	Hz	X	X	O	O	O	O	X		~~Note 2~~
11-68	Soft modulation 2 detection starting frequency	6.00~60.00	20	Hz	X	X	O	O	O	O	X		~~Note 2~~
11-69	Prevent oscillation gain	0.00~200.00	2.00	%	O	O	X	X	X	X	X		~~Note 1~~
11-70	Prevent oscillation upper limit	0.01~100.00	5.00	%	O	O	X	X	X	X	X		~~Note 1~~
11-71	Prevent oscillation time constant	0~30000	100	ms	O	O	X	X	X	X	X		~~Note 1~~
11-72	Prevent oscillation gain switching frequency 1	0.01~300.00	2.00	Hz	O	O	X	X	X	X	X		~~Note 1~~
11-73	Prevent oscillation gain switching frequency 2	0.01~300.00	7.00	Hz	O	O	X	X	X	X	X		~~Note 1~~
11-76	Droop frequency threshold 1	0.00~599.00	0.00	Hz	X	X	O	O	O	O	X		~~Note 4~~
11-77	Droop frequency threshold 2	0.00~599.00	0.00	Hz	X	X	O	O	O	O	X		~~Note 4~~
11-78	Droop torque offset	0.00~100.00	0.00	%	X	X	O	O	O	O	X		~~Note 4~~
11-79	LOC/REM panel button selection	0: Forward and reverse rotation control 1: Local/remote control	0	-	O	O	O	O	O	O	O		
11-80	Local/remote selection mode	0: Allow switching directly 1: Switching prohibited during operation 2: Stop operation after switching	~~0~~	-	O	O	O	O	O	O	O		
11-81	OVP4 threshold (%)	1.00~2.00	1.10	~~%~~	O	O	O	O	X	X	O		
11-82	OVP4 gain	0~256	64	-	O	O	O	O	X	X	O		

*: Please refer to the descriptions in Appendix One

Group 12 monitor function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
12-00	Display screen selection (LED)	00000~77777 Starting from the left-most number, this is the sequence of the screens that will be displayed after pressing the DSP buttons 1: Output current 2: Output voltage 3: DC bus voltage 4: Heatsink temperature* 5: PID feedback 6: AI1 value 7: AI2 value	00321 (Note 4)	-	O	O	O	O	O	O	O	*1 *6
12-01	PID feedback display mode (LED)	0: Use integers to display the feedback value (xxx) 1: Use one decimal place to show the feedback value (xx.x) 2: Use two decimal places to show the feedback value (x.xx)	0		O	O	O	O	O	O	O	*6
12-02	PID feedback display unit setting (LED)	0: xxxxx (no unit) 1: xxxPb (pressure) 2: xxxFL (flow rate)	0		O	O	O	O	O	O	O	*6
12-03	Linear speed display (LED)	0~60000	1500/ 1800	RPM	O	O	O	O	O	O	O	*6
12-04	Linear speed display mode (LED)	0: Display inverter output frequency 1: Use integers to display the linear speed (xxxxx) 2: Use 1 decimal place to display the linear speed (xxxx.x) 3: Use 2 decimal places to display the linear speed (xxx.xx) 4: Use 3 decimal places to display the linear speed (xx.xxx)	0	-	O	O	O	O	O	O	O	*6
12-05	Display the digital input/output terminal status (LED/LCD)	The LED display is as follows When there is no input/output  Correspondence when there is input/output   The LCD display is as follows 	-		O	O	O	O	O	O	O	

Group 12 monitor function group													
Code	**Parameter name**	**Scope**	**Factory settings**	**Unit**	**Control mode** * **(V/F+PG, SV, PMSV** are only for special projects)							**Attribute**
					V/F	**V/F +PG**	**SLV**	**SV**	**PM SV**	**PM SLV**	**SLV2**	
12-06 ~ 12-10	Reserved											
12-11	Output current during current failure	Displays the output current during the current failure	-	A	O	O	O	O	O	O	O	
12-12	Output voltage during current failure	Displays the output voltage during the current failure	-	V	O	O	O	O	O	O	O	
12-13	Output frequency during current failure	Displays the output frequency during the current failure	-	Hz	O	O	O	O	O	O	O	
12-14	DC voltage during current failure	Displays the DC voltage during the current failure	-	V	O	O	O	O	O	O	O	
12-15	Frequency command during current failure	Displays the frequency command during the current failure	-	Hz	O	O	O	O	O	O	O	
12-16	Frequency command	When the LED enters this parameter, only monitor frequency commands are allowed	-	Hz	O	O	O	O	O	O	O	
12-17	Output frequency	Displays the current output frequency	-	Hz	O	O	O	O	O	O	O	
12-18	Output current	Displays the current output current	-	A	O	O	O	O	O	O	O	
12-19	Output voltage	Displays the current output voltage	-	V	O	O	O	O	O	O	O	
12-20	DC voltage (Vdc)	Displays the current DC voltage	-	V	O	O	O	O	O	O	O	
12-21	Output power (kw)	Displays the current output power	-	kW	O	O	O	O	O	O	O	
12-22	Motor speed (rpm)	Displays the current motor speed In VF/SLV mode motor speed = output frequency x $\frac{120}{\text{Motor number of poles}}$ In PG/SV/PMSV mode, the motor speed is calculated based on the feedback frequency **(The maximum limit of motor speed (rpm) is 65535)**	-	rpm	O	O	O	O	O	O	O	
12-23	Output power factor (Pfo)	Displays the current output power factor	-	-	O	O	O	O	O	O	O	
12-24	Control mode	Displays the control mode 0: VF 1: PG 2: SLV 3: SV 4: PSV 5: PMSLV 6: SLV2	-	-	O	O	O	O	O	O	O	
12-25	AI1 input	Displays the current AI1 input (-10V corresponds to -100%, 10V corresponds to 100%,)	-	%	O	O	O	O	O	O	O	
12-26	AI2 input	Displays the current AI2 input (0V or 4mA corresponds to 0%, 10V or 20mA corresponds to 100%)	-	%	O	O	O	O	O	O	O	
12-27	Motor torque	Displays the current torque command (100% corresponds to the motor torque)	-	%	X	X	O	O	O	O	X	
12-28	Motor torque current (Iq)	Displays the current q-axis current	-	%	X	X	O	O	O	O	X	
12-29	Motor excitation current (Id)	Displays the current d-axis current	-	%	X	X	O	O	O	O	X	
12-30	ASR deviation amount	Displays the deviation amount of the speed controller (speed command - feedback speed) (100% corresponds to the maximum frequency set for 01-02)	-	%	X	O	X	O	O	X	X	
12-31	Reserved											
12-32	ASR output	Displays the output value of the speed controller (100% corresponds to the maximum	-	%	X	O	X	O	O	X	X	

Group 12 monitor function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
		frequency set for 01-02)										
12-33	PG feedback	Displays the speed feedback value of the speed controller (100% corresponds to the maximum frequency set for 01-02)	-	%	X	O	X	O	O	X	X	
12-34	PG pulse count	Displays the pulse count of the speed controller	-	Pulse	X	O	X	O	O	X	X	~~Note 4~~
12-35	Zero servo pulse count	Displays the zero speed servo position error pulse count in SV position mode (The resolution is four times the 20-27 PG pulse count)	-	Pulse	X	X	X	O	O	X	X	
12-36	PID control input	Displays the error input of the PID controller (PID target value - PID feedback) (100% corresponds to the maximum frequency set for 01-02 or 01-16)	-	%	O	O	O	O	O	O	O	
12-37	PID output	Displays the output of the PID controller (100% corresponds to the maximum frequency set for 01-02 or 01-16)	-	%	O	O	O	O	O	O	O	
12-38	PID setting	Displays the target value of the PID controller (100% corresponds to the maximum frequency set for 01-02 or 01-16)	-	%	O	O	O	O	O	O	O	
12-39	PID feedback	Displays the feedback value of the PID controller (100% corresponds to the maximum frequency set for 01-02 or 01-16)	-	%	O	O	O	O	O	O	O	
12-40	Reserved											
12-41	Inverter temperature display	Displays the temperature of the heatsink or IGBT**	*	°C	O	O	O	O	O	O	O	
12-42	RS-485 error code		-	-	O	O	O	O	O	O	O	
12-43	Inverter status		-	-	O	O	O	O	O	O	O	
12-44	Pulse input frequency	Displays the frequency value of the pulse input	-	Hz	O	O	O	O	O	O	O	
12-45	Recent failure information	Displays information on the current failure	-	-	O	O	O	O	O	O	O	
12-46	Previous failure information	Displays information on the previous failure	-	-	O	O	O	O	O	O	O	
12-47	Previous two failure information	Displays information on the previous two failures	-	-	O	O	O	O	O	O	O	
12-48	Previous three failure information	Displays information on the previous three failures	-	-	O	O	O	O	O	O	O	

Group 12 monitor function group

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
12-49	Previous four failure information	Displays information on the previous four failures	-	-	O	O	O	O	O	O	O	
12-50	DI/DO status of the current failure	Displays the DI/DO status of the current failure; the description is the same as 12-05	-	-	O	O	O	O	O	O	O	
12-51	Inverter status of the current failure	Displays the inverter status during the current failure; the description is the same as 12-43	-	-	O	O	O	O	O	O	O	
12-52	Fault trip time 1 of the current failure	Displays the operation time during the current failure; 12-53 is its number of days and 12-52 is the number of hours if it is less than a day.	-	Hr	O	O	O	O	O	O	O	
12-53	Fault trip time 2 of the current failure		-	day	O	O	O	O	O	O	O	
12-54	Frequency command of the previous failure	Displays the frequency command during the previous failure	-	Hz	O	O	O	O	O	O	O	
12-55	Output frequency of the previous failure	Displays the output frequency during the previous failure	-	Hz	O	O	O	O	O	O	O	
12-56	Output current of the previous failure	Displays the output current during the previous failure	-	A	O	O	O	O	O	O	O	
12-57	Output voltage of the previous failure	Displays the output voltage during the previous failure	-	V	O	O	O	O	O	O	O	
12-58	DC voltage of the previous failure	Displays the DC voltage during the previous failure	-	V	O	O	O	O	O	O	O	
12-59	DI/DO status of the previous failure	Displays the DI/DO status of the previous failure; the description is the same as 12-05	-	-	O	O	O	O	O	O	O	
12-60	Inverter status of the previous failure	Displays the inverter status during the previous failure; the description is the same as 12-43	-	-	O	O	O	O	O	O	O	
12-61	Fault trip time 1 of the previous failure	Displays the operation time during the previous failure; 12-62 is its number of days and 12-61 is the number of hours if it is less than a day.	-	Hr	O	O	O	O	O	O	O	
12-62	Fault trip time 2 of the previous failure		-	day	O	O	O	O	O	O	O	
12-63	Recent warning messages	Displays the current warning message	-	-	O	O	O	O	O	O	O	
12-64	Previous warning message	Displays the previous warning message	-	-	O	O	O	O	O	O	O	
12-65	Motor starting angle	0~360	-	-	X	X	X	X	O	X	X	
12-66	Encoder angle	0~360	-	-	X	O	X	O	O	X	X	
12-67	Cumulative energy (KWHr)	0.0 ~ 999.9		kWHr	O	O	O	O	O	O	O	
12-68	Cumulative energy (MWHr)	0 ~ 60000		MWHr	O	O	O	O	O	O	O	
12-69	Reserved											
12-70	Reserved											
12-71	Reserved											
12-72	RTC date	12.01.01 ~ 99.12.31	-		O	O	O	O	O	O	O	
12-73	RTC time	00:00 ~ 23:59	00:00		O	O	O	O	O	O	O	
12-74	Work pressure setting	0.01 ~ 25.50	2.00	PSI	O	X	X	X	X	X	O	
12-75	Feedback pressure value	0.01 ~ 25.50	-	PSI	O	X	X	X	X	X	O	
12-76	Actual no-load voltage	0.0~600.0	-	V	X	X	O	X	X	X	X	
12-77	Reserved											
12-78	Z-phase deviation value	-9999~9999	-	Pulse	X	X	X	O	O	X	X	
12-79	Pulse input percentage	0.0~100.0	-	%	O	O	O	O	O	O	O	
12-80	AI1 frequency command	0.0~599.0	0	Hz	O	O	O	O	O	O	O	~~Note 2~~
12-81	Reserved											
12-82	Motor load	0~200.0	-	%	O	O	O	O	O	O	O	~~Note 4~~
12-85	Reserved											
12-86	Error status during alarm	0~65534	-	-	O	O	O	O	O	O	O	
12-87	Capacitor life inspection percentage	0.0~200.0	0	%	O	O	O	O	O	O	O	

*: Please refer to the descriptions in Appendix One

Group 13 maintenance function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
13-00	Inverter horse power	----	-	-	O	O	O	O	O	O	O	*4
13-01	Software version	0.00-9.99	-	-	O	O	O	O	O	O	O	*4
13-02	Cumulative working time clearing function	0: Do not clear the cumulative working time 1: Clear the cumulative working time	0	-	O	O	O	O	O	O	O	*1
13-03	Cumulative working time 1	0~23	-	hr	O	O	O	O	O	O	O	*4
13-04	Cumulative working time 2	0~65534 (Note 4)	-	day	O	O	O	O	O	O	O	*4
13-05	Cumulative working time selection	0: Cumulative time while power is connected 1: Cumulative time during operation	0	-	O	O	O	O	O	O	O	*1
13-06	Parameter lock	0: All parameters besides 13-06 and frequency 05-01 on the home page cannot be written 1: User-defined parameter 2: All parameters are writable	2	-	O	O	O	O	O	O	O	*1
13-07	Password function	00000~65534	00000	-	O	O	O	O	O	O	O	~~Note 2~~
13-08	Restore factory settings	0: Do not initialize 2: 2-wire type initialization (60Hz) (220/440V) 3: 3-wire type initialization (60Hz) (220/440V) 4: 2-wire type initialization (50Hz) (230/415V) 5: 3-wire type initialization (50Hz) (230/415V) 6: 2-wire type initialization (50Hz) (200/380V) 7: 3-wire type initialization (50Hz) (200/380V) 8: PLC initialization 9: 2-wire type initialization (60Hz) (230\460V) 10: 3-wire type initialization (60Hz) (230/460V) 11: 2-wire type initialization (60Hz)(230/400V) 12: 3-wire type initialization (60Hz)(230/400V) 13: 2-wire type initialization (50Hz)(230/400V) 14: 3-wire type initialization (50Hz)(230/400V) 15: 2-wire type initialization (Note 4) (50Hz)(220/380V) 16: 3-wire type initialization (Note 4) (50Hz)(220/380V) 17: 2-wire type initialization (60Hz)(200/380V) 18: 3-wire type initialization (60Hz)(200/380V)	-	-	O	O	O	O	O	O	O	
13-09	Failure history clearing	0: Do not clear the failure	0	-	O	O	O	O	O	O	O	*1

Group 13 maintenance function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
	function	history 1: Clear the failure history										
13-10	Reserved											
13-11	CB2 software version	0.00~9.99	-	-	O	O	O	O	O	O	O	*4
13-12	Optional card Id	0~255	0		O	O	O	O	O	O	O	*5
13-13	Optional card CPLD software version.	0.00~9.99	-		O	O	O	O	O	O	O	*5
13-14	Failure saving selection	0: Automatic reset and restart failure messages are not saved in the failure history 1: Automatic reset and restart failure messages are saved in the failure history	1		O	O	O	O	O	O	O	
13-15 ~ 13-20	Reserved											
13-21	Previous failure information	Displays information on the previous failure	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-22	Previous two failure information	Displays information on the previous two failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-23	Previous three failure information	Displays information on the previous three failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-24	Previous four failure information	Displays information on the previous four failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-25	Previous five failure information	Displays information on the previous five failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-26	Previous six failure information	Displays information on the previous six failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-27	Previous seven failure information	Displays information on the previous seven failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-28	Previous eight failure information	Displays information on the previous eight failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-29	Previous nine failure information	Displays information on the previous nine failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-30	Previous ten failure information	Displays information on the previous ten failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-31	Previous eleven failure information	Displays information on the previous eleven failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-32	Previous twelve failure information	Displays information on the previous twelve failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-33	Previous thirteen failure information	Displays information on the previous thirteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-34	Previous fourteen failure information	Displays information on the previous fourteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-35	Previous fifteen failure information	Displays information on the previous fifteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-36	Previous sixteen failure information	Displays information on the previous sixteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-37	Previous seventeen failure information	Displays information on the previous seventeen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-38	Previous eighteen failure information	Displays information on the previous eighteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-39	Previous nineteen failure information	Displays information on the previous nineteen failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-40	Previous twenty failure information	Displays information on the previous twenty failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-41	Previous twenty-one failure information	Displays information on the previous twenty-one failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-42	Previous twenty-two failure information	Displays information on the previous twenty-two failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-43	Previous twenty-three failure information	Displays information on the previous twenty-three failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-44	Previous twenty-four	Displays information on the	-	-	O	O	O	O	O	O	O	~~Note 1~~

Group 13 maintenance function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
	failure information	previous twenty-four failures										
13-45	Previous twenty-five failure information	Displays information on the previous twenty-five failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-46	Previous twenty-six failure information	Displays information on the previous twenty-six failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-47	Previous twenty-seven failure information	Displays information on the previous twenty-seven failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-48	Previous twenty-eight failure information	Displays information on the previous twenty-eight failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-49	Previous twenty-nine failure information	Displays information on the previous twenty-nine failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-50	Previous thirty failure information	Displays information on the previous thirty failures	-	-	O	O	O	O	O	O	O	~~Note 1~~
13-51	Cooling fan cumulative operation time	0~99999	0	-	O	O	O	O	O	O	O	
13-52	Cooling fan life inspection percentage	0~150	0	%	O	O	O	O	O	O	O	
13-53	IGBT life inspection percentage	0~150	0	%	O	O	O	O	O	O	O	

Note: The LCD primary frequency setting page is 12-16, which is the same as segment 0 speed frequency command 05-01.

Group 14 PLC setting group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
14-00	T1 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-01	T1 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-02	T2 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-03	T2 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-04	T3 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-05	T3 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-06	T4 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-07	T4 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-08	T5 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-09	T5 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-10	T6 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-11	T6 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-12	T7 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-13	T7 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-14	T8 setting value 1	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-15	T8 setting value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-16	C1 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-17	C2 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-18	C3 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-19	C4 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-20	C5 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-21	C6 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-22	C7 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-23	C8 setting value	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-24	AS1 setting value 1	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-25	AS1 setting value 2	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-26	AS1 setting value 3	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-27	AS2 setting value 1	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~

Group 14 PLC setting group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
14-28	AS2 setting value 2	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-29	AS2 setting value 3	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-30	AS3 setting value 1	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-31	AS3 setting value 2	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-32	AS3 setting value 3	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-33	AS4 setting value 1	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-34	AS4 setting value 2	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-35	AS4 setting value 3	0~65534 (Note 4)	0	-	O	O	O	O	O	O	O	~~Note 6~~
14-36	MD1 setting value 1	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-37	MD1 setting value 2	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-38	MD1 setting value 3	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-39	MD2 setting value 1	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-40	MD2 setting value 2	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-41	MD2 setting value 3	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-42	MD3 setting value 1	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-43	MD3 setting value 2	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-44	MD3 setting value 3	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-45	MD4 setting value 1	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-46	MD4 setting value 2	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~
14-47	MD4 setting value 3	0~65534 (Note 4)	1	-	O	O	O	O	O	O	O	~~Note 6~~

Group 15 PLC monitoring group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F +PG	SLV	SV	PM SV	PM SLV	SLV2	
15-00	T1 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-01	T1 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-02	T2 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-03	T2 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-04	T3 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-05	T3 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-06	T4 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-07	T4 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-08	T5 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-09	T5 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-10	T6 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-11	T6 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-12	T7 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-13	T7 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-14	T8 current value 1	0~9999	0	-	O	O	O	O	O	O	O	
15-15	T8 current value 2 (mode 7)	0~9999	0	-	O	O	O	O	O	O	O	
15-16	C1 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-17	C2 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-18	C3 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-19	C4 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-20	C5 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-21	C6 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-22	C7 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-23	C8 current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-24	AS1 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-25	AS2 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-26	AS3 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-27	AS4 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-28	MD1 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-29	MD2 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-30	MD3 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-31	MD4 calculation result	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	
15-32	TD current value	0~65534 ~~(Note 4)~~	0	-	O	O	O	O	O	O	O	

Group 16 LCD function group													
Code	**Parameter name**	**Scope**	**Factory settings**	**Unit**	**Control mode** * (V/F+PG, SV, PMSV are only for special projects)							**Attribute**
					V/F	**V/F+ PG**	**SLV**	**SV**	**PMSV**	**PMSLV**	**SLV2**	
16-00	Main screen monitoring	5~82 (Note 4) When using the LCD operator, the monitoring item displayed on the first row (the initial value is frequency command)	16	-	O	O	O	O	O	O	O	*1
16-01	Sub-screen monitoring 1	5~82 (Note 4) When using the LCD operator, the monitoring item displayed on the second row (the initial value is output frequency)	17	-	O	O	O	O	O	O	O	*1
16-02	Sub-screen monitoring 2	5~82 (Note 4) When using the LCD operator, the monitoring item displayed on the third row (the initial value is output current)	18	-	O	O	O	O	O	O	O	*1
16-03	Display unit selection	0~39999 determines the display method and unit of the frequency command 0: The frequency display unit is 0.01 Hz 1: The frequency display unit is 0.01% 2: The frequency display unit is rpm 3~39: Reserved 40~9999: User-specified format，Entering 0XXXX means displayed as XXXX when 100% 10001~19999: User-specified format，Entering 1XXXX means displayed as XXX.X when 100% 20001~29999: User-specified format，Entering 2XXXX means displayed as XX.XX when 100% 30001~39999: User-specified format，Entering 3XXXX means displayed as X.XXX when 100%	0	-	O	O	O	O	O	O	O	
16-04	Engineering unit selection	0: Do not use engineering unit 1：FPM 2：CFM 3：PSI 4：GPH	0	-	O	O	O	O	O	O	O	

Group 16 LCD function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PMSV	PMSLV	SLV2	
		5：GPM										
		6：IN										
		7：FT										
		8：/s										
		9：/m										
		10：/h										
		11：°F										
		12：inW										
		13：HP										
		14：m/s										
		15：MPM										
		16：CMM										
		17：W										
		18：KW										
		19：m										
		20：°C										
		21：RPM										
		22：Bar										
		23：Pa										
		24：KPa										
		25: PRS										
		26: SPM										
16-05	LCD backlight	0~7	5	-	O	O	O	O	O	O	O	*1
16-06	Reserved											
16-07	Copy function selection	0: Do not copy parameter 1: Read the inverter parameter and save it to the operator 2: Write the operator parameter into the inverter 3: Compare the inverter and operator parameters	0	-	O	O	O	O	O	O	O	
16-08	Allow read selection	0: Do not allow reading of the inverter parameter and saving to the operator 1: Allow reading of the inverter parameter and saving to the operator	0	-	O	O	O	O	O	O	O	
16-09	Operator disconnection selection	0: Continue operating when the LCD operator is disconnected 1: Display failure when the LCD operator is disconnected	0	-	O	O	O	O	O	O	O	*1
16-10	RTC time display setting	0: Hide 1: Display	0		O	O	O	O	O	O	O	~~Note 8~~
16-11	RTC date setting	12.01.01 ~ 99.12.31	12.01.01		O	O	O	O	O	O	O	~~Note 8~~
16-12	RTC time setting	00:00 ~ 23:59	00:00		O	O	O	O	O	O	O	~~Note 8~~
16-13	RTC timer function	0: Invalid 1: Valid 2: Set according to DI	0		O	O	O	O	O	O	O	~~Note 8~~

Group 16 LCD function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PMSV	PMSLV	SLV2	
16-14	P1 start time	00:00 ~ 23:59	08:00		O	O	O	O	O	O	O	~~Note 8~~
16-15	P1 end time	00:00 ~ 23:59	18:00		O	O	O	O	O	O	O	~~Note 8~~
16-16	P1 start day	1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday	1		O	O	O	O	O	O	O	~~Note 8~~
16-17	P1 end day		5		O	O	O	O	O	O	O	~~Note 8~~
16-18	P2 start time	00:00 ~ 23:59	08:00		O	O	O	O	O	O	O	~~Note 8~~
16-19	P2 end time	00:00 ~ 23:59	18:00		O	O	O	O	O	O	O	~~Note 8~~
16-20	P2 start day	1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday	1		O	O	O	O	O	O	O	~~Note 8~~
16-21	P2 end day		5		O	O	O	O	O	O	O	~~Note 8~~
16-22	P3 start time	00:00 ~ 23:59	08:00		O	O	O	O	O	O	O	~~Note 8~~
16-23	P3 end time	00:00 ~ 23:59	18:00		O	O	O	O	O	O	O	~~Note 8~~
16-24	P3 start day	1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday	1		O	O	O	O	O	O	O	~~Note 8~~
16-25	P3 end day		5		O	O	O	O	O	O	O	~~Note 8~~
16-26	P4 start time	00:00 ~ 23:59	08:00		O	O	O	O	O	O	O	~~Note 8~~
16-27	P4 end time	00:00 ~ 23:59	18:00		O	O	O	O	O	O	O	~~Note 8~~
16-28	P4 start day	1: Monday 2: Tuesday 3: Wednesday 4: Thursday 5: Friday 6: Saturday 7: Sunday	1		O	O	O	O	O	O	O	~~Note 8~~
16-29	P4 end day		5		O	O	O	O	O	O	O	~~Note 8~~
16-30	RTC offset selection	0: Invalid 1: Valid 2: Set according to DI	0		O	O	O	O	O	O	O	~~Note 8~~
16-31	RTC offset time setting	00:00 ~ 23:59	00:00	-	O	O	O	O	O	O	O	~~Note 8~~
16-32	Timer 1 source	0: None, 1: P1, 2:P2, 3:P1+P2 4:P3, 5:P1+P3, 6:P2+P3, 7:P1+P2+P3, 8:P4, 9:P1+P4, 10:P2+P4, 11:P1+P2+P4 12:P3+P4 13:P1+P3+P4, 14:P2+P3+P4	1		O	O	O	O	O	O	O	~~Note 8~~
16-33	Timer 2 source		2		O	O	O	O	O	O	O	~~Note 8~~
16-34	Timer 3 source		4		O	O	O	O	O	O	O	~~Note 8~~
16-35	Timer 4 source		8		O	O	O	O	O	O	O	~~Note 8~~

Group 16 LCD function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PMSV	PMSLV	SLV2	
		15:P1+P2+P3+P4, 16:Off, 17:Off+P1 18:Off+P2, 19:Off+P1+P2 20:Off+P3, 21:Off+P1+P3 22:Off+P2+P3 23:Off+P1+P2+P3 24:Off+P4 25:Off+P1+P4 26:Off+P2+P4 27:Off+P1+P2+P4 28:Off+P3+P4 29:Off+P1+P3+P4 30:Off+P2+P3+P4 31:Off+P1+P2+P3+P4										
16-36	RTC speed selection	0: Off 1: Selected by timer 1 2: Selected by timer 2 3: Selected by timer 3 4: Selected by timer 4 5: Selected by timer 1 + 2	0		O	O	O	O	O	O	O	~~Note 8~~
16-37	RTC operation direction selection	xxx0b: RTC Run1 forward xxx1b: RTC Run1 reverse xx0xb: RTC Run2 forward xx1xb: RTC Run2 reverse x0xxb: RTC Run3 forward x1xxb: RTC Run3 reverse 0xxxb: RTC Run4 forward 1xxxb: RTC Run4 reverse	0000b		O	O	O	O	O	O	O	~~Note 8~~

Group 17 automatic tuning function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PM SV	PM SLV	SLV2	
17-00	*Automatic tuning mode selection	0: Rotational automatic tuning 1: Static automatic tuning 2: Stator resistance measurement 3: Reserved 4: Circuit tuning 5: Rotational automatic tuning integration (option: 4+2+0) 6: Static automatic tuning integration (option: 4+2+1)	VF:2 VF+PG:2 SLV:6 SV:6 SLV2:6	-	O	O	O	O	X	X	O	
17-01	Motor rated output power	0.00~600.00	KVA	KW	O	O	O	O	X	X	O	
17-02	Motor rated current	~~0.1~1200.0~~ 25%~120% inverter Rated current	KVA	A	O	O	O	O	X	X	O	
17-03	Motor rated voltage	200V: 50.0~240.0 400V: 100.0~480.0	- -	V	O	O	O	O	X	X	O	
17-04	Motor rated frequency	4.8~599.0	50.0/60.0	Hz	O	O	O	O	X	X	O	
17-05	Motor rated speed	0~24000	KVA	rpm	O	O	O	O	X	X	O	
17-06	Motor number of poles	2~16 (even number)	4	Pole	O	O	O	O	X	X	O	
17-07	PG pulse count	0~60000	1024	ppr	O	O	O	O	X	X	O	

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2	
17-08	Motor no-load voltage	200V: 50~240 400V:100~480	-	V	O	O	O	O	X	X	O	
17-09	Motor excitation current	15%~70% motor rating Constant current	-	A	X	X	O	O	X	X	X	*1
17-10	Automatic tuning start	0: Invalid 1: Valid	0	-	O	O	O	O	X	X	O	
17-11	Automatic tuning error history	0: No errors 1: Motor data error 2: Stator resistance tuning error 3: Leakage inductance tuning error 4: Rotor resistance tuning error 5: Mutual inductance tuning error 6: DT error 7: Encoder error 8: Motor acceleration error 9: Warning	0	-	O	O	O	O	X	X	O	
17-12	Motor leakage inductance ratio	0.1~15.0	3.4	%	X	X	O	O	X	X	X	
17-13	Motor slip frequency	0.10~20.00	1.00	Hz	X	X	O	O	X	X	X	
17-14	Rotational tuning mode selection	0: VF-based rotational automatic tuning 1: Vector-based rotational automatic tuning	0	-	O	O	O	O	X	X	O	

KVA: This parameter varies according to the different inverter capacities.

*Before using motor automatic tuning, it is recommended to first select 00-32 application adjustment.
Note: The default factory value of vector-based 17-00 is 6 static automatic tuning integration (option: 4+2+1). If the motor is unloaded and rotational tuning can be performed, it is recommended to perform 5: rotational automatic tuning integration (option: 4+2+0)

▪It will only appear to be settable when 1:17-00=1, 2, 6

Group 18 slip compensation function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PMS LV	SLV2	
18-00	Low-speed slip compensation gain	0.00~2.50	VF:0.00 SLV*	-	O	X	O	O	X	X	O	*1
18-01	High-speed slip compensation gain	-1.00~1.00	0.0	-	O	X	O	X	X	X	X	*1
18-02	Slip compensation limit	0~250	200	%	O	X	X	X	X	X	X	
18-03	Slip compensation filter time	0.0~10.0	1.0	Sec	O	X	X	X	X	X	X	
18-04	Regenerative slip compensation selection	0: Invalid 1: Valid	0	-	O	X	X	X	X	X	X	
18-05	FOC delay time	1~1000	100	ms	X	X	O	X	X	X	X	
18-06	FOC gain	0.00~2.00	0.1	-	X	X	O	X	X	X	X	

*: Please refer to the descriptions in Appendix One

Group 19 frequency skipping function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PMSLV	SLV2	
19-00	Frequency skipping center frequency	5.00~100.00	20.00	%	O	O	X	X	X	X	O	*1
19-01	Frequency skipping amplitude	0.1~20.0	10.0	%	O	O	X	X	X	X	O	*1
19-02	Frequency skipping oscillation frequency	0.0~50.0	0.0	%	O	O	X	X	X	X	O	*1
19-03	Frequency skipping oscillation time	0~50	0	ms	O	O	X	X	X	X	O	*1
19-04	Frequency skipping cycle	0.0~1000.0	10.0	Sec	O	O	X	X	X	X	O	*1
19-05	Frequency skipping ratio	0.1~10.0	1.0		O	O	X	X	X	X	O	*1
19-06	Frequency skipping upper offset amplitude	0.0~20.0	0.0	%	O	O	X	X	X	X	O	*1
19-07	Frequency skipping lower offset amplitude	0.0~20.0	0.0	%	O	O	X	X	X	X	O	*1

Group 20 speed control function ground												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2	
20-00	ASR gain 1	0.00~250.00	-	-	X	O	O	O	O	O	X	*1
20-01	ASR integral time 1	0.001~10.000	-	Sec	X	O	O	O	O	O	X	*1
20-02	ASR gain 2	0.00~250.00	-	-	X	O	O	O	O	O	X	*1
20-03	ASR integral time 2	0.001~10.000	-	Sec	X	O	O	O	O	O	X	*1
20-04	ASR integral time limit	0~300	200	%	X	X	O	O	O	O	X	
20-05	ASR positive limit	0.1 ~ 10.0	5.0	%	X	O	X	X	X	X	X	
20-06	ASR negative limit	0.1 ~ 10.0	1.0	%	X	O	X	X	X	X	X	
20-07	Acceleration/deceleration P/PI selection	0: PI speed control is only effective at constant speed; only P is used for control during acceleration and deceleration. 1: PI speed control is effective in both constant speed and acceleration/deceleration	0	-	X	O	O	O	O	X	X	
20-08	ASR delay time	0.000~0.500	0.004	Sec	O	X	O	O	O	O	X	~~Note 5~~
20-09	Speed observer gain 1	0.00~2.55	0.61	-	X	X	O	X	X	X	X	*1
20-10	Speed observer integral time 1	0.01~10.00	0.05	Sec	X	X	O	X	X	X	X	*1
20-11	Speed observer gain 2	0.00~2.55	0.61	-	X	X	O	X	X	X	X	*1
20-12	Speed observer integral time 2	0.01~10.00	0.06	Sec	X	X	O	X	X	X	X	*1
20-13	Speed feedback low filter constant 1	1~1000	4	ms	X	X	O	X	X	X	X	
20-14	Speed feedback low filter constant 2	1~1000	30	ms	X	X	O	X	X	X	X	
20-15	ASR gain change frequency 1	0.0~599.0	4.0	Hz	X	O	O	O	O	X	O	
20-16	ASR gain change frequency 2	0.0~599.0	8.0	Hz	X	X	O	O	O	X	O	
20-17	Low-speed torque compensation gain	0.00~2.50	1.00	-	X	X	O	X	X	X	X	*1
20-18	High-speed torque compensation gain	-10~10	0	%	X	X	O	X	X	X	X	*1
20-19	Overspeed (OS) selection	0: Deceleration stop 1: Free-run stop 2: Continue operating	1		X	O	X	O	O	X	X	
20-20	Overspeed (OS)	0~120	115	%	X	O	X	O	O	X	X	

Group 20 speed control function ground												
Code	**Parameter name**	**Scope**	**Factory settings**	**Unit**	**Control mode** * (V/F+PG, SV, PMSV are only for special projects)							**Attribute**
					V/F	**V/F+ PG**	**SLV**	**SV**	**PM SV**	**PM SLV**	**SLV2**	
	detection threshold											
20-21	Overspeed (OS) detection time	0.0~2.0	0.5	Sec	X	O	X	O	O	X	X	
20-22	Speed deviation (DEV) selection	0: Deceleration stop 1: Free-run stop 2: Continue operating	2		X	O	X	O	O	X	X	
20-23	Speed deviation (DEV) detection threshold	0~50	10	%	X	O	X	O	O	X	X	
20-24	Speed deviation (DEV) detection time	0.0~10.0	0.5	Sec	X	O	X	O	O	X	X	
20-25	PG disconnection selection	0: Deceleration stop 1: Free-run stop 2: Continue operating	1	-	X	O	X	O	O	X	X	
20-26	PG disconnection detection time	0.0~10.0	2.0	Sec	X	O	X	O	O	X	X	
20-27	PG pulse count	0~9999	1024	ppr	O	O	X	O	O	X	X	~~Note 5~~
20-28	PG rotation direction selection	0: Forward is counter-clockwise 1: Forward is clockwise	0	-	O	O	X	O	O	X	X	~~Note 5~~
20-29	PG pulse frequency division ratio	001~132	1	-	X	O	X	O	O	X	X	
20-30	PG gear ratio 1	1~1000	1	-	X	O	X	O	X	X	X	
20-31	PG gear ratio 2	1~1000	1	-	X	O	X	O	X	X	X	
20-32	Special encoder selection	0: None 1: Resolver	0		X	X	X	O	O	X	X	
20-33	Constant speed detection threshold	0.1~5.0	1.0		X	O	O	O	O	O	X	*1
20-34	Speed reduction compensation gain	0~25600	0		X	X	O	O	O	X	X	*1
20-35	Speed reduction compensation time	0~30000	100	ms	X	X	O	O	O	X	X	*1
20-36 ~ 20-42	Reserved											
20-43	Speed multiplier	1~500	20		O	O	X	O	X	X	X	~~Note 5~~
20-44	Speed command limit	0.1~30.0	6.0	Hz	O	X	X	X	X	X	X	~~Note 5~~

Group 21 torque and position control function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PM SV	PM SLV	SLV2	
21-00	Torque control selection	0: Speed control 1: Torque control	0	-	X	X	X	O	O	X	X	
21-01	Torque reference filter time	0~1000	0	ms	X	X	X	O	O	X	X	
21-02	Speed limit selection	0: According to AI input 1: According to the setting value of 21-03 2: According to the communication position input (2502H)	0	-	X	X	X	O	O	X	X	
21-03	Speed limit value	-120~120	0	%	X	X	X	O	O	X	X	*1
21-04	Speed limit bias voltage	0~120	10	%	X	X	X	O	O	X	X	*1
21-05	Forward torque limit	0~300	*	%	X	X	O	O	O	O	X	
21-06	Negative torque limit	0~300	*	%	X	X	O	O	O	O	X	
21-07	Forward regenerative torque limit	0~300	*	%	X	X	O	O	O	O	X	
21-08	Reverse regenerative torque limit	0~300	*	%	X	X	O	O	O	O	X	
21-09	Position control maximum frequency	0.1~100.0	20.0	Hz	X	X	X	O	O	X	X	
21-10	Segment 0 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-11	Segment 0 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-12	Segment 1 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-13	Segment 1 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-14	Segment 2 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-15	Segment 2 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-16	Segment 3 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-17	Segment 3 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-18	Segment 4 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-19	Segment 4 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-20	Segment 5 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-21	Segment 5 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-22	Segment 6 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-23	Segment 6 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-24	Segment 7 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-25	Segment 7 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-26	Segment 8 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-27	Segment 8 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-28	Segment 9 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-29	Segment 9 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-30	Segment 10 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-31	Segment 10 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	

Group 21 torque and position control function group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2	
21-32	Segment 11 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-33	Segment 11 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-34	Segment 12 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-35	Segment 12 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-36	Segment 13 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-37	Segment 13 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-38	Segment 14 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-39	Segment 14 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-40	Segment 15 rotation count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-41	Segment 15 pulse count command	-9999 ~ 9999	0	-	X	X	X	O	O	X	X	
21-42	Position mode selection	0: Enter position mode when the speed is lower than the minimum frequency 1: Z-phase locking function	0		X	X	X	O	O	X	X	
21-43	Offset angle	0 ~9999	0	Pulse	X	X	X	O	O	X	X	

*: Please refer to the descriptions in Appendix One

Group 22 PM motor group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2	
22-00	PM motor rated power	0.00~600.00	KVA	kW	X	X	X	X	O	O	X	
22-01	PM motor rated voltage	200V: 50.0~240.0 400V: 100.0~480.0	220.0 440.0	V	X	X	X	X	O	O	X	~~Note 7~~
22-02	PM motor rated current	25%~200% of the inverter's rated current	KVA	A	X	X	X	X	O	O	X	
22-03	PM motor number of poles	2~96	6	poles	X	X	X	X	O	O	X	
22-04	PM motor rated rotation speed	6~60000	1500	rpm	X	X	X	X	O	O	X	
22-05	PM motor maximum rotation speed	6~60000	1500	rpm	X	X	X	X	O	O	X	
22-06	PM motor rated frequency	4.8~599.0	75.0	Hz	X	X	X	X	O	O	X	
22-07	PM type selection	0:SPM 1:IPM	0		X	X	X	X	X	O	X	~~Note 7~~
22-08	PM encoder type	0: Tamagawa non-less wiring type cable 1: Tamagawa less wiring type cable 2: SUMTAK less wiring type cable 3: General differential incremental type cable 4: Sine wave type cable	0		X	X	X	X	O	X	X	
22-09	Reserved											
22-10	PM SLV starting current	20% ~ 200% Motor rated current	100	%	X	X	X	X	X	O	X	
22-11	I/F mode starting frequency switching point	10 ~ 100 (Note 7)	10	%	X	X	X	X	X	O	X	

Group 22 PM motor group												
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PM SV	PM SLV	SLV2	
22-12 22-13	Reserved (Note 4)											
22-14	PM motor armature resistance	0.001 ~ 30.000	1.000	Ω	X	X	X	X	O	O	X	
22-15	PM motor D-axis inductance	0.01 ~300.00	10.00	mH	X	X	X	X	O	O	X	
22-16	PM motor Q-axis inductance	0.01 ~ 300.00	10.00	mH	X	X	X	X	O	O	X	
22-17	PM no-load voltage	200V: 0~250 400V: 0~500	150 300	V	X	X	X	X	O	O	X	~~Note 7~~
22-18	Weak magnetic limit	0~120	90	%	X	X	X	X	O	O	X	
22-19	Reserved											
22-20	Pole shift angle	0~360	0	deg	X	X	X	X	O	X	X	*4
22-21	PM motor tuning	0: Do not perform PM motor tuning 1: Parameter automatic tuning (applicable to PMSLV) 2: Pole alignment and circuit adjustment (applicable to PMSV) 3: Rotational automatic tuning	0	-	X	X	X	X	O	O	X	
22-22	PM motor tuning failure history	0. No error 1. Stationary pole alignment failure 2. No PG option card 3. Rotational pole alignment forced stop 4. Encoder feedback direction error 5. Circuit tuning timeout 6. Encoder error 7. Other motor tuning error 8. Current abnormal during rotational pole alignment 9. Current abnormal during circuit adjustment 10. Reserved 11. Stator resistance measurement timeout	0	-	X	X	X	X	O	O	X	*4
22-23 22-24	Reserved											
22-25	Initial pole detection method selection	0. Use the angle before stopping 1. Method 1 2. Method 2 3. Method 3	1 (Note 7)	-	X	X	X	X	O	O	X	
22-26	High-Speed Control Ratio Enable (applicable to PMSLV)	0. Low-speed open-circuit control 1. Low-speed high-frequency estimation control 2. Fully closed-circuit control	0	-	X	X	X	X	X	O	X	
22-27	Method 2 voltage command	5~120 (Note 7) (22-25=2 or 22-26=1 valid)	50	%	X	X	X	X	O	O	X	
22-28	Method 2 frequency division ratio	0~8 (Note 7) (22-25=2 or 22-26=1 valid)	2	-	X	X	X	X	O	O	X	
22-29	Weak magnetic voltage command limit	80~110 (Note 7) (related to 22-18)	100	%	X	X	X	X	O	O	X	~~Note 9~~

Group 22 PM motor group

Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PM SV	PM SLV	SLV2	
22-30	SPM speed estimation gain (Note 7)	1~150	85	%	X	X	X	X	X	O	X	~~Note 4~~
22-31	SPM speed estimation filter frequency (Note 7)	1~2000	60	Hz	X	X	X	X	X	O	X	~~Note 4~~
22-32	MTPA selection	0: Invalid 1: Method 1 2: Method 2 3: Method 3	0	-	X	X	X	X	O	O	X	~~Note 7~~
22-33	MTPA gain	0~400%	200	%	X	X	X	X	O	O	X	~~Note 7~~
22-34	IPM estimator gain	1~300.0	180	-	X	X	X	X	X	O	X	~~Note 7~~
22-35	Reserved											
22-36	PM motor type selection	0: General PM motor 1: DVEN motor	0	-	X	X	X	X	X	O	X	~~Note 8~~
22-37	PM motor horse power and rotation speed	1: 0.75KW 1800RPM 4: 1.5KW 1800RPM 7: 2.2KW 1800RPM 10: 3.7KW 1800RPM 13: 5.5KW 1800RPM 16: 7.5KW 1800RPM 19: 11KW 1800RPM 22: 15KW 1800RPM 25: 18.5KW 800RPM 28: 22KW 1800RPM	0	-	X	X	X	X	X	O	X	~~Note 8~~
22-38	Open-loop to closed-loop switching point frequency width (%)	1.0~40.0	5.0	%	X	X	X	X	X	O	X	
22-39	Pre-DC injection time	0~20.00	0.10	Sec	X	X	X	X	X	O	X	
22-40	High-frequency angle detection time	0.01~1.00	0.10	-	X	X	X	X	X	O	X	~~Note 9~~
22-41	PM stopping method	0: Brake directly when deceleration or shutdown is lower than 22-11 1: Open-circuit stop when deceleration or shutdown is less than 22-11.	0	-	X	X	X	X	X	O	X	
22-42	Fully closed circuit low-speed segment calibration constant Ka	64~8192	200	-	X	X	X	X	X	O	X	~~Note 9~~
22-43	Fully closed circuit high-speed segment calibration constant Kb	64~8192	500	-	X	X	X	X	X	O	X	~~Note 9~~
22-44	Fully closed circuit high-speed position filter constant	1~256	4	-	X	X	X	X	X	O	X	
22-45	PM magnetic flux	0.001~10.000	0.700	-	X	X	X	X	X	O	X	
22-52	Low-speed coefficient	3000~60000	4000	-	X	X	X	X	X	O	X	
22-53	Low-speed integral filter time	1~256	32	V	X	X	X	X	X	O	X	
22-54	Motor voltage standard	50.0~600.0	300	-	X	X	X	X	X	O	X	
22-55	Fully closed circuit high-speed filter coefficient	1~256	32	-	X	X	X	X	X	O	X	
22-56	Fully closed circuit low-speed filter coefficient	1~256	64	-	X	X	X	X	X	O	X	

Group 23 pump and HVAC group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2	
23-00	Function selection	0: Invalid 1: Pump selection 2: HVAC selection (in development) 3. Compressor selection (in development)	0	-	O	X	X	X	X	X	O	
23-01	Single/multiple pump and primary/secondary unit setting	0: Single Pump 1: Host 2: Auxiliary pump 1 3: Auxiliary pump 2 4: Auxiliary pump 3	0	-	O	X	X	X	X	X	O	
23-02	Work pressure setting	0.10 ~ 650.00	2.00	PSI	O	X	X	X	X	X	O	
23-03	Maximum pressure of pressure transmitter	0.10 ~ 650.00	10.00	PSI	O	X	X	X	X	X	O	
23-04	Pump pressure command source	0: Set by parameter 23-02 1: Set by AI	0		O	X	X	X	X	X	O	
23-05	Display method selection	0: Display target pressure and feedback pressure 1: Only display current pressure 2: Only display feedback pressure	0		O	X	X	X	X	X	O	
23-06	Proportional gain (P)	0.00~10.00	0.10	-	O	X	X	X	X	X	O	*1
23-07	Integral time (I)	0.0~100.0	0.5	Sec	O	X	X	X	X	X	O	*1
23-08	Derivative time (D)	0.00~10.00	0.00	Sec	O	X	X	X	X	X	O	*1
23-09	Constant pressure error range	23-20=0 : 0.01 ~ 650.00 23-20=1 : 1~100	5	%/ PSI	O	X	X	X	X	X	O	
23-10	Constant pressure sleep frequency	0.00 ~ 599.00	30.00	Hz	O	X	X	X	X	X	O	
23-11	Constant pressure sleep time	0.0 ~ 255.5	1.0	Sec	O	X	X	X	X	X	O	
23-12	Maximum pressure limit	23-20=0 : 0.00 ~ 650.00 23-20=1 : 0~100	50	%/ PSI	O	X	X	X	X	X	O	
23-13	High pressure warning time	0.0 ~ 600.0	10.0	Sec	O	X	X	X	X	X	O	
23-14	High-pressure shutdown time	0.0 ~ 600.0	20.0	Sec	O	X	X	X	X	X	O	
23-15	Minimum pressure limit	23-20=0 : 0.00 ~ 650.00 23-20=1 : 0~100	5	%/ PSI	O	X	X	X	X	X	O	
23-16	Low-pressure warning time	0.0 ~ 600.0	0.0	Sec	O	X	X	X	X	X	O	
23-17	Low-pressure failure shutdown time	0.0 ~ 600.0	0.0	Sec	O	X	X	X	X	X	O	
23-18	Pressure loss detection time	0.0 ~ 600.0	0.0	Sec	O	X	X	X	X	X	O	
23-19	Pressure loss detection ratio	0 ~ 100	0	%	O	X	X	X	X	X	O	
23-20	Pressure percentage switching	0: Pressure 1: Percentage	1	-	O	X	X	X	X	X	O	
23-22	Auxiliary machine	0.00 ~ 599.00	45.00	Hz	O	X	X	X	X	X	O	

Group 23 pump and HVAC group													
Code	Parameter name	Scope	Factory settings	Unit	Control mode * (V/F+PG, SV, PMSV are only for special projects)							Attribute
					V/F	V/F+ PG	SLV	SV	PM SV	PM SLV	SLV2	
	trip frequency											
23-23	Water usage detection direction	0: Detect upwards 1: Detect downwards	1	-	O	X	X	X	X	X	O	
23-24	Water use inspection pressure range	23-20=0 : 0.00 ~ 65.00 23-20=1 : 0~10	1	%/ PSI	O	X	X	X	X	X	O	
23-25	Water usage detection cycle	0.0 ~ 200.0	30.0	Sec	O	X	X	X	X	X	O	
23-26	Water usage detection acceleration time	0.1 ~ 6000.0	KVA	Sec	O	X	X	X	X	X	O	*1
23-27	Water usage detection deceleration time	0.1 ~ 6000.0	KVA	Sec	O	X	X	X	X	X	O	*1
23-28	Forced operation frequency	0.00 ~ 599.00	0.00	Hz	O	X	X	X	X	X	O	
23-29	Multi-pump parallel alternating time	0 ~ 240	3	Hr/min	O	X	X	X	X	X	O	
23-30	Multi-pump parallel auxiliary water pumping detection time	0.0 ~ 30.0	0.0	Sec	O	X	X	X	X	X	O	
23-31	Multi-pump parallel synchronization selection	0: Off 1: Pressure setting and Run/Stop synchronization 2: Pressure setting synchronization 3: Run/Stop synchronization	1		O	X	X	X	X	X	O	
23-34	Constant pressure error range 2	23-20=0: 0.01 ~ 650.00 23-20=1: 1~100	5	%/ PSI	O	X	X	X	X	X	O	
23-35	Multi-unit parallel connection switching selection	0: Do not perform function 1: Timer alternation selection 2: Sleep stop alternation selection 3: Timer and sleep stop alternation selection 4: Multi-unit parallel testing mode	1		O	X	X	X	X	X	O	
23-36	PUMP unit display	0: PSI 1: FPM 2: CFM 3: PSI 4: GPH 5: GPM 6: IN 7: FT 8: /s 9: /m 10: /h 11: °F 12: inW 13: HP 14: m/s 15: MPM 16: CMM 17: W 18: KW 19: m 20: °C 21: RPM 22: Bar	0		O	X	X	X	X	X	O	

Group 23 pump and HVAC group												
Code	**Parameter name**	**Scope**	**Factory settings**	**Unit**	**Control mode** * (V/F+PG, SV, PMSV are only for special projects)							**Attribute**
					V/F	**V/F+ PG**	**SLV**	**SV**	**PM SV**	**PM SLV**	**SLV2**	
		23: Pa 24: KPa										
23-37	Water leakage detection time	0.0~100.0	0.0	Sec	O	X	X	X	X	X	O	
23-38	Water leakage detection restart pressure change amount	23-20=0 : 0.01 ~ 65.00 23-20=1 : 1~10	1	%/ PSI	O	X	X	X	X	X	O	
23-39	Water leakage detection restart error range	23-20=0 : 0.01 ~ 650.00 23-20=1 : 1~100	5	%/ PSI	O	X	X	X	X	X	O	
23-41~ 23-70	Reserved											
23-71	Pressure setting maximum value	0.10~650.00	10.00	PSI	O	X	X	X	X	X	O	
23-72	Parallel alternating time switching	0: Hour 1: Minute	0		O	X	X	X	X	X	O	
23-73	Secondary unit wakeup selection	0: Invalid 1: Valid	0		O	X	X	X	X	X	O	
23-74	High-pressure action setting	0: Invalid 1: High-pressure warning only 2: High-pressure warning error all effective	2		O	X	X	X	X	X	O	
23-75	Low-pressure action setting	0: Invalid 1: Low-pressure warning only 2: Low-pressure warning error all effective	0		O	X	X	X	X	X	O	
23-78	Pressure loss detection action selection	0: Invalid 1: Pressure loss warning 2: Pressure loss error	0		O	X	X	X	X	X	O	
23-79	Multi-pump parallel alternating time day	0~254	0		O	X	X	X	X	X	O	

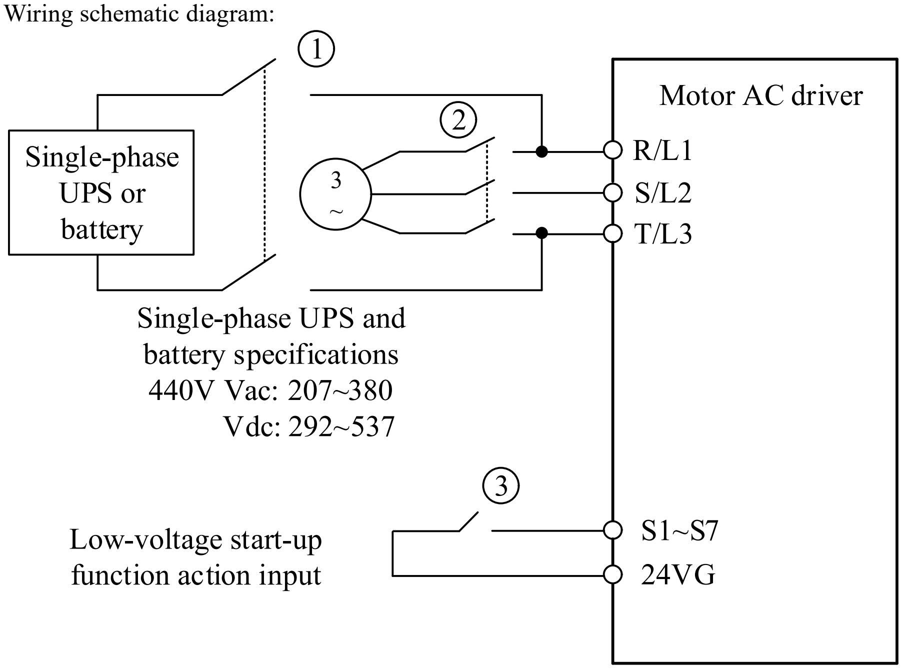
Appendix One: Default factory value and parameter upper limit value adjusted according to different horse powers

Model	Frame	11-01 When the carrier wave <= 8K, the maximum frequency of SLV (Hz)	11-01 When the carrier wave > 8K, the maximum frequency of SLV (Hz)	18-00 SLV/SV initial value (low-speed slip compensation)
2P5	1	150	150	1.00
201				
202	2	150	150	1.00
203				
205				
208	3	150	150	1.00
401	1	150	150	1.00
402				
403	2	150	150	1.00
405				
408	3	150	150	1.00
410				

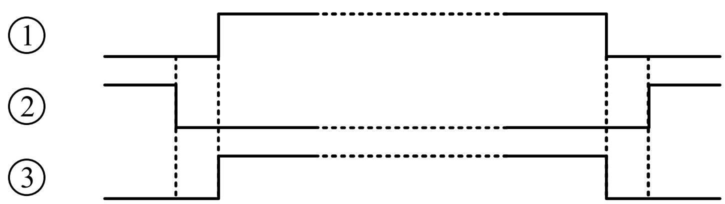
Model	21-05 ~ 21-08 (torque limit) initial value	20-08 (ASR filter time) initial value (s)	00-14~00-17 00-21~00-24 Acceleration/deceleration time initial value (s)	11-01 Default factory carrier wave kHz	11-01 Maximum carrier wave (SLV,PMSLV maximum frequency > 80Hz) kHz	11-01 Maximum carrier wave (other mode) kHz
2P5	200%	0.001	10.0	4	8	16
201				4	8	16
202	200%	0.001	10.0	4	8	16
203				4	8	16
205				4	8	16
208	200%	0.001	10.0	4	8	16
401	200%	0.001	10.0	4	8	16
402				4	8	16
403	200%	0.001	10.0	4	8	16
405				4	8	16
408	200%	0.001	10.0	4	8	16
410				4	8	16

Low-voltage start function description:

Wiring schematic diagram:



Electromagnetic contactor action timing diagram



Before inputting the backup power, electromagnetic contactors ① and ③ must be turned on, and electromagnetic contactor ② must remain open. Electromagnetic contactor ③ can only be turned on after electromagnetic contactor ① is turned on. When the backup power is about to be removed and before electromagnetic contactor ② is turned on, electromagnetic contactors ① and ③ must remain open.

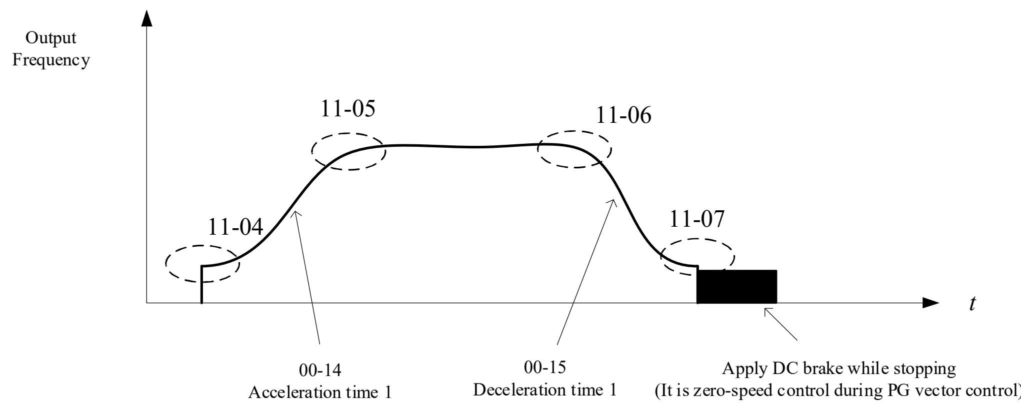
Notes for low-voltage start-up operation:

1. Start the low-voltage start-up function (DI=62), the fan will not operate to prevent a drop in emergency power voltage.
2. When starting the low-voltage start-up function, there is no input phase loss protection.
3. When starting the low-voltage start-up function, the operating frequency of the motor will operate according to the 07-31 low-voltage operation frequency.

Related parameter descriptions:
07-30 Low-voltage threshold selection setting enabled.
07-13 Low-voltage detection threshold 400V model parameter lower limit can be set to 250V.
03-00~03-06 setting 62 low-voltage startup function action input.
07-31 sets the low-voltage operation frequency.

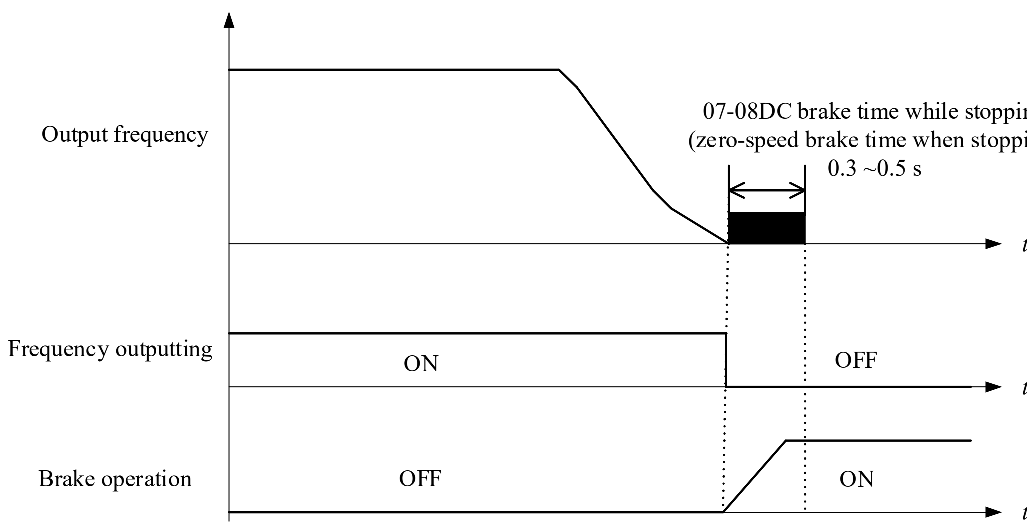
Reduce the acceleration and deceleration impacts during the start and stop of equipment such as elevators

In passenger elevators, if there are acceleration or deceleration impact (discomfort) during startup or stopping, please adjust the following parameters



Remark: In the low-speed deceleration S curve characteristic time, when the output frequency did not reach the value set for the minimum output frequency of 01-08 motor 1, the S curve characteristic will be terminated, and change to stop DC braking (zero speed control).

DC braking and zero speed control functions while stopping



When the mechanical action of the brake is slower, to prevent dropping while stopping, please perform DC brake (zero-speed control when using PG vector control) until the brake is fully closed.

Remark 1: Regulations in various countries across Europe states that when elevators stop, the inverter and motor has to be separated through a contactor. Except for emergency situations, separation can only occur when the brake is fully closed and the inverter is in base-emitter cut-off (the signal in the base-emitter cut-off is ON).

Remark 2: When separating in motor control or DC brake (zero-speed control), sometimes the inverter may malfunction due to surges. In addition, when there is contactor set between the inverter and motor, please set the 08-10 output phase loss protection as 1 (effective).

4.3 Descriptions of parameter functions

00-Basic function group

00- 00	Motor control mode
Scope	**[0]: V/F** **[1]: Reserved** **[2]: SLV** **[3]: Reserved** **[4]: Reserved** **[5]: PMSLV** **[6]: SLV2**

The control algorithm of the inverter is as described below:

Table 4.3. 1 Inverter control algorithm

00-00 Settings	Control algorithm	Control fundamentals	Application example
0	V/F	· V/F mode without PG (open circuit).	· Drives general motor. · Replaces existing inverter. · Location that does not require automatic tuning. · Applicable to ND (general load) mode.
2	SLV	· Current vector control without PG (Sensorless vector control)	Used in application situations without PG, able to provide higher precision in speed and torque requirements.
5	PMSLV	· Sensorless current vector control without PG for permanent magnet motors).	· Used in application situations without PG, able to provide higher precision in speed and torque requirements.
6	SLV2	· Voltage vector control without PG.	Used in application situations without PG, vector control can provide higher rotation speed operations, and provide higher precision speed and torque requirements than V/F.

(1). 00-00=0

. Select the V/F curve (01-00) according to the motor and application requirements.

. If the motor wiring length is more than 50 meters, stationary motor parameter tuning (17-00=2) needs to be performed. Please refer to the descriptions in parameter 17-automatic tuning function group to understand descriptions related to motor parameter tuning.

(2). 00-00=2

. Confirm that the inverter capacity and motor power corresponds to one another, and use the motor parameter tuning function to measure and save the motor parameters.

. Perform rotational motor parameter tuning before operating to improve the SLV mode performance.

. Please refer to the descriptions in parameter 17-automatic tuning function group to learn the descriptions regarding motor parameter tuning.

(3) 00-00=5

Confirm that the inverter capacity and motor power corresponds to one another, and use the motor parameter tuning function to measure and save the motor parameters.

Perform automatic tuning before operation to improve the PMSLV mode performance.

Please refer to the descriptions in parameter 22-21 PM motor tuning function.

Please choose a brake resistor with appropriate power and resistance according to the motor power and application scenario.

(4) 00-00=6

. Confirm that the inverter capacitor and motor power corresponds to one another. Use the motor parameter tuning function to measure and save the motor parameters.

. Please refer to the descriptions in parameter 17-automatic tuning function group to learn the descriptions regarding motor parameter tuning.

. Select and adjust the V/F curve (01-00) according to the motor and application requirements.

✧ **This 00-00 parameter is not affected by the initialization parameter setting.**

00- 01	Motor operation direction
Scope	**[0]:** Forward **[1]:** Reverse

If the operation command is controlled by the button panel (the setting of 00-02 is 0), the button panel can be used to control forward and reverse, and the control results will be saved in 00-01. Users can also modify the 00-01 parameter to control forward and reverse directly. This parameter will be selected by the 11-00 motor direction locking command and restricted to whether it can rotate forward/reverse.

00- 02	Primary operation command source selection
Scope	**[0]:** Button panel control **[1]:** External terminal control **[2]:** Communication control **[3]:** PLC **[4]**: RTC (in development)

(1) 00-02=0: By setting 00-02=0, use the digital operator button (stop, run and forward/reverse buttons) to execute inverter operations.
➔(Please use by referring to Chapter 4-1 panels)
(2) 00-02=1: By setting 00-02=1, use the control circuit terminals to execute inverter operations.

00- 03	Secondary operation command source selection
Scope	[**0**]**:** Button panel control [**1**]**:** External terminal control [**2**]**:** Communication control [**3**]**:** PLC [**4**]**:** RTC (in development)

(1) 00-03=0: By setting 00-03=0, use the digital operator button (stop, run and forward/reverse buttons) to execute inverter operations.
➔(Please use by referring to Chapter 4-1 panels)
(2) 00-03=1: By setting 00-03=1, use the control circuit terminals to execute inverter operations.
It must be used with the **multi-function digital input function (**12: Primary/secondary operation switching function)

■ **2-wire operation**

- The use of 2-wire operation is through execution by setting 03-00 (S1 terminal function selection) to 0 (forward operation/stop) and set 03-01 (S2 terminal function selection) as 1 (reverse operation/stop).
- When the control circuit terminal S1 is ON and S2 is OFF, the inverter will rotate forward; and when S1 is OFF, the inverter will stop.
- When the control circuit terminal S1 is OFF and S2 is ON, the inverter will rotate in reverse; and when S2 is OFF, the inverter will stop.
- 2-wire control is as shown in Figure 4.3.1; if S1 and S2 are both ON simultaneously for more than 500 milliseconds, the warning "EF9 (flashing) FWD-REV error" will pop up and the inverter will stop. After the situation is released, the inverter will resume normal operation.

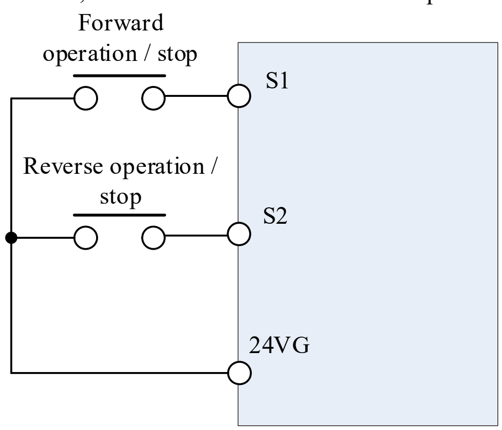


Figure 4.3. 1 Example of 2-wire wiring

- When the inverter parameter 13-08 (initialization) is set to 2, 4 or 6 and is 2-wire program initialization, the multi-function input terminal S1 will operate in forward direction/stop command, and S2 will be reverse operation/stop command.

■ **3-wire operation**

- When any of the parameters (multi-function digital input terminal S3~S7) between 03-02 to 03-06 is set as 26, and the multi-function digital input terminal is set as forward /reverse command, the S1 and S2 terminals will be set as 3-wire control operation command and stop command, and their original functions will be off.
- When the inverter parameter 13-08 (initialization) is set to 3, 5 or 7 is 3-wire program initialization. The multi-function digital input terminal S7 is the forward /reverse command.
- Figure 4.3.2 below is an example of 3-wire control. The multi-function input terminal S7 is the forward /reverse command terminal.

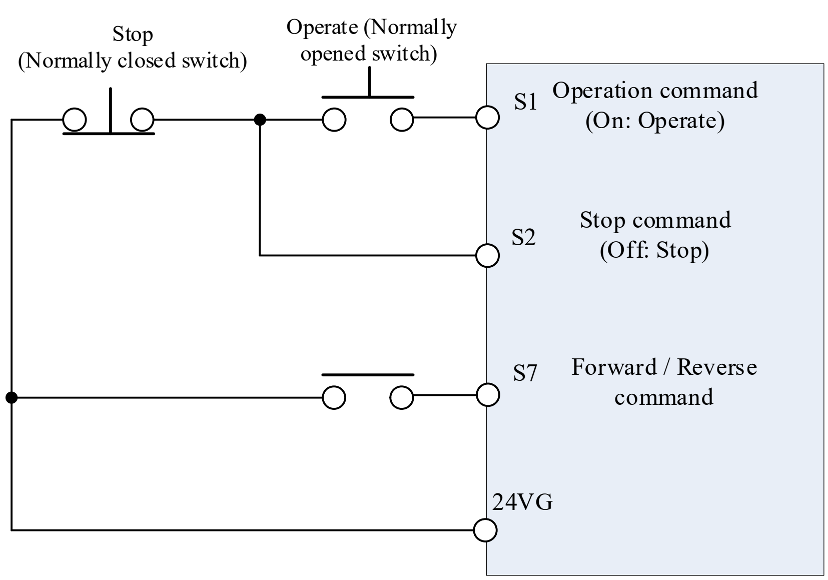


Figure 4.3. 2 Example of 3-wire wiring

- The S1 terminal must remain conducted for 50 milliseconds or more for the operation command to self-hold. Please refer to Figure 4.3.3. 3-wire operation program.

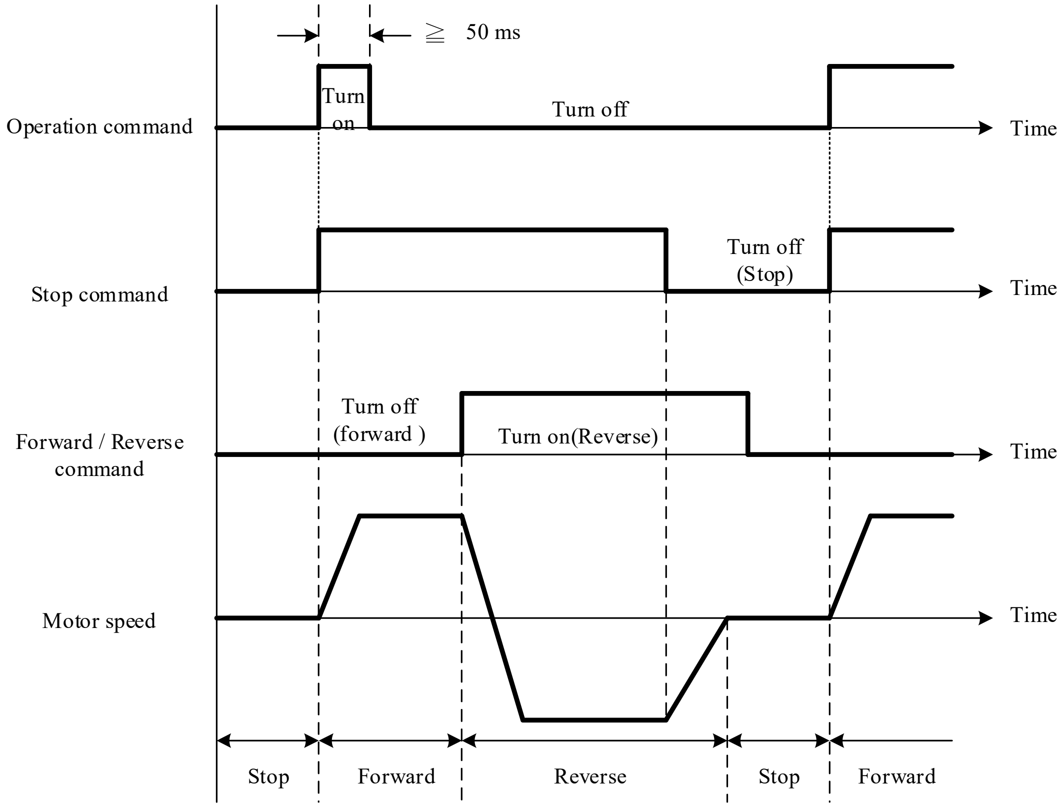


Figure 4.3. 3 3-wire operation program

2-wire operation with self-hold function

- When any of the parameters between 03-00 to 03-06 (multi-function digital input terminal S1~S7) is set to 53 (two-wire self-holding stop command), its external operation is 2-wire forward /reverse method but includes the self-holding function. Therefore, the multi-function digital terminal must be set as the stop command (also with self-holding function).
- The figure below is an example of 2-wire self-holding wiring; the multi-function input terminal S1 is forward operation (03-00=0), the multi-function input terminal S2 is the reverse operation (03-01=1), and S5 is the 2-wire self-holding stop command (03-04=53).

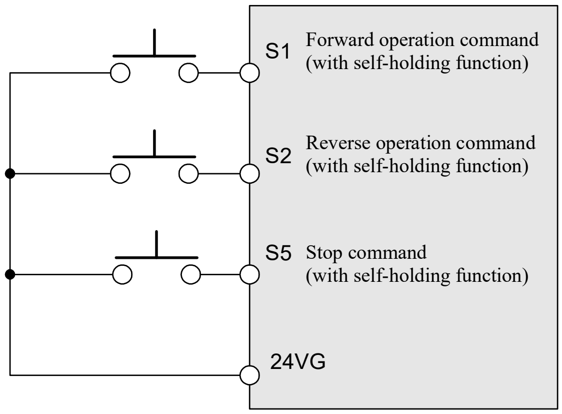


Figure 4.3. 4Self-holding 2-wire wiring example

S1, S2 and S5 terminals must remain conducted for 50 milliseconds or more in order for the forward , reverse and stop commands to self-hold.

Please refer to the 2-wire self-holding operation program below.

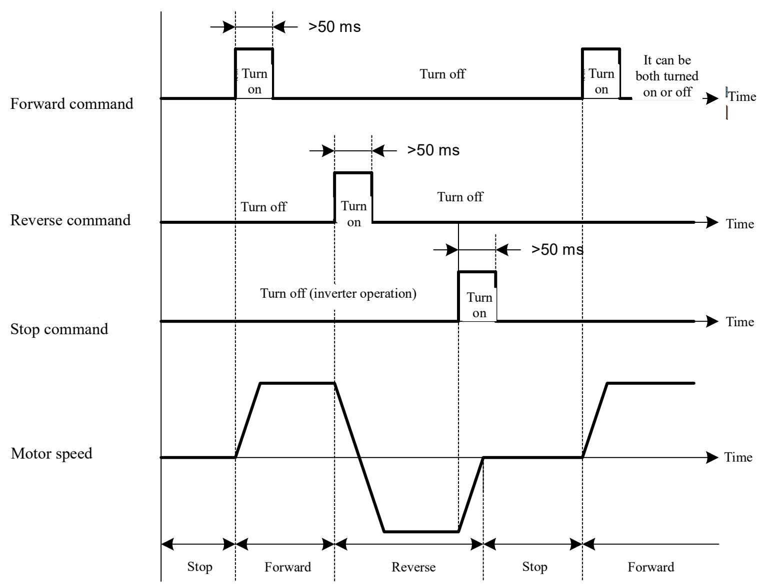


Figure 4.3. 5 Self-holding 2-wire operation program

2-wire operation with self-holding function (multi-function digital input terminal S1~S7 set as 53) cannot be set with 3-wire operation(multi-function digital input terminals S1~S7 set as 26) simultaneously. If set simultaneously, the SE02 error will occur.

(3) 00-02=2

- Inverter operations can be controlled through the RS-485 communication port.
  Please refer to parameter 09-communication function group to understand detailed descriptions on RS-422/485 communication.

(4) 00-02=3

- The inverter operation stop and frequency command can be controlled using the built-in PLC function of the inverter; the setting values of 00-05 is ineffective at this time.
- At this time, the RUN and STOP buttons on the operator can be used to start and stop the built-in PLC function of the inverter.

(5) 00-02=4

- When the primary operation command is set as RTC, the inverter operation command will be executed according to the RTC timer actions.

00- 04	Language selection			
Scope	**[0]:** English	**[1]:** Simplified Chinese	**[2]:** Traditional Chinese	**[3]:** Turkish

The 00-04 language selection parameters must be used with the LCD digital operator in order to be displayed.

- When 00-04 is set as 0, the string on the LCD digital operator will be displayed in English.
- When 00-04 is set as 1, the string on the LCD digital operator will be displayed in Simplified Chinese.
- When 00-04 is set as 2, the string on the LCD digital operator will be displayed in Traditional Chinese.
- When 00-04 is set as 3, the string on the LCD digital operator will be displayed in Turkish.

Remark: When initializing parameters, this parameter will not be restored to the default factory value.

00- 05	Primary frequency command source selection	
00- 06	Secondary frequency command source selection	
Scope	**[0]:** Set with the up and down button on the button panel **[1]:** External control (analog AI1) **[2]:** Terminal UP/DOWN **[3]:** Communication control **[4]:** Pulse input **[5]:** Reserved	**[6]:** RTC(in development) **[7]:** AI2 auxiliary frequency **[8]:** Panel knob VR **[9]:** Handwheel frequency (in development) (only 00-05 has this option)

(1) 00-05/00-06=0:

- The digital operator inputs the frequency reference command directly, or is set by changing the parameter 05-01 (frequency reference 1). Please refer to section 4.1.4, screen mode - frequency reference setting details.
- If the secondary frequency is set as the digital operator (00-06 = 0), the frequency command of the secondary frequency can only be modified in parameter 05-01.

(2) 00-05/00-06=1:

- Enter the frequency reference command from the control circuit terminal AI1 (voltage/current input) or AI2 (voltage/current input, set through 04-00).
- When the input voltage signal is the primary frequency reference command, use the AI1 terminal.
- When the input current signal (4-20mA) is the primary frequency reference command, then use the AI2 terminal; the setting steps are as shown below:
  ① Input 0V to the AI1 terminal
  ② Set 04-00=1: (Choose 4~20mA input as the multi-function analog input terminal AI2 signal)
  ③ Set the flip switch SW4 to the I (current) position.
  ④ Set 04-05=10 (add the AI2 signal to AI1).
- Refer to Figure 4.3.6 to understand the details for selecting analog terminal setting as the primary speed frequency source.

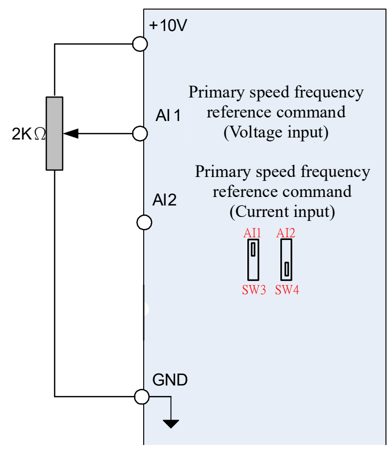


Figure 4.3. 6 Analog input for the primary speed frequency reference command

Remarks

1. When the current signal is entered to the AI2 terminal, select the voltage/current switching switch SW4 to I (original factory setting), and set 04-00= 1 or 3 (AI2=4~20mA).
2. When the voltage is entered to the AI2 terminal, select the voltage/current switching switch SW4 to the V (original factory setting) position and set 04-00= 0 or 2 or 4 (AI2 = 0~10V).
3. Follow the AI1 input signal and set 04-00 correctly.

(3) 00-05/00-06=2:

Use the frequency increase and decrease functions of the DI terminal to control the frequency command. Please refer to the parameter descriptions 03-00 to 03-06 to understand related functions.

(4) 00-05/00-06=3:

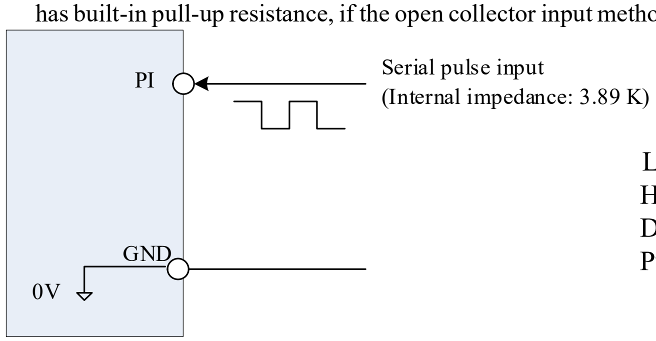
Use PLC or other MODBUS protocol related devices to input the frequency reference from the RS-485 communication port.

Please refer to parameter 09-communication function group to understand more communication descriptions on RS-485.

(5) 00-05/00-06=4:

Use pulse input as the frequency command. Please refer to the descriptions of parameters 03-30~03-34 to understand the details on using pulse input.

Use the frequency reference function of pulse input, as shown in Figure 4.3.7. Since the PI input terminal has built-in pull-up resistance, if the open collector input method is used, external resistors are not required.



Specifications

L level - 0.0 to 0.5 V

H level - 4.0 to 13.5 V

Duty cycle - (ON / OFF) 30 % to 70%

Pulse frequency - 50 to 32 KHz

Figure 4.3. 7 Frequency reference function of pulse input

(6) 00-05/00-06=6:

Use the RTC function as the source of frequency command; please refer to the related descriptions of the RTC function in group 16.

(7) 00-05/00-06=7:

When 04-05 is set to 0 (auxiliary frequency), the frequency command can be provided through the multi-function analog input AI2, with a maximum output frequency of (01-02, Fmax) = 100%. If 04-05 is not set to 0 and the frequency is 0, please refer to the descriptions of multi-speed in parameter 03-00~03-06.

(8) 00-05/00-06=8:

Use the FREQ.SET knob on the panel as the frequency command.

(9) 00-05=9:

Use the handwheel as the frequency command; the rotation speed of the handwheel is multiplied by the speed calculation multiplier (20-43), then limited by the parameter speed command limit (20-44), and used as the inverter's operating command. Selecting this option requires the installation of an induction motor with a PG card (JN7-PG-L or JN7-PG-O).* PG card is only available for special projects

00- 07	Frequency source combination mode selection
Scope	**[0]:** Primary frequency source **[1]:** Primary frequency source + secondary frequency source

(1) When 00-07= 0, the frequency source is set by parameter 00- 05.

(2) When 00-07= 1, the frequency source is the primary frequency source set by parameter 00- 05 plus the secondary frequency source set by 00- 06. At this time, 00-05 and 00-06 cannot have the same frequency source set, otherwise the error message SE01 will be displayed.

If the primary frequency source is from external control and the secondary frequency source is from the digital operator, the frequency of the secondary frequency source is set by the 0 segment speed frequency (05-01) setting.

00- 08	Communication frequency command
Scope	**【0.00~599.00】Hz**

- This parameter is used to read communication frequency commands (read only).
- This parameter is only effective in communication mode.

00- 09	Communication frequency command memory
Scope	**[0]:** Do not memorize the communication frequency command before power failure (00-08) **[1]:** Memorize the communication frequency command before power failure (00-08)

- This parameter is only effective in communication mode.

00- 10	Minimum frequency detection action
Scope	**[0]:** A warning will pop up when lower than the minimum frequency **[1]:** Operates with minimum frequency when lower than the minimum frequency **[2]:** No stp0 warning, output frequency command **[3]:** No stp0 warning, output 0 when lower than the minimum frequency

- When 00-10=0: When the frequency command is lower than 01-08 (minimum output frequency), the STP0 warning will pop up.
- When 00-10=1: When the frequency command is lower than 01-08 (minimum output frequency), it will operate with the minimum output frequency.
- When 00-10=1: When the frequency command is lower than 01-08 (minimum output frequency), there is no stp0 warning and it will output the frequency command.
- When 00-10=1: When the frequency command is lower than 01-08 (minimum output frequency), there is no stp0 warning and it will output 0 when it is lower than the minimum frequency.

00- 11	PID frequency lower limit selection
Scope	**[0]:** PID sleep limit frequency lower limit **[1]:** PID sleep limit 0Hz

- When the PID frequency lower limit is in sleep mode (please refer to parameter descriptions 10-17 to 10-20), if 00-11 = 0, the PID sleep mode will limit the frequency lower limit. If 00-11 = 1, PID sleep mode will limit the frequency to 0 Hz.

00-12	Frequency upper limit
Scope	**【0.1~109.0】%**
00-13	Frequency lower limit
Scope	**【0.0~109.0】%**

The upper and lower limits of the frequency reference are based on the maximum 100% output reference, either 01-02 (Fmax) or 01-16, with a base increment of 0.1%.

- The setting value of 00-12 must be greater than 00-13, otherwise the "SE01" set range error message will be displayed.
- When the frequency reference is zero and the operation command is inputted, the motor operates at the lower limit of the frequency reference, determined by 00-13 and the minimum frequency of 01-08 (or 01-22). Please refer to Figure 4.3.8.

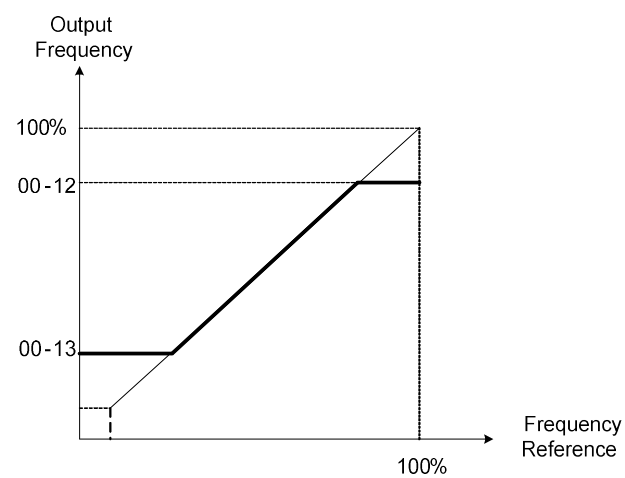


Figure 4.3. 8 Reference frequency upper and lower limits

The maximum set frequency on the panel is based on 01-02 combined with 00-12, with the frequency upper limit not exceeding 599 Hz. And the AI analog input frequency is 100% of 01-02.

00-14	Acceleration time 1	00-22	Deceleration time 3
Scope	【0.1~6000.0】 Sec	Scope	【0.1~6000.0】 Sec
00-15	Deceleration time 1	00-23	Acceleration time 4
Scope	【0.1~6000.0】 Sec	Scope	【0.1~6000.0】 Sec
00-16	Acceleration time 2	00-24	Deceleration time 4
Scope	【0.1~6000.0】 Sec	Scope	【0.1~6000.0】 Sec
00-17	Deceleration time 2	00-25	Acceleration/deceleration switching frequency
Scope	【0.1~6000.0】 Sec	Scope	【0.00~599.00】Hz
00-21	Acceleration time 3		
Scope	【0.1~6000.0】 Sec		

Set the various acceleration/deceleration time; the original acceleration time set by the manufacturer was 00-14, and the deceleration time is 00-15.

- Acceleration time: The maximum output frequency (01-02) or (01-16) time required from 0% to 100%
- Deceleration time: The maximum output frequency (01-02) or (01-16) time required from 0% to 100%

The default factory settings of the acceleration/deceleration time and jog acceleration/deceleration time vary from model to model.

Table 4.3. 2The default factory acceleration/deceleration times of the various models

Model		Default factory setting values of acceleration/deceleration times
Horse power (200V class)	Horse power (400V class)	
0.5~7.5HP	1~10HP	10s

A. Switch between acceleration/deceleration time through multi-function digital input terminals.

Use the multi-function digital input terminals (S1 ~S7), in combination with the ON/OFF status of the terminals to choose the acceleration/deceleration times during operation.

The table below shoes the switching combinations of the acceleration/deceleration times (binary).

Table 4.3. 3 Conversion combinations of acceleration/deceleration times

Acceleration/deceleration time selection 2 (Set 03-00 to 03-06 = 30)	Acceleration/deceleration time selection 1 (Set 03-00 to 03-06 = 10)	Acceleration time	Deceleration time
0	0	Taccc1(00-14)	Tdec1(00-15)
0	1	Taccc2(00-16)	Tdec2(00-17)
1	0	Taccc3(00-21)	Tdec3(00-22)
1	1	Taccc4(00-23)	Tdec4(00-24)

0 : OFF 1 : ON

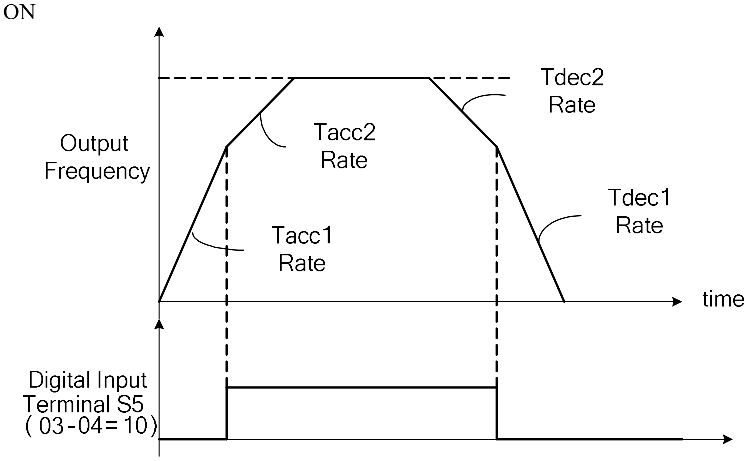


Figure 4.3. 9 Switching between acceleration/deceleration times through the multi-function digital input (example)

B. Switch between the acceleration/deceleration times according to the motor selection

Set the function of the multi-function terminal to 40 motor1/motor2 switching, and the input terminal switch can be used to switch between motors. The switching of motor1/motor2 is limited to VF control mode an VF with PG control mode only.* PG card is only available for special projects

When motor1 is selected, the multi-stage acceleration/deceleration time switches in accordance with Table 4.3.3.

When motor2 is selected, the multi-stage acceleration/deceleration time switches in accordance with Table 4.3.4.

Table 4.3. 4Motor2 acceleration/deceleration time selection

When motor2 is selected		
Acceleration/deceleration time selection 1 (Set 03-00 to 03-06 = 10)	**Acceleration time**	**Deceleration time**
0	Taccc3(00-21)	Tdec3(00-22)
1	Taccc4(00-23)	Tdec4(00-24)

C. Automatically switches acceleration/deceleration times

- When the setting value of the output frequency reaches 00-25, the first and forth acceleration/deceleration times are switched automatically according to the set frequency in 00-25. Please refer to Figure 4.3.10 below.

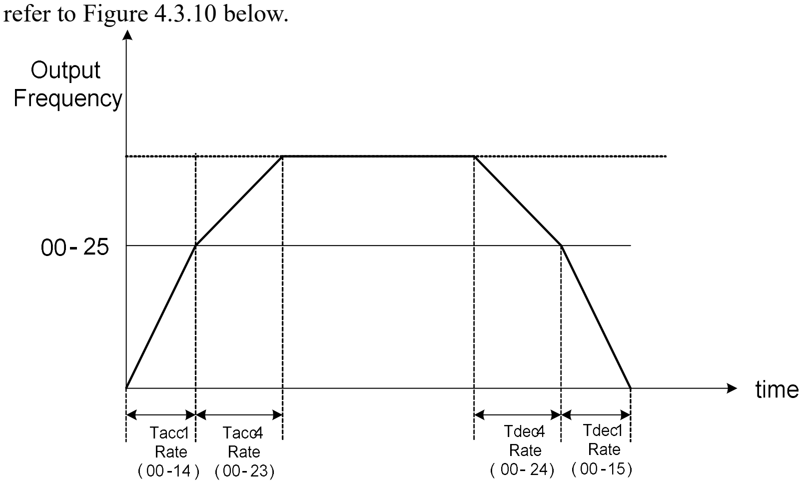


Figure 4.3. 10 Automatic acceleration/deceleration switching

- When the output frequency Fout < 00-25: The acceleration/deceleration time = first acceleration time/first deceleration time (00-14 and 00-15).
- When the output frequency Fout ≧ 00-25: The acceleration/deceleration time = the fourth acceleration time/fourth acceleration time (00-23 and 00-24)
- The priority of multi-function digital input acceleration/deceleration time selection 1 (03-00~03-06 set as 10) and acceleration/deceleration time selection 2 (set to 30) is higher than 00-25.

00-18	Jog frequency
Scope	【0.00~599.00】Hz
00-19	Jog acceleration time
Scope	【0.1~600.0】Sec
00-20	Jog deceleration time
Scope	【0.1~600.0】Sec

00-19 (jog acceleration time) The acceleration time set from zero to the maximum output frequency (01-02) or (01-16), and the acceleration time 00-20 (jog deceleration time) is set from the maximum output frequency (01-02) or (01-16) to zero.

Set the operation command source (00-02) to 1 for external terminal control. Set the jog frequency in 00-18 (default factory setting is 6.0Hz), and configure the multi-function terminal settings 03-00 to 03-06 and set them to the jog forward command (6) or jog reverse command (7), and the motor will operate according to the configured settings.

00- 26	Emergency stop time
Scope	**【0.0~6000.0】 Sec**

Use the multi-function digital input terminal (S1~S7) to decelerate and stop within the time set in 00-26

- Set the multi-function digital input terminal (03-00~03-06) to 14: When the emergency stop contact is ON (it is usually ON), decelerate and stop within the time set in 00-26.
- Set the multi-function digital input terminal (03-00~03-06) to 15: When the emergency stop contact is OFF (it is usually OFF), it will stop freely.
- After the emergency stop command is entered, the inverter cannot be restarted before it stops. To cancel emergency stop, please close the operation command and emergency stop command. Please refer to Figure 4.3.11 below.
- When error is detected, this function can be used as a way of stopping.

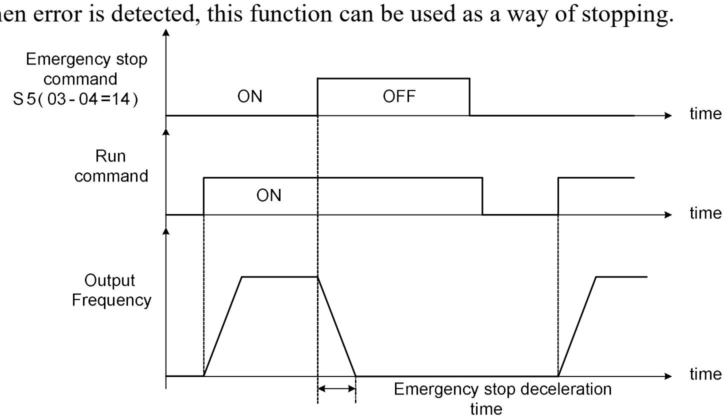


Figure 4.3. 11 An example of emergency stop operation

00- 28	Primary frequency command characteristic selection
Scope	**[0]:** Positive characteristic (0~10V/4~20mA corresponds to 0~100%) **[1]:** Negative characteristic (0~10V/4~20mA corresponds to 100~0%)

- When the analog frequency reference signal is entered from the control terminal AI1 or AI2, select the characteristic of the primary frequency reference command for the corresponding analog signal.
- 00-28 = 0: The positive characteristic of the primary frequency reference command. (0-10V or 4-20mA /0-100%, -10-0V/-100%-0)
  = 1: Inverse characteristics of the primary frequency reference.
- Please refer to Figure 4.3.12 below for the characteristics of the primary frequency reference
- When analog frequency reference signal is inputted into AI2, it must be below 04-05=0 (auxiliary frequency) in order to be effective.

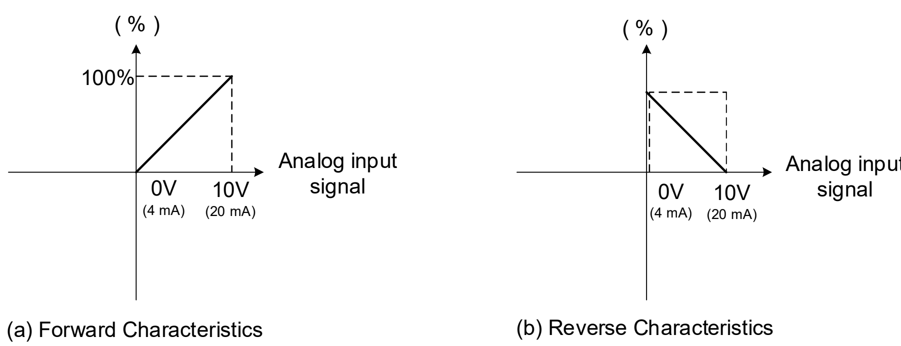


Figure 4.3. 12Positive/inverse characteristics of the primary frequency reference

00- 29	Zero-speed operation selection
Scope	**[0]:** Operates according to the frequency command **[1]:** Stop **[2]:** Operates according to the minimum frequency **[3]:** Zero speed operation

Under sensor vector mode (SV/PMSV) (00- 00=3/4), when the operating frequency is lower than the minimum output frequency, as shown in Figure 4.3.13.

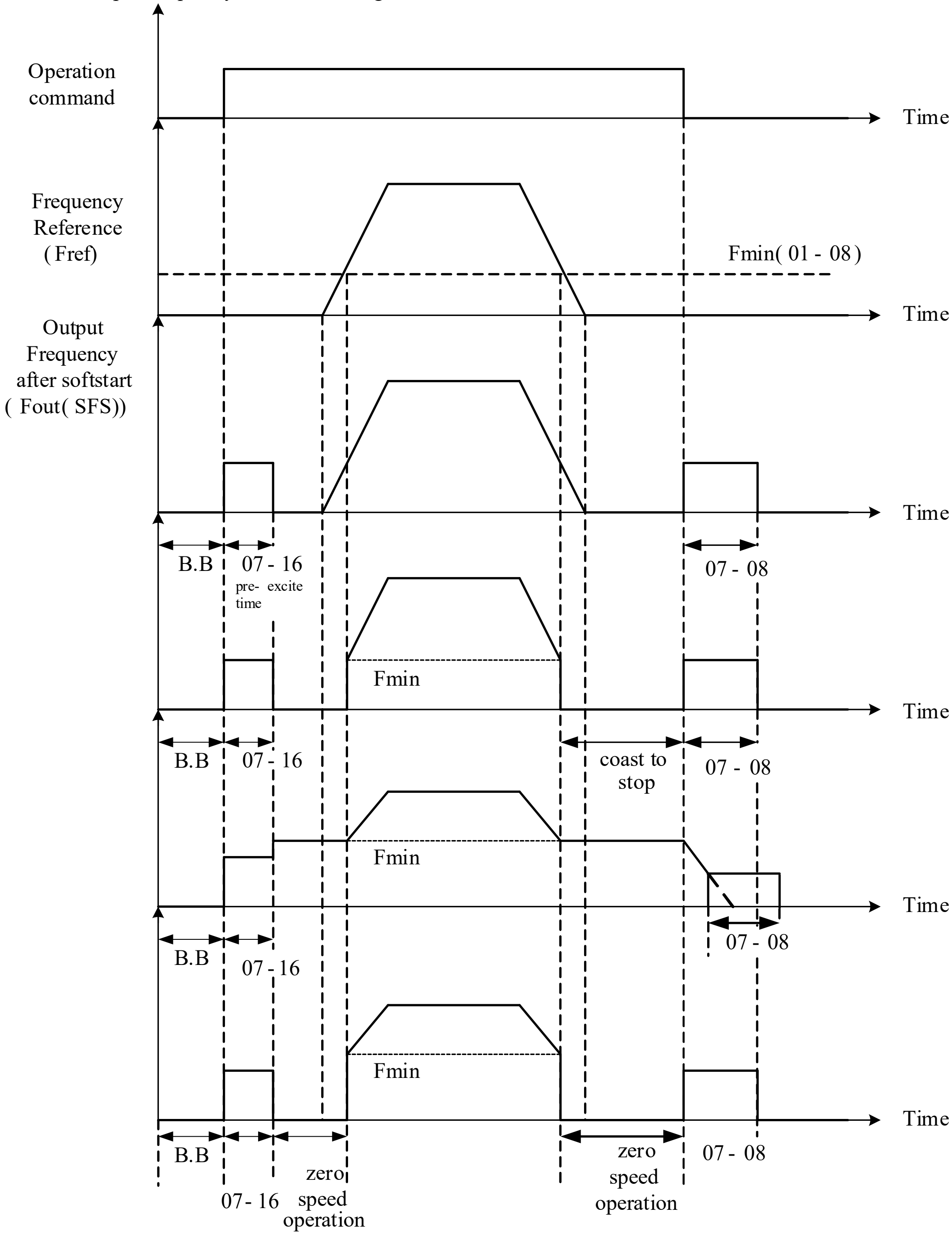


Figure 4.3. 13 Zero speed operation of vector control (SV/PMSV) mode

- When the operation command (forward or reverse) is OFF, when the output frequency reduces to the activation frequency of the DC brake (07-06), and the DC brake executes this function according to the execution time of the DC brake (07-08), please refer to Figure 4.3.84 for details on pre-excitation operations.

00- 32	Application adjustment
Scope	**[0]:** Universal **[1]:** Reserved **[2]:** Conveyor-specific parameters **[3]:** Exhaust fan-specific parameters **[4]:** Reserved **[5]:** Air compressor-specific parameters **[6]:** Hoist-specific (for lifting and lowering) parameters **[7]:** Crane-specific (for lateral movement) parameters **[8]:** Handwheel-specific parameters **[9]:** EVERISING sawing machine-specific parameters **[10]:** Punch press-specific parameters **[11]:** Textile machine-specific parameters

Note 1: If the setting value is changed back to 0 (off) by other setting values, 2-wire initialization will be performed (230/400V)(60Hz)
Note 2: Before setting the parameter 00-32 application adjustment, please perform 13-08 initialization setting first.
Warning: If parameter 00-32 (application adjustment) is set, then the input/output terminal setting function will change automatically according to the setting value. Before trial run, please confirm the input/output signal of the inverter and the external sequence control first. Failure to confirm may result in personal accidents.

(1). Reserved

(2). Conveyor-specific parameters

Parameters	Name	Settings
00-00	Control mode selection	0 : V/F
00-14	Acceleration time 1	3.0 sec
00-15	Deceleration time 1	3.0 sec
08-00	Stall prevention function	xx0x: Stall prevention effective during deceleration

(3) : Exhaust fan-specific parameters

Parameters	Name	Settings
00-00	Control mode selection	0 : V/F
11-00	Direction locking command	1: Reverse prohibited
00-27	Reserved	-
01-00	V/F curve selection	F
07-00	Instantaneously stop and restart selection	1: Effective
08-00	Stall prevention function	xx0x: Stall prevention effective during deceleration

(5). Air compressor-specific parameters

Parameters	Name	Settings
00-00	Control mode selection	0 : V/F
11-00	Direction locking command	1: Reverse prohibited
00-14	Acceleration time 1	5.0 sec
00-15	Deceleration time 1	5.0 sec
01-00	V/F curve selection	F
07-00	Instantaneously stop and restart selection	1: Effective
08-00	Stall prevention function	xx0x: Stall prevention effective during deceleration

(6). Hoist-specific (for lifting and lowering) parameters

Parameters	Name	Settings
00-00	Control mode selection	2: SLV
00-05	Primary frequency command source selection	0: Button panel
11-43	Frequency holding during startup	3.0 Hz
11-44	Time holding during startup	0.3 sec
00-14	Acceleration time 1	3.0 sec
00-15	Deceleration time 1	3.0 sec
11-01	Carrier frequency	5.0kHz
05-01	Segment 0 speed frequency setting	6.0 Hz
05-02	Segment 1 speed frequency setting	30.0 Hz
05-03	Segment 2 speed frequency setting	60.0 Hz / 50Hz
03-28	Optocoupler output	5: Frequency detected 2
07-18	Cut-off time	0.3 sec
08-00	Stall prevention function	xx1x: Stall prevention ineffective during deceleration
03-13	Frequency detection threshold	2.0 Hz
03-14	Frequency detection width	0.1 Hz
08-18	Undertorque action selection	0: Deceleration stop after detection
08-19	Undertorque detection threshold	2%
08-20	Undertorque detection time	0.5 sec
08-09	Input phase loss protection selection	1: Effective
08-10	Output phase loss protection selection	1: Effective

(7). Crane-specific (for lateral movement) parameters

Parameters	Name	Settings
00-00	Control mode selection	0: V/F
00-05	Primary frequency command source selection	0: Button panel
00-14	Acceleration time 1	3.0 sec
00-15	Deceleration time 1	3.0 sec
11-01	Carrier frequency	5.0kHz
05-01	Segment 0 speed frequency setting	6.0 Hz
05-02	Segment 1 speed frequency setting	30.0 Hz
05-03	Segment 2 speed frequency setting	60.0 Hz/50.0Hz
03-04	Multi-function terminal S5 function setting	2: Multi-speed command 1
03-05	Multi-function terminal S6 function setting	3: Multi-speed command 2
03-28	Optocoupler output	23: Frequency command source
08-00	Stall prevention function	xx1x: Stall prevention ineffective during deceleration
08-09	Input phase loss protection selection	1: Effective
08-10	Output phase loss protection selection	1: Effective

(8). Handwheel-specific parameters~~(in development)~~ only for special cases

Parameters	Name	Settings
00-00	Control mode selection	0 : V/F
00-02	Primary operation command source selection	1: External control
00-05	Primary frequency command source selection	9: Handwheel frequency
00-16	Acceleration time 2	0.1 sec
00-17	Deceleration time 2	0.1 sec
01-00	V/F curve selection	F
07-09	Stop mode selection	1: Free-run stop
07-18	Minimum cut-off time	0.1 sec
07-46	DC injection current limit	100%
08-00	Stall prevention function	xx1x: Stall prevention ineffective during deceleration
11-62	Prevent oscillation selection	2: Mode 3
20-08	ASR delay time	0
20-27	PG pulse count	100
20-43	Speed multiplier	20
20-44	Speed command limit	6.0 Hz

(9). EVERISING sawing machine-specific parameters

Parameters	Name	Settings
00-00	Control mode selection	5 :PMSLV
00-02	Primary operation command source selection	1: External control
00-05	Primary frequency command source selection	1: External control AI1 frequency
00-13	Frequency lower limit	20.0%
00-14	Acceleration time 1	10.0 sec
00-15	Deceleration time 1	7.0 sec
00-23	Acceleration time 4	4.5 sec
00-25	Acceleration/deceleration switching frequency	13.5Hz
01-14	Motor 1 input voltage setting	220/440V
07-00	Instantaneously stop and restart selection	0: Ineffective
08-00	Stall prevention function	Xx0x: Stall prevention effective during deceleration
11-00	Motor direction locking command	0: Allow forward and reverse
11-55	STOP button selection	1: When the run command is not issued via the digital operator, the STOP key is enabled.
12-03	Linear speed display (LED)	100
12-04	Display speed display mode (LED)	2: Use 1 decimal place to display the linear speed (XXXX.X)
22-05	PM motor maximum rotation speed	2700 rpm
22-04	PM motor rotation speed	1800 rpm
22-36	PM motor type selection	1 : IPM
22-37	PM motor horse power	Choose according to model
13-06	Parameter lock	0: Read only

(10). Punch press-specific parameters

Parameters	Name	Settings
00-14	Acceleration time 1	3.0
00-15	Deceleration time 1	3.0
00-23	Acceleration time 4	10.0
00-24	Deceleration time 4	10.0
00-25	Acceleration/deceleration switching frequency	30.0Hz
07-09	Stop mode selection	1
07-34	Short-circuit brake time while starting	0
20-00	ASR gain 1	0.30
20-01	ASR integral time 1	0.100
20-02	ASR gain 2	0.10
20-03	ASR integral time 2	0.100
20-04	ASR integral time limit	200
20-15	ASR gain change frequency 1	4.0
20-16	ASR gain change frequency 2	8.0
22-29	Weak magnetic voltage command limit	100

(11). Textile machine-specific parameters

Parameters	Name	Settings
00-63	Frequency upper and lower limit setting selection	1: Frequency
00-02	Primary operation command source selection	1: External control
00-05	Primary frequency command source selection	1: External control AI1 frequency
00-14	Acceleration time 1	3.0 sec
00-15	Deceleration time 1	0.5 sec
00-19	Jog acceleration time	3.0 sec
00-20	Jog deceleration time	0.5 sec
00-18	Jog frequency	10.00Hz
00-34	Multi-function terminal operation mode selection	1: Operate/stop-reverse/forward

Parameters	Name	Settings
03-00	Multi-function terminal S1 function setting	0: Two-wire forward /stop
03-01	Multi-function terminal S2 function setting	1: Two-wire reverse/stop
03-02	Multi-function terminal S3 function setting	70: Jog frequency operation

00- 33	Change parameters
Scope	**[0]:** Ineffective **[1]:** Effective

Note: for LCD use only.

- Changing the parameter will list all changed parameters automatically; when the default factory setting value was changed, and the change parameter 00-33=1 is set as effective, advanced mode will list all different default factory parameters one by one at this time, and these parameters can be edited directly. Changing the parameter list items is determined only when 00-33 is set from 0 to 1 or when 00-33 is 1 at power-on.
- To return to the normal editing page, simply set the changed parameter 00-33 = 0 to make it invalid.
- The display function for displaying the changed parameters can list up to 250 changed parameters. If there are more than 250, only the first 250 changed parameters will be listed.

For example: Set 00-03 (secondary operation command source selection) to something different from the default factory setting.

Steps	LCD Display (English)	Description
1		The increase/decrease buttons are used to select the starting parameter group (00) under group setting mode.
2	PARA 00 -01. Motor Direction -02. RUN Source --03. Sub RUN Source	Press the READ/Enter button and increase/decrease buttons to select the secondary operation command source selection (00-03) under sub-group editing. .
3	Edit 00-00 Sub RUN Source 1 Terminal (0 ~4) <2>	Press the READ /ENTER button to enter the data setting/read screen and change the values. (the selected setting value will flash)
4	PARA 00 -33. Modify parameter -41. User P1 -42. User P2	Press the DSP/FUN button once to return to change parameters (00-33) under sub-group editing.
5	Edit 00-33 Modify parameter 1 Enable (0 ~1) <0>	Press the READ /ENTER button to enter the data setting/read screen, and change the value to 1 (changed parameter effective). (the selected setting value will flash).
6	Modify 00 00-03. Sub RUN Source 00-33. Modify parameter	Press the DSP/FUN button once to return to advanced mode.

00- 34	Multi-function terminal operation mode selection
Scope	**[0]:** Forward /stop-reverse/stop **[1]:** Operate/stop-reverse/forward **[2]:** 3-wire operation/stop

(1) When 00-34=0: When the multi-function terminal setting is selected as 0 or 1, it will perform the forward/stop and reverse/stop functions, respectively.

(2) When 00-34=1: When the multi-function terminal setting is selected as 0 or 1, it will perform the operate/stop and reverse/forward functions, respectively.

(3) When 00-34=2: When multi-function terminals S3 ~ S6 are set to 26, the multi-function digital input terminals will be set to forward /reverse commands. Terminals S1 and S2 will be set to 3-wire control operation and stop commands, with the original functions disabled.

User parameter setting (00-41 to 00-56) (for LCD use only)

00- 41	User parameter 0 Function setting
00- 42	User parameter 1 Function setting
00- 43	User parameter 2 Function setting
00- 44	User parameter 3 Function setting
00- 45	User parameter 4 Function setting
00- 46	User parameter 5 Function setting
00- 47	User parameter 6 Function setting
00- 48	User parameter 7 Function setting
00- 48	User parameter 8 Function setting
00- 50	User parameter 9 Function setting
00- 51	User parameter 10 Function setting
00- 52	User parameter 11 Function setting
00- 53	User parameter 12 Function setting
00- 54	User parameter 13 Function setting
00- 55	User parameter 14 Function setting
00- 56	User parameter 15 Function setting

- Any 16 parameters (except for 00-00, 00-41~00-56, and the parameters from group 0 to group 22 other than group 17) can be planned (selected) for user parameters (00-41 to 00-56) and placed in the same list. This feature allows frequently used parameters to be accessed and set quicker.
- When the access level (13-06) is set to 1 (user level), user parameters 00-41 to 00-56 can be displayed and changed.
- User parameters 00-41 to 00-56 can only be changed under advanced mode, and cannot be changed while operating.
- Usage method: Set the parameter values you want from 00-41 to 00-56, then set 13-06 to 1.
- When 13-06=1 (user level), only the parameters from 00-00 to 00-56 can be set or can be read under advanced mode, and 13-06=1 can only be performed when 00-41 to 00-56 is set.
- When in user level, to exit, first press RESET on the home page, and then press the hotkey DSP / FUN to call group 13.

Example 1: Set 03-00 (multi-function terminal S1 function setting) to user parameter 0 (00-41)

Steps	LCD Display (English)	Description
1		Select start parameter group (00) under advanced mode.
2	PARA 00 -41. User P0 -42. User P1 -43. User P2	Press the READ / Enter buttons and accelerate / decelerate buttons to select user parameter 0 (00-41). .
3	Edit 00- 1 User P0=00 41 00-41 User P0 <00-01 - 24-07>	Press the READ / ENTER button to enter the data setting/read screen. (the selected setting value will flash)
4	Edit 00-41 User P0=00-41 03-00 S1 Function Sel <00-01 - 24-07>	Use the left / right buttons and accelerate / decelerate buttons to set the setting value to 03-00 (multi-function terminal **S1** function setting).
5	Edit 00-41 User P0= 03-00 03-00 S1 Function Sel <00-01 - 24-07>	Press the READ / Enter button to save the setting value (03-00), and the number will stop flashing and display **User P0 = 03-00**; 03-00 (multi-function terminal **S1** function setting) is defined as 00-41. The number selected will start flashing again a few seconds later.
6	Monitor Freq Ref 12-16=000.00Hz ----- ------------- ----------- ------- 12-17=000.00Hz 12-18=0000.0A	Press the DSP / FUN button once to return to the home page of the operator. (If the DSP / FUN button was not pressed within one minute, the display screen will return to the monitor mode screen in the left figure automatically. The automatic return time can be set with 16-06).

Example 2: After one or multiple parameters from 00-41 to 00-56 is set, set the user set parameter, as shown in the example below:

Steps	LCD Display (English)	Description
1	Group 13 Driver Status 14 PLC Setting 15 PLC Monitor	Select start parameter group (03) under advanced mode.

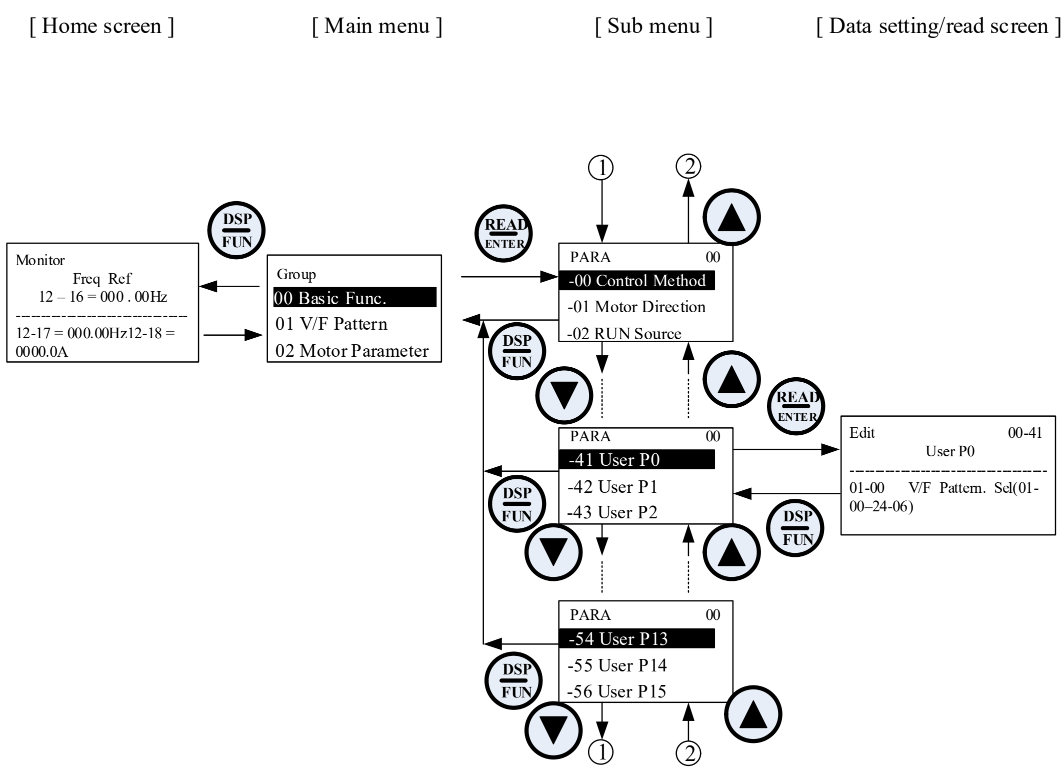
2	PARA 13 -06. Access Level -07. Password 1 -08. Initialize	Press the READ / Enter button and accelerate / decelerate buttons to enter the parameter access level (13-06) display screen.

Steps	LCD Display (English)	Description
3	Edit 13-06 Access Level -------------------------------------- 1 User Level (0~2) < 2 >	Press the READ / ENTER button to enter the data setting/read screen. (the selected setting value will flash)
4	─ADV─ G01-02 Access Level 1 User Level (0-2) < 2 >	• Use the accelerate / decelerate button to change the setting value to 1 (13-06=1, user level), and press the READ / ENTER button to save the setting value (03-00), and the number will stop flashing and be displayed. (The number selected will start flashing again a few seconds after being set). • User level (13-06=1) can be set using one or multiple parameter settings from 00-41 to 00-56. If user parameter was not set, 13-06 does not need to be set for user level (setting value=1).
5	PARA 13 -06. Access Level	Press the DSP / FUN button once to return to the display sub-menu of the operator.
6	Group 00.User Function	Press the DSP / FUN button once to return to the group menu. The up button needs to be pressed at this time to select the 00 User Function group.
7	Monitor Freq Ref 12-16=000.00Hz -------------------------------------- 12-17=000.00Hz 12-18=0000.0A	Press the DSP / FUN button one time to return to the home page; to exit user parameters, first press RESET and then press the DSP / FUN hotkey to call group 13.
8	Group 00.User Function00 User 13.Driver Status	Group 13 will appear at this time and the parameter 13-06 can be changed to exit parameters, or enter group 00 to edit user parameters.
9	PARA 00 -41. S1 Function Sel	When in 00 user parameter, press the READ / Enter buttons and accelerate /decelerate buttons to select user parameter 0 (00-41) display.
10	Edit 00-41 S1 Function Sel 00 2-Wire (FWD-RUN) (00~57) < 00 > < 03-00 >	Press the READ / ENTER button to enter the data setting/read screen. (the selected setting value will flash). In this example, 03-00 (multi-function terminal **S1** function setting) has been defined as user parameter 00-41, and the original parameter group position is displayed at the bottom-right.
11	Edit 00-41 S1 Function Sel 06 FJOG (00~57) < 00 > < 03-00 >	Use the accelerate / decelerate buttons to change the setting value to 6, and use the READ / ENTER button to save the setting value. When the selected setting value no longer flashes, the setting value will also be saved to 00-41 and 03-00.

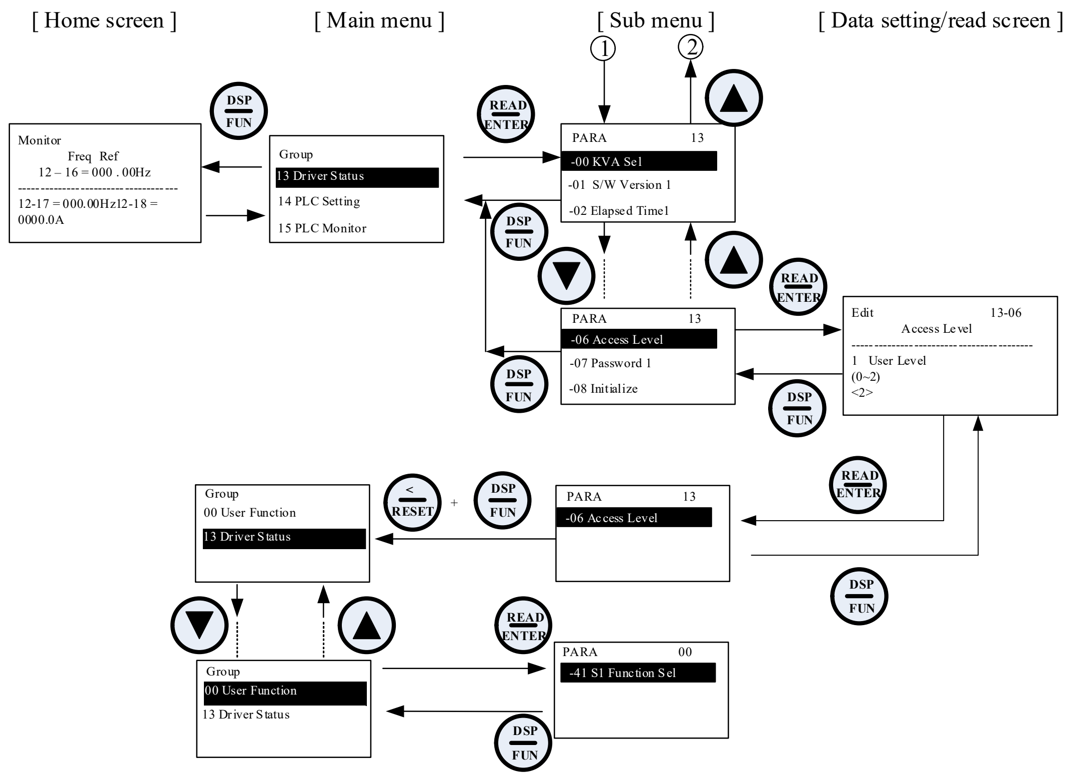
12	Monitor Freq Ref 12-16=000.00Hz --------------------------------- ------ 12-17=000.00Hz	Press the DSP / FUN button once to return to the display home page of the operator. (If the DSP / FUN button was not pressed within one minute, the display screen will return to the monitor mode screen in the left figure automatically. The automatic return time can be set with 16-06).

User parameter operation mode structure

A. Define any other parameter (except for 00-00 and 00-41~00-56 and the parameters from group 0 to group 22) as user parameters



* User level (13-06=1) can be set using one or multiple parameter settings from 00-41 to 00-56.



00- 57	SV high-speed mode
Scope	[0]SV high-speed mode 1 [1]SV high-speed mode 2

- When operating under SV mode, SV high-speed mode 2 can be used when acceleration and deceleration is required urgently.

00- 63	Frequency upper and lower limit setting selection
Scope	**[0]** Percentage **[1]** Frequency

(1) When 00-63=0: The upper and lower limits of the frequency, parameters 00-12 and 00-13, will be displayed with percentages.
(2) When 00-63=1: The upper and lower limits of the frequency, parameters 00-12 and 00-13, will be displayed with frequency Hz.

01-V/F control function group

01- 00	V/F curve selection
Scope	**【0~FF】**

When using V/F mode without PG or VF mode with PG and SLV2 mode, the V/F characteristic of the inverter output can be set with 01-00.

. When the V/f curve is used, the inverter input voltage needs to be set with 01-14.
. There are three ways to set the V/f curve:
(1) 01-00 = 0 to E: Select from the 15 preset types (0 to E).
(2) 01-00 =0F, use 01-02~01-09 and 01-12~01-13 to define the V/f curve for users with voltage limitations.
(3) 01-00 = FF: Use 01-02~01-09 and 01-12~01-13 to define the V/f curve for users without voltage limitations. References are as shown in the figure below.

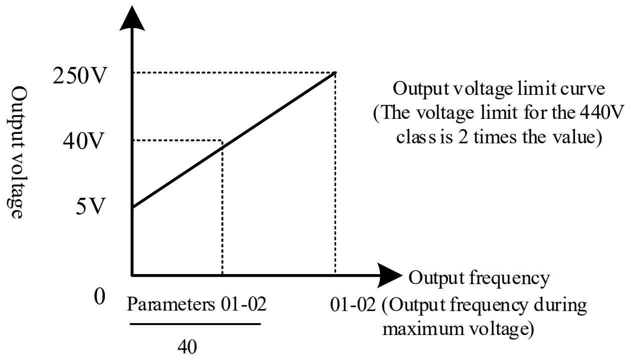


Figure 4.3. 14 References for user-defined V/f curves

. The default factory setting of 01-00 is F, and when 01-00 is set to 1, the contents of 01-02~01-09 and 01-12~01-13 are the same.
. When one of the 15 preset types is selected, the setting values of 01-02 to 01-13 are changed automatically. There are three types of values for 01-02~01-09 and 01-12~01-13 here; the value depends on the capacity of the inverter.
. V/F characteristics of reference tables 4.3.5~4.3.20.

* This parameter is not affected by the initialization parameter (13-08).

Table 4.3. 5 0.5 - 2HP V/f curve (200V)

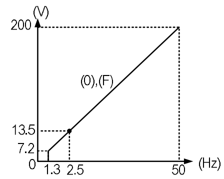
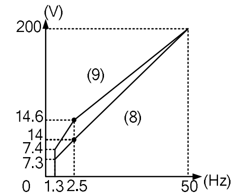
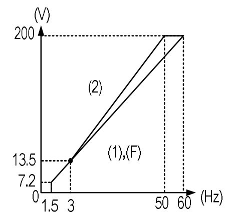
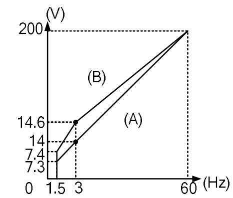
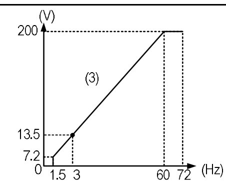
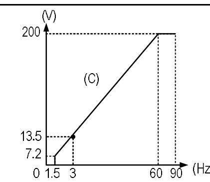
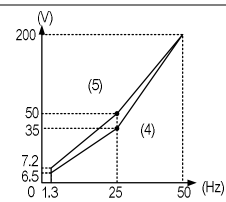
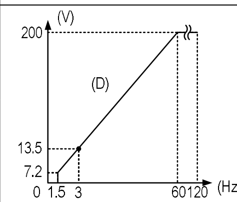
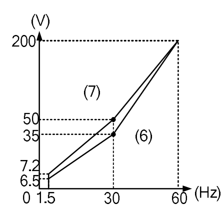
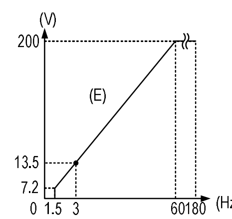
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3">
</td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3">
</td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td>
</td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td rowspan="2">50Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2">
</td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2">
</td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2">
</td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2">
</td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 6 3 ~ 10HP V/f curve (200V)

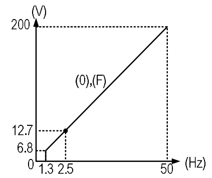
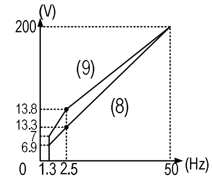
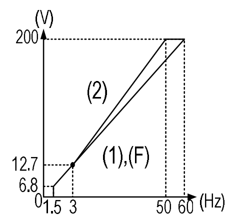
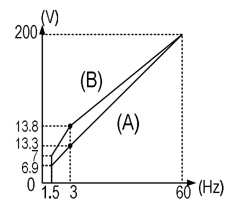
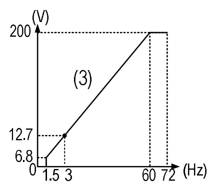
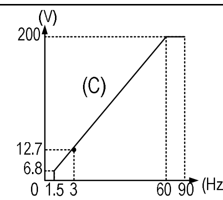
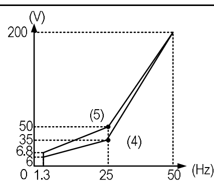
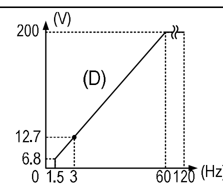
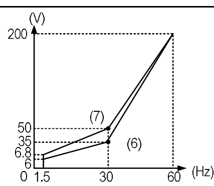
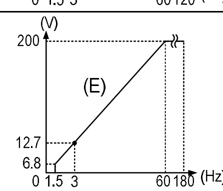
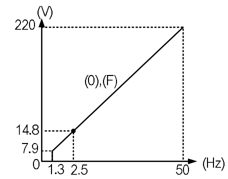
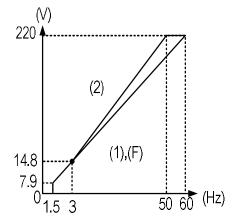
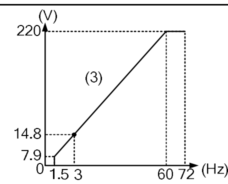
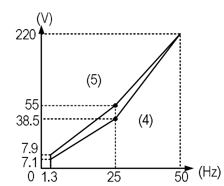
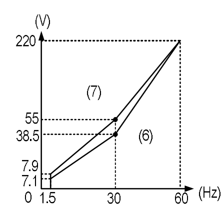
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 7 0.5 ~ 2HP V/f curve (220V)

Type	Specifications		01-00 setting	V/F curve
General use	50Hz		0	
			F (50Hz default factory value)	
	60Hz	60 Hz Saturated	1	
			F (60Hz default factory value)	
		50 Hz Saturated	2	
Deceleration torque (wind and hydraulic machinery)	72Hz		3	
	50Hz	Cubic deceleration curve	4	
		Quadratic deceleration curve	5	
	60Hz	Cubic deceleration curve	6	
		Quadratic deceleration curve	7	

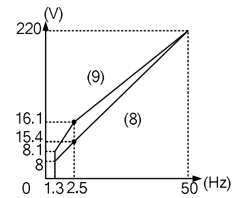
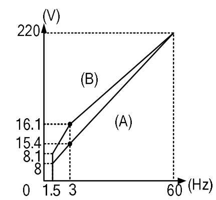
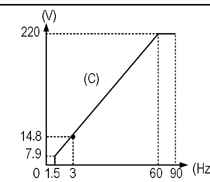
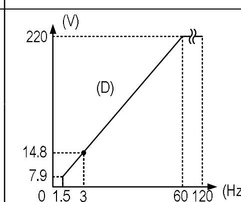
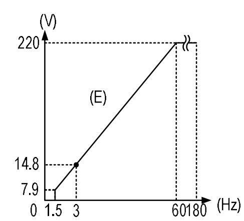
Type	Specifications		01-00 Setting	V/F curve
High starting torque	50Hz	Low starting torque	8	
		High starting torque	9	
	60Hz	Low starting torque	A	
		High starting torque	B	
Constant horsepower torque (reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3. 8 3 ~ 10HP V/f curve (220V)

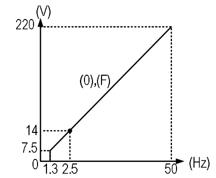
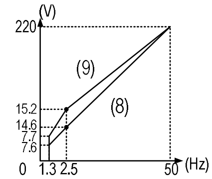
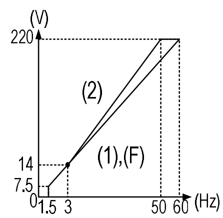
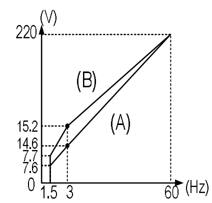
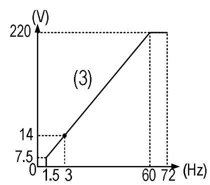
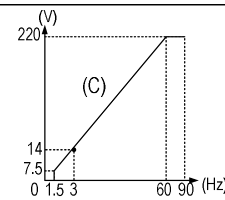
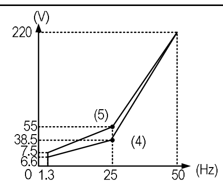
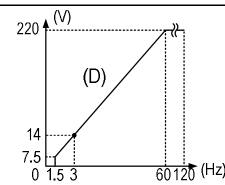
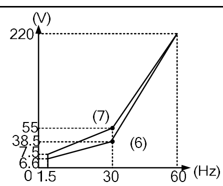
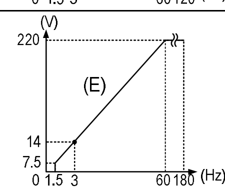
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2">
</td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2">
</td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3">
</td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3">
</td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td>
</td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td>
</td></tr>
<tr><td rowspan="2">50Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2">
</td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2">
</td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2">
</td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2">
</td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 9 0.5 ~ 2HP V/f curve (230V)

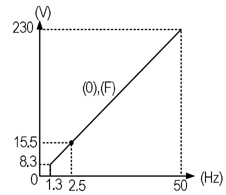
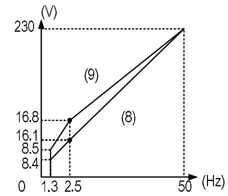
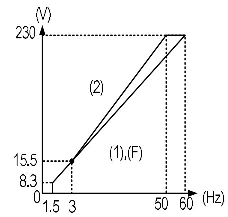
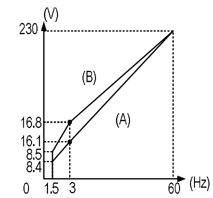
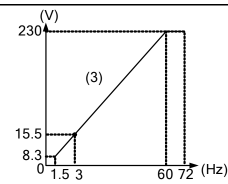
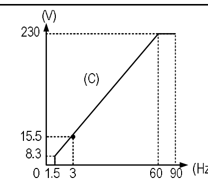
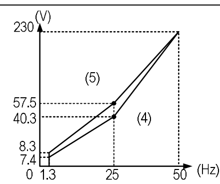
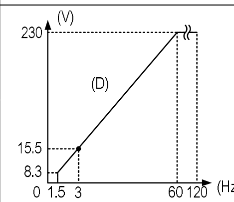
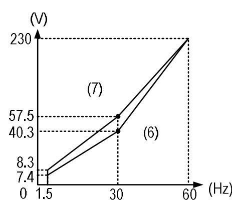
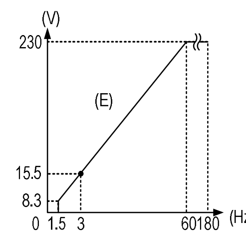
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 10 3 - 10HP V/f curve (230V)

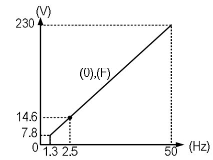
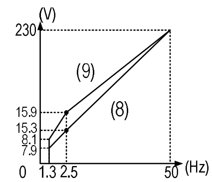
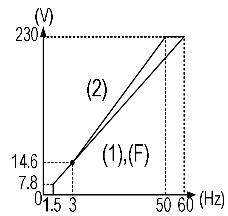
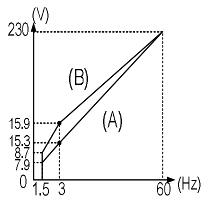
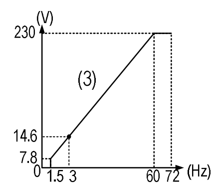
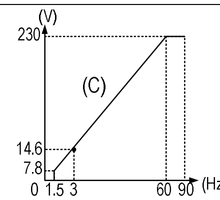
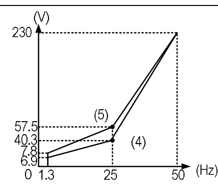
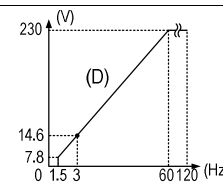
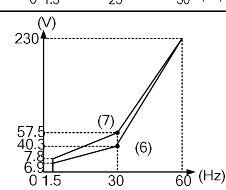
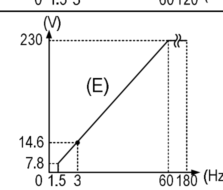
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 11 1 - 2HP V/f curve (380V)

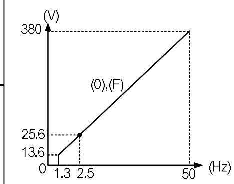
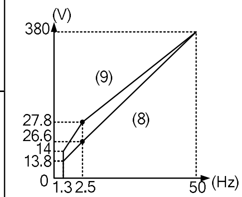
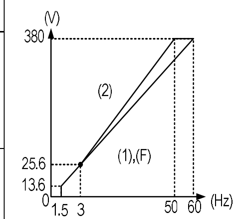
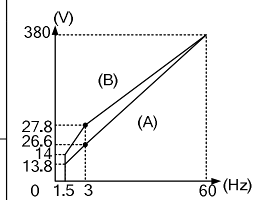
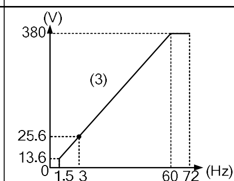
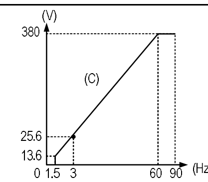
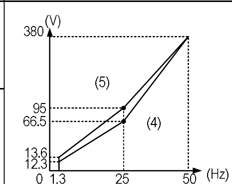
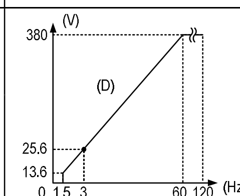
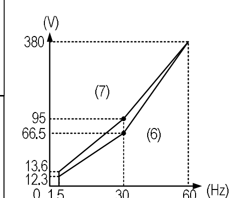
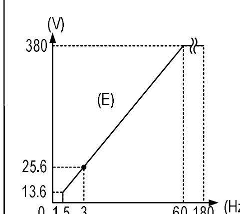
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)				High starting torque	B	
		50 Hz Saturated	2						
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 12 3 - 10HP V/f curve (380V)

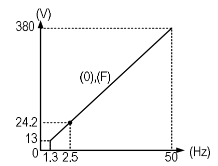
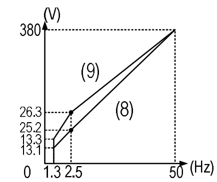
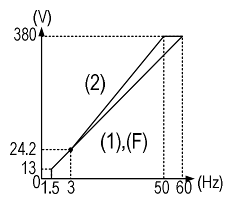
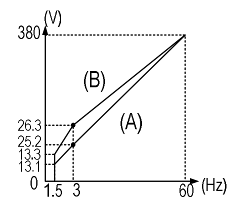
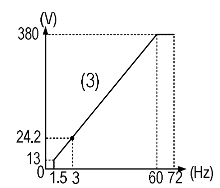
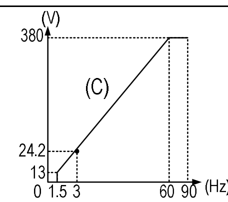
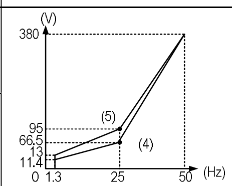
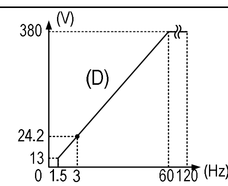
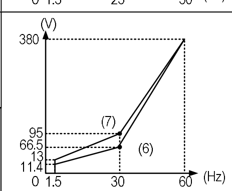
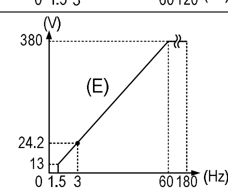
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 13   1 - 2HP V/f curve (400V)

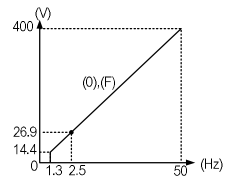
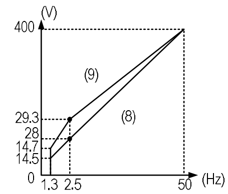
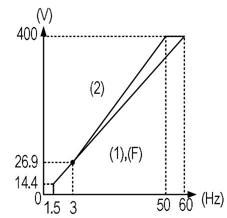
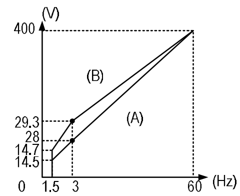
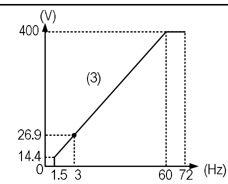
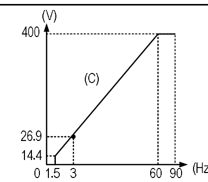
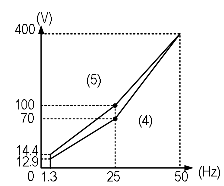
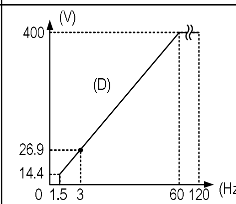
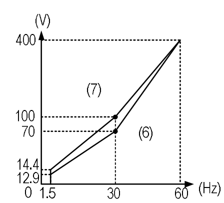
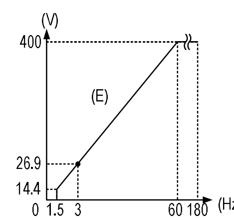
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 14 3 - 10HP V/f curve (400V)

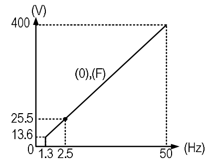
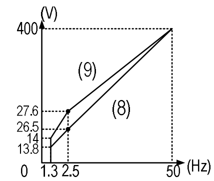
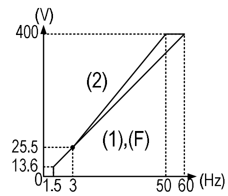
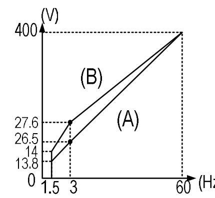
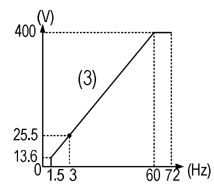
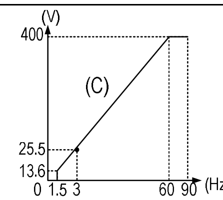
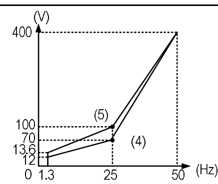
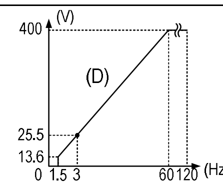
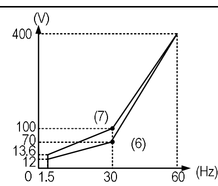
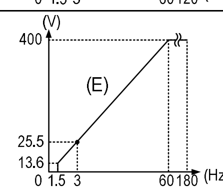
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 15 1 - 2HP V/f curve (415V)

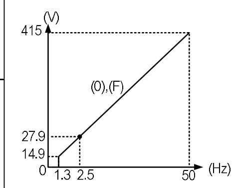
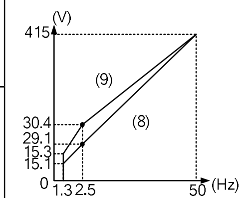
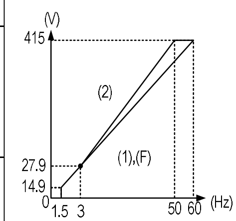
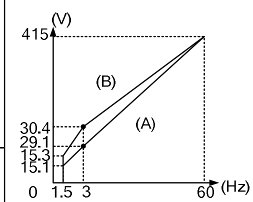
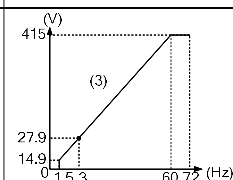
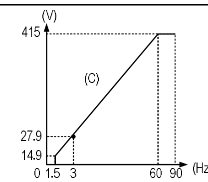
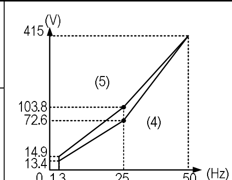
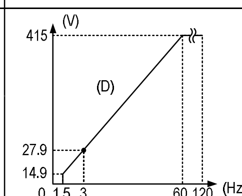
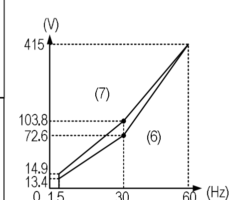
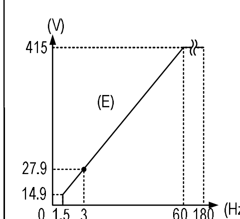
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50 Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 16 3 - 10HP V/f curve (415V)

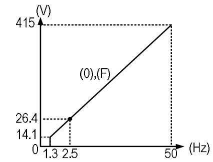
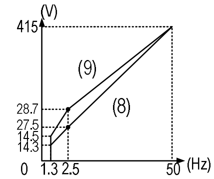
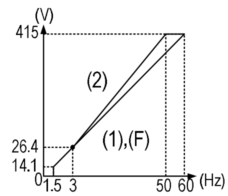
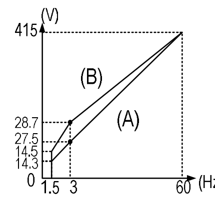
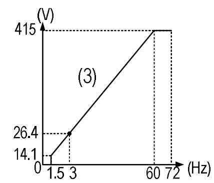
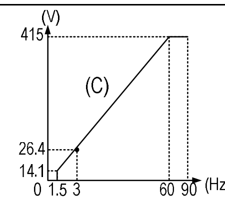
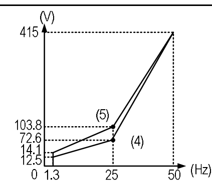
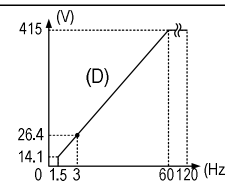
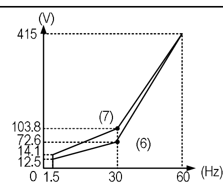
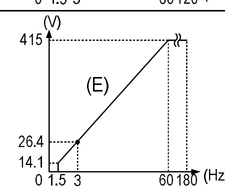
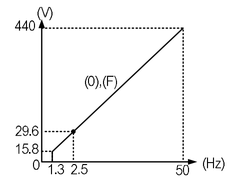
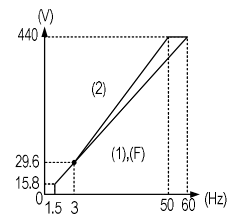
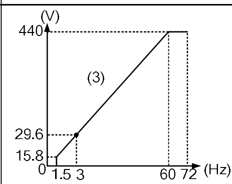
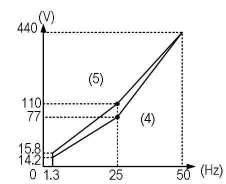
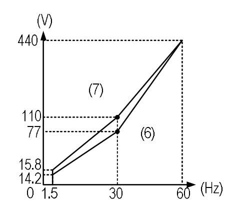
<table>
<tr><th>Type</th><th colspan="2">Specifications</th><th>01-00 setting</th><th>V/F curve</th><th>Type</th><th colspan="2">Specifications</th><th>01-00 Setting</th><th>V/F curve</th></tr>
<tr><td rowspan="5">General use</td><td colspan="2" rowspan="2">50Hz</td><td>0</td><td rowspan="2"></td><td rowspan="5">High starting torque</td><td rowspan="2">50Hz</td><td>Low starting torque</td><td>8</td><td rowspan="2"></td></tr>
<tr><td>F (50Hz default factory value)</td><td>High starting torque</td><td>9</td></tr>
<tr><td rowspan="3">60Hz</td><td rowspan="2">60 Hz Saturated</td><td>1</td><td rowspan="3"></td><td rowspan="3">60Hz</td><td rowspan="2">Low starting torque</td><td rowspan="2">A</td><td rowspan="3"></td></tr>
<tr><td>F (60Hz default factory value)</td></tr>
<tr><td>50 Hz Saturated</td><td>2</td><td>High starting torque</td><td>B</td></tr>
<tr><td rowspan="5">Deceleration torque (wind and hydraulic machinery)</td><td colspan="2">72Hz</td><td>3</td><td></td><td rowspan="5">Constant horsepower torque (reducer)</td><td colspan="2">90Hz</td><td>C</td><td></td></tr>
<tr><td rowspan="2">50Hz</td><td>Cubic deceleration curve</td><td>4</td><td rowspan="2"></td><td colspan="2" rowspan="2">120Hz</td><td rowspan="2">D</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>5</td></tr>
<tr><td rowspan="2">60Hz</td><td>Cubic deceleration curve</td><td>6</td><td rowspan="2"></td><td colspan="2" rowspan="2">180Hz</td><td rowspan="2">E</td><td rowspan="2"></td></tr>
<tr><td>Quadratic deceleration curve</td><td>7</td></tr>
</table>

Table 4.3. 17 1 - 2HP V/f curve (440V)

Type	Specifications		01-00 setting	V/F curve
General use	50Hz		0	
	50Hz		F (50Hz default factory value)	
	60Hz	60 Hz Saturated	1	
	60Hz	60 Hz Saturated	F (60Hz default factory value)	
	60Hz	50 Hz Saturated	2	
Deceleration torque (wind and hydraulic machinery)	72Hz		3	
	50Hz	Cubic deceleration curve	4	
	50Hz	Quadratic deceleration curve	5	
	60Hz	Cubic deceleration curve	6	
	60Hz	Quadratic deceleration curve	7	

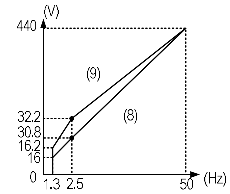
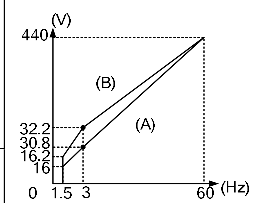
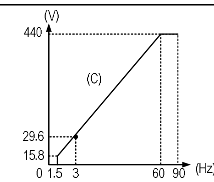
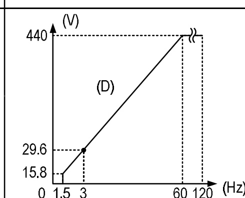
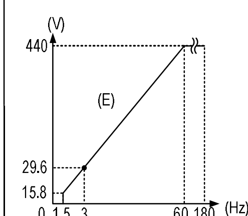
Type	Specifications		01-00 Setting	V/F curve
High starting torque	50Hz	Low starting torque	8	
	50Hz	High starting torque	9	
	60Hz	Low starting torque	A	
	60Hz	High starting torque	B	
Constant horsepower torque (reducer)	90Hz		C	
	120Hz		D	
	180Hz		E	

Table 4.3. 18 3 - 10HP V/f curve (440V)

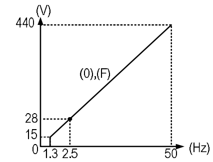
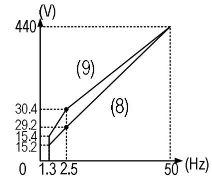
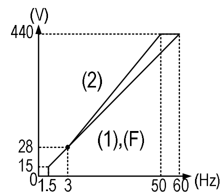
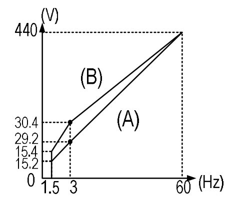
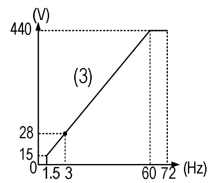
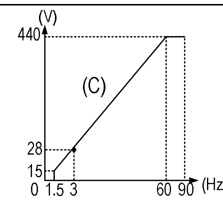
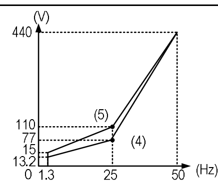
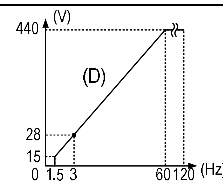
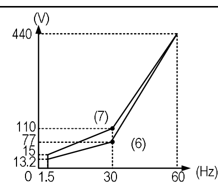
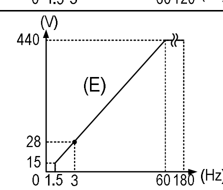
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 19 1 - 2HP V/f curve (460V)

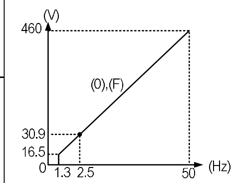
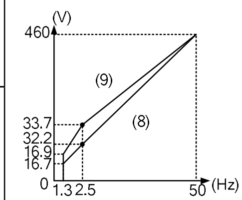
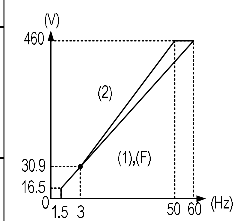
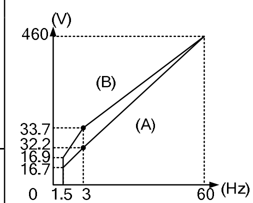
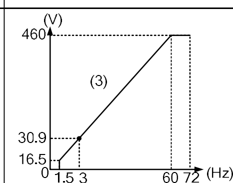
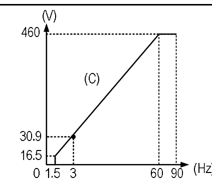
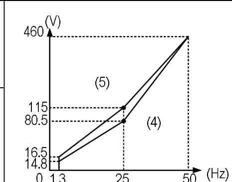
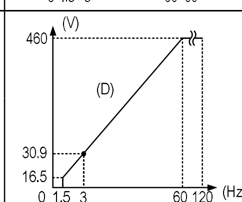
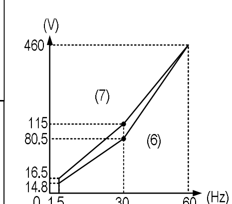
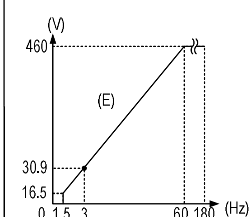
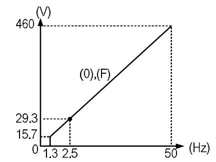
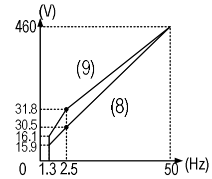
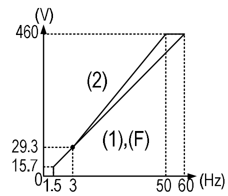
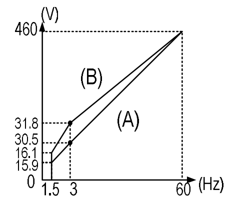
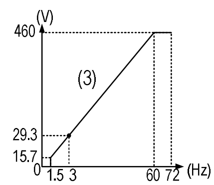
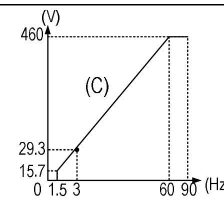
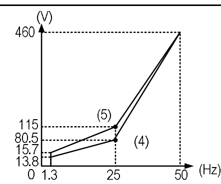
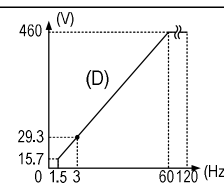
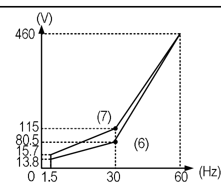
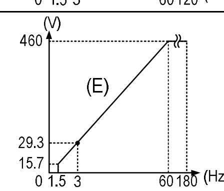
Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

Table 4.3. 20 3 - 10HP V/f curve (460V)

Type	Specifications		01-00 setting	V/F curve	Type	Specifications		01-00 Setting	V/F curve
General use	50Hz		0		High starting torque	50Hz	Low starting torque	8	
			F (50Hz default factory value)				High starting torque	9	
	60 Hz	60 Hz Saturated	1			60Hz	Low starting torque	A	
			F (60Hz default factory value)						
		50 Hz Saturated	2				High starting torque	B	
Deceleration torque (wind and hydraulic machinery)	72Hz		3		Constant horsepower torque (reducer)	90Hz		C	
	50Hz	Cubic deceleration curve	4			120Hz		D	
		Quadratic deceleration curve	5						
	60Hz	Cubic deceleration curve	6			180Hz		E	
		Quadratic deceleration curve	7						

01- 02	Motor 1 maximum output frequency
Scope	【4.8~599.0】**Hz**
01- 03	Motor 1 maximum output voltage
Scope	200V:【0.1~255.0】**V** 400V:【0.2~510.0】**V**
01- 04	Motor 1 intermediate output frequency 2
Scope	【0.0~599.0】**Hz**
01- 05	Motor 1 intermediate output voltage 2
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 06	Motor 1 intermediate output frequency 1
Scope	【0.0~599.0】**Hz**
01- 07	Motor 1 intermediate output voltage 1
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 08	Motor 1 minimum output frequency
Scope	【0.0~599.0】**Hz**
01- 09	Motor 1 minimum output voltage
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 12	Motor 1 base frequency
Scope	【4.8~599.0】**Hz**
01- 13	Motor 1 base output voltage
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**

V/f curve setting (01-02~01-09 and 01-12~01-13)

- Only when 01-00 is set to "F" or "FF", **can 01-02~01-09 and 01-12~01-13** be set by users. If 01-00 was set to any value other than F or FF, the parameter cannot be changed.
- Please follow the frequency setting rules described below, otherwise the warning message "SE03" V/f curve error will be displayed.

F_{max}	$\geq$	F_{base}	$>$	F_{mid2}	$>$	F_{mid1}	$>$	F_{min}
(01-02)		(01-12)		(01-04)		(01-06)		(01-08)

- If 01-04 and 01-05 (or 01-18 and 01-19) was set to 0, the program will ignore the setting values of Fmid2 and Vmid2.
- The maximum frequency of 01-02 motor 1 must not exceed 4 times the base frequency of 01-12 motor 1.
- There are no related standards for the voltage setting values of parameter 01-02 to parameter 01-09.
- The values of parameters 01-03, maximum output voltage of motor 1, and 01-13, basic output voltage of motor 1, will be restored to the default factory settings based on the option configured in parameter 13-08.
- When the control method 00-00 is changed, parameters 01-08(F_{min}) and 01-09 (V_{min}) will change the default factory settings of the various control methods.
- Refer to the user-defined V/F curve in the figure below.

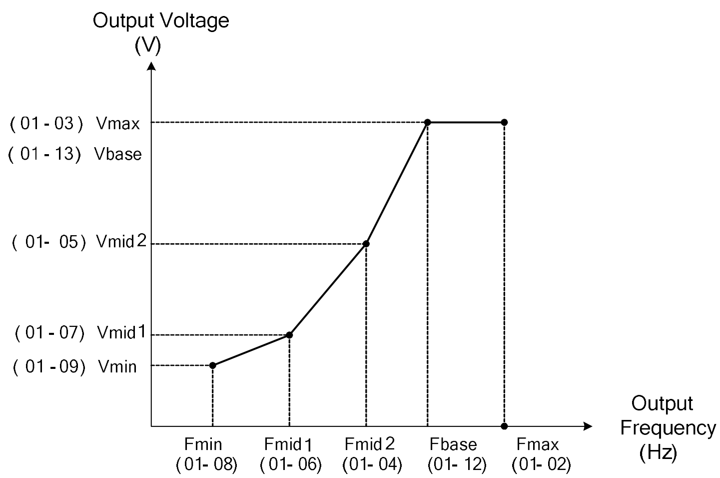


Figure 4.3. 15 User-defined V/F curve

- Set the V/F curve based on the allowed load characteristics of the motor. In low-torque high-speed applications, the motor may overheat. If the motor operates for long periods of time under such condition, special attention is required for motor cooling.
- If parameter 01-10 was used to enable the automatic torque boost function, under low-frequency starting and operation, the motor voltage will change automatically in order to provide sufficient motor torque.

SV (flux vector control) V/F curve setting

. Under normal circumstances, the V/F curve does not need to be adjusted in SLV control mode. The V/F curve is adjusted by changing the maximum output frequency setting 01-02 (Fmax), the basic frequency 01-12 (Fbase), the minimum output frequency 01-08 (Fmin), the maximum output voltage 01-03 (Vmax), or the basic output voltage 01-13 (Vbase).

. Since the current controller is used for SV/SLV mode, therefore, group 01 can only adjust the frequency curve under SV/SLV mode, and the voltage is already adjusted by the current controller. Regardless of whether the motor is operating in applications within the constant power range or higher than the rated frequency of the motor, the parameters 02-19 or 17-04 can be used to reduce the setting value of the no-load voltage, and restart to perform automatic parameter adjustment to achieve pre-magnetic weakening mode. The adjustment range of the no-load voltage is approximately 10~40V. After the no-load voltage is reduced, motor oscillation can be prevented. The only disadvantage of field weakening control is that it will cause the current to increase.

. Under SLV mode, the basic frequency (01-12,F_{base}) needs to be set to the rated frequency on the motor nameplate.

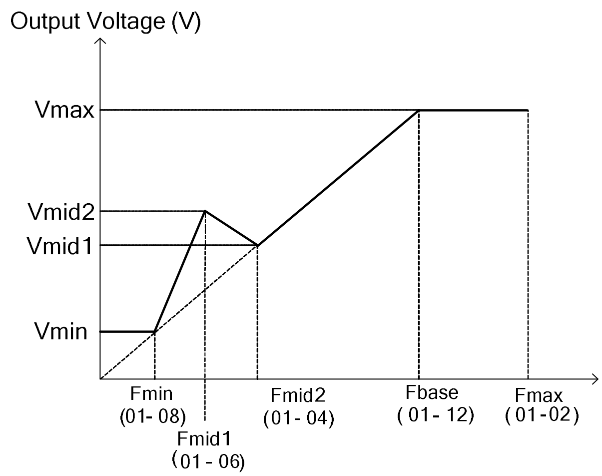


Figure 4.3. 16 Torque increase

***The setting method of SLV2's V/F curve is the same as VF mode**

01-10	Torque compensation gain
Scope	【0.0~2.0】
01-11	Torque compensation mode selection
Scope	**0:** Torque compensation mode 0 **1:** Torque compensation mode 1

Torque compensation gain (01-10) *V/F + PG is for special projects only

.V/F or V/F+PG and SLV2 mode: The inverter calculates the compensation voltage based on the motor voltage drop.

. The torque compensation gain (01-10) can be modified during operation, but usually does not need to be adjusted, except in the following situations:

— If the wiring between the inverter and motor is too long, add setting values.
— If the motor capacity is smaller than the inverter capacity, increase the setting value.
— If the motor vibrates, reduce the setting value.

. Gradually increase the setting value of 01-10 and confirm that the current increase is not too much.

. Confirm that the output current during low-speed will not exceed the rated output current of the inverter; make adjustments by referring to the torque compensation gain in Figure 4.3.17.

Torque compensation mode selection (01-11)
Torque compensation mode 0 is general torque compensation mode.
Torque compensation mode 1 is the high-speed torque compensation mode (120~160Hz). The compensation amount will decrease with the increase of the frequency, and the compensation for 0~120Hz will be the same as torque compensation mode 0.

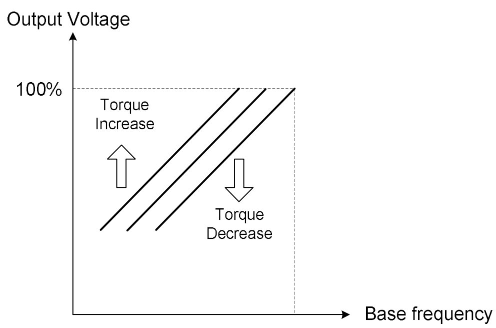


Figure 4.3. 17 Adjust the torque compensation gain to increase output torque

01-14	Input voltage setting
Scope	200V :【155.0~255.0】**V** 400V :【310.0~510.0】**V**

The minimum unit of the inverter input voltage is 0.1V.
(For example: 200V / 208V / 230V / 240V or 380V / 415V / 440V / 460V / 480V).
This setting value is used to pre-define a reference value of the V/f curve (01-00 = 0 to E), and protect against incidents such as over voltage and stalls

Note: The input voltage setting will be restored to the default factory setting based on the option configured in parameter 13-08.
If the setting value of parameter 01-14 is lower than the actual input voltage, then the output voltage (parameter 12-19) and output power (parameter 12-21) will be displayed incorrectly.

01-15	Torque compensation time
Scope	【0~10000】**ms**

. The setting of the torque compensation delay time uses millisecond as the unit.
. It can be adjusted under the following conditions:
- If the motor vibrates, increase the setting value.
- If the motor responds too slowly, reduce the setting value.

01- 16	Motor 2 maximum output frequency
Scope	【4.8~599.0】**Hz**
01- 17	Motor 2 maximum output voltage
Scope	200V:【0.1~255.0】**V** 400V:【0.2~510.0】**V**
01- 18	Motor 2 intermediate output frequency 2
Scope	【0.0~599.0】**Hz**
01- 19	Motor 2 intermediate output voltage 2
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 20	Motor 2 intermediate output frequency 1
Scope	【0.0~599.0】**Hz**
01- 21	Motor 2 intermediate output voltage 1
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 22	Motor 2 minimum output frequency
Scope	[0.0~599.0] **Hz**
01-23	Motor 2 minimum output voltage
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 24	Motor 2 base frequency
Scope	【4.8~599.0】**Hz**
01- 25	Motor 2 base output voltage
Scope	200V:【0.0~255.0】**V** 400V:【0.0~510.0】**V**
01- 26	Motor 2 V/F curve selection
Scope	**【0~FF】**

*Set the motor 2 V/F curve; its setting method is the same as motor 1
*The motor 2 V/F curve is the same as the motor 1 V/F curve; please refer to tables 4.3.5~4.3.20.

02-IM motor parameter group

02- 00	Motor 1 no-load current		
Scope	【0.01~600.00】**A**		
02- 01	Motor 1 rated current		
Scope	V/F and V/F+PG modes are 10%~200% of the inverter's rated current, and the SLV **and** SV modes are 25%~200% of the inverter's rated current. *** (V/F+PG, SV and PMSV** are only for special projects		
02-03	Motor 1 rated rotation speed	**02-11**	Motor 1 magnetic core saturation factor 2 <1>
Scope	【0~60000】**rpm**	**Scope**	【1~100】**%**
02- 04	Motor 1 rated voltage	**02-12**	Motor 1 magnetic core saturation factor 3 <1>
Scope	200V**:**【50.0~240.0】**V**	**Scope**	【80~300】**%**
	400V**:**【100.0~480.0】**V**		
02- 05	Motor 1 rated power	**02-13**	Motor 1 magnetic core loss
Scope	【0.01~600.00】**KW**	**Scope**	【0.0~15.0】**%**
02-06	Motor 1 rated frequency	**02-15**	Motor 1 line-to-line resistance <1>
Scope	【4.8~599.0】**Hz**	**Scope**	【0.001~60.000】Ω
02-07	Motor 1 number of poles	**02-16**	Motor 1 rotor resistance
Scope	【2~16】	**Scope**	【0.001~60.000】Ω
02-09	Motor 1 excitation current <1>	**02-17**	Motor 1 leakage inductance
Scope	[15~70]**%** motor rated current	**Scope**	【0.01~200.00】mH
02-10	Motor 1 magnetic core saturation factor 1 <1>	**02-18**	Motor 1 mutual inductance
Scope	【1~100】**%**	**Scope**	【0.1~6553.4】mH

The motor parameter settings are as shown below. When motor 1 is selected during motor parameter tuning, these motor parameters are set to (17-10=1) automatically, and usually do not need to be further adjusted, except for some special applications, such as constant horsepower control for spindle motors of tools.
Please refer to reference group 22 for the parameter settings of permanent magnet motors

(1) Set (02-07) for the number of poles for the motor.
- Set the number of poles for the motor as indicated on the motor nameplate.

(2) Motor rated power (02-05)
- Set it to the power value on the motor nameplate.

(3) Motor rated current (02-01)
- Set it to the motor nameplate full load current.
- If under SLV and SV control modes, to adjust the rated current of the motor, please adjust 17-02 in the automatic tuning function group and restart the automatic tuning function.

(4) Motor rated voltage (02-04)
- Set it to the rated voltage on the motor nameplate.
- When setting the rated voltage of the motor, the maximum output voltage of the VF curve will be adjusted.

(5) Motor 1 rated frequency (02-06)
- Set it to the motor nameplate frequency.

(6) Motor 1 rated rotation speed (02-03)
- Set it to the motor nameplate rotation speed.

(7) Motor no-load voltage (02-19)
- When parameter 17-08 or 02-19 is set, this parameter is the same as 17-08. This parameter determines the rated flux of the motor under the rated rotation speed in SLV or SV control mode. Using setting values 10~50V lower than the input voltage can ensure that the motor provides torque performances at the rated (or higher) rotation speed.
- Smaller no-load voltage can reduce the no-load current, reduce flux and increase the load current,

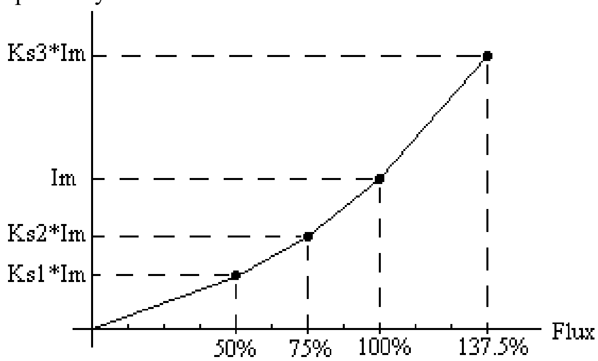
and larger no-load voltages are the opposite.

(8) Motor excitation current (02-09)

- This data can be obtained from automatic tuning. Manual tuning needs to be performed in situations where automatic tuning without rotation is not possible.
- During manual tuning, start tuning from 33% and observe the no-load voltage (actual value) of 12-67. If 12-67 is greater than the no-load voltage (setting value) of 17-08, reduce 02-09; and if 12-67 is smaller than 17-08, then increase 02-09.
- Adjust 02-09 motor excitation current while monitoring 12-76 actual no-load voltage because when the excitation current changes, the changes of 12-76 actual no-load voltage will also be affected. Therefore, it needs to be adjusted close to the no-load voltage 17-08 set.

(9) Settings for motor magnetic core saturation 1, 2, and 3 (02-10, 02-11, 02-12).

- This parameter is set automatically by the automatic tuning function, and usually does not need to be adjusted.
- This parameter sets the motor magnetic core saturation coefficients at flux levels of 50% (02-10), 75% (02-11), and 137.5% (02-12) to reduce the effects of core saturation.
- The magnetic core saturation coefficient is a percentage of the motor excitation current. When the flux reaches 137.5%, the core saturation coefficient needs to be greater than 137.5%. When the flux is 50% or 75%, the magnetic core saturation coefficient needs to be less than 50% and 75% respectively.



Im: 02-09 excitation current
Ks1: 02-10 motor magnetic core saturation coefficient 1
Ks2: 02-11 motor magnetic core saturation coefficient 2
Ks3: 02-12 motor magnetic core saturation coefficient 3

Figure 4.3. 18 Y-equivalent model of an induction motor

(10) Motor magnetic core loss setting (02-13)

- Set the motor magnetic core loss to a percentage of the motor's rated output power.

$$\% W_{core}\,(02\text{-}13) = \frac{3 \times \text{motor magnetic loss (watt)} \times 100\%}{\text{Motor rated output power (watt , 02-05)}}$$

- When in V/F control mode, the motor magnetic loss setting (02-13) is used to compensate for torque accuracy.

(11) Motor line-to-line impedance R1 (02-15).

(12) Motor no-load current (02-00).

- Calculate this setting value according to the motor's rated frequency (17-05) and the motor's rated current (17-03).
- In V/F control mode, when the output current is greater than the motor's no-load current, the slip compensation is enabled.
- 02-01 must be greater than 02-00, otherwise the warning message "SE01" setting range error will appear.
- Refer to Figure 4.3.19 Y-equivalent model motor inductance.

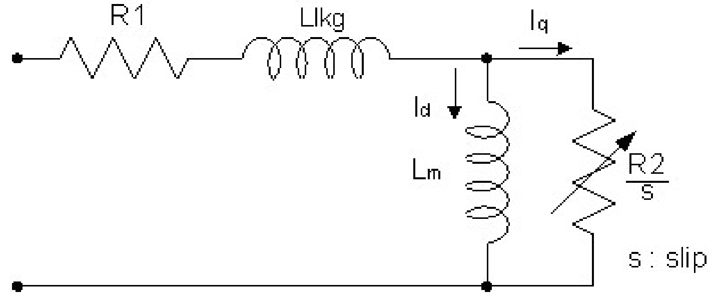


Figure 4.3. 19 Y-equivalent model of an induction motor

02- 20	Motor 2 no-load current	02-26	Motor 2 number of poles
Scope	【0.01~600.00】**A**	**Scope**	【2~16】
02- 21	Motor 2 rated current	**02-32**	Motor 2 line-to-line resistance
Scope	25%~200% inverter rated current.	**Scope**	【0.001~60.000】Ω
02-22	Motor 2 rated rotation speed	**02-33**	Motor 1 leakage inductance ratio <1>
Scope	【0~60000】**rpm**	**Scope**	【0.1~15.0】**%**
02- 23	Motor 2 rated voltage	**02-34**	Motor 1 slip <1>
Scope	200V :【50.0~240.0】**V**	**Scope**	【0.1~20.0】**Hz**
	400V :【100.0~480.0】**V**		
02- 24	Motor 2 rated power	**02-37**	Motor mechanical loss
Scope	【0.01~600.00】**KW**	**Scope**	[0.0~10.0]%
02-25	Motor 2 rated frequency	**02-34**	Motor 1 slip <1>
Scope	【4.8~599.0】**Hz**	**02-37**	Motor mechanical loss

Motor 2 parameter setting is the same as the control modes of motor 1 and motor 2; they are fixed at V/f mode, therefore, there are fewer parameters that need to be set

(13) Motor 1 leakage inductance ratio (02-33)

- This data is converted and set by the manual tuning parameter function and usually does not need to be adjusted. This tuning has no field strengthening function.
- $\xi = \frac{LlKg}{Lr}$ The definition of leakage inductance ratio is the ratio of leakage inductance to rotor inductance; the default factory setting is 3.4%. Adjusting this leakage inductance ratio will change the motor leakage inductance parameter.
- When the leakage inductance ratio is adjusted too large or too small, it will cause the motor to vibrate, have strange noises, and the motor is unable to rotate. The typical adjustment range is 3.0% to 5.0%, with 4.0% being a universal value that allows motors to operate properly on their own. But with the difference in motor structures, the leakage inductance ratio size can be adjusted accordingly.

(14) Motor 1 slip (02-34)

- This data is converted and set by the manual tuning parameter function and usually does not need to be adjusted. This tuning has no field strengthening function.
- The default factory setting of the motor slip is 1Hz. The motor slip can be roughly calculated first from the motor nameplate;
  Using 60Hz, 4-pole motor for example, the synchronous rotation speed is
  $$N = \frac{120 \times Frequence}{Pole} = \frac{120 \times 60}{4} = 1800$$ rpm
  And the rated rotation speed labeled on the motor nameplate is 1700 rpm, therefore, the slip is
  $$Slip = \frac{1800 - 1700}{60} = 1.67\,Hz$$.
- Adjusting the motor slip will change the rotor resistance parameter, and the slip size can be adjusted according to the different motor characteristics.

(15) Motor mechanical loss (02-37)

- The adjustment range of mechanical loss is 0.0~10.0%; this parameter is only effective under speed mode and the speed command must be zero.
- If the speed command is equal to zero but the shaft drifts slowly and cannot come to a complete stop, the 02-37 mechanical loss parameter can be adjusted upwards until the shaft comes to a complete stop.

<1>After executing the automatic tuning function, the parameter marked in group 02 will be updated to an automatic tuning value. Please refer to the description of group 17's automatic tuning function for details on parameter changes.

03-external terminal digital input/output function group

03- 00	Multi-function terminal **S1** function setting	**03- 04**	Multi-function terminal **S5** function setting
03- 01	Multi-function terminal **S2** function setting	**03-05**	Multi-function terminal **S6** function setting
03- 02	Multi-function terminal **S3** function setting	**03-06**	Multi-function terminal **S7** function setting (S7 not available for Frame1)
03- 03	Multi-function terminal **S4** function setting		

Scope	**[0]:** Two-wire forward /stop **[1]:** Two-wire reverse/stop **[2]:** Multi-speed/location setting command 1 **[3]:** Multi-speed/location setting command 2 **[4]:** Multi-speed/location setting command 3 **[5]:** Multi-speed/location setting command 4 **[6]:** Jog forward command **[7]:** Jog reverse command **[8]:** UP increase frequency command **[9]:** DOWN decrease frequency command **[10]:** Acceleration/deceleration setting command 1 **[11]:** Acceleration/deceleration prohibited **[12]:** Primary/secondary operation switching function **[13]:** Primary/secondary frequency switching function **[14]:** Emergency stop (decelerate to zero and stop) **[15]:** Cut-off stop (freely operate and stop) **[16]:** PID function prohibited **[17]:** Fault reset (RESET) **[18]:** Reserved **[19]:** Speed search 1 (from maximum frequency) **[20]:** Manual energy-saving function **[21]:** PID integral reset **[22]:** Reserved **[23]:** Reserved	**[24]:** PLC input **[25]:** External fault **[26]:** Three-wire forward /reverse **[27]:** Local/remote selection **[28]:** Remote mode selection **[29]:** Jog frequency selection **[30]:** Acceleration/deceleration time selection 2 **[31]:** Inverter overheat early warning **[32]:** Synchronization command **[33]:** DC brake **[34]:** Speed search 2 (from frequency command) **[35]:** Timer function input **[36]:** PID soft start invalid **[37]:** Frequency skipping operation **[38]:** Frequency skipping upper offset **[39]:** Frequency skipping lower offset **[40]:** Motor 1/motor 2 switching **[41]:** PID sleep **[42]:** PG invalid **[43]:** PG integral reset **[44]:** Speed/torque mode switching **[45]:** Negative torque command **[46]:** Zero-speed servo	**[47]:** Fire mode (Forced operation mode) **[48]:** KEB acceleration **[49]:** Allow parameter writing **[50]:** Direct operation protection after power is supplied (USP) **[51]:** Multi-speed and multi-point positioning command switching **[52]:** Position command enable **[53]:** Two-wire self-holding (stop command) **[54]:** Reserved **[55]:** RTC time enable **[56]:** RTC offset enable **[57]:** Reserved **[58]:** Safety function **[59]:** Reserved **[60]:** Reserved **[61]:** Reserved **[62]:** EPS input **[63]:** Switch to second set of pressure range error **[64]:** Reserved **[65]:** Short-circuit brake command **[66]:** PID function prohibited 2 **[67]:** Handwheel mode switching **[68]:** External fault 2 **[69]:** External overload **[70]:** Jog frequency operation

Refer to Figure 4.3.20 below multi-function parameter input and related parameters.

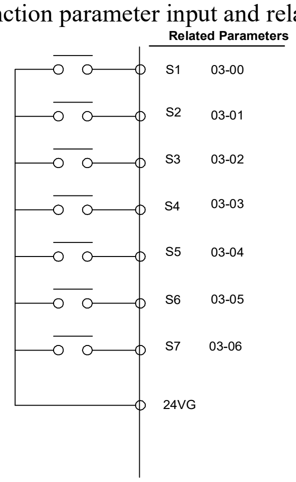


Figure 4.3. 20 Multi-function digital input and related parameters

Table 4.3. 21 Multi-function digital input setting (03-00 to 03-06) ("O": Effective, "X": ineffective)

Setting	Function		Description	Control mode * (V/F + PG, SV and PMSV are only for special projects						
	Name	LCD display		V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2
0	2-wire type (clockwise operation)	2-Wire (FWD-RUN)	2-wire type (ON: Forward operation command).	O	O	O	O	O	O	O
1	2-wire type (Reverse rotation operation)	2-Wire (REV-RUN)	2-wire type (ON: Reverse direction operation command).	O	O	O	O	O	O	O
2	Multi-speed/position setting instructions 1	Muti-Spd/Pos Ref 1	Multi-speed/location command selection 1.	O	O	O	O	O	O	O
3	Multi-speed/position setting instructions 2	Muti-Spd/Pos Ref 2	Multi-speed/location command selection 2.	O	O	O	O	O	O	O
4	Multi-speed/position setting instructions 3	Muti-Spd/Pos Ref 3	Multi-speed/location command selection 3.	O	O	O	O	O	O	O
5	Multi-speed/position setting instructions 4	Muti-Spd/Pos Ref 4	Multi-speed/location command selection 4.	O	O	O	O	O	O	O
6	FJOG command	FJOG	ON: Jog mode forward operation (00-18).	O	O	O	O	O	O	O
7	RJOG command	RJOG	ON: Jog mode reverse operation (00-18).	O	O	O	O	O	O	O
8	UP command	UP command	ON: Output frequency increase command (can only be used with the DOWN command).	O	O	O	O	O	O	O
9	DOWN command	DOWN command	ON: Output frequency decrease command (can only be used with the UP command).	O	O	O	O	O	O	O
10	Acceleration/deceleration time selection 1	Acc/Decel Time Selection 1	Acceleration/deceleration time selection command 1	O	O	O	O	O	O	O
11	Acceleration/deceleration prohibited	ACC/DEC Inhibit	ON: Acceleration/deceleration prohibited	O	O	O	O	O	O	O
12	Primary/secondary operation switching function	Run Change Sel	The source of the operate command is from the secondary frequency command parameter setting **(00 - 03)**	O	O	O	O	O	O	O
13	Primary/secondary frequency switching function	Freq Change Sel	The source of the frequency command is from the secondary frequency command parameter setting **(00 - 06)**	O	O	O	O	O	O	O
14	Emergency stop	E-Stop	ON: Emergency stop input	O	O	O	O	O	O	O
15	External base cut-off command	Ext. BB	ON: Inverter base cut-off	O	O	O	O	O	O	O
16	PID control off	PID Disable	ON: PID control off	O	O	O	O	O	O	O
17	Failure reset	Fault Reset	Failure reset	O	O	O	O	O	O	O
18	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
19	Speed search command 1	Speed Search 1	ON: Search speed from maximum output frequency	O	O	O	O	O	X	O
20	Manual energy-saving command	Energy saving	ON: Set the manual energy-saving control with 11-12 and 11-18	O	O	X	X	X	X	X
21	PID integral reset	PID I-Reset	ON: PID control integral reset	O	O	O	O	O	O	O
22	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
23	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
24	PLC input	PLC Input	ON: Digital PLC input	O	O	O	O	O	O	O
25	External fault	Ext. Fault	ON: External fault warning	O	O	O	O	O	O	O
26	3-wire control (Forward /reverse command)	3-Wire (FWD/REV)	3-wire (forward /reverse command). ON is reverse and OFF is forward. When the parameter is set to 26, terminals S1 and S2 will become the operate command and stop command respectively, and the original function will be disabled.	O	O	O	O	O	O	O
27	Local/Remote control selection	Local/Remote	ON: Local mode (through the digital operator) OFF: The frequency command and operation command are determined through the parameter (00-02 and 00-05) settings.	O	O	O	O	O	O	O
28	Remote mode operation selection	Remote Mode Sel	ON: RS-485 communication OFF: Control circuit terminal	O	O	O	O	O	O	O
29	Jog frequency selection	JOG Freq sel	ON: Select jog frequency command	O	O	O	O	O	O	O
30	Acceleration/deceleration time selection 2	Acc/Decel Time Selection 2	Acceleration/deceleration time selection command 2	O	O	O	O	O	O	O
31	Inverter overheat alarm (OH2)	Overheat Alarm	ON: Inverter overheat (OH2) alarm input (OH2 will be displayed)	O	O	O	O	O	O	O

Setting	Function		Description	Control mode * (V/F + PG, SV and PMSV are only for special projects)						
	Name	LCD display		V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2
32	Synchronization command	Sync Command	ON: Speed synchronization enabled. OFF: Speed synchronization disabled (other frequency command enabled).	O	O	O	O	O	O	O
33	DC brake command	DC Brake Command	ON: Execute DC brake	O	O	O	O	X	X	O
34	Speed search command 2	Speed Search 2	ON: Search speed from set frequency	O	O	O	O	X	O	O
35	Timer function input	Timer Input	.Set the timer function in 03-33 and 03-34 .Set the timer function output in 03-11 and 03-12	O	O	O	O	O	O	O
36	PID soft start disabled	PID SFS Disable	ON: PID soft start disabled	O	O	O	O	O	O	O
37	Frequency skipping operation	Traverse Run	ON: Frequency skipping operation	O	O	X	X	X	X	O
38	Frequency skipping upper offset	Upper Dev Run	ON: Upper offset frequency skipping	O	O	X	X	X	X	O
39	Frequency skipping lower offset	Lower Dev Run	ON: Lower offset frequency skipping	O	O	X	X	X	X	O
40	Motor 1/motor 2 switching	Motor 2 Switch	ON: Start motor 2	O	O	O	O	O	O	O
41	PID sleep	PID Sleep	ON: PID sleep	O	O	O	O	O	O	O
42	Speed command without PG	PG Invaid	ON: Speed control without PG	X	O	X	X	X	X	X
43	Speed control integral reset	I-Time Reset	ON: Integral reset with PG speed control	X	O	X	O	O	X	X
44	Speed / torque control mode change	Speed/Torque Control change	ON: Torque control mode	X	X	X	O	O	X	X
45	Reverse torque command	Reverse Tref	ON: Reverse external torque command	X	X	X	O	O	X	X
46	Zero servo command	Zero-Servo	ON: Zero servo operation	X	X	X	O	O	X	X
47	Fire mode (Forced operation mode)	Fire Mode	ON: Inverter will operate with the maximum frequency of 01-02 motor 1 (when there are hardware failures such as C, SC, CUV, FUL and STO, the FIRE MODE function will stop.)	O	O	O	O	O	O	O
48	KEB acceleration command	KEB Accel.	ON: KEB acceleration start	O	O	X	X	X	X	O
49	Parameter writing start	Write Enabled	ON: All parameters are writable OFF: Except for the reference frequency (00-05), all parameters are write-protected	O	O	O	O	O	O	O
50	Direct operation protection after power is supplied (USP)	USP	ON: After power is inputted, the inverter will ignore the operation commands OFF: After power is inputted, the inverter will return to the operation status before the power outage	O	O	O	O	O	O	O
51	Multi-speed and multi-point positioning command switching	Multi Pos. Switch	ON: Multi-point positioning position command OFF: Multi-speed frequency command	X	X	X	O	O	X	X
52	Position command enable	Multi Pos. Enable	ON: Position command effective OFF: Position command ineffective	X	X	X	O	O	X	X
53	2-wire self-holding (stop command)	2-Wire (STOP)	2-wire self-holding mode (ON: Stop command).	O	O	O	O	O	O	O
54	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
55	RTC time enabled	RTC Timer Switch	ON: RTC timer function enabled	O	O	O	O	O	O	O
56	RTC offset enabled	Offset Time Switch	ON: RTC offset enabled	O	O	O	O	O	O	O
57	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
58	Safety function	Safety Function	ON: Stops according to the 08-30 setting	O	O	O	O	O	O	O
59	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
60	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
61	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
62	EPS input	EPS Input	ON: EPS terminal input	X	X	X	O	O	X	X
63	Switch to second set of pressure range error	Switch Const.P. 2	ON: Use second set (23-34) for the PUMP error range OFF: Use first set (23-09) for the PUMP error range	O	O	O	O	O	O	O
64	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
65	Short-circuit brake command	SC Brk	ON: Execute short-circuit brake	X	X	X	X	X	O	X
66	PID function prohibited 2	PID Disable 2	ON: PID control disabled, the previous frequency integral will be remembered.	O	O	O	O	O	O	O

Setting	Function		Description	Control mode * (V/F + PG, SV and PMSV are only for special projects)						
	Name	LCD display		V/F	V/F+PG	SLV	SV	PM SV	PM SLV	SLV2
67	Handwheel mode switching	HMPG Mode Switch	ON: General mode, the frequency command is inputted via analog input AI1 OFF: Handwheel mode	O	X	X	X	X	X	X
68	External fault 2	Ext. Fault 2	ON: External fault warning	O	O	O	O	O	O	O
69	External overload	Ext. Overload	ON: External overload input	O	O	O	O	O	O	O
70	Jog frequency operation	JOG Direction Switch	ON: Select according to jog frequency command	O	O	O	O	O	O	O

(1). 2-wire forward operation (setting=00).
(2). 2-wire reverse operation (setting=01).
. Refer to Figure 4.3.1 2-wire operation mode.
(3). Multi-speed/position command 1 (setting=02).
(4). Multi-speed/position command 2 (setting=03).
(5). Multi-speed/position command 3 (setting=04).
(6). Multi-speed/position command 4 (setting=05).
(7). Jog frequency command (setting=29).
Switch frequency reference via the multi-function digital input.
If under SV or PMSV mode (00-00=3,4), and 03-00~07 is set to 51, the multi-position command is set with the multi-speed command. Refer to the 21-09~21-41 parameter descriptions. Table 4.3.22 below represents the corresponding combinations of multi-speed.

Table 4.3. 22 Multi-speed operation combinations

Speed	Multi-function digital input (S1 to S7)					Frequency selection
	Jog frequency reference	Multi-speed frequency 4	Multi-speed frequency 3	Multi-speed frequency 2	Multi-speed frequency 1	
1	0	0	0	0	0	Segment 0 speed frequency (05-01) or primary speed frequency *2
2	0	0	0	0	1	(04-05 = 0): Determined by the auxiliary speed frequency set or (04-05≠0): Determined by the segment 1 speed frequency (05-02) *3
3	0	0	0	1	0	Segment 2 speed frequency (05-03)
4	0	0	0	1	1	Segment 3 speed frequency (05-04)
5	0	0	1	0	0	Segment 4 speed frequency (05-05)
6	0	0	1	0	1	Segment 5 speed frequency (05-06)
7	0	0	1	1	0	Segment 6 speed frequency (05-07)
8	0	0	1	1	1	Segment 7 speed frequency (05-08)
9	0	1	0	0	0	Segment 8 speed frequency (05-09)
10	0	1	0	0	1	Segment 9 speed frequency (05-10)
11	0	1	0	1	0	Segment 10 speed frequency (05-11)
12	0	1	0	1	1	Segment 11 speed frequency (05-12)
13	0	1	1	0	0	Segment 12 speed frequency (05-13)
14	0	1	1	0	1	Segment 13 speed frequency (05-14)
15	0	1	1	1	0	Segment 14 speed frequency (05-15)
16	0	1	1	1	1	Segment 15 speed frequency (05-16)
17	1*1	—	—	—	—	Jog frequency command (00-18)

0: OFF, 1: ON, —: Simply ignore
*1. The priority of the jog frequency terminal is higher than multi-speed frequencies 1 to 4.
*2. When parameter 00-05=0 (frequency reference input = digital operator), the multi-speed frequency command 1 is set by 05-01 (frequency reference 0).
When parameter 00-05=1 (frequency reference input = control circuit terminal), the multi-speed frequency command 1 receives input from the analog command terminal (AI1 or AI2).
*3. The default factory setting of the analog input (AI2) is the auxiliary frequency, only when 04-05≠0 is set can it be the segment one speed of the multi-speed. However, when PID control 10-03=XXX1B, even if the PID function prohibit (multi-function digital input setting=16) is enabled, you cannot switch to the auxiliary frequency.

Wiring example

Figures 4.3.21 and 4.3.22 below represents the operation example of segment 9 speed.

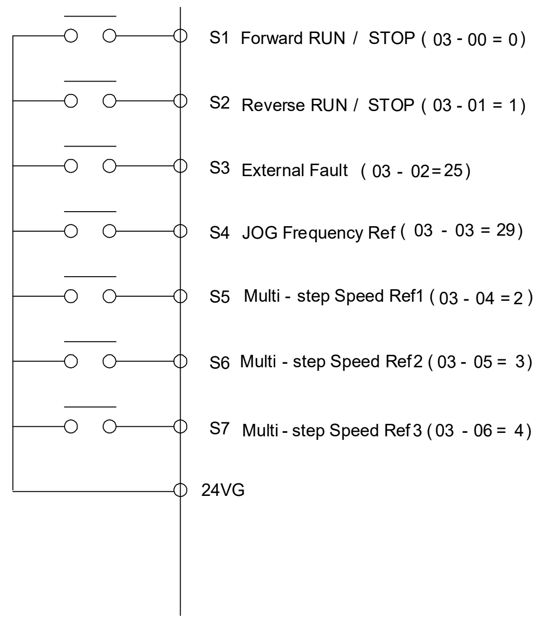


Figure 4.3. 21Control terminal wiring example

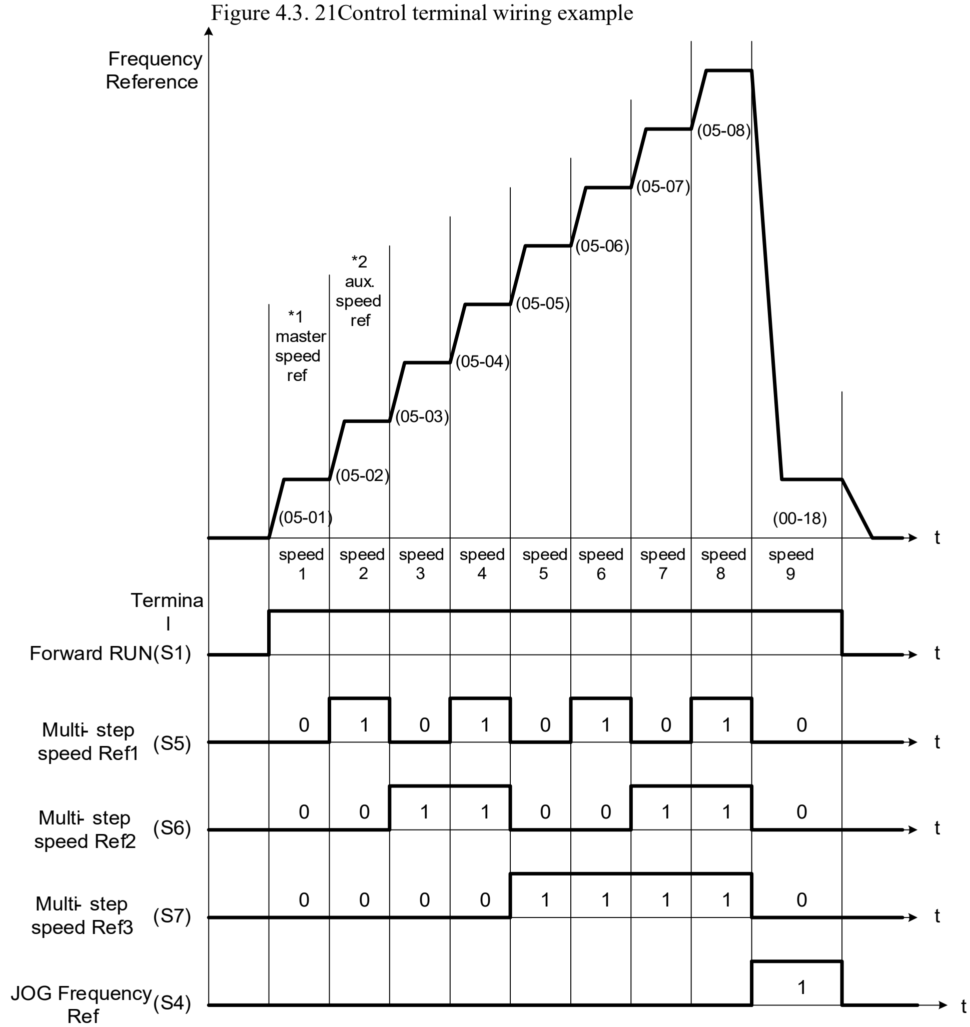


Figure 4.3. 22 Segment 9 speed timing diagram

*1. When 00-05 = 1, the multi-speed frequency reference value is inputted from AI1 or AI2; when 00-05 = 0, the multi-speed frequency reference value is determined by 05-01.
*2. When 04-05 = 0, the multi-speed frequency command 2 is determined by the auxiliary speed frequency set; when 04-05≠0, it is determined by the segment 1 speed frequency (05-02).

(8). Jog forward command (FJOG) command (setting=06).
(9). Jog reverse command (RJOG) command (setting=07).

The jog execution direction can be forward or reverse.

Setting = 06: FJOG command (ON: Jog frequency forward is set by 00-18).
= 07: RJOG command (ON: Jog frequency reverse is set by 00-18).

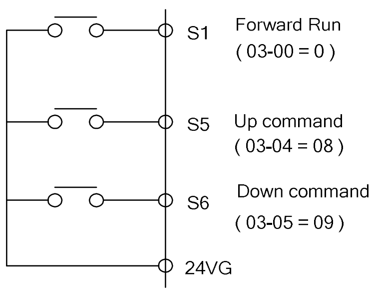
The execution priority of the FJOG and RJOG commands are higher than other frequency commands.

When the FJOG and RJOG command are executed more than 500 milliseconds, they will stop operating using the stopping method set by 07-09 (stop method selection).

*1. When the primary frequency is AI2 (00-05=7) and 04-05 = 0, the primary frequency is determined by the auxiliary speed frequency of AI2; when 04-05≠0, it is determined by 00-18.

(10). Accelerate (UP) command (setting=08).
(11). Decelerate (DOWN) command (setting=09).

- The inverter can increase or decrease the changes of the output frequency while the motor is operating by using the digital operator (refer to parameter 11-56) or an external multi-function digital input (terminal S1 to S7).
- When operations are performed using external multi-function digital input terminals, set 00-02 (operation command option) to 1 (control terminal), set 00-05 (terminal UP/DOWN) to 2, and set any one of the parameters from 03-00 to 03-06 to 08 (UP command) and 09 (DOWN command). 2 terminals need to be paired to perform the UP command and DOWN command.
- The output frequency will go UP or DOWN with the acceleration and deceleration time set.
- The error message "SE02 DI terminal Error" (SE02) will be displayed when the following situations occur:
  (1) Only a single UP or Down command was set.
  (2) The UP command and acceleration/deceleration prohibited command were enabled simultaneously.
  (3) The Down command and acceleration/deceleration prohibited command were enabled simultaneously.
- Please refer to Figure 4.3.23 and Figure 4.3.24 on the wiring and timing example of UP/DOWN.



UP Command (terminal S5)	1	0	0	1
DOWN Command (terminal S6)	0	1	0	1
Operation Status	Accel (UP)	Decel (DWN)	Hold	Hold

1: ON, 0: OFF

Figure 4.3. 23 UP/DOWN wiring example

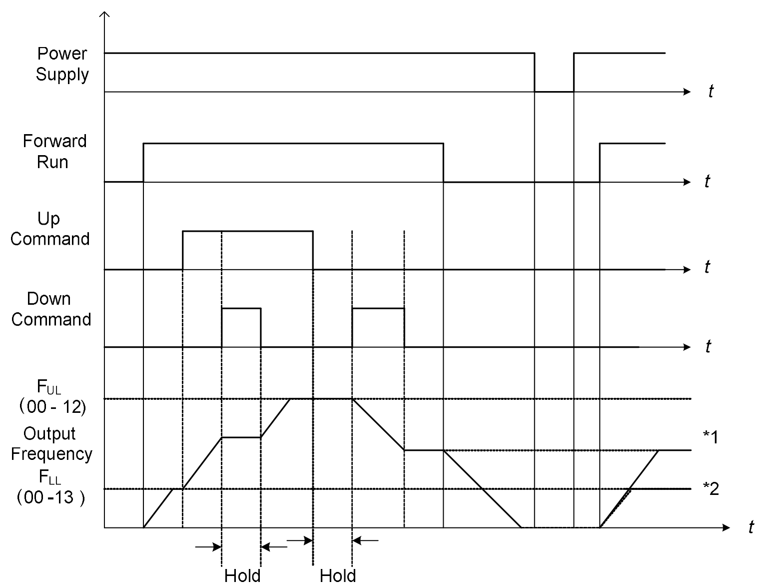


Figure 4.3. 24 Up / Down command timing example

- When using the UP / Down command, if operation commands are inputted, the output frequency will accelerate to the frequency reference lower limit (00-13).
- When using the UP / Down commands, the output frequency is limited to the frequency reference upper limit (00-12) and the frequency reference lower limit (00-13).
- The acceleration/deceleration time used by this function is the same as normal operations: Tacc1 /Tdec1 (00-14,15) or Tacc2 / Tdec 2 (00-16, 17).
- Refer to 03/40 UP / Down frequency bandwidth setting for using the other functions of UP / Down.
- *1. When 11-58 =1 and operation commands are inputted, the output frequency will accelerate to the previously saved frequency command.
- *2. When 11-58 =0 and operation commands are inputted, the output frequency will accelerate to the frequency reference lower limit (00-13).

(12). Acceleration/deceleration time selection 1 (setting=10).
(13). Acceleration/deceleration time selection 2 (setting=30).
Refer to the chapter on page 4-42 "Multi-function digital input terminal switching acceleration/deceleration time".
(14). Acceleration/deceleration prohibited command (setting=11).
Refer to Figure 4.3.25 below for the operation method of acceleration/deceleration prohibited. When the acceleration/deceleration prohibited command is input, the inverter will pause the acceleration/deceleration speed of the motor and maintain the output frequency.
This function can be used with 11-58 to record the reference frequency.

When 11-58=0:
When ACC/DEC prohibited is ON during the motor acceleration/deceleration process, the motor will stop at the output frequency at that moment and use the output frequency as the frequency command. When ACC/DEC prohibited is changed to OFF or when a shutdown command is given, the frequency command will be restored to the frequency originally set.
In addition, when the stop command and power-off is reset, the frequency command will be set to 0 Hz.

Note: If ACC/DEC prohibited is ON before operating, STP0 will appear after operation starts because there is no recorded reference frequency.

When 11-58=1:
When ACC/DEC prohibited is ON during the motor acceleration/deceleration process, the motor will stop at the output frequency at that moment and use the output frequency as the frequency command. If switched to the stop status or cut the power of the inverter to reset at this time, when ACC/DEC prohibited is still ON, the output frequency will still be saved, and the frequency command will be set as the saved frequency.

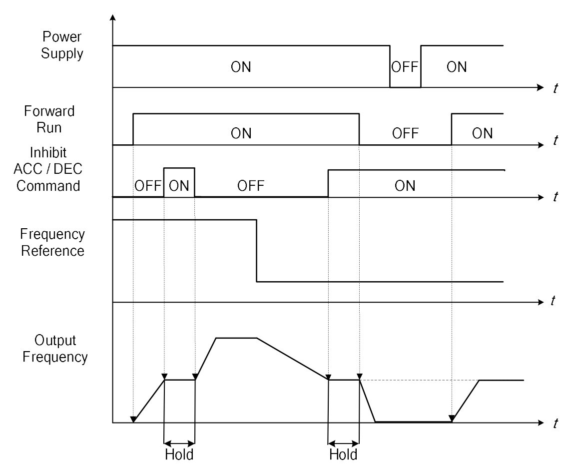


Figure 4.3. 25 Acceleration/Deceleration prohibited instructions

(15) Primary/secondary operation switching function (setting=12)
When the function terminal is on, the operation command source is determined by the secondary operation command parameter setting **(00-03),** and when the function terminal is set to 27 (Local/Remote control selection), the priority will be higher than the primary/secondary operation switching at this time.

(16) Primary/secondary frequency switching function (setting=13)

When the function terminal is on, the frequency command source is determined by the secondary frequency command parameter setting **(00-06),** and when the function terminal is set to 27 (Local/Remote control selection), the priority will be higher than the primary/secondary operation switching at this time. When the PID function is enabled (10-03=XXX1B), this function will become invalid, and the primary frequency will switch to the PID function automatically. When failed to enable PID or when PID is off, then can the primary and secondary frequency be switched; refer to the diagram.

(17) Emergency stop (setting=14).

Decelerates and stops by referring to the "Emergency stop deceleration time" of parameter 00-26 and not 07-09 "Stop mode selection".

(18) External hardware base block command (setting=15).

The base block command is executed using the multi-function digital input terminal ON/OFF, and prohibits inverter output.

During operation: When an external base block signal is detected, "BBn BaseBlock (Sn)" will be displayed on the digital operator; if n=1-8 here, it means that the inverter output has been cut. After the base block signal is released, the motor will resume operation according to the reference signal. Before the previous base block command is inputted, perform speed search in frequency reference to confirm the current frequency and continue operating.

During deceleration: When an external base block signal is entered, "BBn BaseBlock (SN)" will be displayed on the digital operator, and if n=1-8 here, it means cut the inverter output. The motor will usually stop at this time. After releasing the base block signal, the inverter will remain in stop mode.

During acceleration: The operation method is the same as during operation.

Refer to Figure 4.3.26 below for the timing when using the base block command.

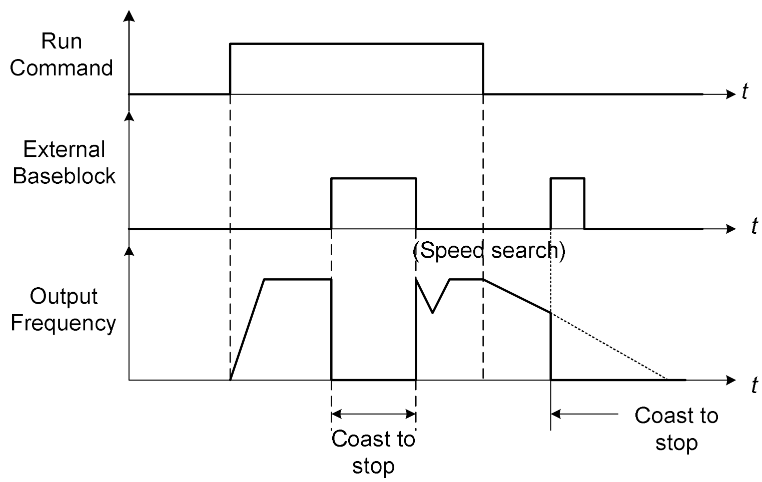


Figure 4.3. 26 External base block operation

(19). Disable PID control (setting=16).

(20). Failure reset (setting=17).

When the inverter detects failure, failure output starts, and the inverter will output base block. The digital operator displays the failure message.

- When failures occur, the following methods can be used to reset the failure:
  a. Set one of the multi-function digital input (03-00 to 03-06) to 17 (failure reset), and enable the failure reset signal.
  b. Press the RESET button on the digital operator.
  c Turn off the power then turn it back on.

(21). External speed search command 1 (setting=19).

(22). External speed search command 2 (setting=34).

- Refer to the "Speed search" function in 07-operation stop control function group.

(23). Manual energy-saving command (setting=20).

- Enable: Enable the manual energy-saving function with the 11-12 and 11-18 settings. Please refer to Figure 4.3.115 for manual energy-saving operations.

(24). PID integral reset (setting=21).

(25). PLC input (setting=24)

Must be used with the Drive Link software program, and use the PLC software program in it to edit the ladder diagram. When the signal passes through and the output is turned on, the signal will be sent to the inverter at this time to turn the inverter on.

(26). External failure (setting=25).

- When external failures occur, the external failure input terminal is activated, the inverter will be turned off and the motor will come to a free-run stop.
- If the external input terminal S3 is set to (03-02=25) external failure, the "EF3 Ext. Fault (S3)" (EF3) message will be displayed.
- All eight input terminals (S1 to S7) can be assigned as external failure input.

(27). 3-wire (forward /reverse command) (setting=26).

When parameters (S3~S6) is set to 26 (forward /reverse command), terminals S1 and S2 will become the operation command and stop command respectively. Refer to Figure 4.3.2 for details.

(28). Local / Remote control selection (setting=27).

- Users can switch the inverter frequency reference and input operation commands in Local (controlled with the digital operator) or Remote mode (controlled with the control circuit terminal or RS485 connection). Using 00-05 (frequency reference) and 00-02 (operation method) to determine the input source selection.
- Local/Remote mode can be controlled by one of the multi-function digital input terminals S3 to S7 by setting one of the parameters from 03-02 to 03-06 to 27 (Local/Remote control selection). If 03-00 to 03-01 is 3-wire control, S1 & S2 will be set to operate & stop input by force. Refer to Table 4.3.23 below.

Table 4.3. 23 Local / Remote control selection

Input terminal	Mode	Content
ON	Local mode	. Executes frequency commands and operation commands through the digital operator. . SEQ and REF indicators go off.
OFF	Remote mode	. Executes frequency commands and operation commands through the control terminals or RS-485 communication. Can use 00-05 (frequency command) and 00-02 (operation command). . SEQ and REF indicators light up.

To switch between Local/Remote modes, the inverter must be in a stopped operation status.

(29). Remote mode operation selection (setting=28).

- Under Remote mode, the SEQ and REF indicators light up, and the frequency command can be controlled with terminals AI1 and AI2, and the operation commands are controlled through terminals S1, S2 or RS-485 communication terminals.
- Set one of the parameters from 03-02 to 03-06 to 28 (Remote mode operation selection), or set the control terminals (S1~S7), or set the RS-485 communication. Refer to Figure 4.3.27.

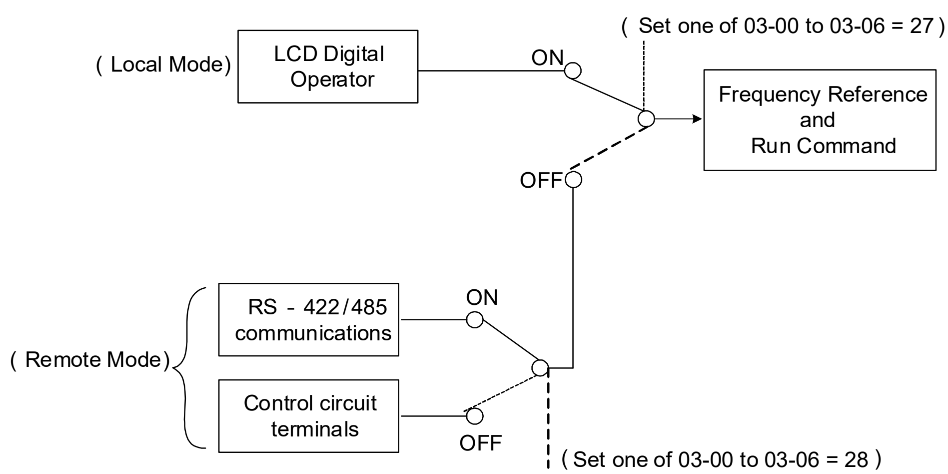


Figure 4.3. 27 Remote mode operation selection

(30). Jog frequency selection (setting=29)

When ON, the 00-18 (jog frequency) frequency is used as the command.

(31). Acceleration/deceleration time selection 2 (setting=30)

When acceleration/deceleration time selection 2 is ON, 00-16 acceleration time 2 and 00-17 deceleration time 2 are followed.

(32). Inverter overheat warning (setting=31).

When the inverter detects overheat signals, the “OH2” warning message will be displayed on the digital operator, and the inverter will continue operating.

After the overheat signal of the inverter is released, the digital operate will automatically return to its original display without the need to press the reset button.

(33). Synchronization command (setting=32).

- This function switches between the frequency reference converted from the pulse serial input and other frequency references (according to the setting of 00-05).
- When Local/Remote mode control section (setting value 27) or Remote mode (setting value 28) is selected and their corresponding input is enabled, this function is invalid.
- The set/clear synchronization command can only be set while the inverter stopped operating.

(34). DC brake command (setting=33).

When the inverter is stopped, use this setting to execute the DC brake function through terminals that have been set.

If operation command or jog command was inputted, the DC brake operation will be cleared and the motor will start operating.

Only either the short-circuit brake command or the DC brake command can be used each time. If both were set simultaneously, the SE02 error (DI Terminal Error) will pop up

Refer to Figure 4.3.28 DC brake timing figure below.

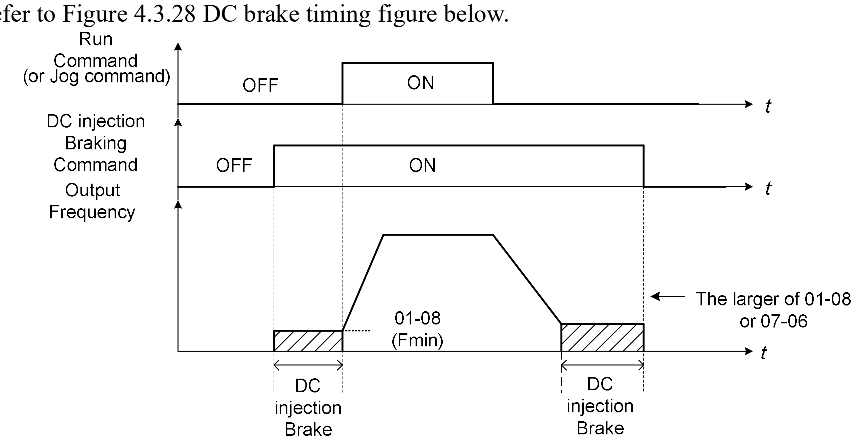


Figure 4.3. 28 DC brake timing figure

(35). Timer function input (setting=35).

The “timer function” of reference parameters 03-37 & 03-38.

(36). Disable PID SFS (setting=36).

The “PID control” function of the reference parameter 10-PID function group.

(37). Frequency skipping command (setting=37).

(38). Frequency skipping upper offset (setting=38).

(39). Frequency skipping lower offset (setting=39).

Refer to the “frequency skipping operation” function of reference group 19-frequency skipping function.

(40). Motor 2 switch command function (setting=40).

(41). PID sleep (setting=41)

Please set the activation of 10-29 setting 2 PID sleep mode to activate from the multi-function digital input, and use by referring to the descriptions of parameters 10-17~10-20.

(42). Speed control without PG (setting=42).

Used to release/activate speed control. When the multi-function digital input is on, disable speed control (general V/f control).

(43). Speed control integral reset (setting=43).

Used to switch between proportional (P) control and proportional-integral (PI) control in speed control. When the multi-function digital input is enabled, use the proportional (P) control (integral reset).

(44). Speed/torque control changing (setting=44).

Used to switch between speed control and torque control of SV (sensing vector) control mode.

It is torque control when enabled and speed control when disabled. For more details, please refer to parameter 21-torque control function group.

(45). External torque reference polarity inversion command (Setting = 45).

Enable: External torque reference command reverse.

For more details, please refer to the relevant description of parameter 21-00 "Torque control selection".

(46). Zero servo command (setting=46).

Enable: Zero servo operation.

- Please refer to Figure 4.3.124.

(47). Fire mode operation (setting=47).

Enable: Release hardware and software failure or warning protection.

Mainly used for special applications such as exhaust fans.

(48). KEB accelerated command (setting=48).

Enables KEB acceleration commands (when 11-47 is not zero).

Refer to the parameter descriptions of 11-47 and 11-48

(49). Parameter write protect (setting=49).

Refer to the descriptions of 13-06. If one of the parameters from 03-00 to 03-06 is set to 49 (parameter write protection), when the corresponding control terminal is enabled, the parameters can be accessed from the digital operator; otherwise, it would be write protection.

(50). Direct operation protection after power is supplied (setting=50).

If the operation command (controlled with the terminal) has been preset and when the power is on, the inverter will start operating immediately. Direct operation protection after power is supplied (USP) function (when any one of the parameters from 03-00 to 03-06 is set to 50), it will prevent automatic starting; therefore, the inverter will not start operating because of external signals. Refer to the figure below.

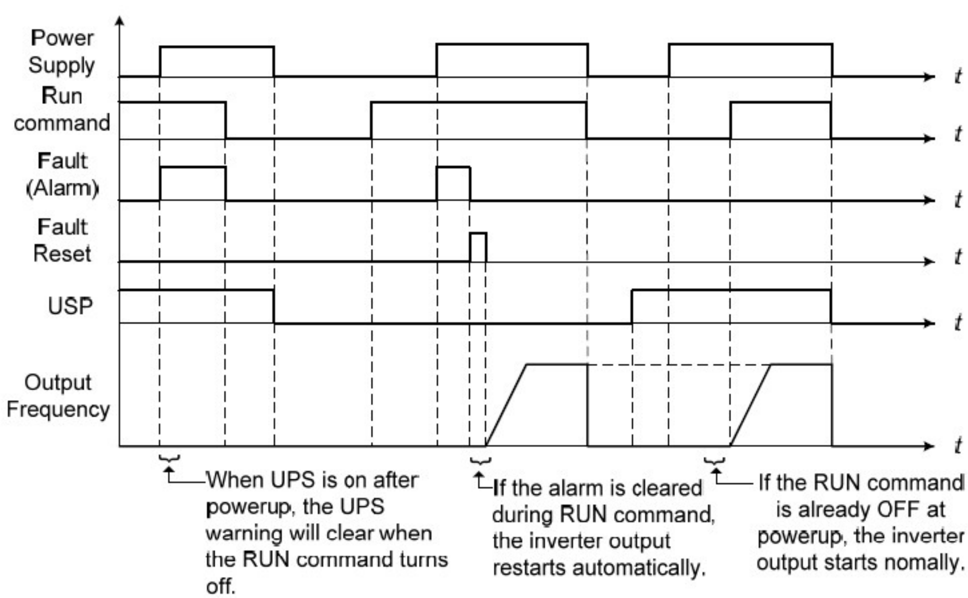


Figure 4.3. 29 Example of direct operation protection after power is supplied

(51). Multi-speed and multi-point positioning command switching (setting=51).

(52). Position command enabling (setting=52)

Refer to the parameter descriptions of 21-09 and 21-41

(53). 2-wire self-holding stop command (setting=53)

Refer to the description “2-wire operations with self-hold function” of parameter 00-02

(54). RTC time enabled (setting=55)

When 16-13(RTC timer function) is 2 (DI setting) and the RTC time enabled is ON, the RTC timer function can be triggered and used.

(55). RTC offset enabled (setting=56)

When 16-30 (RTC offset selection) is 2 (DI setting) and the RTC offset enabled is ON, it will refer to 16-31 (RTC offset time setting) and operate until this set time is completed.

(56). Safety mechanism (setting=58).

After the safety function is set, when the digital terminal starts operating, the inverter will stop according to the 08-30 setting.

(57). EPS input (setting=62)

The EPS input terminal must be used with the low-voltage starting function.

(58). Switch to second set of pressure error range (setting=63)

In PUMP mode (when 23-00=1), the constant pressure error range is used. This is the pressure deviation threshold used to wake up the inverter from sleep mode. When switch to second set of pressure error range is ON, it will switch from the original constant pressure error range (23-09) to constant pressure error range 2 (23-34).

(59). Short-circuit brake command (setting=65)

When stopping the inverter, use this setting to execute the short-circuit brake function through set terminals.

For example, if operation command or jog command was inputted, the short-circuit brake operation will be cleared and the motor will start operating.

Only either the short-circuit brake command or the DC brake command can be used each time. If both were set simultaneously, the SE02 error (DI Terminal Error) will pop up

Please refer to the following figure for the short-circuit brake action timing.

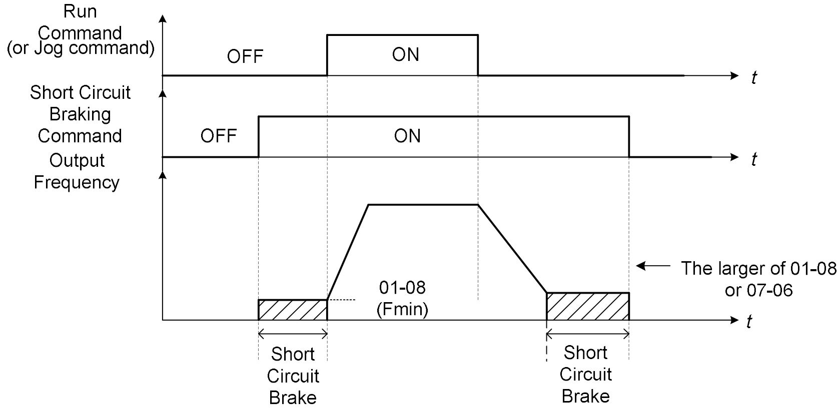


Figure 4.3. 30 Example of short-circuit brake action timing

(60). PID function prohibited 2 (setting=66).

When PID is DISABLED, it will switch to the 00-05 frequency source, and when DISABLE is cancelled, the previous frequency command is integrated and PID mode operation will resume.

(61). Handwheel mode switching (setting=67)

When 8 is selected for parameter 00-32 (application adjustment): After handwheel is applied (HMPG), the function set for this terminal can start operating, and to switch between general mode job or handwheel mode job, when used in general mode, the frequency command is determined by the analog input AI1, and when handwheel mode is used, the frequency command is determined by the pulse it inputted.

➢ Please refer to the following figure for the action of this function:

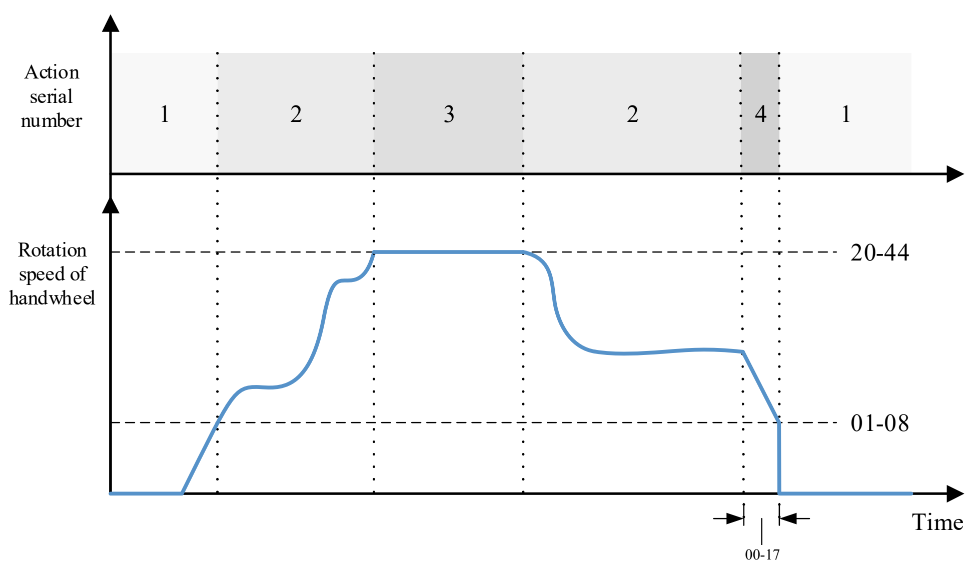


Figure 4.3. 31 Handwheel movement example

Description of handwheel movement serial number:

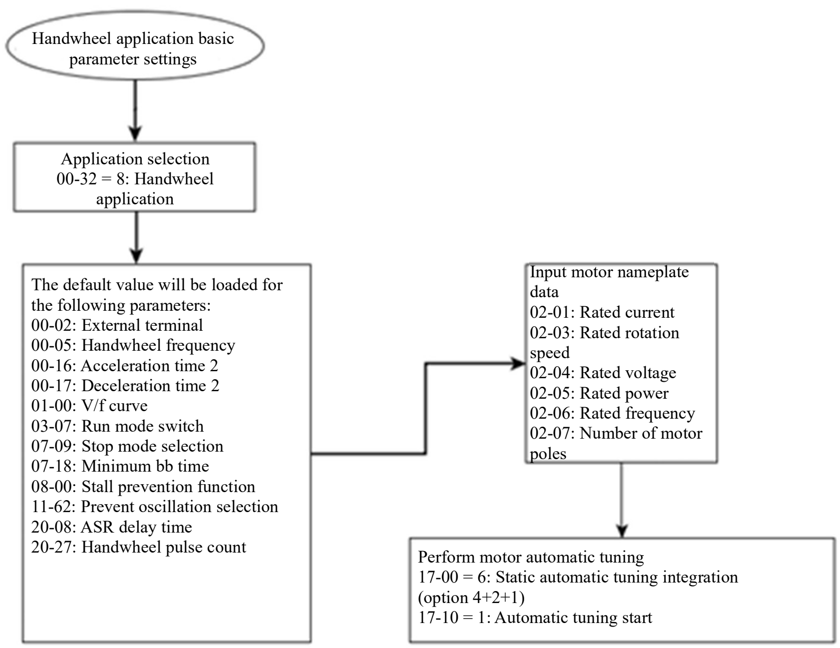
- Area 1: When inputted in the run command, DC current is injected into the motor to perform the brake action, and the current injected is determined by 07-46. Cancel the run command and the inverter will stop the DC current injection action.

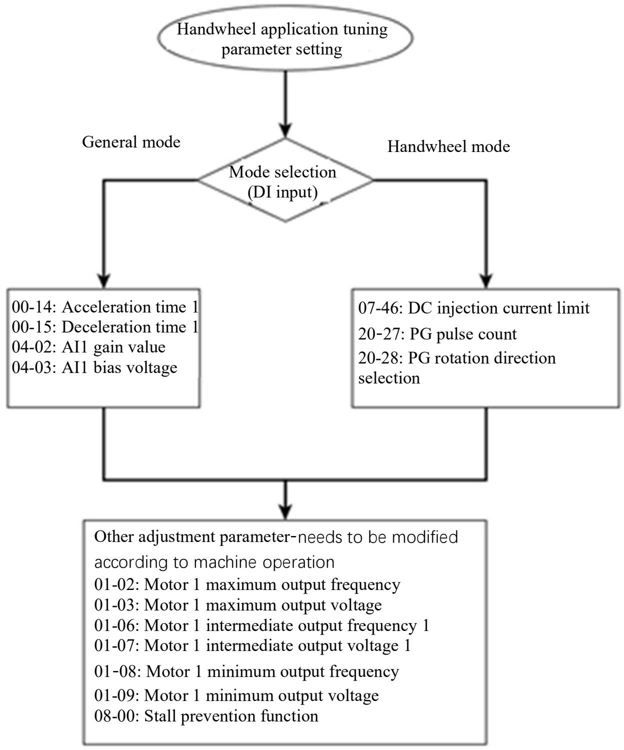
- Area 2: When the handwheel rotation speed is greater than the parameter (01-08) motor 1 minimum output frequency, the inverter will start outputting according to the V/f curve. If the output torque was insufficient, please set the 01-06, 01-07, 01-08 and 01-09 V/f curve parameters appropriately.
- Area 3: When the handwheel rotation speed exceeds the speed command limit of the parameter (20-44), the inverter output will be limited at the rotation speed set in the parameter.
- Area 4: When the handwheel stops rotating (stops pulse input), the speed command will follow the setting of parameter (00-17) deceleration time 2, and the motor will start decelerating. When the motor speed is less than the minimum output frequency of parameter (01-08) motor 1, DC current injection braking action will be performed.

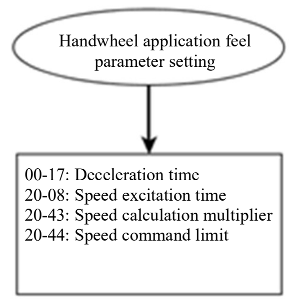
ps: After the handwheel generates pulses and inputs them to the PG card to calculate the speed command, it will be multiplied by the speed multiplier of the parameter (20-43) speed, then filtered based on the ASR delay time set in parameter (20-08). In addition, the parameter (20-28) PG rotation direction selection can be set to determine whether the rotation directions of the handwheel and motor are the same.

ps: When adjusting the 01-06, 01-07, 01-08 and 01-09 V/f curve parameters, pay attention to the parameter (12-18) inverter output current to prevent the occurrence of various failures that may cause industrial safety accidents.

➢ Please refer to the following flowcharts for the parameter settings:







(62). External failure 2 (setting=68).

- When external failures occur, the external failure input terminal is activated, the inverter will be turned off and the motor will come to a free-run stop.
- If the external input terminal S3 is set to (03-02=68) external failure, the "EF3 Ext. Fault (S3)" (EF3) message will be displayed.
- All eight input terminals (S1 to S7) can be assigned as external failure input.

(63). External overload (setting=69), the input terminal is a normally closed switch.

- When an external overload occurs and the external overload input terminal is off, the inverter will be turned off and the operation of the motor will decelerate and stop.
- If the external input terminal S5 is set to (03-04=69) external overload, the "TOL Ext. OverLoad" message
- will be displayed.
- To enable the external overload function, fire mode (08-48=1) needs to be enabled first. Only the external input terminal S5 can be assigned as external overload input.
- Setting the external input terminal as the external overload will set the input terminal as normally closed; therefore, before setting the external overload function, do not set operation command to come from external terminals, otherwise it will cause unnecessary harm.

(64). Jog frequency operation (setting=70).

- When ON, operation will be performed according to the jog frequency command and according to the 00-18 setting.

03- 08	(S1~S7) DI scan time
Scope	【0】 Scan time 4ms 【1】 Scan time 8ms

- If 03-08 is set to 0, when the inverter's **CPU** chip scans the **TM2** terminal, all signals are viewed as normal execution signals.
- If 03-08 is set to 1, 8ms continuous input of the same signal is required in order for the inverter to view this signal as a normal execution signal, otherwise it will be viewed as noise.
- User can decide the scan interval according to the impact level of the noise in the usage environment. When the noise is severe, set **03- 08** to 1, but the response speed will be slower at this time.

03- 09	Multi-function terminal S1-S4 type selection	
Scope	[xxx0b]: S1 A contact	[xxx1b]: S1 B contact
	[xx0xb]: S2 A contact	[xx1xb]: S2 B contact
	[x0xxb]: S3 A contact	[x1xxb]: S3 B contact
	[0xxxb]: S4 A contact	[1xxxb]: S4 B contact

03- 10	Multi-function terminal S5-S7 type selection	
Scope	[xxx0b]: S5 A contact	[xxx1b]: S5 B contact
	[xx0xb]: S6 A contact	[xx1xb]: S6 B contact
	[x0xxb]: S7 A contact	[x1xxb]: S7 B contact

Usually when using external terminals, switches need to be connected. There are different types of switches, including normally off switches and normally on switches, so pay attention when selecting because the working status of the two types of switches are different. This parameter determines whether normally open switch or normally closed switch input is required.

The definitions of each **03-09/03-10** bit are as follows:

03-09= **0** **0** **0** **0** **0:** Means connect to normally on switch
s4 **s3** **s2** **s1** **1:** means connect to normally closed switch
03-10= **0** **0** **0** **0** **0:** Means connect to normally on switch
s7 **s6** **s5** **1:** Means connect to normally closed switch

User selects the type of switch input required

For example: If **S1 and S2** connect to normally closed switch is required, set **03- 09=0011**.

Note: Before setting the terminal to connect to normally on/normally closed switches, do not set the operation command to come from external terminals, otherwise it will cause unnecessary harm.

03-11	Relay (R1A-R1C) output	
03-12	Optocoupler output (DO1-DOG)	
03-28	Optocoupler output (DO2-DOG) (Frame1 no DO2)	
Scope	**[0]:** Operation duration **[1]:** Fault indication **[2]:** Frequency reached **[3]:** Any frequency reached (03-13±03-14) **[4]:** Frequency detected 1 (≧ 03-13, the hysteresis range is the setting value of 03-14) **[5]:** Frequency detected 2 (≦ 03-13, the hysteresis range is the setting value of 03-14) **[6]:** Automatic restart **[7]:** Emergency stop **[8]:** Reserved **[9]:** Cut-off stop **[10]:** Reserved **[11]:** Reserved **[12]:** Over-torque detected **[13]:** Current reached **[14]:** Mechanism brake control (03-17~03-18) **[15]:** Reserved **[16]:** Reserved **[17]:** Reserved **[18]:** PLC status **[19]:** PLC control **[20]:** Zero speed **[21]:** Inverter standby **[22]:** Low voltage detected **[23]:** Operation command source **[24]:** Frequency command source **[25]:** Low-torque detected **[26]:** Frequency disconnected **[27]:** Timer function output **[28]:** Frequency skipping upper offset status **[29]:** Frequency skipping operation active **[30]:** Select motor 2	**[31]:** Zero-speed servo status (position mode) **[32]:** Communication control **[33]:** RTC timer 1 **[34]:** RTC timer 2 **[35]:** RTC timer 3 **[36]:** RTC timer 4 **[37]:** PID feedback disconnection detection output **[38]:** Brake release **[39]:** Frequency detected 1 (for overhead crane use) **[40]:** Frequency outputting **[41]:** Position reached (position mode) **[42]:** Overpressure **[43]:** Underpressure **[44]:** Pressure loss detection **[45]:** PID sleep **[46]:** Reserved **[47]:** Reserved **[48]:** Reserved **[49]:** Reserved **[50]:** Frequency detected 3 (≧ 03-44 the hysteresis range is the setting value of 03-45) **[51]:** Frequency detected 4 (≦ 03-44, the hysteresis range is the setting value of 03-45) **[52]:** Frequency detected 5 (≧ 03-46, the hysteresis range is the setting value of 03-47) **[53]:** Frequency detected 6 (≦ 03-46, the hysteresis range is the setting value of 03-47) **[54]:** Short-circuit braking **[57]:** Low current detected **[58]:** Frequency deceleration detected **[59]:** Over-temperature detected **[60]:** Lifetime warning period

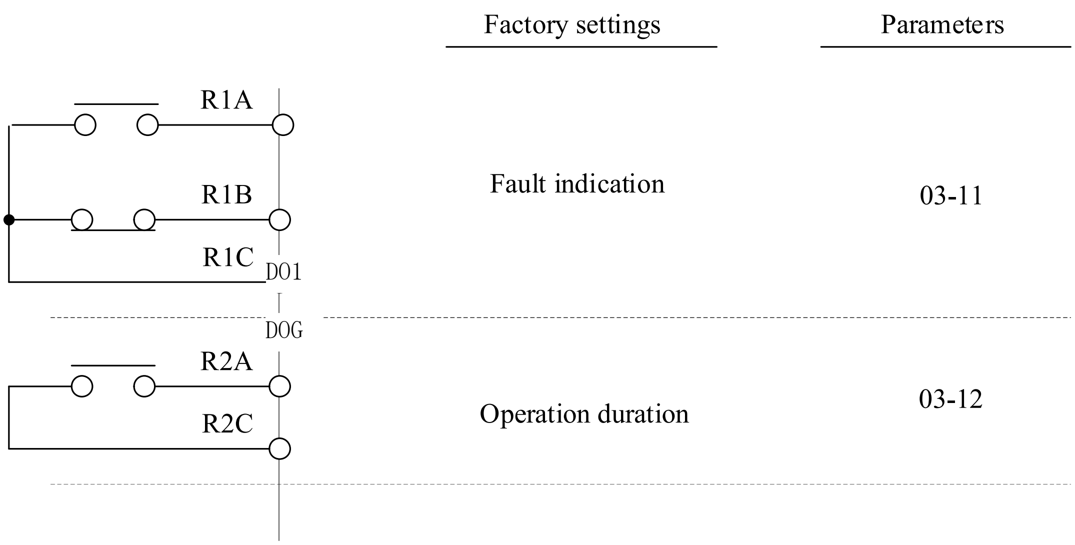


Figure 4.3. 32 Multi-function digital output and related parameters

Table 4.3. 24 Control panel and optical coupling individual parameter setting

Terminal	Frame number 1	Frame number 2 and above
R1A-R1C	03-11=R1A-R1C	03-11=R1A-R1C
DO1	03-12=DO1	03-12=DO1
DO2	None	03-28=DO2

Table 4.3. 25 Multi-function digital output function table

Setting	**Function**		**Content**	**Control method** * (V/F + PG, SV and PMSV are only for special projects						
	Name	**LCD display**		**V/F**	**V/F + PG**	**SLV**	**SV**	**PM SV**	**PM SLV**	**SLV2**
0	Operation duration	Running	ON: Operation duration (Run command is ON)	O	O	O	O	O	O	O
1	Fault indication	Fault	ON: Failure occurred	O	O	O	O	O	O	O
2	Frequency reached	Freq. Agree	ON: Allowed frequency (The allowed frequency width detection is set by 03-14)	O	O	O	O	O	O	O
3	Any frequency reached	Setting Freq Agree	ON: Output frequency = allowed frequency detection threshold (03-13) ± allowed frequency detection width (03-14)	O	O	O	O	O	O	O
4	Frequency detection 1	Freq. Detect 1	ON: Output frequency > 03-13, hysteresis range 03-14	O	O	O	O	O	O	O
5	Frequency detection 2	Freq. Detect 2	OFF: Output frequency > 03-13, hysteresis range 03-14	O	O	O	O	O	O	O
6	Automatic restart	Auto Restart	ON: Automatic restart period	O	O	O	O	O	O	O
7	Emergency stop	Dec to Stop	ON: Emergency stop period	O	O	O	O	O	O	O
8	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
9	Cut-off stop	Baseblock	ON: Baseblock period	O	O	O	O	O	O	O
10	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
11	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
12	Over-torque detected	Over Torque	ON: Over-torque detection is ON	O	O	O	O	O	O	O
13	Current reached	Currebt Agree	ON: ON when the output current > 03-15	O	O	O	O	O	O	O
14	Mechanical brake control (03-17~03-18)	Mechanical Brake Control	ON: Mechanical brake release frequency OFF: Mechanical brake action frequency	O	O	O	O	O	O	O

Setting	Function		Content	Control method *** (V/F + PG, SV and PMSV** are only for special projects						
	Name	LCD display		V/F	V/F + PG	SLV	SV	PM SV	PM SLV	SLV2
15	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
16	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
17	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
18	PLC status	PLC statement	ON: When 00-02 is set to 3 (PLC operation command source)	O	O	O	O	O	O	O
19	PLC control	Control From PLC	ON: The control command source is PLC control	O	O	O	O	O	O	O
20	Zero speed	Zero Speed	ON: Output frequency < minimum output frequency (Fmin)	O	O	O	O	O	O	O
21	Inverter standby	Ready	ON: Inverter standby (no failure after starting)	O	O	O	O	O	O	O
22	Low voltage detection	Low Volt Detected	ON: DC bus voltage = < low voltage warning detection threshold (07-13)	O	O	O	O	O	O	O
23	Operation command source	Run Cmd Status	ON: Operation command from the LED digital operator (local mode)	O	O	O	O	O	O	O
24	Reference frequency source	Freq Ref Status	ON: Reference frequency from the LED digital operator (local mode)	O	O	O	O	O	O	O
25	Low-torque detected	Under Torque	ON: Low torque detection is ON	O	O	O	O	O	O	O
26	Frequency disconnected	Ref. Loss.	ON: Reference frequency lost	O	O	O	O	O	O	O
27	Timer function output	Timer Output	The parameters to set the timer function are 03-33 and 03-34, and the timer function input is set by parameters 03-00 to 03-06	O	O	O	O	O	O	O
28	Frequency skipping upper offset status	Traverse UP	ON: Acceleration period (when frequency skipping is upwards)	O	O	X	X	X	X	O
29	Frequency skipping operation active	During Traverse	ON: During frequency skipping operation (while frequency skipping operation is executing)	O	O	X	X	X	X	O
30	Motor 2 selection	Motor 2 Selection	ON: Switch to motor 2	O	O	O	O	O	O	O
31	Zero-speed servo status (Position mode)	Zero Servo	ON: Move during position mode	X	X	X	O	O	X	X
32	Communication control	Control From Comm	ON: Communication control (communication position: 2507H)	O	O	O	O	O	O	O
33	RTC timer 1	RTC Timer 1	ON: When 16-36 (RTC speed selection) is set to timer 1 and there is activity within the time set in 16-32 (timer 1 source) .	O	O	O	O	O	O	O
34	RTC timer 2	RTC Timer 2	ON: When 16-36 (RTC speed selection) is set to timer 2 and there is activity within the time set in 16-33 (timer 2 source) .	O	O	O	O	O	O	O
35	RTC timer 3	RTC Timer 3	ON: When 16-36 (RTC speed selection) is set to timer 3 and there is activity within the time set in 16-34 (timer 3 source) .	O	O	O	O	O	O	O
36	RTC timer 4	RTC Timer 4	ON: When 16-36 (RTC speed selection) is set to timer 4 and there is activity within the time set in 16-35 (timer 4 source) .	O	O	O	O	O	O	O
37	PID feedback disconnection detection output	PID Fbk Loss	ON: PID feedback disconnected	O	O	O	O	O	O	O
38	Brake release	Brake Relase	ON: Release brake	X	X	O	O	O	X	X
39	Frequency detection 1 (For overhead crane use)	Freq. Detect 1 (Dedicated crane)	ON: Output frequency > 03-13, hysteresis range 03-14	O	O	O	X	X	X	X
40	Frequency outputting	Frequency output Ing	ON: The inverter status is DC braking, base block of stopped status.	X	X	X	O	O	X	X
41	Position reached (Position mode)	Multi Pos. Ready	ON: Complete position search under mode	X	X	X	O	O	X	X
42	Overpressure	High PSI	ON: Overpressure warning or error	O	O	X	X	X	X	X
43	Underpressure	Low PSI	ON: Underpressure warning or error	O	O	X	X	X	X	X
44	Pressure loss detection	Fb PSI	ON: Under-voltage error	O	O	X	X	X	X	X
45	PID sleep	PID Sleep	ON: During PID Sleep	O	O	O	O	O	O	O

Setting	Function		Content	Control method * (V/F + PG, SV and PMSV are only for special projects)						
	Name	LCD display		V/F	V/F + PG	SLV	SV	PM SV	PM SLV	SLV2
46	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
47	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
48	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
49	Reserved	Reserved	Reserved	-	-	-	-	-	-	-
50	Frequency detection 3	Freq. Detect 3	ON: Output frequency > 03-44, hysteresis range 03-45	O	O	O	O	O	O	O
51	Frequency detection 4	Freq. Detect 4	OFF: Output frequency > 03-44, hysteresis range 03-45	O	O	O	O	O	O	O
52	Frequency detection 5	Freq. Detect 5	ON: Output frequency > 03-46, hysteresis range 03-47	O	O	O	O	O	O	O
53	Frequency detection 6	Freq. Detect 6	OFF: Output frequency > 03-46, hysteresis range 03-47	O	O	O	O	O	O	O
54	Short-circuit braking	SC Brk	ON: Short-circuit braking	X	X	X	X	X	O	X
57	Low current detected	Low Current Detect	ON: Output current≦ 03-48 low current detected threshold	O	O	O	O	O	O	O
58	Frequency deceleration detection	Freq. Decel to	ON: When the output frequency < frequency command - 03-14 and currently decelerating	O	O	O	O	O	O	O
59	Over-temperature detected	OH Detect	ON: Heatsink temperature >08-46, hysteresis range 08-47	O	O	O	O	O	O	O
60	End-of-life warning period	-	ON: While “Cyear”, “FLIFE” and “ILIFE” is displayed	O	O	O	O	O	O	O

(1). Operation duration (setting= 0).

Off	The operation command is off and the inverter is in off status.
On	The operation command is on, or the operation command is off but there is still residual output.

(2). Fault indication (setting=1).
- When failures occur, the output contact is in ON status.

(3). Frequency reached (setting=2).
(4). Any frequency reached (setting=3).
(5). Frequency detected 1 (setting=4).
(6). Frequency detected 2 (setting=5).
(7). Frequency detected 3 (setting=50).
(8). Frequency detected 4 (setting=51).
(9). Frequency detected 5 (setting=52).
(10). Frequency detected 6 (setting=53).
- Refer to Table 4.3.26 frequency detection operation.

(11). Automatic restart (setting=6).
- During the automatic restart operation period, the output contact is in ON status.

(12). Emergency stop (setting=7).
- During emergency stop, the output contact is in ON status.

(13). Base block (B.B.) period (setting=9).
- Inverter output base block.

(14). Over-torque detected (no contact point) (setting=12).
(15). Low-torque detected (no contact point) (setting=25).
- By setting any one of the parameters 03-11 or 03-12 to 12 or 25, the over-torque/low-torque signal can output the detected signal from the multi-function digital output terminal, and the threshold action of this function can be set through 8-13~8-20.

(16). Current reached (setting=13).
- When the output current > 03-15 and the duration of the output current > 03-15 is > 03-16, it is in ON status.

(17). PLC status (setting=18).
- When the 00-02 operation command source is set to 3 (PLC control), it is in ON status.

(18). PLC control (setting=19).
- When the inverter control command source is PLC control status, it is in ON status.

(19). Zero-speed (setting=20).

Off	Output frequency = > minimum output frequency (01-08, Fmin)
On	Output frequency < minimum output frequency

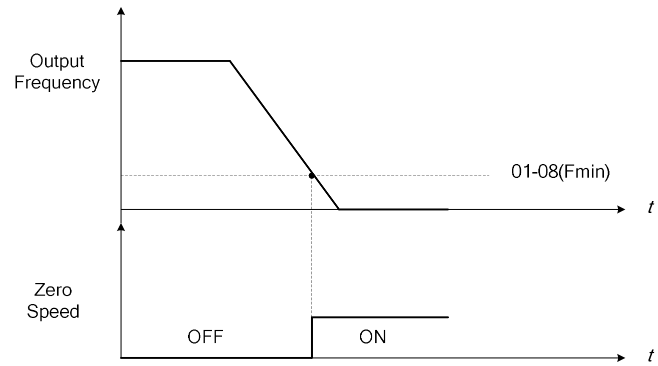


Figure 4.3. 33 Zero-speed operation

(20). Inverter standby (setting=21).
- When started and no failures occurred, the inverter will be in standby status.

(21). Low voltage detection (setting=22).
- ON = The DC bus voltage of the main circuit is below the under-voltage detection threshold (07-13).

(22). Operation command source (setting=23).

Off	Remote mode: When 00-02=1 or 2, or when any one of the multi-function digital output terminals (S1 to S7) is set to LOCAL/REMOTE control (setting value=5). The contact point is OFF, and the SEQ indicator on the digital operator lights up.
On	Local mode: When 00-02=0, or when any one of the multi-function digital output terminal (S1 to S7) is set to LOCAL/REMOTE control (setting value=5). The contact point is ON, and the SEQ indicator on the digital operator is off.

(23). Frequency reference source (setting=24).

Off	Remote mode: When 00-05=1 or 2, or when any one of the multi-function digital output terminal (S1 to S7) is set to LOCAL/REMOTE control (setting value=5). The contact point is OFF, and the REF indicator on the digital operator lights up.
On	Local mode: When 00-05=0, or when any one of the multi-function digital output terminal (S1 to S7) is set to LOCAL/REMOTE control (setting value=5). The contact point is ON, and the REF indicator on the digital operator is off.

(24). Frequency disconnected (setting=26).
- The operation command is on and the frequency reference is 0, and when 11-41 is set to 1 (operating under multiplying 11-42 by the previous frequency reference), the output contact point is in ON status.

(25). Timer function output (setting=27).
- Refer to the descriptions of parameters 03-37 and 03-38 for the operation of the timer function.

(26). Frequency skipping upper offset (setting=28).
- Refer to parameter 19-frequency skipping function group for the operation of frequency skipping.

(27). Frequency skipping operating (setting=29).
- By setting 28 or 29, the acceleration period or frequency skipping operation can be outputted to the multi-function digital output terminal. Refer to parameter 19-frequency skipping function group for the control of frequency skipping.

(28). Motor 2 selection (setting=30).

(29). Zero-speed servo status (position mode) (setting=31).
- Under zero servo status, it is in ON status.

(30). Communication control (setting=32). Communication position: 2507H, the control method is DO2 DO1 RY1. If DO2 DO1 and RY1 are all set to communication control, then set 2507H to 5 (101), then DO2 and RY1 will move.

(※ E710 Frame1 no DO2)

(31) RTC timer 1~4 (setting=33~36)ON: When timer 1 is selected for 16-36 (RTC speed selection) and there is action within the time set by 16-32~16-35 (timer 1~4 source).

(32). PID feedback disconnection detection output (setting=37) When PID feedback is disconnected (please refer to the settings of parameter 10-11~10-13), it is in ON status.

(33). Brake release (setting=38) ON status is release brake. Please refer to parameters 03-41~42 for the conditions and descriptions of brake release.

(34). Frequency detected 1 (for overhead crane use) (setting=39)

(35). Frequency outputting (setting=40)

- Refer to Table 4.3.26 frequency detection operation.

(36). Position reached (position mode) (setting=41)

- Perform position search under position mode, and it will become ON status after completed.

(37). Overpressure warning/error (setting=42)

- Please refer to the settings of parameters 23-12~23-14.

(38). Underpressure warning/error (setting=43)

- Please refer to the settings of parameters 23-15~23-17.

(39). Pressure loss detection warning/error (setting=44)

- Please refer to the settings of parameters 23-18~23-19.

(40). PID sleep (setting=45)

- Notify during PID sleep.

(41). Short-circuit braking (setting=54)

- While executing short-circuit brake, the output terminal closes.

(42) When low current (set as 57) is detected: When the output current <= 03-48, the relay operates.

(43) Frequency deceleration detection (set as 58)

- When the output frequency < frequency command - 03-14, and is currently decelerating, the relay operates. Please refer to Table 4.3.26 frequency detection operation.

(44) Over-temperature detected (setting is 59)

- Heatsink temperature > 08-46 relay operates, the hysteresis range is 08-47.

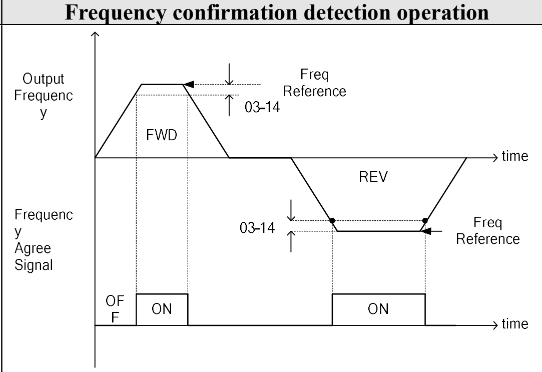
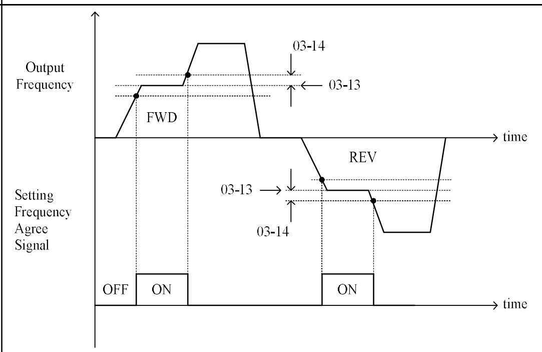
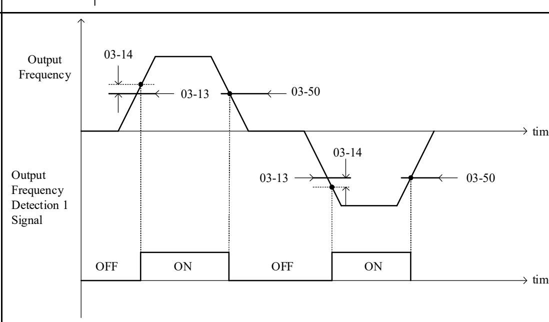
(45) End-of-life warning period (setting is 60)

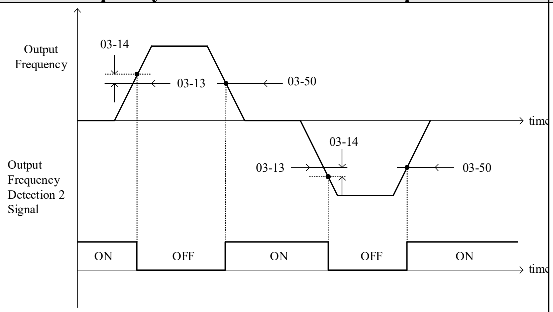
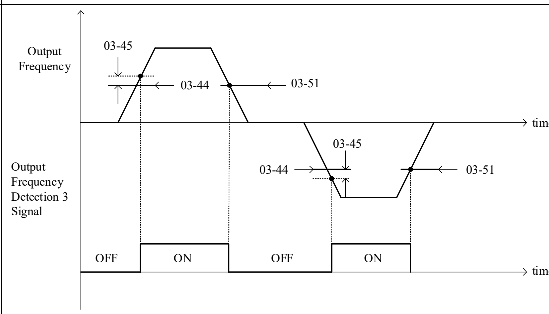
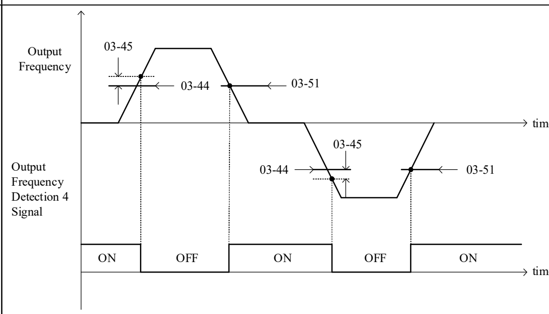
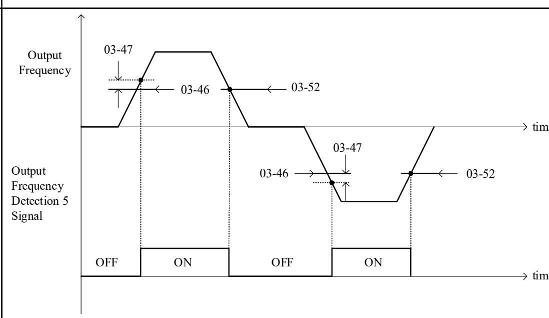
- When the end-of-life warnings “Cyear”, “FLIFE”, “ILIFE” appears, the relay is in ON status.

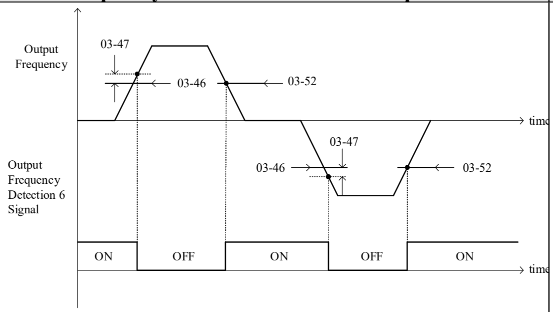
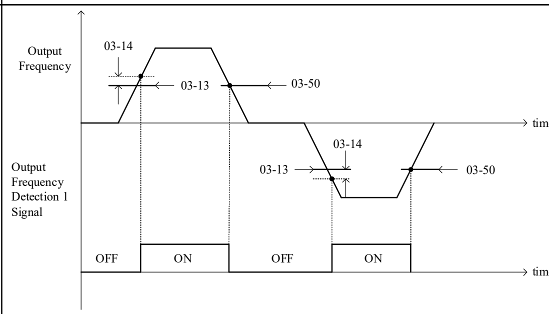
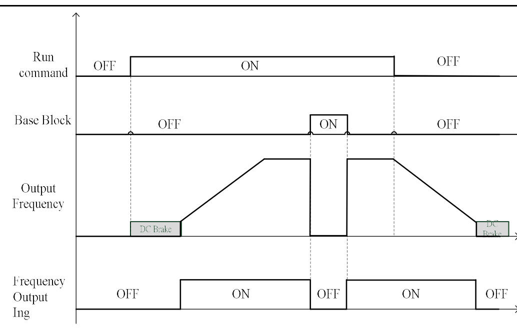
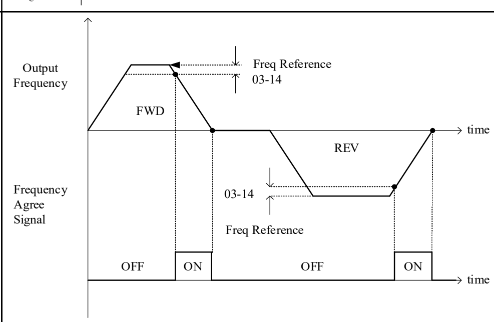
03-13	Frequency detection threshold	**03-47**	Frequency detection width 3
Scope	【0.0~599.0】 **Hz**	**Scope**	【0.1~25.5】 **Hz**
03-14	Frequency detection width	**03-50**	Frequency detection threshold 4
Scope	【0.1~25.5】 **Hz**	**Scope**	【0.0~599.0】 **Hz**
03-44	Frequency detection threshold 2	**03-51**	Frequency detection threshold 5
Scope	【0.0~599.0】 **Hz**	**Scope**	【0.0~599.0】 **Hz**
03-45	Frequency detection width 2	**03-52**	Frequency detection threshold 6
Scope	【0.1~25.5】 **Hz**	**Scope**	【0.0~599.0】 **Hz**
03-46	Frequency detection threshold 3		
Scope	【0.0~599.0】 **Hz**		

- Frequency detection function: Set the multi-function output terminals R1A-R1C, DO1 or DO2 (03-11, 03-12 or 03-28) as the output frequency confirmation signal and set frequency confirmation and output frequency detection 1~6.
- The frequency detection operation time table is as described in Table 4.3.26 below.

Table 4.3. 26 Frequency detection operation

Function	**Frequency confirmation detection operation**	**Description**
Frequency reached		· When the output frequency is in the frequency reference ± frequency detection width (03-14) range, the frequency reached output signal is ON. · Set any one of the parameters 03-11, 03-12 or 03-28 to 2 (frequency reached).
Any frequency reached		· When the output frequency reached the frequency confirmation detection threshold (03-13) and is within the frequency confirmation detection width (03-14) range during the acceleration period, any frequency reached signal set is ON. · Set any one of the parameters 03-11, 03-12 or 03-28 to 3 (any frequency reached).
Frequency detection 1		· During the acceleration period, if its output frequency is greater than the frequency detection threshold (03-13) + frequency detection width (03-14), then the frequency detected 1 signal will change to ON. · During the deceleration period, if its output frequency is less than the frequency detection threshold 4 (03-50), then the frequency detected 1 signal will change to OFF. · Set any one of the parameters 03-11, 03-12 or 03-28 to 4 (frequency detected 1).

Function	Frequency confirmation detection operation	Description
Frequency detected 2		· During the acceleration period, if its output frequency is greater than or equal to the frequency detection threshold (03-13) + frequency detection width (03-14), then the frequency detected 2 signal will change to OFF. · During the deceleration period, if its output frequency is less than or equal to the frequency detection threshold 4 (03-50), then the frequency detected 2 signal will change to ON. · Set any one of the parameters 03-11, 03-12 or 03-28 to 5 (frequency detected 2).
Frequency detection 3		· During the acceleration period, if its output frequency is greater than or equal to the frequency detection threshold 2 (03-44) + frequency detection width 2 (03-45), then the frequency detected 3 signal will change to ON. · During the deceleration period, if its output frequency is less than or equal to the frequency detection threshold 5 (03-51), then the frequency detected 3 signal will change to OFF. · Set any one of the parameters 03-11, 03-12 or 03-28 to 50 (frequency detected 3).
Frequency detected 4		· During the acceleration period, if its output frequency is greater than or equal to the frequency detection threshold 2 (03-44) + frequency detection width 2 (03-45), then the frequency detected 4 signal will change to OFF. · During the deceleration period, if its output frequency is less than or equal to the frequency detection threshold 5 (03-51), then the frequency detected 4 signal will change to ON. · Set any one of the parameters 03-11, 03-12 or 03-28 to 51 (frequency detected 4).
Frequency detection 5		· During the acceleration period, if its output frequency is greater than or equal to the frequency detection threshold 3 (03-46) + frequency detection width 3 (03-47), then the frequency detected 5 signal will change to ON. · During the deceleration period, if its output frequency is less than or equal to the frequency detection threshold 6 (03-52), then the frequency detected 5 signal will change to OFF. · Set any one of the parameters 03-11, 03-12 or 03-28 to 52 (frequency detected 5).

Function	Frequency confirmation detection operation	Description
Frequency detected 6		· During the acceleration period, if its output frequency is greater than or equal to the frequency detection threshold 3 (03-46) + frequency detection width 3 (03-47), then the frequency detected 6 signal will change to OFF. · During the deceleration period, if its output frequency is less than or equal to the frequency detection threshold 6 (03-52), then the frequency detected 6 signal will change to ON. · Set any one of the parameters 03-11, 03-12 or 03-28 to 53 (frequency detected 6).
Frequency detection 1 (For overhead crane use)		· During the acceleration period, if its output frequency is greater than the frequency detection threshold (03-13) + frequency detection width (03-14), then the frequency detected 1 (overhead crane use) signal will change to ON. · During the deceleration period, if its output frequency is less than the frequency detection threshold 4 (03-50), then the frequency detected 1 (overhead crane use) signal will change to OFF. · Set any one of the parameters 03-11, 03-12 or 03-28 to 39 (frequency detected 1 (overhead crane use)).
Frequency outputting		· When the inverter outputs frequency, the output terminal closes.
Frequency deceleration detection		· When the output frequency is outside the range of the frequency reference ± frequency detection width (03-14) range, and the output signal is ON when the frequency is decelerating. · Set any one of the parameters 03-11, 03-12 or 03-28 to 58 (frequency deceleration detection).

03-15	Current reached threshold
Scope	**【0.1~999.9】 A**
03-16	Current reached detection delay time
Scope	**【0.1~10.0】 Sec**
03-53	Current reached threshold 2
Scope	**【0.0~999.9】A**

Note: The maximum value of 03-53 will be limited to the setting value of 03-15

- When **03-11** is set to **[13]**: When the output current **> 03-15**, the relay operates.
- **03-15**: Setting value **0.1~** according to the rated current of the motor.
- **03-16**: Setting value **(0.1~10.0)** unit seconds, in addition when the output current ≤ 03-53, also the delay time of the relay signal from **ON** to **OFF** is **100ms** (fixed).

Timing diagram:

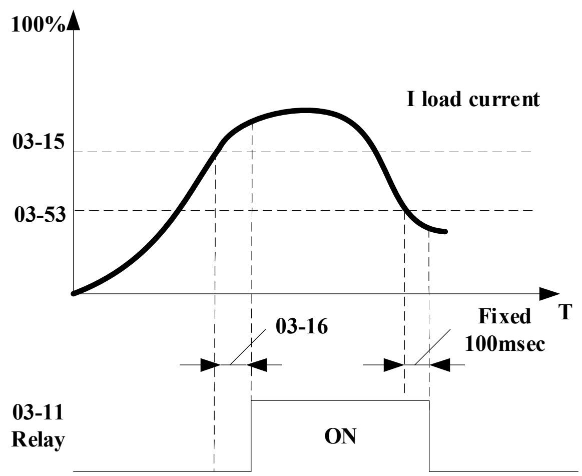


Figure 4.3. 34 Example of current reached

03-48	Low current detected threshold
Scope	**【0.0~999.9】 A**
03-49	Low current detected delay time
Scope	**【0.00~655.34】 Sec**

- When 03-11 is set to [57]: When the output current <= 03-48, the relay operates.
- When 03-48 is set to 0.0, the low current detection function is off.
- If the current is continuously lower than the setting value of 03-48 within the 03-49 time, the relay operates. Also, the delay time for the relay signal to change from ON to OFF is 100ms (fixed).

The timing diagram is as follows:

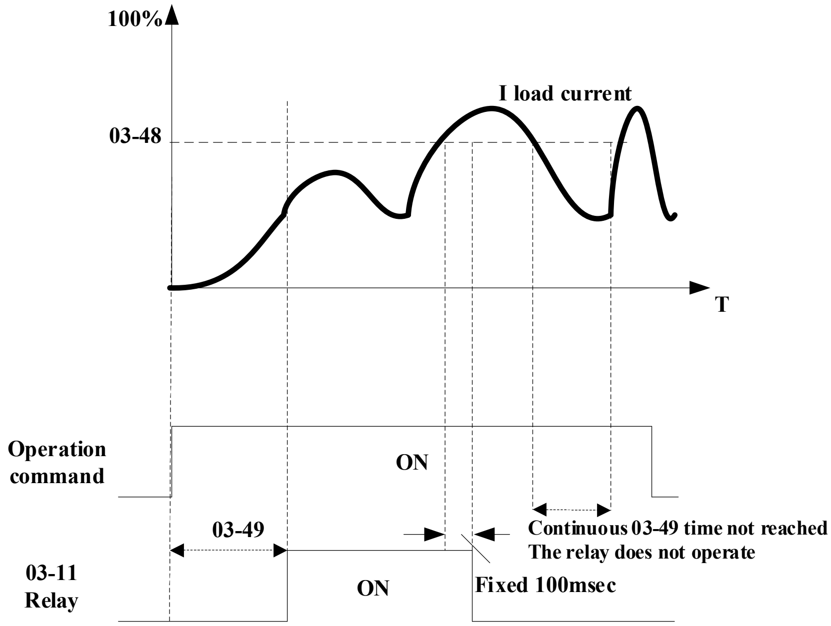


Figure 4.3. 35 Example of low current detected

03-17	Mechanical brake release threshold setting
Scope	**【0.00~599.00】 Hz**
03-18	Mechanical brake action threshold setting
Scope	**【0.00~599.00】 Hz**

- When **03-11 = [14]**,
  During acceleration, when the actual frequency reached **03-17** mechanical brake release frequency, the relay outputs;
  During deceleration, when the actual frequency reached **03-18** mechanical brake operation frequency, the relay stops outputting.
- When **03-17 ≤ 03-18**, the timing diagram is as follows:

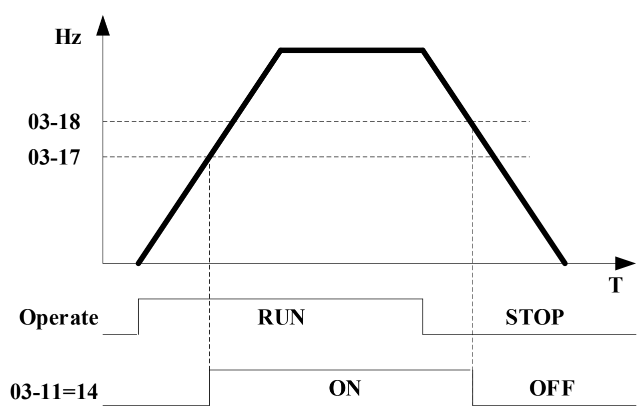


Figure 4.3. 36 Example of mechanical brake release (03-17≤03-18)

- When **03-17 ≥ 03-18**, the timing diagram is as follows:

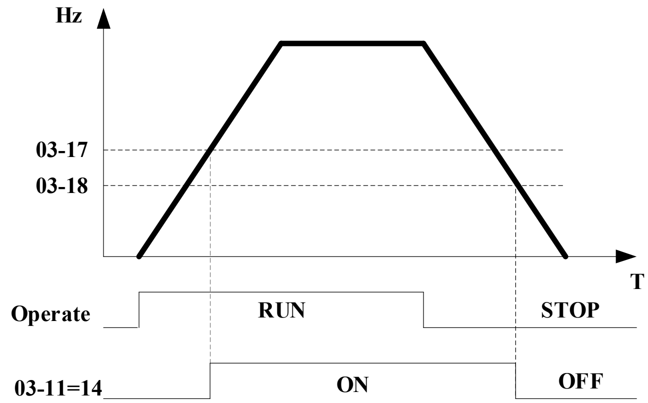


Figure 4.3. 37 Example of mechanical brake release (03-17≥03-18)

03-19	Relay (R1A-R1C) and DO1 type selection
Scope	[xxx0b]: R1 A contact [xxx1b]: R1 B contact [xx0xb]: Optocoupler 1 A contact [xx1xb]: Optocoupler 1 B contact

03-27	UP/DOWN frequency hold selection
Scope	[0]: Maintain UP/DOWN frequency when stopped [1]: Clear Up/DOWN frequency when stopped [2]: Allow frequency UP/DOWN when stopped. [3]: Update frequency during acceleration.
03-40	Up/Down frequency bandwidth setting
Scope	**【0.00~5.00】Hz**

- Set 03-27 to 0, when the Run Command is removed, its frequency command before deceleration will be retained and not cleared, and the next run command will output according to the frequency previously recorded.
- When 03-27 is set to 1, if Run Command is removed, its frequency command will be cleared before deceleration.
- When 03-27 is set to 2, if there is no Run Command, its UP/DOWN command is valid and is written into the frequency command.
- When 03-27 is set to 3, the frequency command will remain in uncleared status, and when the Run Command is sent again, if the UP/DOWN button is pressed before the operation command caught up with the frequency command, the frequency command will be set according to the operation frequency.

When 03-40 is set to 0Hz, the original **up/down** function will be retained.
When 03-40 is no 0, the frequency command will be set according to the original frequency plus the frequency set in 03-40
For example: Set terminal **S1: 03- 00=[8] Up** increase frequency command**,** terminal **S2: 03- 01=[9] Down** decrease frequency command**, 03- 40=[△]Hz**

Mode 1**:** When 03-40 is set to 0Hz, the original **up/down** function will be retained, as shown in Figure 4.3.24.
Mode 2**:** When the 03-40 setting is not 0Hz, and the terminal conduction time is **<2Sec**, for each conduction, the frequency changes by **△Hz** (the frequency set in 03-40).

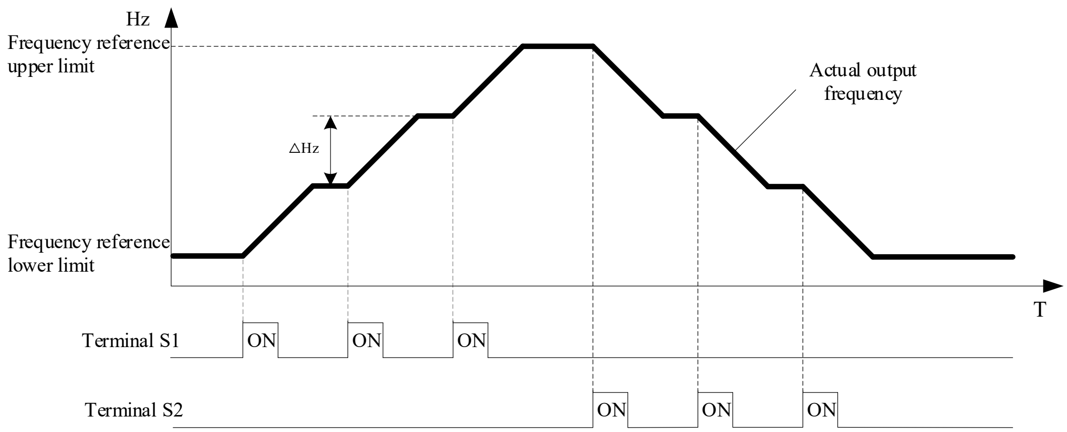


Figure 4.3. 38 Example of UP/DOWN timing (mode 2)

Mode 3**:** When the 03-40 setting is not 0Hz, and the terminal conduction time is **>2Sec**, the frequency changes based on general acceleration and deceleration**.**

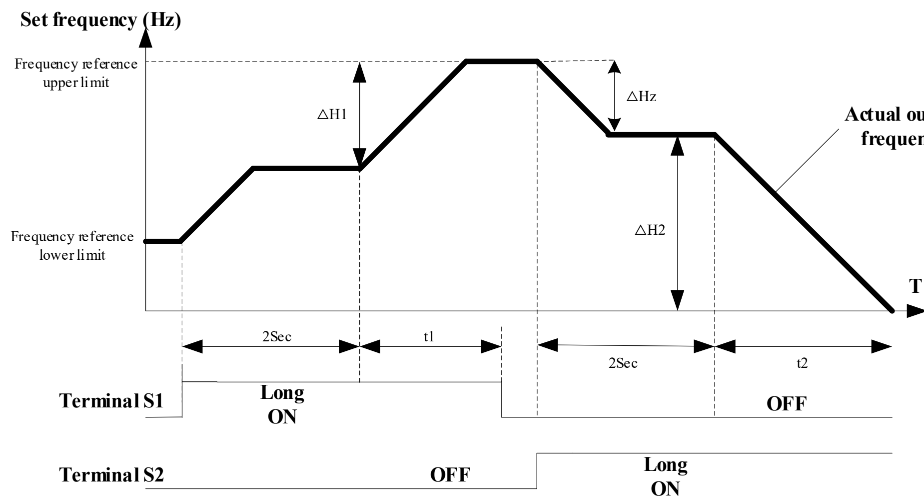


Figure 4.3. 39 Example of UP/DOWN timing (mode 3)

※Description:
△H1: Set the frequency increase during acceleration, **t1:** Terminal conduction time during acceleration,
△H2: Set frequency increase during deceleration, **t2:**Terminal conduction time during deceleration

$$\triangle H1 = \frac{\text{Maximum frequency}}{\text{Acceleration time 2}} \text{ X Terminal channel time } t1$$

$$\triangle H2 = \frac{\text{Maximum frequency}}{\text{Acceleration time 2}} \text{ X Terminal channel time } t2$$

03- 28	Optocoupler output (DO2-DOG) (Frame1 no DO2)
Scope	The scope and definition are the same as 03-11, 03-12 (03-28 is set as 8 is the pulse output function)
03-29	Optocoupler output type selection (DO2-DOG) (Frame1 no DO2)
Scope	**[**xx0xb**]**: Optocoupler 2 A contact **[**xx1xb**]**: Optocoupler 2 B contact

03- 30	Pulse input selection
Scope	**[**0**]:** General pulse input **[**1**]:** PWM method

There are two types of pulse input selection:

(1) General pulse input: The calculation method of PI input is to divide the captured frequency by the pulse input scale set in 03-31, and then map it to the maximum output frequency of 01-02 motor 1.

The percentage displayed when monitoring the pulse input of parameter 12-79 is the ratio between the input signal and the 03-31 pulse input scale.

(2) PWM method: The correct frequency needs to be entered first, the calculation method is to divide the duration of the rising edge pulse by the time period of the previous pulse, then map it to the maximum output frequency of 01-02 motor 1.

The percentage displayed when monitoring the pulse input of parameter 12-79 is the ratio between the rising edge of the input signal and the time period.

Note: The pulse period error of the PWM method is plus or minus 12.5%, and no actions will be taken if exceeded the error range.

The schematic diagram of pulse input selection is as follows:

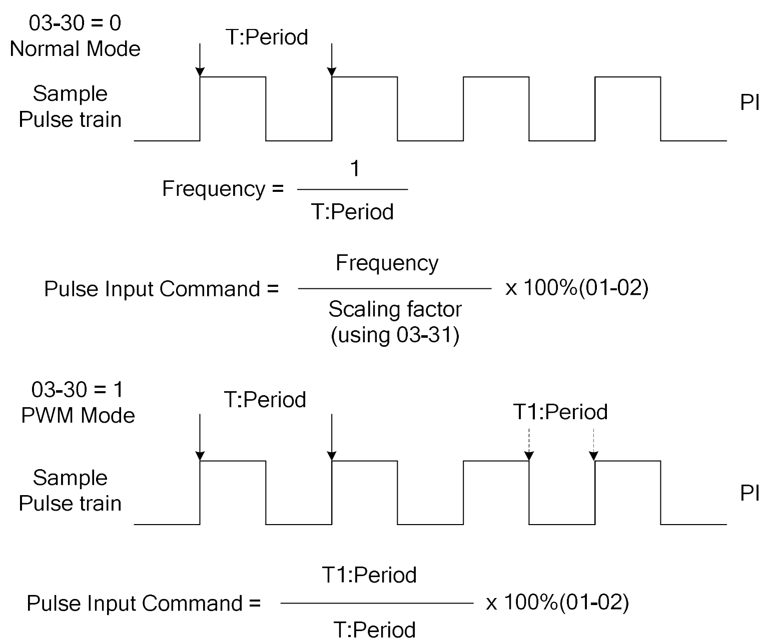


Figure 4.3. 40 Schematic diagram of pulse input selection

03-31	Pulse input scale
Scope	Set and adjust according to 03-30 **【0】50~32000Hz 【1】10~1000Hz**
03- 32	Pulse input gain
Scope	**【**0.0~1000.0**】%**
03-33	Pulse input bias voltage
Scope	**【**-100.0~100.0**】%**
03-34	Pulse input filter time
Scope	**【**0.00~2.00**】Sec**

Refer to Table 3.4.3 control circuit terminal.

- Figure 4.3.41 is the schematic diagram of using pulse input function adjustment.

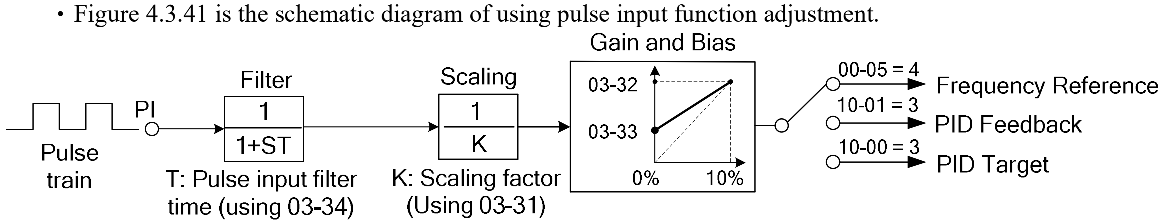


Figure 4.3. 41 Pulse input adjustment

(1). Pulse input frequency command methods.

- First set the 00-05 primary frequency command source selection to 4 pulse input, and then use the format of setting 03-30 pulse input selection as pulse input to connect the pulse input terminal PI with serial connection as the frequency reference. Please refer to Figure 4.3.7 for using pulse input as frequency reference.
- Connect the pulse input terminal PI with serial connection as the frequency reference function, and set the number of pulses through parameter 03-31 (pulse input scale), which is equal to the maximum output frequency (01-02). If there is performance interference, increase the value of 03-34 (pulse input filter time).

(2). PID input method of pulse input.

- First set the primary frequency command source selection of 00-05 to given by 5 PID, and then use 03-30 pulse input selection to set the pulse input format.
  - ➢ When 10-01 is set to 3 (PID feedback value source setting), the pulse train input to the control terminal PI is used as the PID feedback value.
  - ➢ When 10-00 is set to 3 (PID target value source setting), the serial pulse input to the control terminal PI is used as the PID target value. Refer to Figure 4.3.42 on PID control.
- Use parameter 10-03 (PID control mode) to execute PID control, and set the PID feedback value and target value.

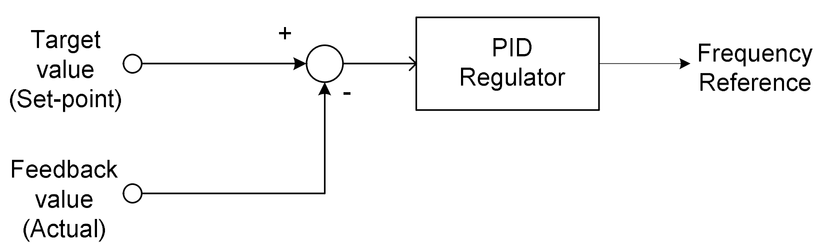


Figure 4.3. 42 PID control

03- 35	Pulse output function setting	
Scope	[1] Frequency command [2] Output frequency [3] Output frequency after soft start [4] Motor speed	[5] PID feedback [6] PID input [7] PG output (must be used with PG card) (only for special projects)

03-36	Pulse input scale
Scope	【1~32000】**Hz**

(1). Pulse input function selection (03-35)

- Refer to Table 4.3.27 on pulse input function selection.

Table 4.3. 27 Pulse input function selection

03-35 Setting	Function	Screen display (LCD)		Remarks
1	Frequency reference (Fref)	Freq Ref	12-16	100% = Maximum output frequency (01-02)
2	Output frequency (Fout)	Output Freq	12-17	100% = Maximum output frequency (01-02)
3	Output frequency after soft start	Output Freq (SFS)	-	100% = Maximum output frequency (01-02)
4	Motor rotation speed (rpm)	Motor Speed	12-22	100% = Maximum output frequency (01-02)
5	PID feedback	PID Feedback	12-39	100% = Maximum output frequency (01-02)
6	PID control input	PID Input	12-36	100% = Maximum output frequency (01-02)
7	PG monitor output	PG Pulse Output		

. 1~4 are speed related items, 5 and 6 are PID related items, and 7 is PG related item that needs to be used with PG card.* **(V/F+PG, SV and PMSV** are only for special projects

(2). Adjust pulse output scale (03-36).

- Use 03-36 (pulse output scale) to adjust PO and set the number of pulse outputs to map 100% of the selected item.
  Refer to Figure 4.3.43 below.

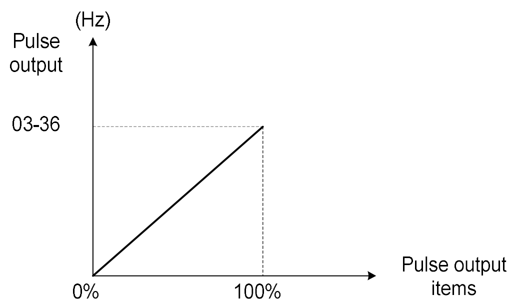


Figure 4.3. 43 Pulse output ratio

- If 03-35 is set to 2 (output frequency), the pulse output of PO and the output frequency of the inverter are synchronized. The pulse output scale is set according to parameter 03-36.

- Refer to Figure 4.3.44 below on pulse output signal level.

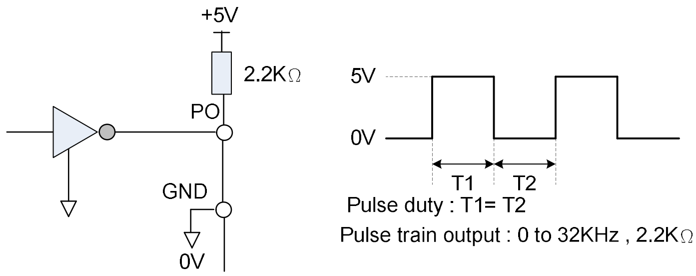


Figure 4.3. 44 Pulse output signal level

- When 03-35 = 7 (PG pulse monitor output), the PG pulse output ratio is 1:1, and the setting value of 03-36 is ignored.

Note: An external pull-up resistor and voltage can be connected to the PO terminal and adjusted according to the customer's environment. (The design of the external power supply and pull-up resistor connected to the PO terminal must comply with the requirements of a voltage below 48V and a current below 50mA)

(3). Application example

Example A. PG connection and operation.

- Operation (or synchronization operation) can be performed by inputting a serial pulse signal as the frequency reference directly. Refer to Figure 4.3.45.

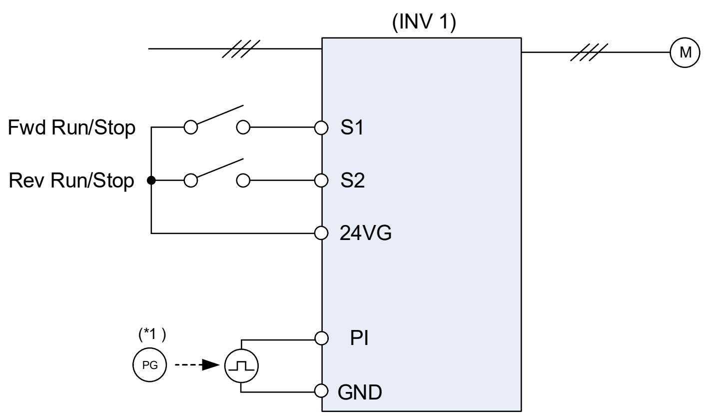


Figure 4.3. 45 PG connection and operation

- Related parameter settings:
  1. Frequency reference selection: 00-05=4 (pulse input).
  2. Pulse input selection: 03-30=0 (general pulse input).
  3. Pulse input scale: 03-31 (the number of pulses with Hz as the unit is set to the same as the maximum output frequency, 01-02).
  4. Pulse input gain: 03-32 (Set the pulse frequency input gain as set in 03-31).
  5. Pulse input bias voltage: 03-33 (Set the pulse frequency input bias voltage as set in 03-31)
  6. Pulse input filter time: 03-34 (if the pulse input is unstable due to interference, increase the setting value).
- Use the forward command and reverse command of the multi-function digital input to change the operation direction.
- If higher accuracy is required, use the SV or V/f + PG control method.*** (V/F+PG, SV and PMSV** are only for special projects

Example B: Connection and operation of 2 inverters

- Refer to Figure 4.3.46 on using 2 inverters for "tracking" or synchronization operations.

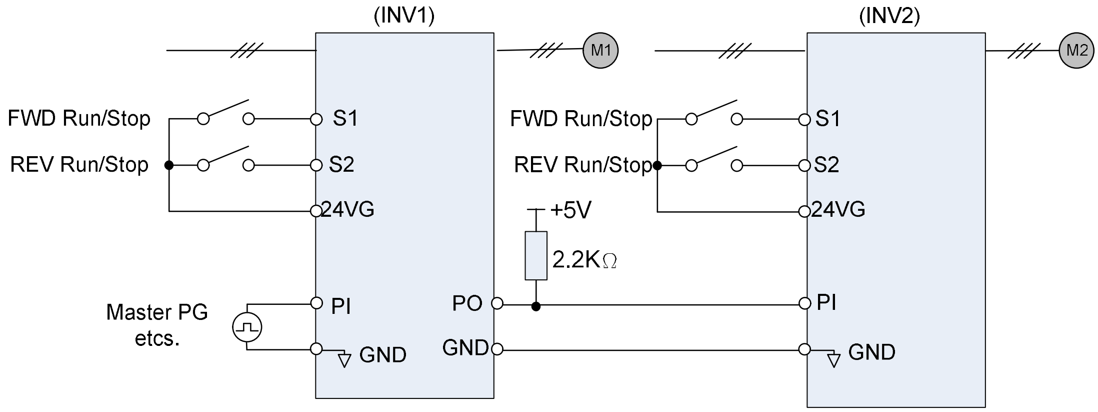


Figure 4.3. 46 Connection and operation of 2 inverters

- INV 1 related parameter settings:
  1. Frequency reference input:
     Case 1: Set the parameters related to pulse input to the same as in the previous Example 1 to operate INV 1 with pulse input (for example the primary PG).
     Case 2: Select the primary frequency reference with 00-05 to operate INV1 with analog frequency reference.
  2. Frequency reference pulse output:
     a. Pulse output function selection: 03-35=2 (Output frequency reference from the pulse output terminal PO).
     b. Pulse output scale: 03-36 (when the speed is full speed, set the number of output pulses).

- INV 2 related parameter settings:
  1. Frequency reference selection: 00-05=4 (pulse input).
  2. Pulse input selection: 03-30=0 (general pulse input).
  3. Pulse input scale: 03-31 (Set the number of pulses with Hz as the unit to the same as the maximum output frequency, 01-02; basically, set this value to the same as 03-31 of INV 1).
  4. Pulse input gain: 03-32 (Set the pulse frequency input gain as set in 03-31. Adjust 03-32 after confirming the proportional setting of INV 2).
  5. Pulse input bias voltage: 03-33 (Set the pulse frequency input bias voltage as set in 03-31. Adjust 03-33 after setting the INV 2 bias voltage).
  6. Pulse input filter time: 03-34 (if the pulse input is unstable due to interference, increase the value set).

Note: An external pull-up resistor and voltage can be connected to the PO terminal and adjusted according to the customer's environment. (The current limit of PO is 50mA)

Example C: Synchronization operation using pulse input.

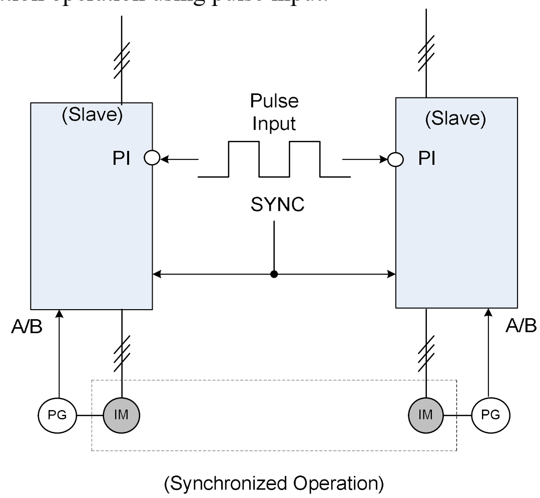


Figure 4.3. 47Synchronization operation with pulse input

- Applies the pulse signals generated by external pulse generators to the pulse input terminal PI of multiple inverters for synchronization.
- Set 00-05 to 4 (pulse input frequency command), and set 03-30 to 0 (general pulse input).
- By setting the corresponding parameters (03-00 to 03-06) to 32, assign any terminal of the multi-function digital input (S1 to S7) as the synchronization command.
- Convert the serial pulses received by the pulse input (terminal PI) to a synchronization frequency command, and the synchronization command (SYNC) allows the frequency reference to be executed. Refer to Figure 4.3.47 on synchronization operation using pulse input.

Example D. Synchronization operation using pulse output

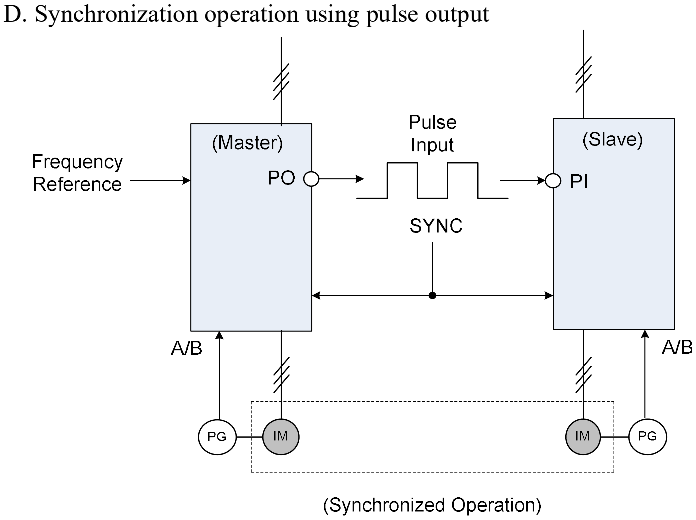


Figure 4.3. 48 Synchronization operation with pulse output

- Set 03-35 to 1 (uses the pulse output function as the frequency command). The internal frequency reference of the primary inverter is converted to pulse output signals (terminal PO).
- Set 00-05 to 4 (pulse input frequency command), and set 03-30 to 0 (general pulse input). Adjust the ratio, gain and bias voltage of 03-31 to 03-33 on the inverter sequentially.
- The pulse output signal converted by the master inverter can be inputted into the pulse input terminal of the slave inverter, allowing the master and slave inverters to operate synchronously.
- Refer to Figure 4.3.48 on synchronization operation using pulse output.

03- 37	Timer ON delay (DI/DO)	03- 54	**Timer ON delay**
Scope	【0.0~6000.0】**Sec**	**Scope**	**【0~12】hour**
03-38	Timer OFF delay (DI/DO)	**03-55**	**Timer OFF delay**
Scope	【0.0~6000.0】**Sec**	**Scope**	**【0~12】hour**

- When any one of the multi-function input parameters 03-00 to 03-06 (S1 to S7) is set to 35 (count function input), and any one of the multi-function output parameters 03-11 or 03-12 is set to 27 (count function output), the timer function is enabled.
- These inputs and outputs are used as general-purpose I/O to set on/off delay times.
- The timer parameters (03-37/03-38) can prevent frequent noises caused by detectors and switches, etc.
- When the on time of the timer function input is higher than the setting value of 03-37, the counter function output will change to on.
- When the off time of the timer function input is higher than the setting value of 03-38, the counter function output will change to off.
- The following figure shows an example

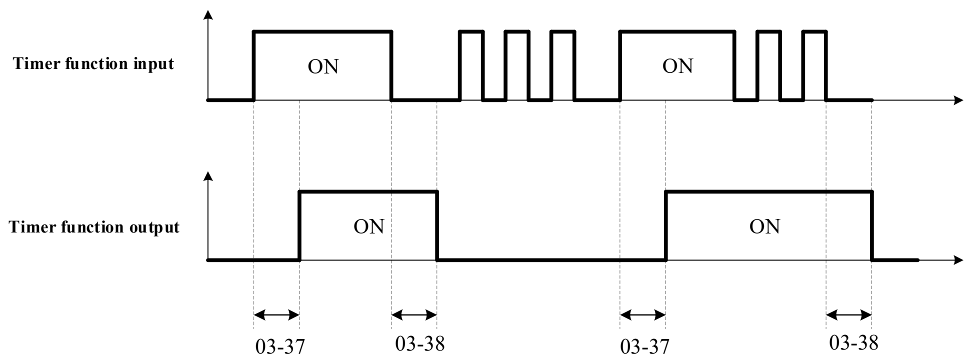


Figure 4.3. 49 Example of counter OFF delay

03- 41	Torque detection threshold
Scope	【0~150】**%**
03-42	Braking action delay out
Scope	【0.00~65.00】**Sec**

Brake release function:
Must be used with the frequency arrival function, as shown in the figure below:
When the inverter starts operating and the output frequency is greater than the 03-13 frequency detection threshold, and the output torque is greater than the 03-41 torque detection threshold, the brake will be released after delaying for the 03-42 braking action delay time.

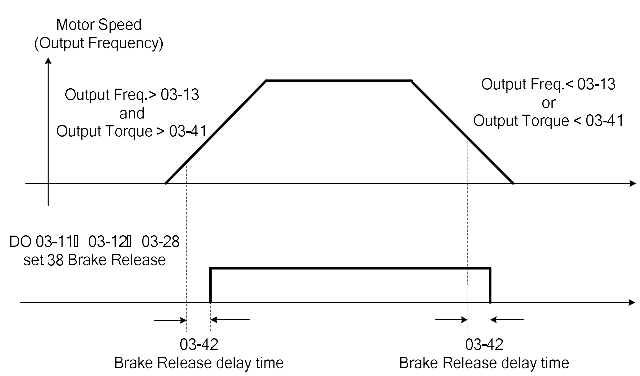


Figure 4.3. 50 Example of using the brake release function with the frequency arrival function

It is recommended to use with the 11-43~11-46 start and stop frequency lock function, as shown in the figure below:

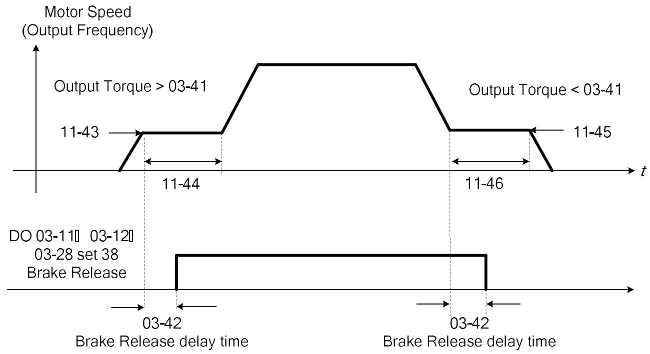


Figure 4.3. 51 Example of using the brake release function with the frequency lock function

03-43	UP/DOWN acceleration/deceleration selection
Scope	**[0]** Acceleration/deceleration time 1 **[1]** Acceleration/deceleration time 2

When using the UP/DOWN function, the 03-43 parameter can be used to switch between the acceleration/deceleration time of the calculate frequency command (ex:**△H1 (**set frequency increase during acceleration) and **△H2(**set frequency increase during deceleration)).

03-57	Emergency stop action setting
Scope	**[0]** Automatic reset ES after stopped **[1]**ES reset command: DI

After the emergency stop function (DI setting=14) is activated:
(1) When 03-57=0: After removing the operation command and emergency stop command DI, the panel ES will disappear and ES resets automatically.
(2) When 03-57=1: After removing the operation command and emergency stop command DI, the panel ES will not disappear, and an external reset command (DI setting=17) needs to be used to reset ES.

03-58	Communication control S1~S4 type selection
Scope	**[xxx0b]:** S1 external input**[xxx1b]:** S1 communication control **[xx0xb]:** S2 external input**[xx1xb]:** S2 communication control **[x0xxb]:** S3 external input**[x1xxb]:** S3 communication control **[0xxxb]:** S4 external input**[1xxxb]:** S4 communication control
03-59	Communication control S5~S7 type selection (Frame1 no S7)
Scope	**[xxx0b]:** S5 external input**[xxx1b]:** S5 communication control **[xx0xb]:** S6 external input**[xx1xb]:** S6 communication control **[x0xxb]:** S7 external input**[x1xxb]:** S7 communication control

When communication register addresses need to be used to write multi-function terminal statuses, the corresponding terminals of 03-58 and 03-59 needs to be set as communication control functions.

004-External terminal analog input/output function group

04- 00	AI input signal type (Frame1 no AI2)	
Scope	**[0]:** AI1 0~10V AI2 0~10V **[1]:** AI1 0~10V AI2 4~20mA **[2]: Reserved** **[3]: Reserved** **[4]:** AI1 4~20mA AI2 0~10V **[5]:** AI1 4~20mA AI2 4~20mA	
04- 01	AI1 signal scan filter time	
Scope	【0.00~2.00】**Sec**	
04- 02	AI1 gain	
Scope	【0.0~1000.0】**%**	
04- 03	AI1 bias voltage	
Scope	【-100~100.0】**%**	
04- 04	AI negative characteristic	
Scope	**[0]:** Disabled **[1]:** Enabled	
04- 05	AI2 function setting (Frame1 no AI2)	
Scope	**[0]:** Auxiliary frequency **[1]:** Frequency gain **[2]:** Frequency bias voltage **[3]:** Voltage bias voltage **[4]:** Acceleration/deceleration shortening coefficient **[5]:** DC brake current **[6]:** Overtorque detection threshold **[7]:** Stall threshold during operation **[8]:** Frequency lower limit	**[9]:** Jump frequency 4 **[10]:** Add to AI1 **[11]:** Forward torque limit **[12]:** Negative torque limit **[13]:** Regenerative torque limit **[14]:** Positive/negative torque limit **[15]:** Torque command/torque limit **[16]:** Torque command/torque compensation **[17]:** PTC overheat protection
04- 06	AI2 signal scan filter time	
Scope	【0.00~2.00】**Sec**	
04- 07	AI2 gain	
Scope	【0.0~1000.0】**%**	
04- 08	AI2 bias voltage	
Scope	【-100.0~100.0】**%**	

The usage methods of the 04-00 AI input signal type are as follows:
For AI1 to use 0~10V, set the 04-00 parameter to 0 or 1. Adjust the SW3 on the control panel to V
For AI1 to use 4~20mA, set the 04-00 parameter to 4 or 5, and adjust the SW3 on the control panel to I.
For AI2 to use 0~10V, set the 04-00 parameter to 0 or 4, and adjust the SW4 on the control panel to V.
For AI2 to use 4~20mA, set the 04-00 parameter to 1 or 5, and adjust the SW4 on the control panel to I.

(1) Analog threshold adjustment inputs AI1 and AI2 (04-02, 04-03, 04-04, 04-07, 04-08)

- For each different analog input AI1 and AI2, its corresponding gain and bias voltage should be listed separately.

AI1 uses 04-02 and 04-03 for adjustment, AI2 uses 04-07 and 04-08 for adjustment. Refer to Figure 4.3.52 on analog input and related parameters.

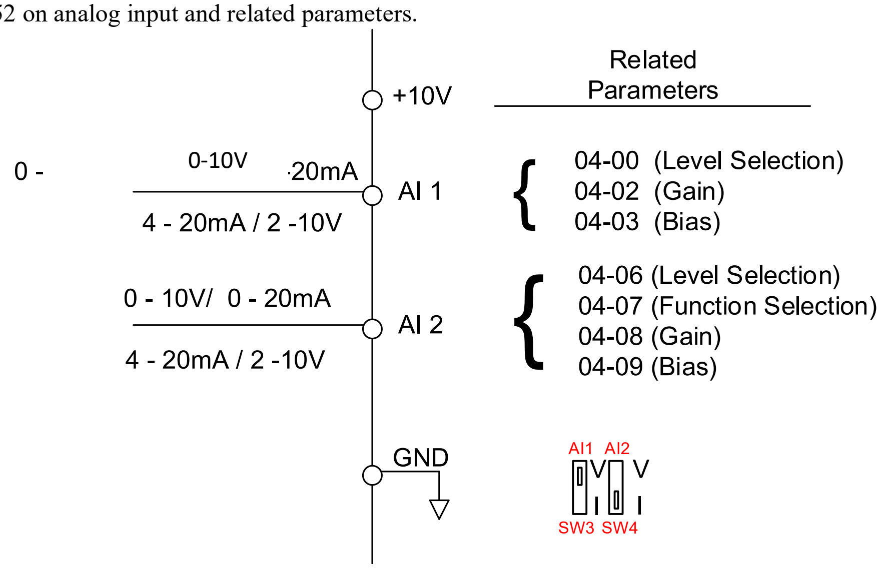


Figure 4.3. 52 Analog input and related parameters

- Refer to Figure 4.3.53 on gain and bias voltage settings.

Gain: Set the frequency reference that corresponds to the 10V or 20mA input as the maximum output frequency ratio (set the maximum output frequency 01-02 to 100%).

Bias voltage: Set the frequency reference that corresponds to the 0V or 4mA input as the maximum output frequency ratio (set the maximum output frequency 01-02 to 100%).

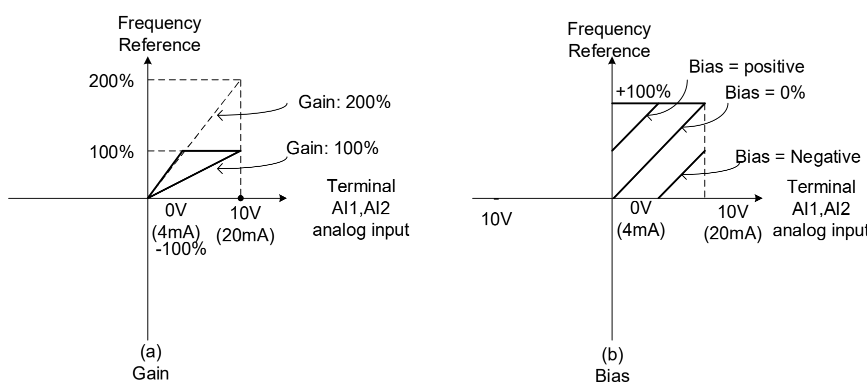


Figure 4.3. 53 Incremental and bias voltage operations (used for frequency reference signal)

04-04(**AI negative characteristic**)

It can be seen from the following negative characteristic curve that the corresponding frequency reference of the AI input 10V or 20mA input is used as the maximum output frequency ratio (set the maximum output frequency 01-02 to 100%), and the ratio will be presented in reverse.

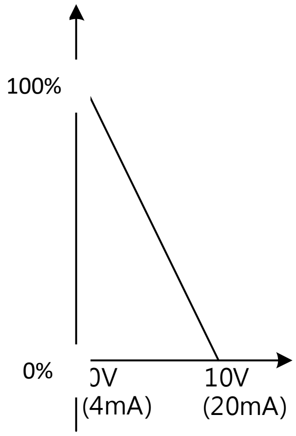


Figure 4.3. 54 AI negative characteristic

(2) AI1 analog input filter time constant (04-01)

(3) AI2 analog input filter time constant (04-06)

・All analog inputs (AI1 and AI2) have individual digital filter with delay. This setting is used to filter the sudden fluctuations or noises in analog input signals. When this setting is increased, the system response will decrease, but protection against interference will increase.

・The definition of filter time constant (setting range: 0.00 to 2.00 seconds) is the time required for the input step signal to reach 63% of its final value.

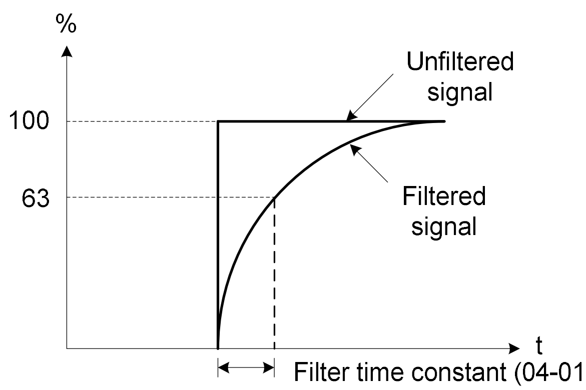


Figure 4.3. 55 Filter time constant

(4) Multi-function analog input function selection (04-05).

・AI2 is a multi-function analog input terminal. Refer to Table 4.3.28 on function settings.

Table 4.3. 28 Multi-function analog input function menu (04-05 setting)

Setting	Function		Description	Control mode * (V/F + PG, SV and PMSV are only for special projects						
	Name	Screen display		V/F	V/F + PG	SLV	SV	PM SV	PM SLV	SLV2
0	Auxiliary reference frequency	AUX.Freq Ref	Maximum output frequency (01-02, Fmax) = 100%	O	O	O	O	O	O	O
1	Reference frequency gain (FGAIN)	Freq Ref Gain	Total gain = AI1 = 04-02 * FGAIN	O	O	O	O	O	O	O
2	Reference frequency bias voltage (FBIAS)	Freq Ref Bias	Total bias voltage = AI1 = 04-03 * FBIAS	O	O	O	O	O	O	O
3	Output voltage bias voltage (VBIAS)	Output Volt Bias	Total output voltage = V/F curve voltage + VBIAS	O	O	X	X	O	O	O

4	Acceleration/deceleration time ratio (K)	Tacc/Tdec Scaling	Actual acceleration/deceleration time = acceleration/deceleration time / K	O	O	O	O	O	O	O
5	DC brake current	DC Inj Current	Adjust the DC brake current (0~100%) according to the analog input, the inverter's rated current = 100%. The DC brake current 07-07 is ineffective at this time.	O	O	O	O	X	X	O
6	Overtorque detection threshold	Over Tq Level	Change the over-torque detected threshold according to the analog input. 08-15 is ineffective at this time.	O	O	O	O	O	O	O
7	Operation duration Stall prevention threshold	Run Stall Level	Adjust the action threshold for stall prevention during operation (30%~200%) according to the analog input. The inverter's rated current = 100%.	O	O	X	X	X	X	O
8	Reference frequency lower limit	Ref. Low Bound	Adjust the frequency command lower limit (0~100%) according to the analog input. The maximum output frequency = 100%. The actual frequency command lower limit is based on the larger value between 00-13 or the multi-function analog input as the frequency command lower limit.	O	O	O	O	O	O	O
9	Jump frequency 4	Jump Freq 4	Jump frequency 4. 100% = Maximum output frequency	O	O	O	O	O	O	O
10	Add to AI1	Add to AI1	Add to AI1. 100% = Maximum output frequency	O	O	O	O	O	O	O
11	Forward torque limit	Positive Tq Limit	100% = motor rated torque	X	X	O	O	O	O	X
12	Negative torque limit	Negative Tq Limit	100% = motor rated torque	X	X	O	O	O	O	X
13	Regenerative torque limit	Regen. Tq Limit	100% = motor rated torque	X	X	O	O	O	O	X
14	Positive/negative torque limit	+/- Tq Limit	100% = motor rated torque	X	X	O	O	O	O	X
15	Torque reference/torque limit of speed control	Tref/Tq Limit	100% = motor rated torque	X	X	X	O	O	X	X
16	Torque reference/torque compensation of speed control	Tq Compensation	100% = motor rated torque	X	X	O	O	O	X	X
17	PTC overheat protection	PTC overheat Stall	This function uses a sensor with a Positive Temperature Coefficient (PTC) thermal resistance characteristic built into the motor to perform motor overheat protection.	O	O	O	O	O	O	O

(1). Auxiliary reference frequency (setting= 0).

- When 00-05 is set to 1 (primary frequency provided by external control) and multi-speed command is set as the auxiliary frequency, the frequency command can be provided by the multi-function analog input AI2, and the maximum output frequency (01-02, Fmax) =100%. Please refer to page 4-100 for the description of multi-speed operation.

(2) Reference frequency gain (FGAIN) (setting=1).

- When 04-05 is set to 1 (frequency reference gain), the multi-function analog input AI2 can be used to adjust the frequency reference gain of AI1.
- The total frequency reference gain of terminal AI1 is the internal gain (04-02) × FGAIN.
- The frequency reference value of AI1 is 100%.
- Refer to Figure 4.3.56 on FGAIN adjustment.

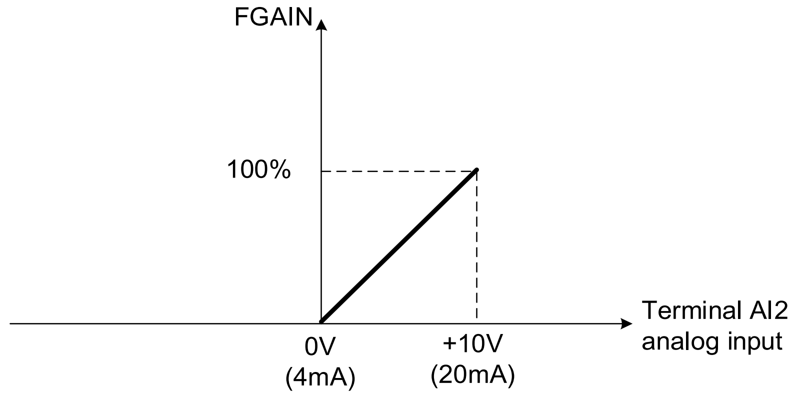


Figure 4.3. 56 Frequency gain adjustment

. Example:

When the internal gain of AI1 (04-02) is set to 100% and 5V for AI2 (such as FGAIN=50%), the frequency reference of terminal AI1 will be 50%, as shown in Figure 4.3.57 below.

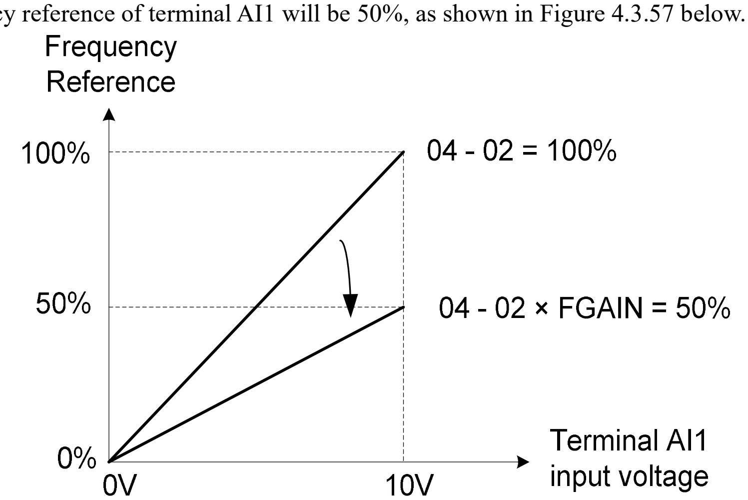


Figure 4.3. 57 Frequency reference gain adjustment (example)

(3) Frequency reference bias voltage (FBIAS) (setting = 2).

- When 04-05 is set to 2 (frequency reference bias voltage, FBIAS), the multi-function analog input AI2 can be used to adjust the frequency reference bias voltage of AI1.
- The total frequency reference bias voltage of terminal AI1 is the sum of the terminal AI1 and the internal bias voltage (04-03) of FBIAS (for example, the total bias voltage = 04-03 + FBIAS).
- AI1 frequency reference value = 100%.

Refer to Figure 4.3.58 below on FBIAS adjustment.

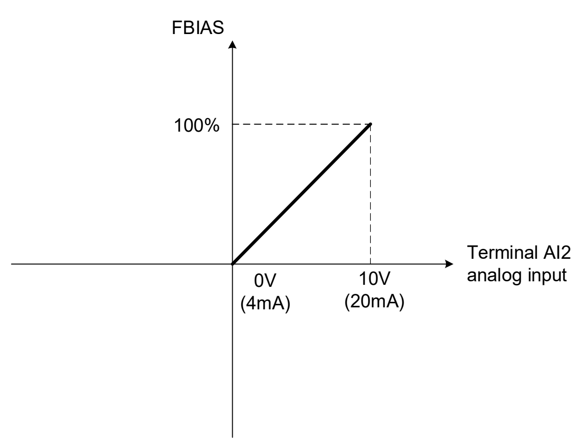


Figure 4.3. 58 Bias voltage adjustment

Example:

When 04-02=100% (AI1 gain), 04-03=0% (AI1 bias voltage), and terminal AI2 is set to 3V, when the input terminal AI1 is 0V, the frequency reference of terminal AI1 will be 30%, as shown in Figure 4.3.59 below.

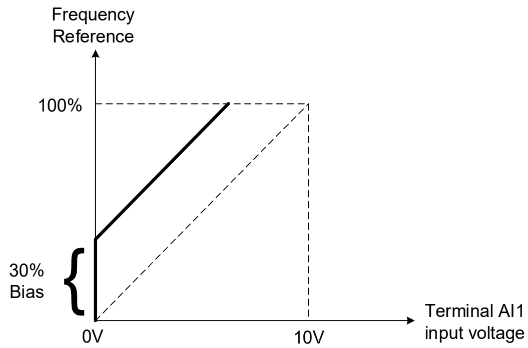


Figure 4.3. 59 Frequency reference bias voltage adjustment (example)

(4) Output voltage bias voltage (VBIAS) (setting= 3).

- When 04-05 is set to 3 (output voltage bias voltage), use the multi-function analog input AI2 to adjust the output voltage.
- The total output voltage of the inverter is the sum of the boosted V/F curve and the VBIAS.
- Maximum output voltage (01-03, Vmax) = 100%.
- Refer to Figure 4.3.60 below on VBIAS adjustment.

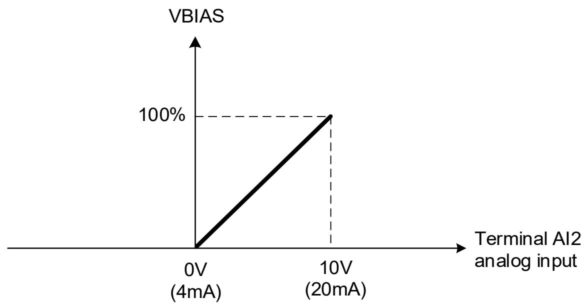


Figure 4.3. 60 Bias voltage adjustment

(5) Acceleration/deceleration time ratio (K) (setting= 4).

- When 04-05 is set to 4 (acceleration/deceleration time ratio), use the multi-function analog input AI2 to adjust the acceleration/deceleration time.
- The actual acceleration/deceleration time is as described below:

$$\text{Actual acceleration/deceleration time} = \frac{\text{actual acceleration/deceleration (00-14~00-17, 00-21~00-24)}}{K}$$

- Acceleration/deceleration time (00-14~00-17, 00-21~00-24) = 100%.
- The acceleration/deceleration time ratio is as shown in Figure 4.3.61 below.

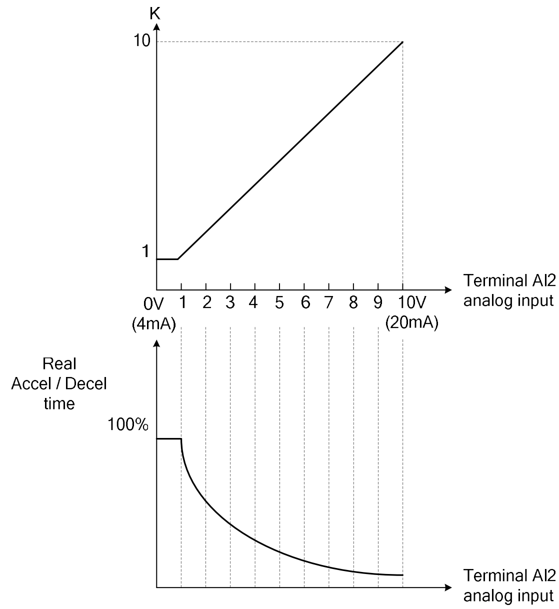


Figure 4.3. 61 Acceleration/deceleration time ratio operation

(6) DC brake current (setting=5).

- When 04-05 is set to 5 (DC brake current), use the multi-function analog input AI2 to adjust the DC brake current.
- Inverter's rated current=100%.
- The setting value of the DC brake current 07-07 is off.
- DC brake current adjustment is as shown in Figure 4.3.62 below.

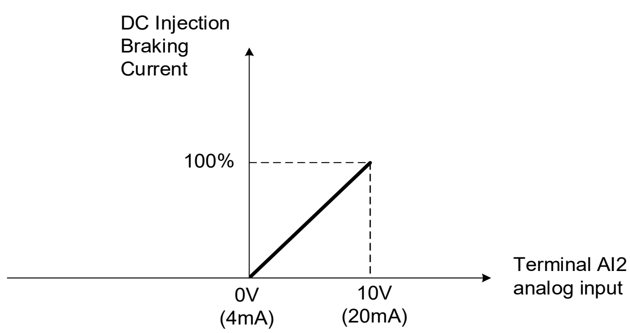


Figure 4.3. 62 DC brake current adjustment

(7) Overtorque detection threshold (setting=6).*** (V/F+PG, SV and PMSV** are only for special projects

- When 04-05 is set to 6 (overtorque detection threshold), use the multi-function analog input AI2 to adjust the overtorque detection threshold.
- 100% inverter rated current (V/F or V/F+PG control mode).
- 100% motor rated torque (SLV or SV control mode).
- If the multi-function analog input is used to adjust the overtorque detection threshold, the internal overtorque detection threshold (08-15) setting becomes invalid.

Refer to Figure 4.3.63 below.

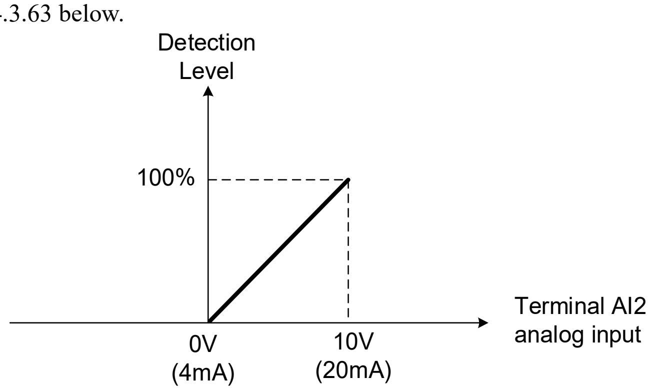


Figure 4.3. 63Overtorque detection threshold adjustment

(8) Stall prevention threshold during operation (setting=7).

- When 04-05 is set to 7 (stall prevention threshold during operation), use the multi-function analog input AI2 to adjust the stall prevention threshold during operation.
- Inverter's rated current = 100%.
- When AI2 is assigned (04-05=7) and parameter 08-03 (stall prevention threshold during operation) is set, the lower value of the two will be used as the stall prevention threshold during operation.
- Application example: If the motor capacity is smaller than the inverter capacity, and operation was performed using the default factory setting and the motor stalled, use the multi-function analog input AI2 to reduce the stall prevention threshold during operation. Refer to Figure 4.3.64 below.

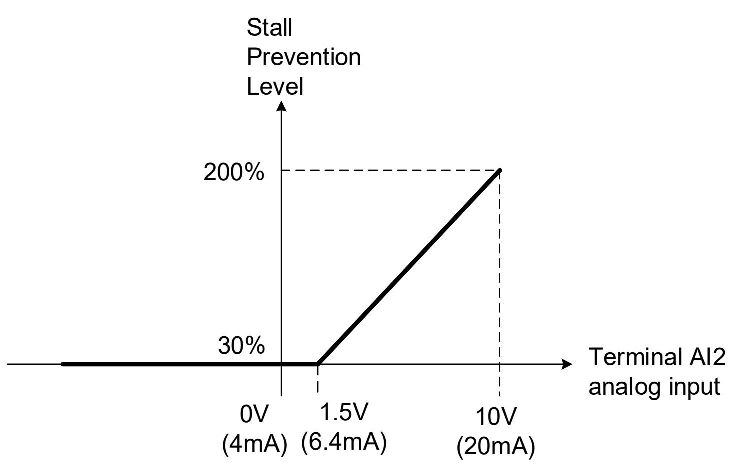


Figure 4.3. 64 Adjustment of stall prevention threshold during operation

(9) Reference frequency lower limit (setting=8).

- When 04-07 is set to 8 (frequency reference lower limit), use the multi-function analog output AI2 to adjust the frequency reference lower limit.
- Maximum output frequency (Fmax, 01-02) = 100%.
- Determine the actual lower limit with the setting value of 00-13 (frequency reference lower limit) and the corresponding maximum value of the multi-function analog input AI2.

Refer to Figure 4.3.65 below.

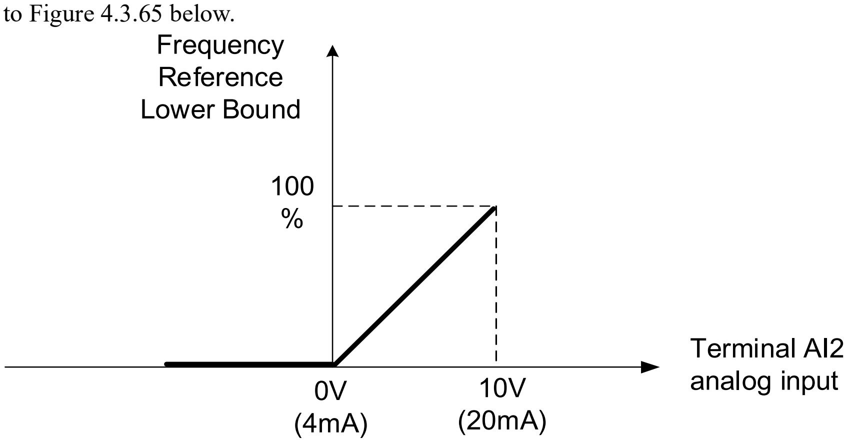


Figure 4.3. 65 Frequency reference lower limit adjustment

(10) Jump frequency 4 (setting=9).

- When 04-05 is set to 9 (jump frequency 4), use the multi-function analog input AI2 to adjust the jump frequency 4.
- Maximum output frequency (01-02, Fmax) = 100%.
- When 11-08 to 11-10 is set to 0.0Hz, the jump frequency function is off. Refer to Figure 4.3.66 below.

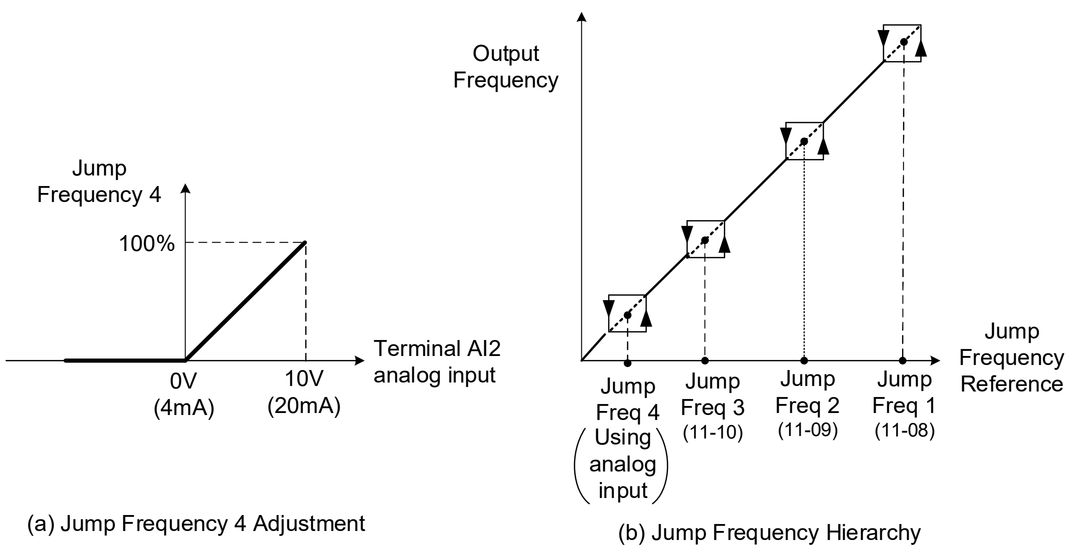


Figure 4.3. 66 Jump frequency 4 setting operation

(11) Add to terminal AI1 (setting=10).

・When 04-05 (AI2 function selection) is set to 10 (add to AI1), it is the same as adding the frequency reference value of the AI2 analog input signal to AI1 as a bias voltage.

Refer to Figure 4.3.67 below.

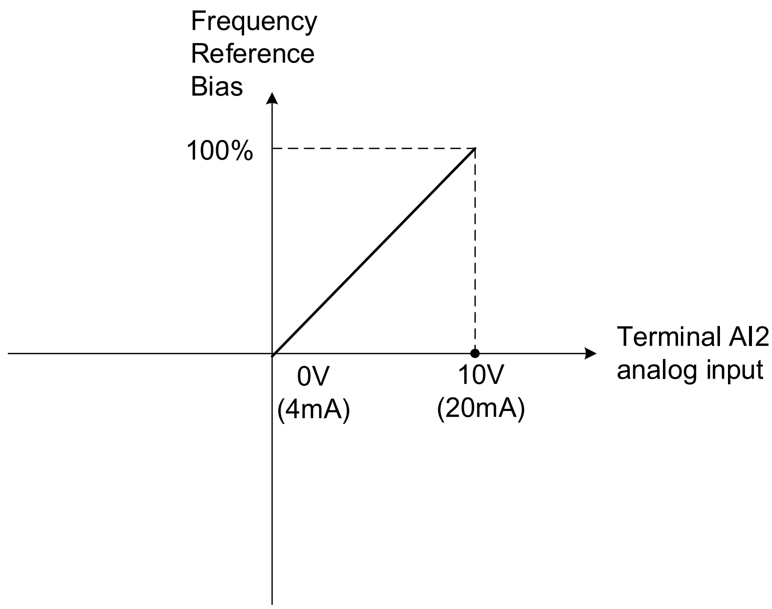


Figure 4.3. 67 Add to AI1 as a bias voltage operation

Example:

When 04-02 (AI1 gain)=100%, 04-03 (AI2 gain)=0%, and terminal AI2 is set to 2V and the input terminal AI1 as 0V, the frequency reference of AI1 will be 20%.

(12) Forward torque limit (setting=11).

(13) Negative torque limit (setting=12).

(14) Regenerative torque limit (setting=13).

(15) Forward/negative torque limit (setting=14).

・For more details on torque limit, please refer to the parameter 21-torque function group.

(16) Torque reference/torque limit during speed control (setting=15).

(17) Torque reference/torque compensation during speed control (setting=16).

・For more details on the torque control function, please refer to the parameter 21-torque function group.

(18) This function uses a sensor with a Positive Temperature Coefficient (PTC) thermal resistance characteristic built into the motor to perform motor overheat protection. (setting=17).

・Please refer to the descriptions of parameters 08-42~08-44 for detailed settings.

04-11	AO1 function setting		
Scope	**[0]:** Output frequency **[1]:** Frequency command **[2]:** Output voltage **[3]:** DC voltage **[4]:** Output current **[5]:** Output power **[6]:** Motor speed **[7]:** Output power factor **[8]:** AI1 input **[9]:** AI2 input	**[10]:** Torque command **[11]:** q-axis current (Frame2 and above are reserved) **[12]:** d-axis current (Frame2 and above are reserved) **[13]:** Speed deviation **[14]:** Reserved **[15]:** ASR output **[16]:** Reserved **[17]:** q-axis voltage (Frame2 and above are reserved) **[18]:** d-axis voltage (Frame2 and above are reserved) **[19]:** Reserved	**[20]:** Reserved **[21]:** PID input **[22]:** PID output **[23]:** PID target value **[24]:** PID feedback value **[25]:** Soft start output frequency **[26]:** PG feedback **[27]:** Reserved **[28]:** Communication control

04-12	AO1 gain
Scope	【0.0~1000.0】**%**
04-13	AO1 bias voltage
Scope	【-100.0~100.0】**%**
04-16	AO2 function setting
Scope	The scope and definition are the same as 04-11
04-17	AO2 gain
Scope	【0.0~1000.0】**%**
04-18	AO2 bias voltage
Scope	【-100.0~100.0】**%**

Refer to Figure 4.3.68 below on analog output and related parameters.

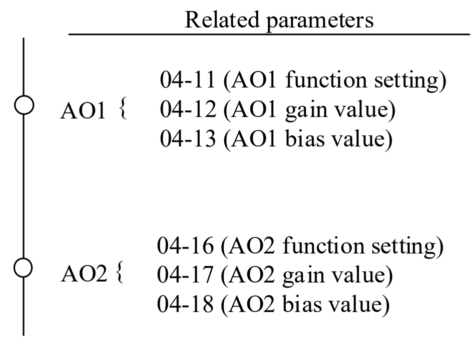


Figure 4.3. 68 Analog output and related parameters

(1). Analog threshold adjustment for analog outputs AO1 and AO2 (04-12, 04-13 and 04-17, 04-18).

- Use 04-12 to adjust AO1 and 04-17 to adjust the AO2 gain, and use 04-13 to adjust AO1 and 04-18 to adjust the AO2 bias voltage to use as the output voltage or current to adjust the multi-function analog output terminals AO1 and AO2.
- Set the gain adjustment to make the output (10V) correspond 100% with the monitor option output.
- For the bias voltage, its output characteristic will mutually cancel the ratio that corresponds 10V to 100%.
- Refer to Figure 4.3.69 for analog output level adjustment.

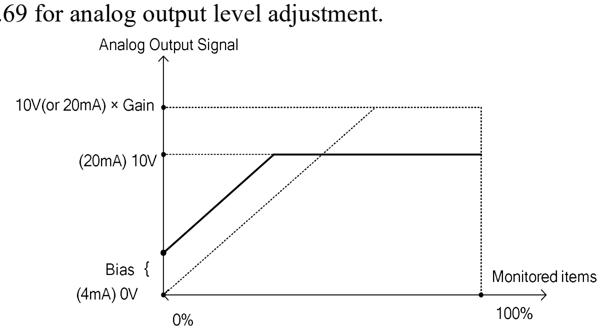


Figure 4.3. 69 Analog output threshold adjustment

(2). Analog output terminal function selection (04-11 and 04-16).

- Refer to Table 4.3.29 for function options.

Table 4.3. 29 Multi-function analog output terminal function selection (04-11 and 04-16)

04-11, 04-16 Setting	**Function (Screen display)**	**Monitor parameter 12 Group**	**Control mode** * (V/F + PG, SV and PMSV are only for special projects						
			VF	VF+PG	SLV	SV	PM SV	PM SLV	SLV2
0	Output Freq	12-17	O	O	O	O	O	O	O
1	Freq Ref	12-16	O	O	O	O	O	O	O
2	Output Voltage	12-19	O	O	O	O	O	O	O
3	DC Voltage	12-20	O	O	O	O	O	O	O
4	Output Current	12-18	O	O	O	O	O	O	O
5	Output KW	12-21	O	O	O	O	O	O	O
6	Motor Speed	12-22	O	O	O	O	O	O	O
7	Output PF	12-23	O	O	O	O	O	O	O
8	AI1 Input	12-25	O	O	O	O	O	O	O
9	AI2 Input	12-26	O	O	O	O	O	O	O
10	Torque Ref	12-27	X	X	O	O	O	O	X
11	Current Iq	12-28	X	X	O	O	O	O	X
12	Current Id	12-29	X	X	O	O	O	O	X
13	Speed Deviation	12-30	X	X	X	O	O	X	X
14	Reserved		X	X	X	X	X	X	X
15	ASR Output	12-32	X	O	X	O	O	X	X
16	Reserved	-	X	X	X	X	X	X	X
17	Voltage Ref Vq	-	X	X	O	O	O	O	X
18	Voltage Ref Vd	-	X	X	O	O	O	O	X
19	Reserved	-	X	X	X	X	X	X	X
20	Reserved	-	X	X	X	X	X	X	X

04-11, 04-16 Setting	Function (Screen display)	Monitor parameter 12 Group	Control mode * (V/F + PG, SV and PMSV are only for special projects						
			VF	VF+PG	SLV	SV	PM SV	PM SLV	SLV2
21	PID Input	12-36	O	O	O	O	O	O	O
22	PID Output	12-37	O	O	O	O	O	O	O
23	PID Setpoint	12-38	O	O	O	O	O	O	O
24	PID Feedback	12-39	O	O	O	O	O	O	O
25	Output Freq (SFS)	-	O	O	O	O	O	O	O
26	PG Feedback	12-33	X	O	X	O	O	X	X
27	Reserved	-	X	X	X	X	X	X	X
28	Comm Control	-	O	O	O	O	O	O	O

	AO output signal type
Scope	**【0】:** AO1 0~10V ; AO2 0~10V **【1】:** AO1 0~10V ; AO2 4~20mA **【2】:** AO1 4~20mA ; AO2 0~10V **【3】:** AO1 4~20mA ; AO2 4~20mA

For standard H & C type:

･When using parameter 04-19 AO2 analog output signal type, it must be used with the setting of the SW6 switch on the control panel.

･When parameter 04-19 is set to 0 and AO2 is 0~10V, the SW6 switch of the control panel is V, and the AO2 output signal type is voltage.

･When parameter 04-19 is set to 1 and AO2 is 4~20V, the SW6 switch of the control panel is I, and the AO2 output signal type is current.

For advanced E & G type:

･When using parameter 04-19 AO analog output signal type, it must be used with the setting of the SW1 and SW2 switches on the control panel.

･When parameter 04-19 is set to 0 and AO1 is 0~10V, the SW1 switch of the control panel is V, and the AO1 output signal type is voltage.
When AO2 is 0~10V, the SW2 switch of the control panel is V, and the AO2 output signal type is voltage.

･When parameter 04-19 is set to 1 and AO1 is 0~10V, the SW1 switch of the control panel is V, and the AO1 output signal type is voltage.
When AO2 is 4~20mA, the SW2 switch of the control panel is I, and the AO2 output signal type is current.

･When parameter 04-19 is set to 2 and AO1 is 4~20V, the SW1 switch of the control panel is I, and the AO1 output signal type is current.
When AO2 is 0~10V, the SW2 switch of the control panel is V, and the AO2 output signal type is voltage.

･When parameter 04-19 is set to 3 and AO1 is 4~20V, the SW1 switch of the control panel is I, and the AO1 output signal type is current.
When AO2 is 4~20mA, the SW2 switch of the control panel is I, and the AO2 output signal type is current.

04-20	AO signal scan filter time
Scope	【0.00~0.50】**Sec**

This setting is used to filter the sudden fluctuations in analog output signals. When this setting is increased, the system response will decrease, but protection against interference will increase.

04-24	Frequency display filter
Scope	【0.00~3.00】
04-25	AI1 filter parameter
Scope	【0.00~3.00】

When the frequency source is AI1 and Keypad VR, 04-24 can be adjusted to filter the displayed frequency

fluctuations.
When the frequency source is AI1, 04-25 can be adjusted to filter AI1 signals.

04-26	AI1 value average filter
Scope	【0 ~255】
04-27	Output frequency display value average filter
Scope	【0 ~255】

04-26: The average filtering count for AI1 sampling is once every 4ms.
04-27: The average filtering count for the displayed value of the output frequency is once every 4ms.

05-Multi-speed function group

05- 00	Multi-speed acceleration/deceleration mode selection
Scope	**[0]:** The acceleration/deceleration time of the segment speed is set by acceleration/deceleration times 1~4 **[1]:** The acceleration/deceleration times are set independently

Scope	【0.0~599.00】 **Hz**	**Scope**	【0.0~6000.0】 **Sec**		
05-01	*Segment **0** speed frequency setting	**05-17**	Multi-speed **0** acceleration time setting	**05-33**	Multi-speed **8** acceleration time setting
05-02	*Segment **1** speed frequency setting	**05-18**	Multi-speed **0** deceleration time setting	**05-34**	Multi-speed **8** deceleration time setting
05-03	*Segment **2** speed frequency setting	**05-19**	Multi-speed **1** acceleration time setting	**05-35**	Multi-speed **9** acceleration time setting
05-04	*Segment **3** speed frequency setting	**05-20**	Multi-speed **1** deceleration time setting	**05-36**	Multi-speed **9** deceleration time setting
05-05	*Segment **4** speed frequency setting	**05-21**	Multi-speed **2** acceleration time setting	**05-37**	Multi-speed **10** acceleration time setting
05-06	*Segment **5** speed frequency setting	**05-22**	Multi-speed **2** deceleration time setting	**05-38**	Multi-speed **10** deceleration time setting
05-07	*Segment **6** speed frequency setting	**05-23**	Multi-speed **3** acceleration time setting	**05-39**	Multi-speed **11** acceleration time setting
05-08	*Segment **7** speed frequency setting	**05-24**	Multi-speed **3** deceleration time setting	**05-40**	Multi-speed **11** deceleration time setting
05-09	*Segment **8** speed frequency setting	**05-25**	Multi-speed **4** acceleration time setting	**05-41**	Multi-speed **12** acceleration time setting
05-10	*Segment **9** speed frequency setting	**05-26**	Multi-speed **4** deceleration time setting	**05-42**	Multi-speed **12** deceleration time setting
05-11	*Segment **10** speed frequency setting	**05-27**	Multi-speed **5** acceleration time setting	**05-43**	Multi-speed **13** acceleration time setting
05-12	*Segment **11** speed frequency setting	**05-28**	Multi-speed **5** deceleration time setting	**05-44**	Multi-speed **13** deceleration time setting
05-13	*Segment **12** speed frequency setting	**05-29**	Multi-speed **6** acceleration time setting	**05-45**	Multi-speed **14** acceleration time setting
05-14	*Segment **13** speed frequency setting	**05-30**	Multi-speed **6** deceleration time setting	**05-46**	Multi-speed **14** deceleration time setting
05-15	*Segment **14** speed frequency setting	**05-31**	Multi-speed **7** acceleration time setting	**05-47**	Multi-speed **15** acceleration time setting
05-16	*Segment **15** speed frequency setting	**05-32**	Multi-speed **7** deceleration time setting	**05-48**	Multi-speed **15** deceleration time setting

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

- **When 05-00=[0]**, multi-speed **(0~ 15) segment 16 speed** acceleration/deceleration times are both determined by **00-14~00-17/00-21~00-24**.
- **When 05-00=[1]**, multi-speed **(0~ 15) 16 segment speed** acceleration/deceleration times are calculated according to **05-17~05-48**, and not determined by **00-14~00-17/00-21~00-24**.

Function Description:

➢ The formula for calculating acceleration/deceleration times during operation is: The denominator is **based on the** maximum output frequency

$$\text{Acceleration time for reaching the set frequency} = \frac{\text{Acceleration time x set frequency of 0 group}}{\text{Maximum output frequency}}$$

$$\text{Deceleration time for reaching the set frequency} = \frac{\text{Deceleration time x set frequency of 0 group}}{\text{Maximum output frequency}}$$

- **When 01-00=[F], the** maximum output frequency**=01-02** setting, when **01-00≠[F], the** maximum output frequency **=50.00 (**or**60.00/90.00/120.0/180.0)**

For example: **01-00≠[F] , 01- 02=[50] hz (maximum output frequency)**, **05- 02=[10] hz (**multi-speed **0)**,
05-17=[5] s (acceleration time**)**, **05-18=[20] s (**deceleration time**)**, then

$$\text{Actual acceleration time of speed 0} = \frac{\text{(Parameters 05-17)x10(Hz)}}{\text{Parameters 01-02}} = 1(\text{s})$$

$$\text{Actual deceleration time of speed 0} = \frac{\text{(Parameters 05-18)x10(Hz)}}{\text{Parameters 01-02}} = 4(\text{s})$$

- when **05-00=[1]**, there are two types of time setting modes

For example: Set: **00-02=[1] (**external terminal operation**);** terminal **S1**: **03-00=[0] (**forward /stop**);**
terminal **S2**: **03-01=[1] (**reverse/stop**);** terminal **S3**: **03-02=[2] (**segment speed**1);**
terminal **S4**: **03-03=[3] (**segment speed **2);** terminal **S5: 03- 03=[4] (**segment speed **3);**

*Segment speed 1 needs to confirm whether the AI2 function setting (04-05) is set to 0 auxiliary frequency. If it is set to auxiliary frequency, it will cause the frequency of segment speed 1 to be set as AI2 auxiliary frequency, and AI2 will determine its frequency value. To use the function of the normal segment speed 1, change the AI2 function setting to any function other than 0 (recommended value: set to 10 ADD to AI1).

Mode **1**:

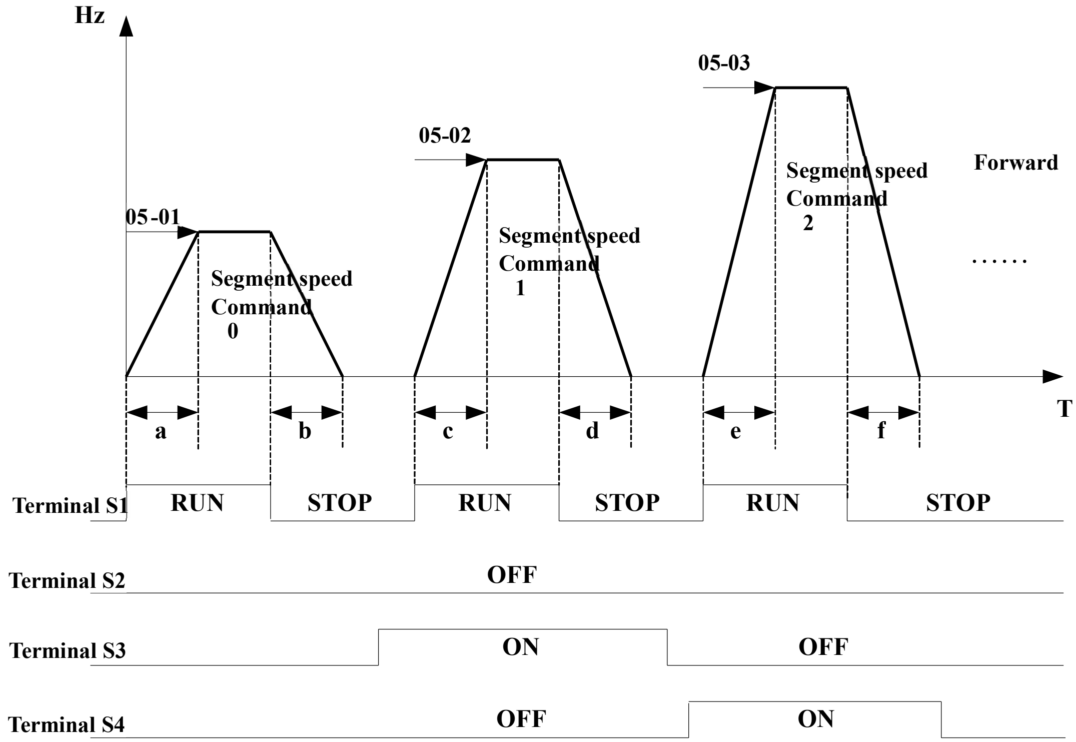


Figure 4.3. 70 Example of multi-speed timing (intermittent operation command)

During intermittent operation command, the basis for the calculation of the acceleration/deceleration times of each segment speed (a~f)

Example $a=\dfrac{(05\text{-}17)x(05\text{-}01)}{01\text{-}02}$, $b=\dfrac{(05\text{-}18)x(05\text{-}01)}{01\text{-}02}$, $c=\dfrac{(05\text{-}19)x(05\text{-}02)}{01\text{-}02}$

$$d=\frac{(05\text{-}20)x(05\text{-}02)}{01\text{-}02}$$

$$e=\frac{(05\text{-}21)x(05\text{-}03)}{01\text{-}02}\quad , \quad f=\frac{(05\text{-}22)x(05\text{-}03)}{01\text{-}02}\quad \text{……….Unit (sec)}$$

Mode **2**:

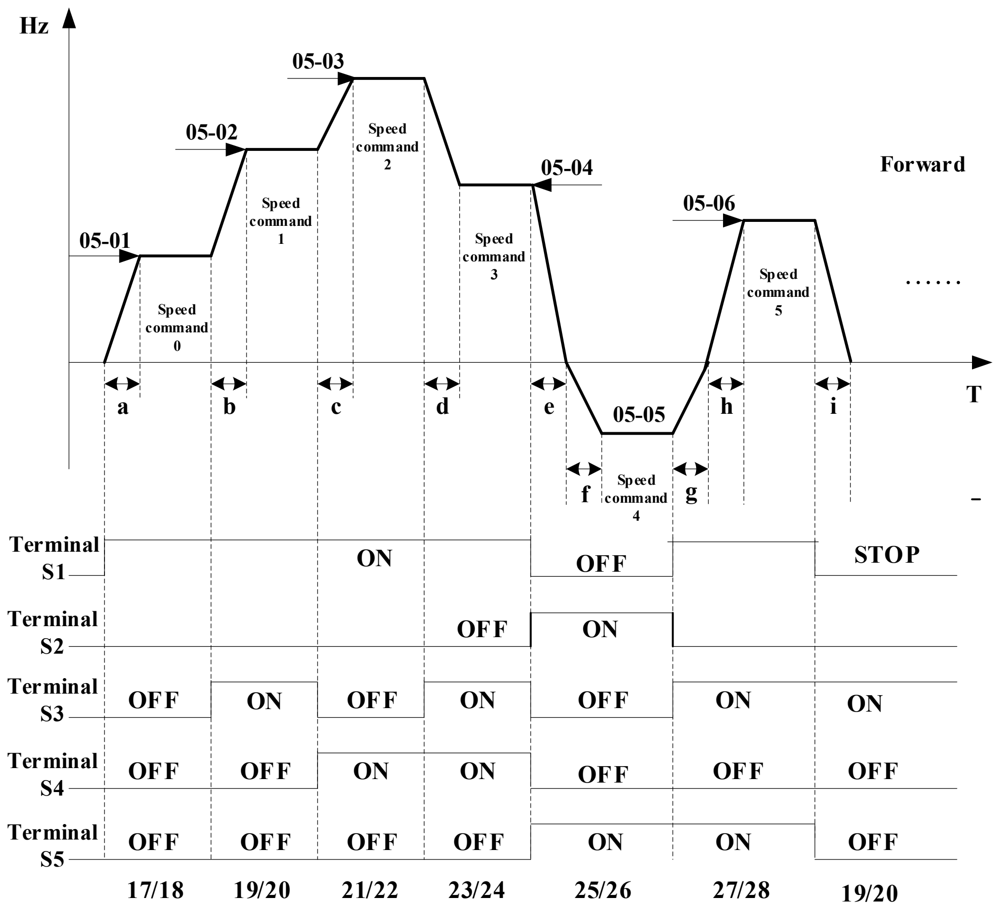


Figure 4.3. 71 Example of multi-speed timing (continuous operation command)

During continuous operation command, the basis for the calculation of the acceleration/deceleration times of each segment speed (a~h)

Example: $a=\dfrac{(05\text{-}17)\text{x}(05\text{-}01)}{01\text{-}02}$,$b=\dfrac{(05\text{-}19)\text{x}[(05\text{-}02)\text{-}(05\text{-}01)]}{01\text{-}02}$

$c=\dfrac{(05\text{-}21)\text{x}[(05\text{-}03)\text{-}(05\text{-}02)]}{01\text{-}02}$,$d=\dfrac{(05\text{-}24)\text{x}[(05\text{-}03)\text{-}(05\text{-}04)]}{01\text{-}02}$

$e=\dfrac{(05\text{-}26)\text{x}(05\text{-}04)}{01\text{-}02}$,$f=\dfrac{(05\text{-}25)\text{x}(05\text{-}05)}{01\text{-}02}$,$g=\dfrac{(05\text{-}27)\text{x}(05\text{-}05)}{01\text{-}02}$

$h=\dfrac{(05\text{-}27)\text{x}(05\text{-}06)}{01\text{-}02}$,$i=\dfrac{(05\text{-}19)\text{x}(05\text{-}06)}{01\text{-}02}$ ....Unit (sec)

06-Automatic operation function group

06- 00	Automatic operation mode selection
Scope	**[0]:** Disabled **[1]:** Execute a single cycle of operation mode, then after stopping, it will continue to operate at the same speed before stopping **[2]:** Continuous cycle operation mode, after it stopped, it will continue to operate with the speed before stopping **[3]:** After a single cycle ends, it will continue operating with the last segment of operation speed, then after it stopped, it will continue operating with the speed before it stopped **[4]:** Execute a single cycle operation mode, after it stopped, it will start operating from the zero segment speed **[5]:** Continuous cycle operation mode, after it stopped, it will start operating from the zero segment speed **[6]:** After a single cycle ends, continue operating using the final segment of operation speed, then after it stops, start operating from the zero segment speed

The operating frequency for segment **0** is set through parameter **05-01**			
Scope	【0.00~599.00】**Hz**		
06- 01	*Segment **1** operation frequency setting	**06- 09**	*Segment **9** operation frequency setting
06- 02	*Segment **2** operation frequency setting	**06- 10**	*Segment **10** operation frequency setting
06- 03	*Segment **3** operation frequency setting	**06- 11**	*Segment **11** operation frequency setting
06- 04	*Segment **4** operation frequency setting	**06- 12**	*Segment **12** operation frequency setting
06- 05	*Segment **5** operation frequency setting	**06- 13**	*Segment **13** operation frequency setting
06- 06	*Segment **6** operation frequency setting	**06- 14**	*Segment **14** operation frequency setting
06- 07	*Segment **7** operation frequency setting	**06- 15**	*Segment **15** operation frequency setting
06- 08	*Segment **8** operation frequency setting		

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

Scope	【0.0~6000.0】**Sec**		
06- 16	Segment **0** speed operation time setting	**06- 24**	Segment **8** speed operation time setting
06- 17	Segment **1** speed operation time setting	**06- 25**	Segment **9** speed operation time setting
06- 18	Segment **2** speed operation time setting	**06- 26**	Segment **10** speed operation time setting
06- 19	Segment **3** speed operation time setting	**06- 27**	Segment **11** speed operation time setting
06- 20	Segment **4** speed operation time setting	**06- 28**	Segment **12** speed operation time setting
06- 21	Segment **5** speed operation time setting	**06- 29**	Segment **13** speed operation time setting
06- 22	Segment **6** speed operation time setting	**06- 30**	Segment **14** speed operation time setting
06- 23	Segment **7** speed operation time setting	**06- 31**	Segment **15** speed operation time setting

Scope	[0]: Stop [1]: Forward [2]: reverse		
06- 32	Segment **0** operation direction selection	**06- 40**	Segment **8** operation direction selection
06- 33	Segment **1** operation direction selection	**06- 41**	Segment **9** operation direction selection
06- 34	Segment **2** operation direction selection	**06- 42**	Segment **10** operation direction selection
06- 35	Segment **3** operation direction selection	**06- 43**	Segment **11** operation direction selection
06- 36	Segment **4** operation direction selection	**06- 44**	Segment **12** operation direction selection
06- 37	Segment **5** operation direction selection	**06- 45**	Segment **13** operation direction selection
06- 38	Segment **6** operation direction selection	**06- 46**	Segment **14** operation direction selection
06- 39	Segment **7** operation direction selection	**06- 47**	Segment **15** operation direction selection

- Automatic operation mode can be achieved by setting multi-segment operation frequency reference commands (05-01, 06-01~06-15), while linking the automatic operation mode time setting (06-16~06-31). Automatic operation mode can be selected by setting (06-00). This automatic operation direction can be set using parameters 06-32~06-47.
- Automatic operation mode is invalid while the functions mentioned below are enabled:
  1. Frequency skipping function.
  2. PID function.
- Under automatic operation mode, the multi-speed reference commands 1~4 (03-00~03-07=2~5) of the external terminal are invalid.

Example of automatic operation mode:

(1) Single-cycle operation (06-00 = 1,4)
Under specific settings, the inverter will perform a single-cycle operation and then stop.

Cycle Operation Parameter Setting

06-00	= 1 (Single cycle automatic operation mode)
06-32~06-34	=1 (Stage 0 - 2 operation is forward)
06-47	= 2 (Stage 15 operation is reversed rotation)
06-35~06-46	= 0 (Frequency 3 - 14 is stop)
05-01	= 15Hz (Stage 0 operation frequency: 15Hz)
06-01	= 30Hz (Stage 1 operation frequency: 30Hz)
06-02	= 50Hz (Stage 2 operation frequency: 50Hz)
06-15	= 20Hz (Stage 15 operation frequency: 20Hz)
06-16	= 20sec (Stage 0 operation time: 20seconds)
06-17	= 25sec (Stage 1 operation time: 25seconds)
06-18	= 30sec (Stage 2 operation time: 30seconds)
06-31	= 40sec (Stage 15 operation time: 40seconds)

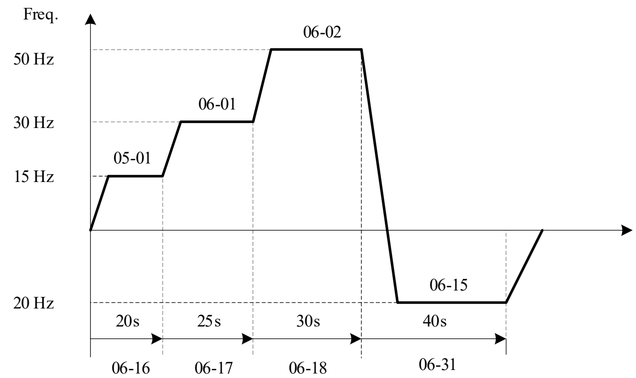


Figure 4.3. 72 Single-cycle automatic operation (stop)

(2) Periodic operation (06-00 = 2,5)
The inverter will repeat the same cycle periodically. It is the same setting as example 1.

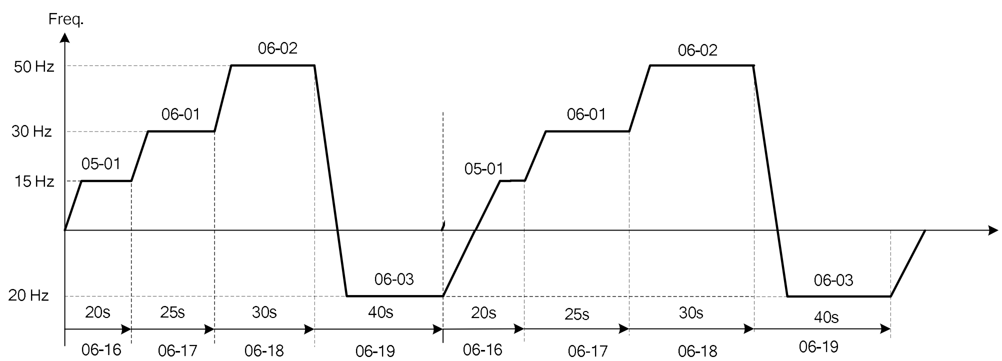


Figure 4.3. 73 Periodic automatic operation

(3) Single-cycle automatic operation mode (06-00=3,6)
The driver will continue operating with the speed of the final step (the final step must be placed on the segment 15 operation frequency).
The other related parameters have the same settings as in example 1.

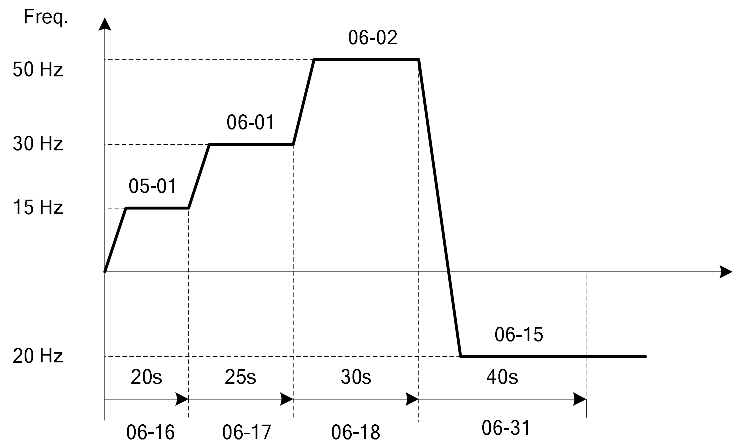
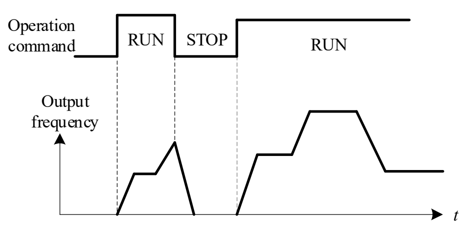
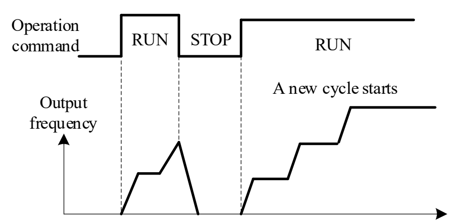


Figure 4.3. 74 Single-cycle automatic operation (continuous)

06-00 = 1 to 3: If the inverter stopped and then restarted, it will continue operating from the uncompleted step.
= 4 to 6: If the inverter stopped and then restarted, it will start a new cycle of operation.

06-00 Setting	1 to 3	4 to 6
Output frequency		

· The acceleration/deceleration time depends on the setting of 00-14 and 00-15 in automatic operation mode.
· If the setting values of 06-16 to 06-31 are all 0, the automatic operation mode will not start.

07-operation stop function group

07- 00	Instantaneously stop and restart selection
Scope	**[0]:** Instantaneously stop and restart ineffective **[1]:** Instantaneously stop and restart effective
07- 01	Automatic reset restart time
Scope	【0~7200】 **Sec**
07- 02	Automatic reset restart count
Scope	【0~10】

When setting 07-00 to 1 instantaneously stop and then restart is effective, if there is temporary power outage, the inverter can automatically resume motor operation once power is reconnected.

- 07-00=0: When the instantaneous power loss exceeds 8 milliseconds, a "UV" failure (primary circuit undervoltage) will be detected.
- 07-00=1: If there is temporary power outage, after power is reconnected, the inverter will restart.

The automatic reset and restart function will restart the inverter when the inverter malfunctioned while operating. This function should only be used when it does not pose a safety risk or cause possible damage to the equipment.
The table below summarizes contents on restarting after failures; if the inverter malfunctioned during operation, the inverter will restart according to the speed search method selected. If the malfunction is not in the table below, then the restart after malfunction function cannot be used.

Table 4.3. 30 Descriptions on restarting after malfunction contents

Parameter name:	Failure content		Number of restarts
07-00 instantaneously stop and restart selection	**UV** (undervoltage)		Unlimited times
07-01 automatic reset and restart time 07-02 automatic reset and restart count	**OC** (over-current) **OCA** (over-current during acceleration) **OCC** (over-current during constant speed) **OCd** (over-current during deceleration) **OL1** (motor overload) **UT** (under-torque detection) **IPL** (input phase loss)	**GF (grounding fault)** **OV** (over-voltage) **OL2** (Frequency converter overload) **OT** (over-torque detection) **OPL** (output phase loss) **CF07** (SLV parameter setting abnormal) **CF08** (PMSLV parameter setting abnormal)	According to parameter 07-02

Note 1: The failure restart function includes the instantaneous stop and restart function and automatic reset and restart function.
Note 2: Please refer to Chapter Five Troubleshooting and Diagnosis for details on failure messages.
Note 3: Please refer to the speed search function (07-19~07-23) on the selection of speed search methods

(1) Automatic reset and restart count (07-02)

If the automatic reset and restart count reached the number of times set in parameter 07-02, the inverter will stop operating. Please troubleshoot first and then restart the inverter manually.

The automatic reset and restart count will be reset to 0 under the following circumstances.

a. No errors occurred after 10 minutes of restarting.

b. Failure cleared input received after the protection action started and confirmed the failure. (For example: The reset/left button was pressed or failure cleared terminal was activated).

c. Switching power on and off.

. Note: To output an automatic restart signal to one of the multi-function digital output, R1A-R1C, DO1 or DO2, please set the corresponding parameters 03-11, 03-12 and 03-28.

Automatic reset and restart operation:

a. When failure message is detected, the failure message will be displayed on the digital operator.

b. The inverter will enter free-run stop status, and after the minimum cut-ff time (07-18) and speed search delay time (07-22) have passed, the inverter will restart the program and execute speed search automatically.

c. If the failure still was not eliminated, when the total failure count exceeded the automatic reset and restart count (07-02), the automatic reset and restart function will not execute and the inverter will stop outputting at this time. The failure contact point will activate.

. Please refer to Figure 4.3.75 below automatic reset and restart operation

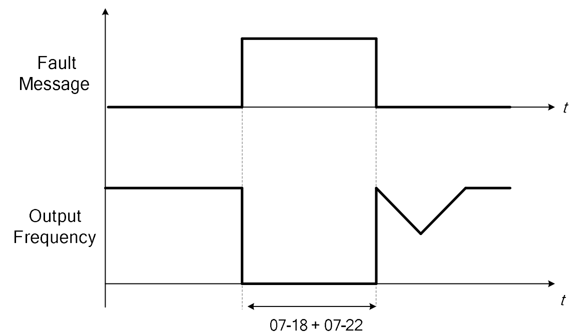


Figure 4.3. 75 Automatic reset and restart operation

(2) Automatic reset and restart time (07-01)

The instantaneous stop and restart time is the same as the automatic reset and restart time.

. When 07-01<07-18, the automatic restart interval is set by 07-18.

. When 07-01>07-18, the automatic restart interval is set by 07-01.

. The automatic restart interval is the larger number between the minimum cut-off time (07-18) and the automatic reset and restart time (07-01), plus the speed search delay time (07-22).

. Refer to Figure 4.3.76 automatic restart interval.

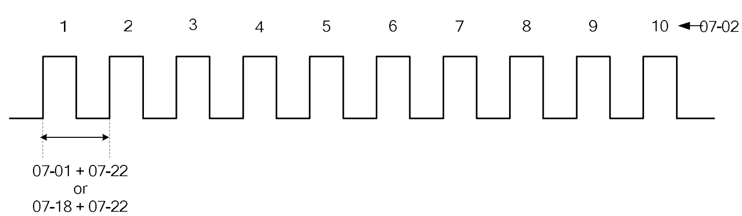


Figure 4.3. 76 Automatic restart interval

***Important* - Using the automatic restart function too frequently will damage the inverter.**

07- 04	Start directly after power on
Scope	**[0]:** When the external operation command is valid, start directly after power is supplied **[1]:** When external operation command is valid, do not start directly after power is supplied
07- 05	Start delay directly after power on
Scope	**【1.0~300.0】 Sec**

(1) Start directly after power on (07-04)

07-04=[0] If when power is connected, the operation switch is at the on status, the inverter will start automatically.

07-04=[1] If when power is connected, the operation switch is at the off status, it cannot start and **STP1** will start flashing at this time. The operation switch needs to be turned off first, and then reconnect the power in order to start.

(2) Start delay directly after power on (07-05)

When **07-04=[0]**, if power is connected, start directly after power on will start counting the delay time **set in 07- 05** and start operating after the time is reached.

! Danger:

- When **07- 04=[0]** and the inverter is set to external operation **(00- 02/00- 03=[1])**, if power is connected and the operation switch is at the on status, the inverter will start automatically. It is recommended for customers to switch off the power switch and operation switch while power is disconnected so that the inverter will not operate directly and cause harm to personnel and machines when power is resumed.
- When **07- 04=[1]** and the inverter is set to external operation **(00- 02/00- 03=[1])**, if power is connected and the operation switch is at the on status, it cannot start and **STP1** will start flashing at this time. The operation switch must first be turned off and the start delay directly after power on timer must finish counting down, then connect the power in order to start up.

07- 06	Brake start frequency
Scope	[0.0~10.0] **Hz**

Brake related operations may vary according to the different control modes (00-00). Please refer to the descriptions below on related operation programs.

- When the control mode is VF, VF+PG, SLV and SLV2 (00-00 = 0, 1, 2, 6)

Startup will execute the DC brake first according to the time set in 07-16. When deceleration stops, parameters 07-06 and 07-08 can be used to set the DC brake start frequency while stopping and the DC brake time while stopping. When the output frequency during deceleration is lower that the setting value of 07-06, DC brake will be performed according to the time set in 07-08.

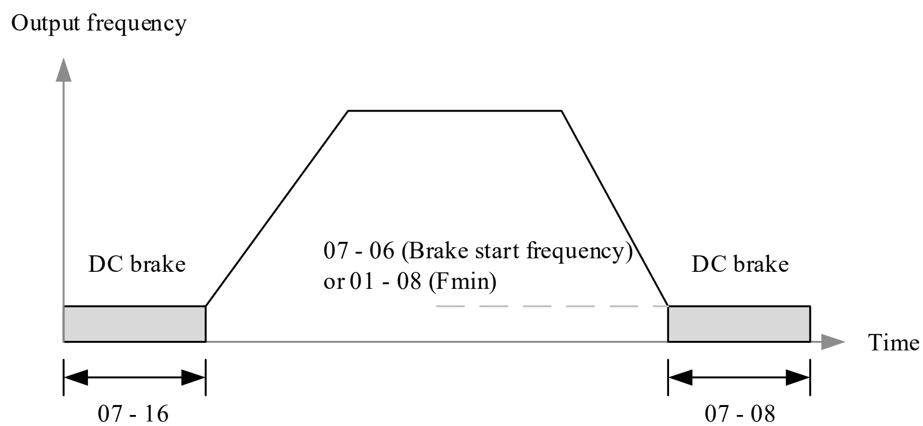


Figure 4.3. 77 Brake actions for VF, VF+PG, SLV and SLV2

(Note) When 07-06 < 01-08, DC brake will start from the frequency set in 01-08.

*** (V/F + PG, SV and PMSV** are only for special projects

- When the control mode is PMSLV (00-00=5),

parameters 07-34 and 07-16 can be used to set the short-circuit brake time during startup and DC brake time during startup respectively. The braking action during startup executes the short-circuit brake according to the time set in 07-34 first, and then executes the DC brake according to the time set in parameter 07-16. When deceleration stops, parameters 07-35 and 07-08 can be used to set the short-circuit brake time while stopping and DC brake time while stopping respectively. When the output frequency during deceleration is lower than 07-06, short-circuit brake will be executed first according to the time set in 07-35, and the execute DC brake according to the time set in 07-08 (if 07-06 < 01-08, the braking function will start being executed from the frequency set in 01-08). Detailed action program is as shown in Figure 4.3.78.

Whether starting or stopping, the DC brake current threshold is set by parameter 07-07 with the rated current of the inverter at 100%. In addition, if the DC brake current threshold set by 07-07 exceeds the rated current value of the motor, the DC brake current threshold will be limited to the rated value of the motor.

Whether starting or stopping, the short-circuit brake current limit is set by parameter 07-36 with the rated current of the motor at 100%.

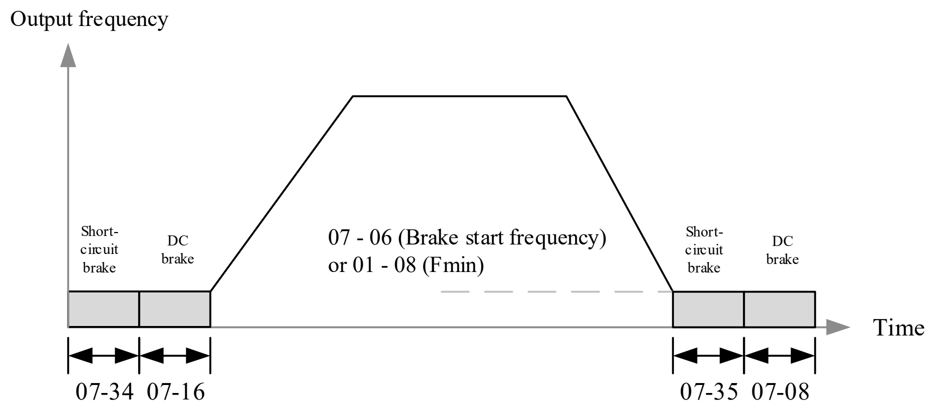


Figure 4.3. 78 PMSLV braking action

(Note) When 07-06 < 01-08, short-circuit brake starts from the frequency set in 01-08.

- When the control mode is SV and PMSV (00-00=3, 4)

Startup will execute zero-speed operation first according to the time set in 07-16. When deceleration stops, parameters 07-06 and 07-08 can be used to set the zero-speed operation start frequency while stopping and the zero-speed operation time while stopping. When the output frequency during deceleration is lower that the setting value of 07-06, zero-speed operation will be performed according to the time set in 07-08.

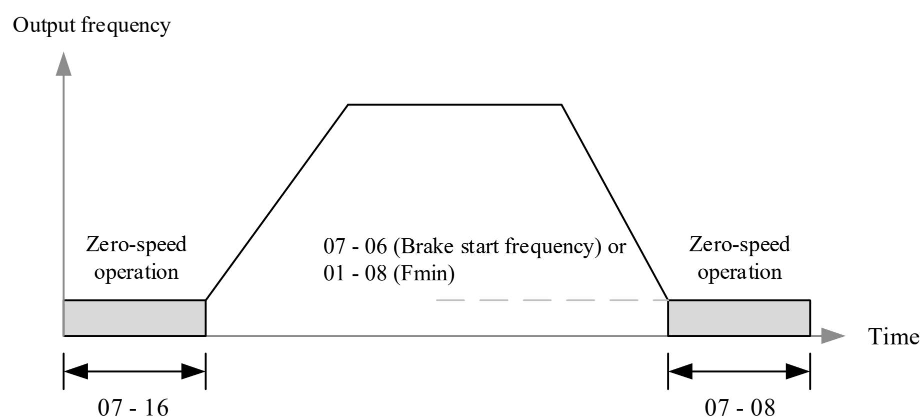


Figure 4.3. 79 SV and PMSV braking action

(Note) When 07-06 < 01-08, zero-speed operation will start from the frequency set in 01-08.

07- 07	DC brake current threshold
Scope	【0~100】**%**
07- 08	DC brake time while stopping
Scope	【0.00~100.00】**Sec**
07- 16	DC brake time while starting
Scope	【0.00~100.00】**Sec**

- If DC voltage is applied on an operating motor, the motor will generate braking torque. This is DC brake, and parameters 07-06 to 07-08 and 07-16 are used to configure these settings.
- Executing the speed search function should release the DC brake.
- The DC brake function can be started by supplying DC current to the motor. This occurs during DC brake time before startup 07-16 and the DC brake time while stopping 07-08.
- For the starting point of the DC brake time 07-16, set the DC brake activation time when the motor starts. This will prevent the load from driving the motor and generating a "windmill effect", ensuring that the motor will stop.
- If 07-16 is set to 0 (release brake during startup), the inverter will start with the minimum output frequency.
- For the DC brake time while stopping 07-08, set the DC brake operation time when the motor stops. If 07-08 is set to 0 (DC brake during shutdown), when the output frequency is smaller than the DC brake start frequency 07-06, the inverter output will turn off and the DC brake will start.
- If the DC brake start frequency 07-06 set is lower than the minimum output frequency 01-08, when the output frequency is smaller than the minimum output frequency 01-08, the DC brake will start.
- Whether starting or stopping, the DC brake current threshold is set by parameter 07-07. Set the DC brake current (07-07) as a part of the inverter's allowable output current (the inverter's allowable output current is set to 100%).
- Increase the DC brake time (07-08, 07-16) or increase the DC brake current (07-07) to shorten the stop time.
- Set any of the terminals (03-00 to 07) to 33 allows controlling the DC brake operations through the multi-function digital input. Please to Figures 4.3.77~4.3.79 on the DC brake timetable.
- If 04-05 (multi-function analog input AI2 function option) is set to 5 (DC brake current), analog input can be used to adjust the DC brake current. Refer to Figure 4.3.62 on DC brake current adjustment.

07- 34	Short-circuit brake time while starting
Scope	【0.00~100.00】**Sec**
07- 35	Short-circuit brake time while stopping
Scope	【0.00~100.00】**Sec**
07- 36	Short-circuit brake current limit
Scope	【0.0~200.0】**%**

- The short-circuit brake function is used on PMSLV control mode. The braking method is using IGBT switching to cause the motor's three-phase to short-circuit and generate brake torque. The brake action program can be adjusted by setting parameters 07-06 and 07-34 to 07-36.
- If 07-35 is set to 0, the inverter will start with the minimum output frequency.
- Parameter 07-36 uses the rated current of the motor as 100%, and uses it to limit the maximum current during short-circuit braking.
- Set any of the terminals (03-00 to 07) to 65 allows controlling the short-circuit brake operations through the multi-function digital input

07- 09	Stop mode selection
Scope	**[0]:** Deceleration stop **[1]:** Free-run stop **[2]:** Full-range DC brake stop **[3]:** Free-run stop with timer

Selects the stopping method to use when executing stop commands. There is a total of four stopping methods, and under SV mode, DC brake and free-run stop with timer cannot be used.

(1) 07-09=0:

· Decelerates and stops according to the setting of 07-09. When the operation command is removed, the motor will decelerate to the minimum output frequency 01-08 (Fmin) and then stops.

· The deceleration speed is determined by the deceleration time (default factory setting: 00-15). When the output frequency has been reduced to the DC brake start frequency (07-06) or minimum output frequency (01-08), the DC brake will start using the larger setting value and the motor will stop.

. Actual deceleration time = $\dfrac{\text{Output frequency when the stop command starts}}{\text{Maximum output frequency } F_{max} \text{ (01-02)}} \times$ setting value of deceleration time

. If the S curve has been set, it will be added to the total stop time.

· Refer to Figure 4.3.80

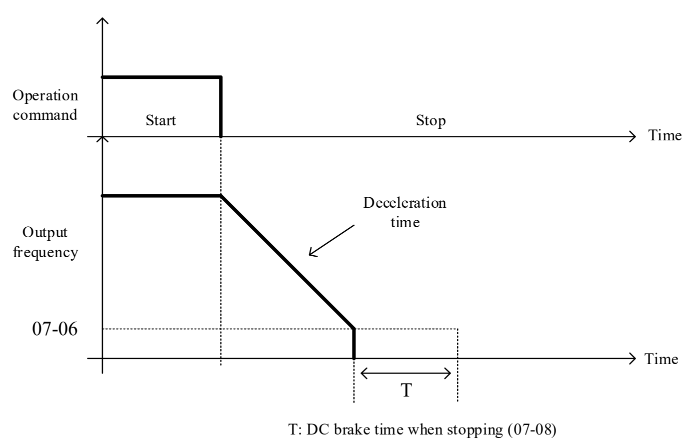


Figure 4.3. 80 Decelerate and stop

(2) 07-09=1:

- If the operation command is removed, the inverter turns off and the motor enters a free-run stop decelerating with the friction of the drive system.
- After the operation command is removed, the subsequent operation command will be ignored until the minimum base block time (07-18) ends.
- Please refer to Figure 4.3.81.
- If under SLV mode (00-00 = 2), the next startup after free-run will start the speed search function automatically. If the equipment will use the mechanical brake to stop the motor after the operation command is removed, please change parameter 07-26 to 1 (effective) (parameter 07-26 is only effective in software version 1.3 and later).

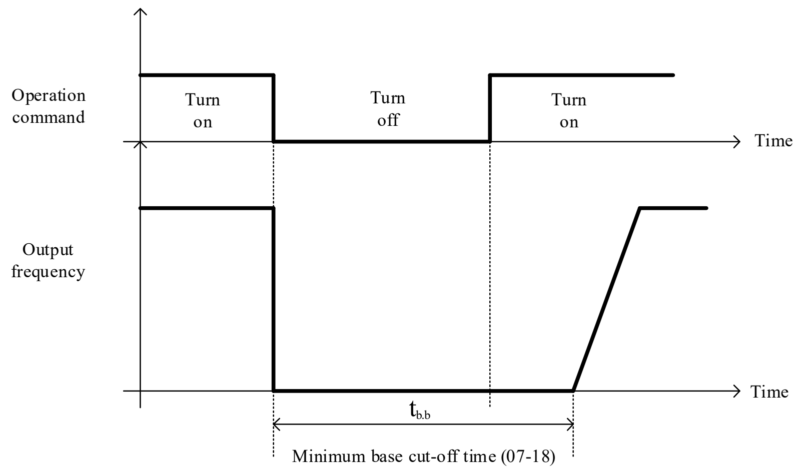


Figure 4.3. 81 Free-run stop

(3) 07-09=2:

- If the operation command is removed, the inverter will perform base block (b.b.) with the minimum base block time (07-18), and then the 07-07 setting DC brake will stop the motor.
- The DC brake time (tDCDB) in Figure 4.3.82 is determined by the setting value of 07-08 (DC brake time while stopping) and the frequency when the operation command is removed.

$$t_{DCDB} = \frac{(07\text{-}08) \times 10 \times \text{output frequency}}{F_{max}\ (01\text{-}02)}$$

- If over-current protection occurred during the DC braking process, increase the minimum b.b. time (07-18) until protection no longer occurs.
- Please refer to Figure 4.3.82 to understand the DC brake stop function.

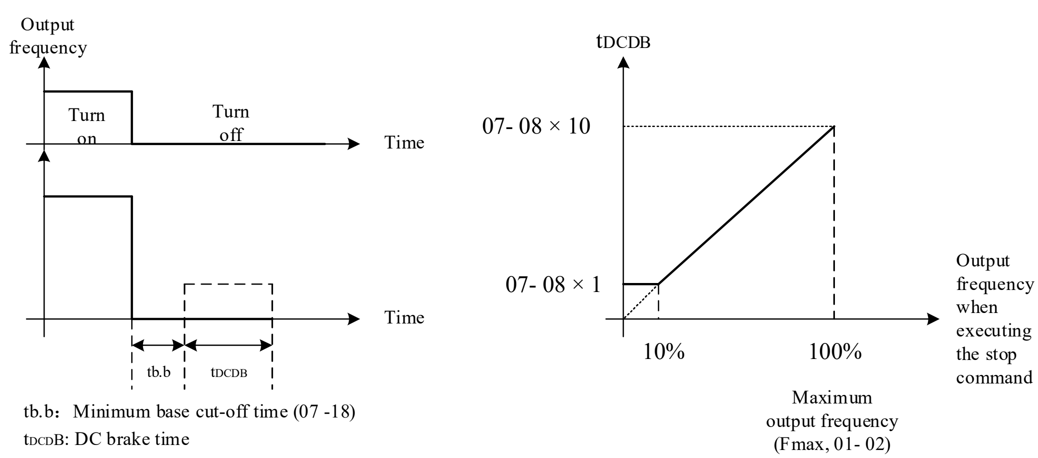


Figure 4.3. 82 DC brake stop

(4) 07-09=3

- If the operation command is removed, the inverter will base block and the motor will free-run stop. If operation command was inputted before the operation wait time is reached, the inverter will not operate and the operation command will be ignored.
- When the operation command is removed, the operation wait time (T1) is determined by the deceleration time (00-15,17, 22 or 24) and the output frequency.
- Please refer to Figure 4.3.83

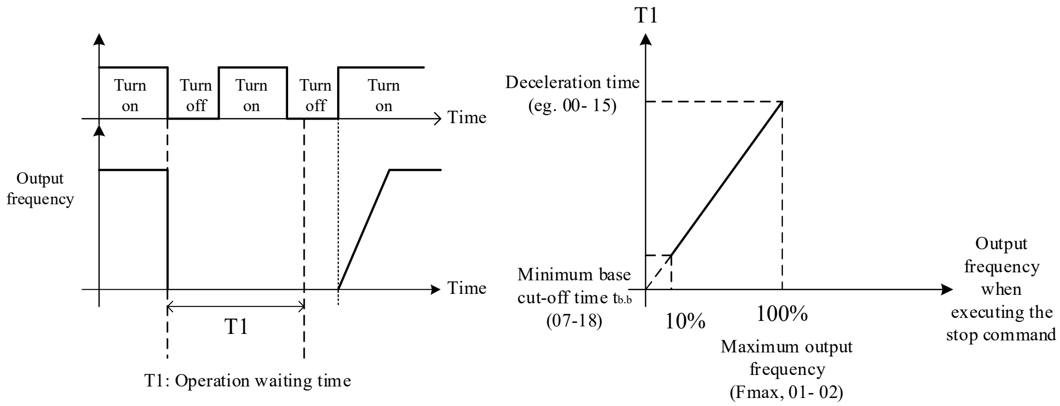


Figure 4.3. 83 Timer free-run stop

07- 13	Low voltage detection threshold
Scope	**[**200V model**:** 150~300V**]** [400V model**:**250~600V]
07- 25	Low voltage detection time
Scope	【0.00~1.00】**Sec**
07- 30	Low voltage threshold selection
Scope	**[0]:** Disabled **[1]:** Enabled
07- 31	*Low voltage operation frequency
Scope	【0.00~599.00】**Hz**

*: When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz

Low voltage detection (07-13).
Adjust the 07-13 voltage threshold 150 to 210 Vdc (220 V class models) or 250 to 420 Vdc (for 440V class models). When the voltage is lower than the setting value of 07-13 (07-13 setting value / 1.414 is the AC voltage detection threshold) and the time exceeds the setting value of 07-25, the low voltage error “UV” will activate.

If 07-25=0.00s, once it is detected that the voltage is too low, UV will activate.

Set preventive measures:

①. The input voltage will limit the inverter output voltage; if the voltage decreased or the load is too big, the motor may stall.

②. When the input voltage is lower than the setting value of 07-13, the output will be shut off immediately; it will not start automatically when power is restored.

Low voltage threshold selection (07-30)
When the low voltage threshold selection setting is 1 (effective), the 07-13 voltage threshold lower limit of the 440V class models is adjusted to 250V.

Low voltage operation frequency (07-31)
When DI terminal-62 EPS input is used, the frequency command will run according to parameter 07-31. Please refer to page 4-114 on the description of low voltage start.

07- 14	Pre-excitation time
Scope	【0.00~10.00】**Sec**
07- 15	Pre-excitation threshold
Scope	【50~200】**%**

If higher start torque is required, especially for driving large-powered motors, pre-excitation time 07-14 can be set to use pre-excitation operation to generate motor flux.

(1) Pre-excitation time (07-14)

- When inputting operation commands (forward or reverse), the inverter will automatically perform pre-excitation with the pre-excitation time (07-14) set.
- As shown in Figure 4.3.84, after the flux reaches 100%, set the pre-excitation time. The time required to establish magnetic flux is the function value of the motor's electrical time constant.

(2) Pre-excitation threshold (07-15)

- Use the pre-excitation threshold (07-15) to provide a higher excitation current within the pre-excitation time (07-14). This will increase the motor's speed and stability.
- To quickly establish magnetic flux, the pre-excitation time (07-14) can be reduced and set the pre-excitation threshold (07-15) at a high point.
- If the pre-excitation threshold (07-15) set is higher than 100%, a higher excitation current will be provided during pre-excitation time (07-14), and the time required to establish magnetic flux inside the motor can be shortened. When the pre-excitation threshold (07-15) set reaches 200%, the time required to establish magnetic flux can be reduced to approximately half.
- If the pre-excitation threshold (07-15) is set to a higher value, the motor may generate larger noises during the pre-excitation time period.
- When 100% magnetic flux is established and the excitation current has returned to 100%, pre-excitation has ended. Refer to Figure 4.3.84 below.

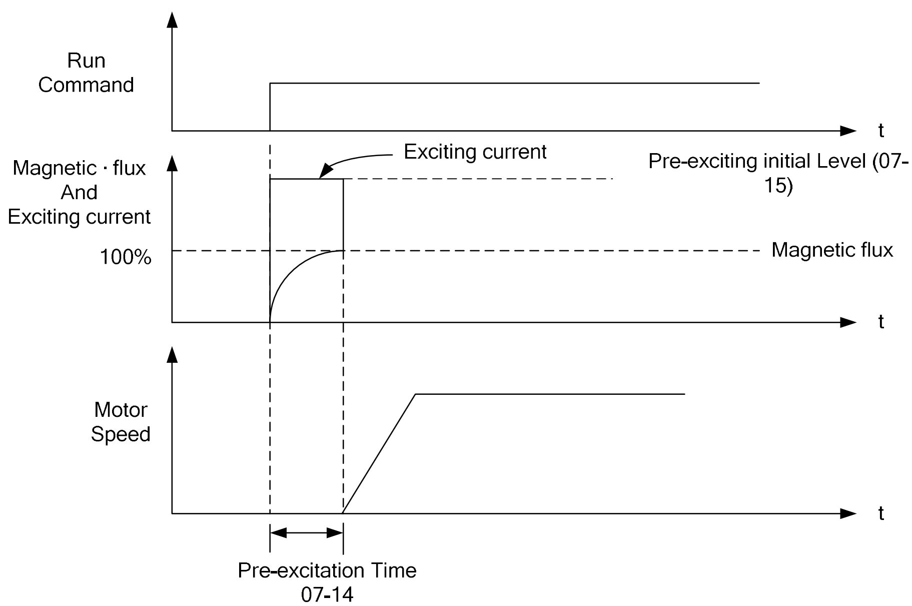
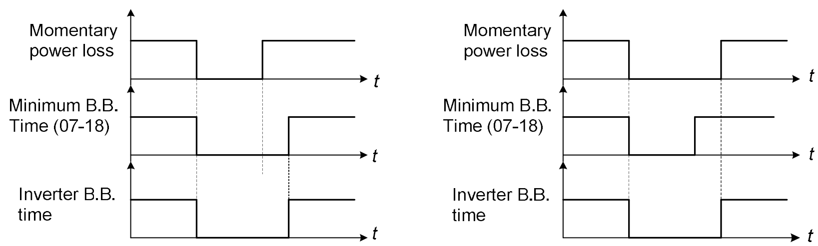


Figure 4.3. 84 Pre-excitation operation

07- 18	Minimum cut-off time
Scope	【0.1~5.0】**Sec**

- During a momentary power loss and the inverter continues to operate (07-00=1) after the power resumes, the operation command must always exist.
- Failure output signal contact output.
- When momentary power loss is detected, the inverter will turn off the output and retain B.B. for a set period of time automatically. When setting the time 07-18, the residual voltage is expected to be almost zero.
- When the momentary power loss time exceeds the minimum base block time (07-18), operation will start immediately after speed search.
  Please refer to Figure 4.3.85 below.



(a) When minimum baseblock time (07-18) is longer than momentary power loss time

(b) When minimum baseblock time (07-18) is shorter than momentary power loss time

Figure 4.3. 85 Minimum B.B time and momentary power loss time

- Minimum base block time (07-18) is also used for speed search and DC brake functions.
- Set the minimum base block time (07-18) required.
- Execute the speed search or DC brake function, and if over-current “OC” occurs, increase the setting.
- Momentary power loss and normal speed search after search is completed for the speed used to start this equipment.

07- 19	Direction seeking current
Scope	【0~100】**%**
07- 20	Speed seeking current
Scope	【0~100】**%**
07- 21	Speed seeking integral time
Scope	【0.1~10.0】**Sec**
07- 22	Speed seeking delay time
Scope	【0.0~20.0】**Sec**
07-23	Voltage recovery time
Scope	【0.1~5.0】**Sec**
07- 26	SLV selection of starting method after free-run stop
Scope	**[0]:** Speed search start [1]: Normal start
07- 27	SLV start method selection after malfunction
Scope	**[0]:** Speed search start [1]: Normal start
07- 28	Start method selection after cut-off
Scope	[0]: Speed search start [1]: Normal start
07- 32	Speed seeking mode selection
Scope	[0]: Disabled [1]: Mode 1 (execute speed search once after power up) [2]: Mode 2 (execute speed search every time)
07- 33	Speed seeking start frequency selection
Scope	[0]: Motor maximum output frequency [1]: Frequency command

- The speed search function is used to search for the actual speed, and start successfully with the detected speed. Effective when power is resumed after momentary power loss and when restarted after failures.
- If start speed search is selected under V/F+PG or SV control mode (with PG control), the inverter will be started with the frequency detected.* **(V/F+PG, SV and PMSV** are only for special projects
- Set the multi-function digital input terminal to external speed search command 1 or 2. The external speed search command 1 (setting value=19) and 2 (setting value=34) cannot be set simultaneously, otherwise the "SE02" (**digital input terminal error**) may occur.
- If external search command is used to execute speed search, make sure that the speed search command comes before the operation command, or at least must become effective simultaneously with the operation command. A typical operation order is displayed in Figure 4.3.86 below.

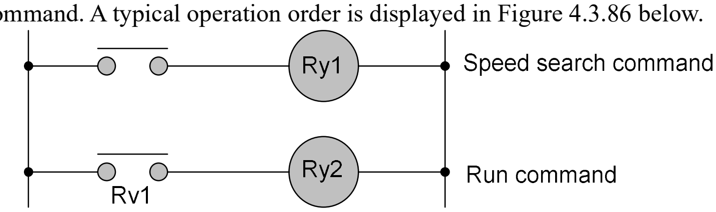


Figure 4.3. 86 Speed search and operation commands

- Speed search is not applicable to motors and high-speed motors with capacities two classes higher or lower than the inverter.
- To use the speed search function and when the control mode is V/F, it is recommended to execute static motor parameter tuning.

- To use the speed search function and when the control mode is SLV mode, rotational motor parameter tuning needs to be executed. If longer motor wiring was replaced after executing parameter tuning, static parameter tuning needs to be executed also.
- Speed search uses the current detection principles.

(1). Direction search current (07-19)
  - Set the bidirectional current threshold
  - If speed search failed on low-speed (5Hz or more), increase the setting value Please note that if the setting value is too big, slight DC brake effects will be generated.

(2). Speed search current (07-20)
  - Set the speed search current threshold.
  - The setting value must be lower than the excitation current (02-09) or equal to the no-load current. If the no-load current is unknown, it is recommended to start setting at 20%. Excessive speed search current will cause inverter output saturation.
  - To use speed search under momentary power loss situations, if over-current (OC) is detected, increase the minimum base block time (07-18).

(3). Speed search integral time (07-21)
  - Set the integral time during speed search.
  - If OV occurred, increase the setting value to make the speed search time longer. If quick start is required, the setting value can be decreased.

(4). Speed search delay time (07-22)
  - If the output-side of the inverter has contactors, the 07-22 speed search delay time can be set.
  - The default factory setting is 0.2 seconds; the inverter will start performing speed search after the delay time has passed. Set 07-22 = 0.0 seconds and the speed search delay function will be disabled.

(5). Voltage recovery time (07-23).
  - Set the voltage recovery time.
  - Set the time for the inverter output voltage to be restored to the normal voltage.

(6). Selection of start method after SLV free-run stop (07-26)
  . =0 speed search start. =1 normal start. (the default factory value is speed search start)
  - If under SLV mode (00-00=2), the stop mode is set as free-run stop (07-09=1) or free-run stop with timer function (07-09=3), the next startup after free-run will start the speed search function automatically. If the equipment will use the mechanical brake to stop the motor after the operation command is removed, please change this parameter to 1 normal start.

(7). Starting method when SLV mode malfunctions (07-27)
  . =0 speed search start. =1 normal start. (the default factory value is speed search start)
  - Under SLV mode (00-00=2), if malfunction occurs, speed search will be used to start automatically. If the equipment will use the mechanical brake to stop the motor after the operation command is removed, please change this parameter to 1 normal start.

(8). Start method selection after external cut-off ends (07-28)
  . =0 speed search start. =1 normal start. (the default factory value is speed search start)
  - After external cut-off ends, the inverter usually will start with the speed search method.
  - If under VF (00-00 = 0) or SLV mode (00-00=2), the external cut-off time is long, and the motor has already stopped when external cut-off ends, this parameter can be set to 1, and the inverter will start accelerating with the minimum frequency after external cut-off ends.

(9). Speed search mode selection (07-32)
  0: Invalid
  After inputting the operation command, operation will start from the minimum output frequency. However, other functions that will trigger speed search will not be restricted

1: Execute speed seeking once after power on

When the inverter supplies power, after the operation command is inputted for the first time, speed search will be executed first, and the motor will be started with the frequency found.

2: Speed search will be executed during every operation, and the motor will be started with the frequency found.

Note: If the motor started vibrating when the PM motor is performing speed search, it is recommended to reduce the setting values of 20-00 & 20-02.

(10). Speed search start frequency selection (07-33)

Used to set the speed search starting frequency

0: Motor maximum output frequency

The inverter will start performing speed search from the maximum frequency of the motor

1: Frequency command

The inverter will start performing speed search from the frequency command set

■ Current detection method speed search

(a) Speed search during startup

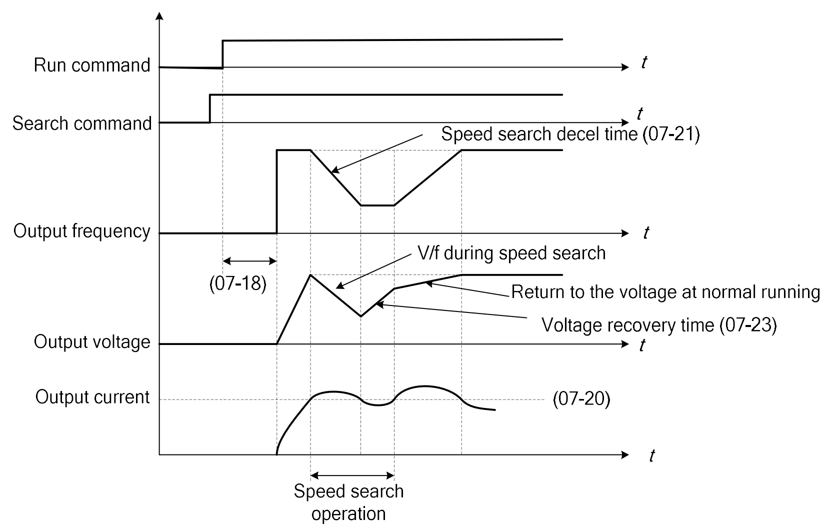


Figure 4.3. 87 Speed search during startup

(b) Speed search during momentary power loss recovery period

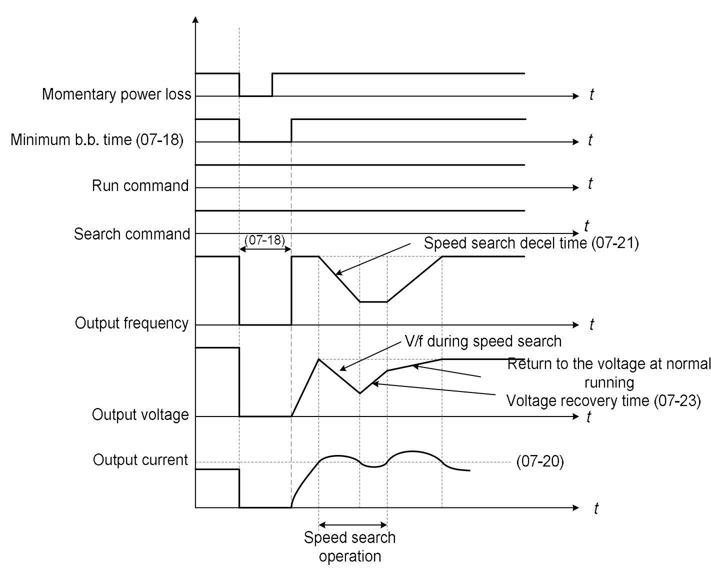


Figure 4.3. 88 Speed search during momentary power loss

- When the minimum base block time (07-18) is longer than the momentary power loss time, the search speed operation starts after the minimum base block time (07-18).
- When the minimum base block time (07-18) is shorter, speed search operation will start resuming immediately after power is recovered.

07- 29	Operation command selection during DC braking
Scope	**[0]:** Not allowed to start during the process **[1]:** Allowed to start during the process

After starting DC brake, if 0 was set for the operation command while the DC brake is activated, operation will only start again after the DC brake has ended. If it was set to 1, operation can start again during the DC brake process without the need until the braking ends.

07- 42	Voltage limit gain
Scope	0.0 ~ 50.0%

- When output voltage saturation occurs and caused the motor operation to vibrate abnormally, this parameter can be gradually increased to suppress and limit the output voltage.
- When this parameter is too big, insufficient torque may occur. Please reduce this parameter at this time.

07- 43	PM motor speed search short-circuit brake time
Scope	【0.00~100.00】Sec
07- 44	PM motor speed search DC brake time
Scope	【0.00~100.00】Sec

If the motor is rotating due to inertia or other factors at a speed significantly lower than the minimum speed control range, parameters 07-43 and
07-44 can be used to perform braking and stop the motor then restart. If the motor is rotating due to inertia or other factors at a speed significantly higher than the minimum speed control range, no matter what the values of 07-43 and 07-44 are, it will start with the frequency found directly.

If 07-43 and 07-44 are set to 0, no matter what the actual rotation speed of the motor is, it will start with the frequency found after speed search ends.

07- 45	STP2 function selection
Scope	**[0]:** Enable STP2 **[1]:** Cancel STP2

- If the STP2 function is enabled and the 00-02 primary operation command source is set to external control and there is operation signals inputted, if the digital operator is used to stop the operation, the digital operator will display the flashing warning message of "Terminal STOP" (STP2).
- If the STP2 function is cancelled and the 00-02 primary operation command source is set to external control and there is operation signals inputted, if the digital operator is used to stop the operation, the digital operator will not display the STP2 flashing warning message.

07- 46	DC injection current limit
Scope	0 ~ 150%

Under handwheel mode, when the handwheel output frequency is less than the minimum output frequency (01-08) of motor 1, DC current will be injected to perform braking. The unit of this parameter is a percentage of the motor 1 rated current (02-01).

07- 47	PM speed switching frequency mode
Scope	**[0]:** Disabled **[1]:** Mode 1 **[2]:** Mode 2

According to the mode shown in the figure below, three-segment speed switching can be performed by using parameter 00-25 (acceleration/deceleration switching frequency) when ≠0, along with parameter 22-11 (I/f mode start frequency switching point) for frequency switching acceleration/deceleration.
Invalid: Please refer to 00-25 parameter frequency to perform speed switching.
Mode 1: Speed switching can be performed after startup; perform speed switching by following Figure 4.3.89.
Mode 2: Speed switching as shown in the figure below can only be achieved during the first operation, but switching will become invalid when decelerating 22-11.

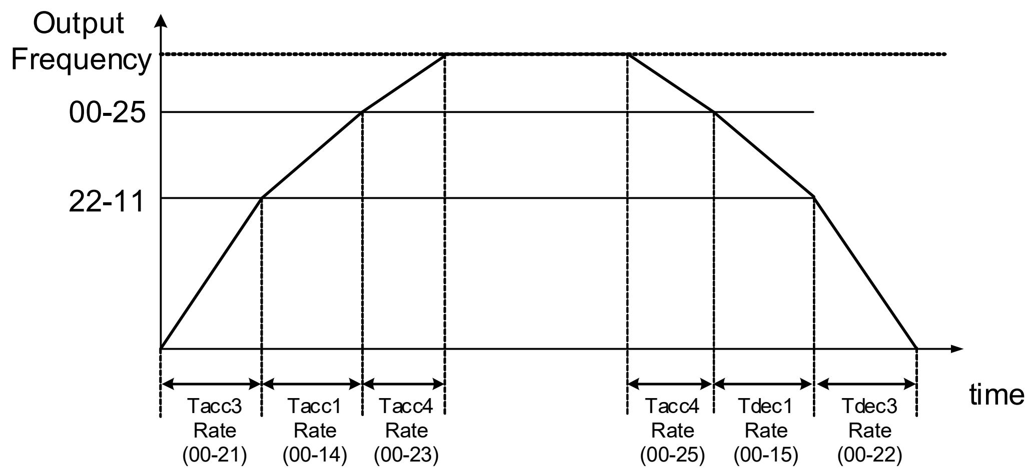


Figure 4.3. 89 PM speed switching

Note: When 00-25≠0, frequency switching cannot be less than the frequency setting of parameter 22-11, and this parameter can only be under PMSLV mode.

08-Protection function group

08- 00	Stall prevention function
Scope	**[xxx0b]:** Stall prevention effective during acceleration **[xxx1b]:** Stall prevention ineffective during acceleration **[xx0xb]:** Stall prevention effective during deceleration **[xx1xb]:** Stall prevention ineffective during deceleration **[x0xxb]:** Stall prevention effective during operation **[x1xxb]:** Stall prevention ineffective during operation **[0xxxb]:** Stall prevention during operation is in accordance with stage one deceleration time **[1xxxb]:** Stall prevention during operation is in accordance with stage two deceleration time
08- 01	Acceleration stall prevention threshold
Scope	【20~200】**%**
08- 02	Deceleration stall prevention threshold
Scope	**200V :**【330V~410V】 **400V :**【660V~820V】
08- 03	Stall prevention threshold during operation
Scope	【30~200】**%**
08-21	Acceleration stall prevention limit
Scope	【1~100】**%**
08-22	Operation stall detection time
Scope	【2~100】**mSec**
08- 40	Motor 2 acceleration stall prevention threshold
Scope	【20~200】**%**
08-41	Motor 2 acceleration stall prevention limit
Scope	【1~100】**%**

*Note: The stall prevention function is only effective under V/F control mode.

Stall prevention during acceleration (08-00=xxx0b)

- This function is used to prevent the generation of excessive current during the acceleration period due to greater loads of the motor or the need of faster acceleration times.
- When the stall prevention function (08-00=xxx0b) was enabled during acceleration, and the output current of the inverter exceeded -15% of the acceleration stall prevention threshold (08-01), the acceleration speed will start reducing. If the setting value of the acceleration stall prevention threshold (08-01) is reached, the motor will stop accelerating.
- This parameter is the rated percentage of the inverter, therefore, when the motor capacity is smaller than the inverter and the motor stalled during acceleration, the setting value of parameter 08-01 can be reduced.

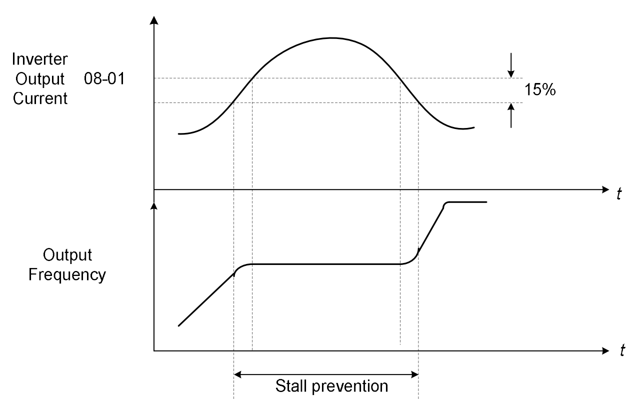


Figure 4.3. 90 Stall prevention during acceleration

- If the motor is used at a constant power (CH) area, the stall prevention threshold (08-01) will automatically reduce to prevent stalling,
  The stall prevention threshold during acceleration in a constant power area is as shown below:

$$\text{Acceleration stall prevention threshold (in constant power area)} = \frac{[\text{acceleration stall prevention threshold (08-01)}] \times [\text{Fbase (01-12)}]}{\text{Output frequency}}$$

08-21 reduces the stall prevention threshold in the constant power area down to the limit value required by the needed threshold. Refer to the figure below.

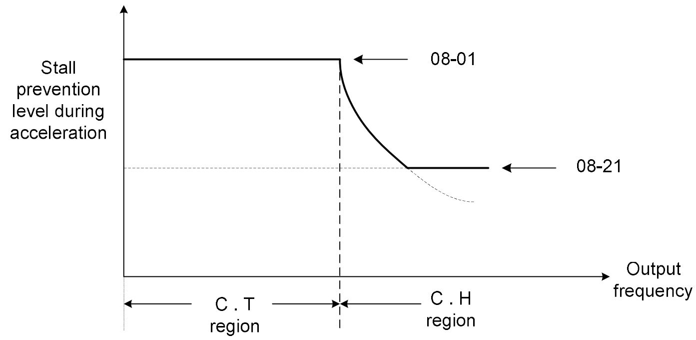


Figure 4.3. 91 Stall prevention threshold and limit during acceleration

08-40 motor 2 acceleration stall prevention threshold and 08-41 motor 2 acceleration stall prevention limit are used to switch between motor 1/motor 2 when the external terminal DI-40 is used.

Stall prevention selection during deceleration (08-00=xx0xb)

- The stall prevention function during deceleration automatically extends the deceleration time based on the DC voltage level to prevent over voltage during deceleration.
- During deceleration, when the DC voltage exceeds the stall prevention threshold, deceleration stops; when the DC voltage is lower than the detection threshold, deceleration continues.
- The stall prevention threshold can be set with 08-02; refer to Table 4.3.31.

Figure 4.3. 31 Stall prevention threshold during deceleration

Inverter type	08-02 default factory value (stall prevention during deceleration, DC voltage)
200V class model	385VDC
400V class model	770VDC

- Refer to Figure 4.3.92 stall prevention during deceleration
- When the brake starts (braking resistor or braking module), set **08-00=xx1xb** (invalid).

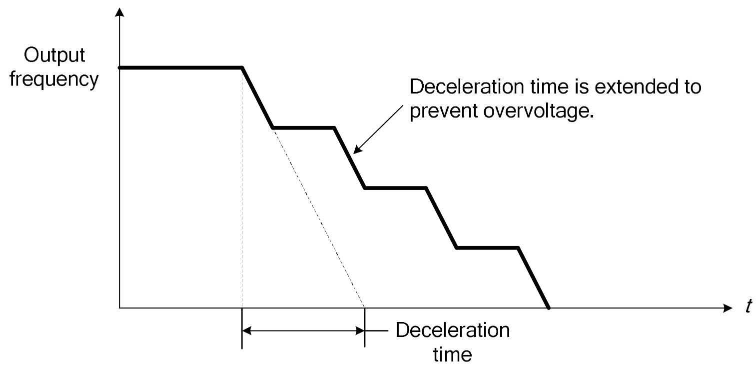


Figure 4.3. 92 Stall prevention during deceleration

Stall prevention during operation (08-00=x0xxb)

Stall prevention is only effective under V/F control mode with or without PG during operation.

- This function reduces the output frequency of the inverter automatically to prevent motor stalling.
- If the inverter's output current exceeds the time set with 08-22 and the threshold set with 08-03, the inverter's output frequency will decelerate with deceleration time 1 (00-15) or deceleration time 2 (00-17). When the inverter's output current drops below -2% of the threshold (08-03), the output frequency will accelerate again.
- Refer to Figure 4.3.93 below.

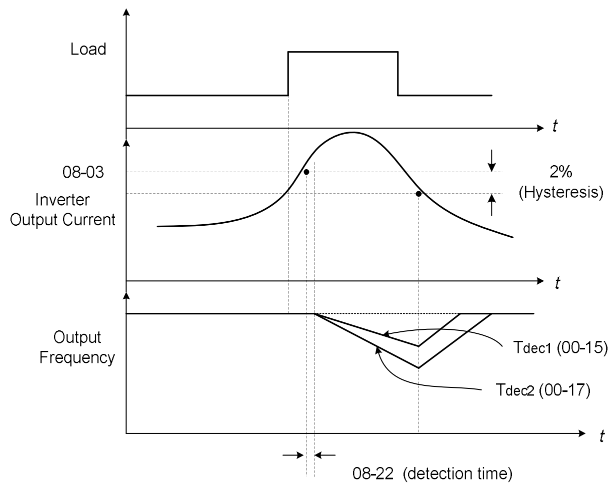


Figure 4.3. 93 Stall prevention during operation

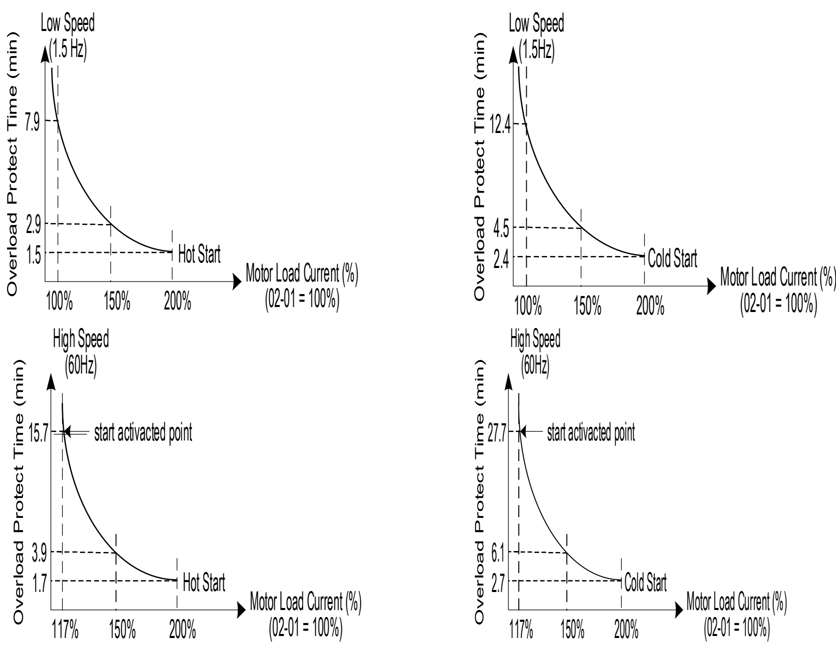
Note: The stall prevention threshold during operation can be set with the multi-function analog input AI2 (04-05=7).

08- 05	Motor overload (OL1) protection selection	
Scope	**[xxx0b]:** Motor overload ineffective **[xx0xb]:** Motor overload cold start **[x0xxb]:** Standard motor **[0xxxb]:** Reserved	**[xxx1b]:** Motor overload effective **[xx1xb]:** Motor overload hot start **[x1xxb]:** Inverter motor **[1xxxb]:** Reserved
08-07	Motor overload (OL1) protection threshold	
Scope	[0]: Motor overload (OL1) protection 0 [1]: Motor overload (OL1) protection 1 [2]: Motor overload (OL1) protection 2	

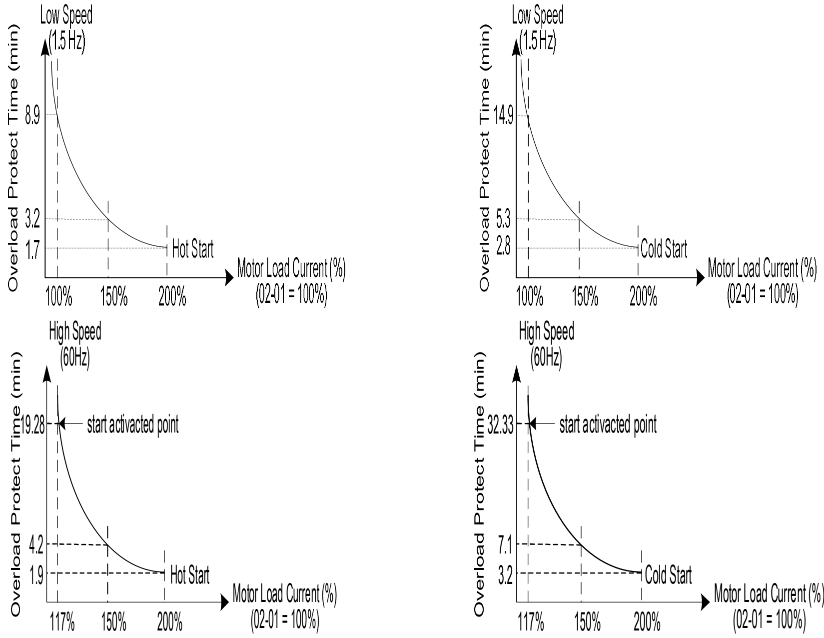
Motor overload protection selection (08-05).

- Set the motor overload protection function with 08-05 according to the motor used.
- When two or more motors are connected to the same inverter, disable the motor overload protection function (set 08-05=xxx0b) and provide overload protection using other methods separately. For example, connect a thermal overload relay at the power of each motor.
- When the power supply is turned on and off normally, the motor overload protection function 08-05=xx1xb (hot start protection characteristic curve) resets the thermal value every time the power is turned off.
- For motors without cooling fans (general standard motor), when operating at low speeds, the thermal consumption capacity is lower, set 08-05=x0xxb.
- For motors with cooling fans (dedicated motors for inverters or V/F motors), the thermal consumption capability is not related to the rotation speed, set 08-05= x1xxb.
- Use electronic overload protection to protect the motor from overloading. Set the parameter 02-01 according to the rated current on the motor's nameplate.
- Refer to Figure 4.3.94 below Example of standard motor overload protection curve (08-05 = x0xxb). The overload curve delay time varies according to the difference in 08-07 (motor overload (OL1) protection threshold).

08-07=0:



08-07=1:



08-0=2:

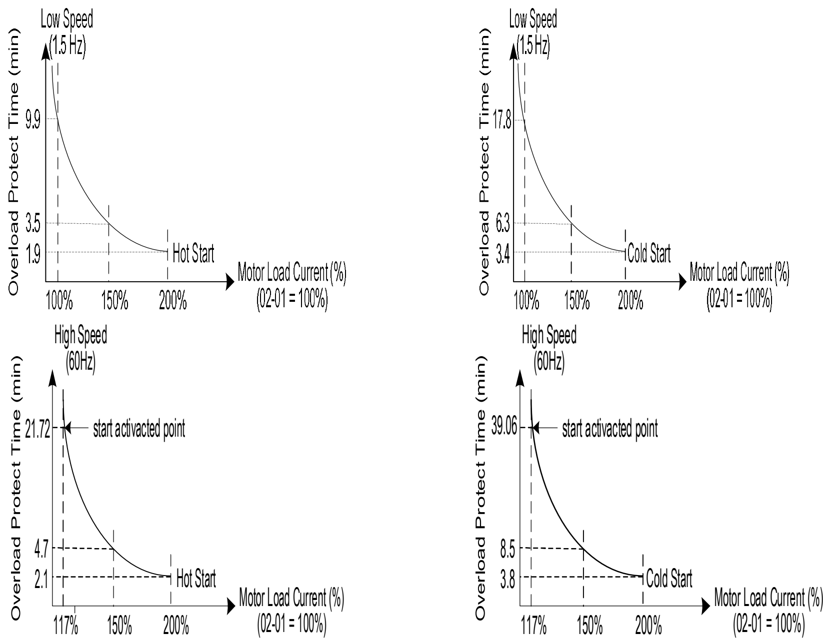


Figure 4.3. 94 Motor overload protection curve (example of a standard motor)

08- 0	Overload (OL1) protection action start method
Scope	**[0]:** Stops output after overload protection [**1**]**:** Continues operation after overload protection

- **08-06 = [0]:** After the motor electronic relay protection is triggered, the inverter immediately shuts off and displays **OL1**. To resume operation, press the **RESET** key or use an external reset terminal.
- **08-06 = [1]:** After the motor electronic relay protection is triggered, operation continues, but the inverter flashes **OL1** until the current drops below the normal level, at which point the **OL1** display disappears.

08- 08	Automatic Voltage Regulation Function **(AVR)**
Scope	**[0]:AVR** Enabled **[1]:AVR** Disabled

- The automatic voltage regulation (AVR) function is designed to address output voltage instability caused by fluctuations in input voltage.
  When **08-08 = [0]**, the maximum output voltage is limited. If the three-phase input voltage fluctuates and is lower than the input voltage set in parameter 01-14, the output voltage will also fluctuate accordingly.
  When **08-08 = [1]**, the maximum output voltage is not limited, and output voltage will remain stable regardless of input voltage variations.

08- 09	Input phase loss protection selection
Scope	**[0]:** Disabled **[1]:** Enabled

Input phase loss protection selection (08-09).

- Set 08-09 to enable or disable the input phase loss function.
  08-09 = 0: Disables input phase loss function.
  =1: Enables input phase loss function.
- When enabled and input phase loss is detected, the digital operator will display the "IPL Input Phase Loss" (IPL) fault message. The fault contact activates and the inverter stops with free-run deceleration.
- If output current is below 30% of the rated inverter current, input phase loss detection has no effect.

08- 10	Output phase loss protection selection
Scope	**[0]:** Disabled **[1]:** Enabled

Output phase loss protection selection (08-10).

- Set 08-10 to enable or disable the output phase loss function.
  Disables input phase loss function.08-10 = 0: Disables output phase loss function.
  = 1: Enables output phase loss function.
- When enabled and output phase loss is detected, the digital operator displays the "OPL Output Phase Loss" (OPL) fault message. The fault contact activates and the inverter stops with free-run deceleration.
- If output current is below 10% of the rated inverter current, output phase loss detection has no effect.

08- 13	Overtorque detection selection
Scope	**[0]:** Overtorque detection disabled **[1]:** Detection begins after reaching set frequency **[2]:** Detection during operation
08- 14	Overtorque action selection
Scope	**[0]:** Decelerates to stop upon detection **[1]:** Displays warning and continues operation **[2]:** Free-run stop upon detection
08- 15	Overtorque detection threshold
Scope	【0~300】**%**
08- 16	Overtorque detection time
Scope	【0.0~10.0】**Sec**
08- 17	Undertorque detection selection
Scope	**[0]:** Undertorque detection disabled **[1]:** Detection begins after reaching set frequency **[2]:** Detection during operation
08- 18	Undertorque action selection
Scope	**[0]:** Decelerates to stop upon detection

	[1]: Displays warning and continues operation **[2]:** Free-run stop upon detection
08- 19	Undertorque detection threshold
Scope	【0~300】**%**
08- 20	Undertorque detection time
Scope	【0.0~10.0】**Sec**

- The overtorque detection function monitors increased inverter output current or motor torque due to increased mechanical load. The undertorque detection function monitors decreases in mechanical load (e.g., belt breakage) that reduce inverter output current or motor torque.
- Torque detection parameters determine how to respond to overtorque (08-13~14) or undertorque (08-17~18) conditions.
- Overtorque (08-15) / Undertorque (08-19) detection level settings depend on the control method: * (**V/F+PG, SV, PMSV** are only for special projects)
  (1) In V/f control or V/f+PG mode, detection is based on 100% of the inverter's rated output current.
  (2) In SLV or SV control mode, detection is based on 100% of the motor's rated torque.
- Overtorque/undertorque detection signals can be output to multifunction digital output terminals (R1A–R1C, DO1), configured using parameters 03-11 to 03-12 (Multifunction Digital Output Terminal Function Selection) set to 12 or 25. Refer to the parameters in Figure 4.3.95.

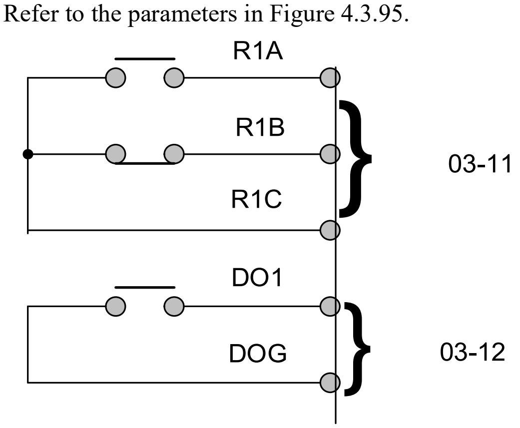


Figure 4.3.95 Overtorque/Undertorque detection signals using multifunction digital output terminals

- Overtorque Detection Setting Example:

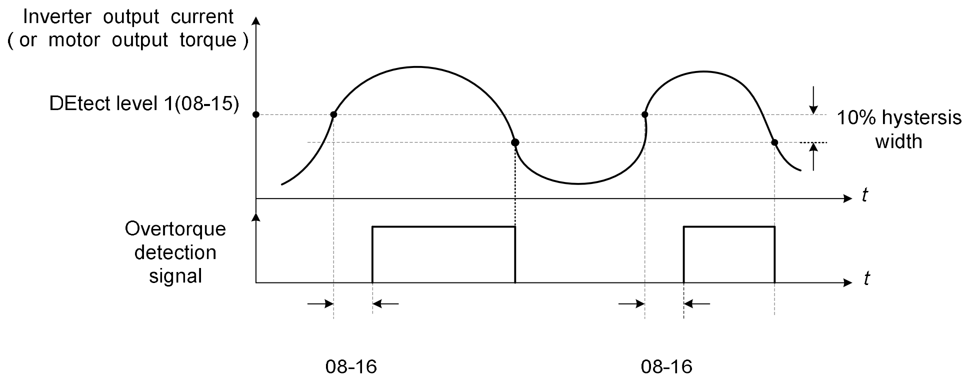


Figure 4.3.96 Overtorque Detection Operation

- Undertorque Detection Setting Example:

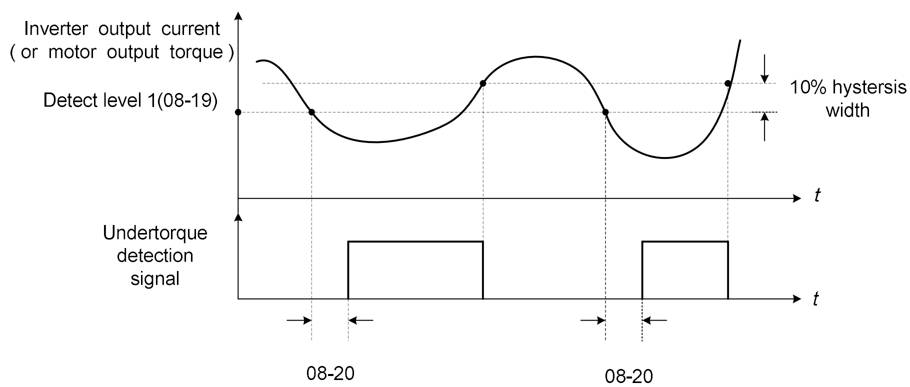


Figure 4.3.97 Undertorque Detection Operation

08- 23	Grounding failure (GF) selection
Scope	**[0]:** Disabled **[1]:** Enabled

Ground fault protection setting (08-23).

- Adjust 08-23 to enable or disable ground fault protection.
  08-23 = 0: Disables ground fault function.
  = 1: Enables ground fault function.
- If the inverter's leakage current approaches 50% of the rated output current and the ground fault function is enabled (08-23), the digital operator will display the "GF Ground Fault" (GF) fault message. The fault contact will activate, and the inverter will stop by free-run deceleration.

08- 24	External fault operation selection
Scope	**[0]:** Deceleration stop **[1]:** Free-run stop **[2]:** Continues operation
08- 25	External fault detection selection
Scope	**[0]:** Detection active immediately after power-on **[1]:** Detection active only during operation

External Fault Operation Selection (08-24):
When multifunction terminal is set to 25 for external fault and this terminal receives a signal, the stop method is determined by parameter 08-24. The stop options are as explained in parameter 07-09.
External Fault Detection Selection (08-25):
Parameter 08-25 determines under what conditions an external fault is detected.
(1) When 08-25 = 0 (detection active immediately after power-on), the inverter begins fault detection as soon as it is powered on.
(2) When 08-25 = 1 (detection active only during operation), fault detection begins only while the inverter is running.

08- 30	Safety function selection
Scope	[0]**:** Decelerates to stop **[1]:** Free-run stop

When a digital multifunction terminal is set to 58 (Safety Function), the inverter will stop according to the setting of 08-30 when the switch is opened.

08- 37	Cooling Fan Operation Selection
Scope	**[0]:** Starts when inverter is running **[1]:** Always on **[2]:** Starts when temperature is high
08- 38	Fan close delay time
Scope	【0~600】**Sec**

Fan Operation Selection (08-37):

(1) When 08-37 = 0 (fan starts during operation), the fan runs when the inverter operates. If the inverter is stopped and remains so for longer than the fan delay time (08-38), the fan will turn off.
(2) When 08-37 = 1 (fan starts immediately after power-on), the fan runs as soon as the inverter is powered on.
(3) When 08-37 = 2 (fan starts when temperature is high), the fan runs when the heat sink temperature exceeds a preset internal threshold while the inverter is operating. Once the temperature drops or the delay time (08-38) expires, the fan will shut off.

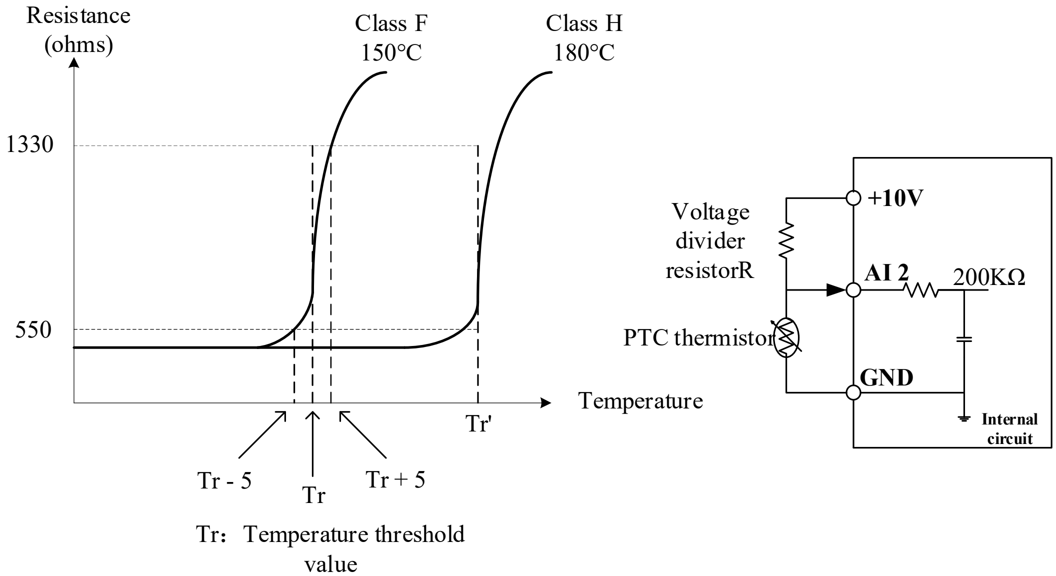
Note 1: When 08-37 = 0 (fan starts during operation), if the inverter is not running but the heat sink temperature rises too high, the fan will automatically turn on to reduce the temperature.

08 - 35	Motor overheat fault selection
Scope	[0]**:** Disabled [1]**:** Decelerates to stop [2]**:** Free-run stop [3]**:** Continues operation
08 - 36	PTC Input Filter Time
Scope	【0.00 ~ 5.00】
08 - 39	Motor overheat protection delay time
Scope	【1 ~ 300】**Sec**
08 - 42	PTC protection threshold
Scope	【0.1 ~ 10.0】**V**
08 - 43	PTC reset threshold

Scope	【0.1 ~ 10.0】V
08 - 44	PTC warning threshold
Scope	【0.1 ~ 10.0】V

Motor Overheat Protection Selection:

- This function uses a Positive Temperature Coefficient (PTC) thermistor built into the motor fan, which increases resistance with temperature, to protect the motor from overheating.
- The PTC thermistor should be connected between terminal AI2 and GND, with a voltage-dividing resistor R added, as shown in Figure 4.3.98 (b).
  (1) The inverter behavior in response to motor overheat is as follows:
  08-35 = 0: Motor overheat fault is disabled.
  08-35 = 1: Inverter decelerates to stop when motor overheats.
  08-35 = 2: Inverter performs a free-run stop when motor overheats.
  08-35 = 3: Inverter continues running despite motor overheating until the “08-42 PTC Protection Level” is reached, at which point it free-runs to stop.
  (2) When parameter 08-35 = 0, motor overheat protection is disabled.
  (3) When parameter 08-35 = 1 or 2 (stop operation when motor overheats), and motor temperature increases such that the AI2 voltage level exceeds the value set in [08-44 PTC Warning Level], and the delay time set in parameter 08-39 has elapsed, the motor overheat protection activates. The digital operator displays the fault message “OH4 Motor overheat,” and the motor either decelerates to a stop (08-35 = 1) or performs a free-run stop (08-35 = 2).
  (4) When parameter 08-35 = 3 (continue operation when motor overheats), and the AI2 voltage level exceeds the [08-44 PTC Warning Level], the digital operator displays “OH3 Motor Temp Warning,” and the motor continues running. If the AI2 level exceeds [08-42 PTC Protection Level] and the delay time set in 08-39 has elapsed, overheat protection activates and the operator displays “OH4 Motor overheat,” after which the motor performs a free-run stop.
  (5) When parameter 08-35 = 1, 2, or 3, the fault “OH4 Motor overheat” can be cleared once the AI2 voltage level drops below [08-43 PTC Reset Level].
  (6) External PTC Thermistor Characteristics (per British Standards):
  In the motor overheat protection diagram shown in Figure 4.3.98, the reference temperature (Tr) is 150°C for Class F insulation and 180°C for Class H insulation.
  Tr – 5°C: RT≦ 550Ω. Input the RT value into Equation (1) to calculate the corresponding voltage value for [08-43 PTC Reset Level].
  Tr + 5°C: RT≧1330Ω. Input the RT value into Equation (1) to calculate the corresponding voltage value for [08-42 PTC Protection Level].
  (7) For PTC thermistors of different specifications, the reference values for parameters 08-42 and 08-43 can be calculated using Equation (1).
  (8) $$V = 10 \times \frac{R_{PTC} \,//\, 200}{R + \left(R_{PTC} \,//\, 200\right)}$$ (1).
  (9) Please follow the PTC level setting rule below to avoid parameter configuration errors. [08-43 PTC Reset Level] must be less than [08-42 PTC Protection Level].



(a) PTC Thermistor Characteristics

(b) PTC Thermistor Connections

Figure 4.3.98 (a) Positive temperature coefficient (PTC) thermistor resistance vs. temperature characteristics; (b) Terminal wiring diagram

08 - 46	Temperature Reached Level
Scope	【0 ~ 254】°C
08 - 47	Temperature Reset Level
Scope	【0 ~ 254】°C

Note: The maximum value of 08-47 is limited by the value set in **08-46**.

Inverter Temperature Trigger and Reset Level Selection

- When parameter 03-11 is set to [59]:
- 08-46: When inverter temperature exceeds 08-46, the relay activates.
- 08-47: When output current is ≤ 08-47, the relay signal switches from ON to OFF.

Timing Diagram Below:

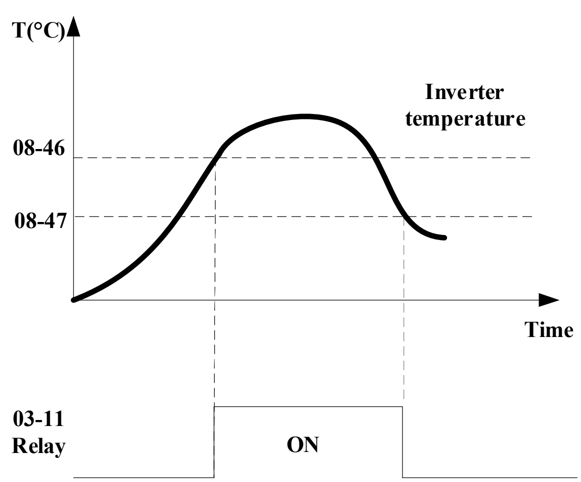


Figure 4.3.99 Inverter Temperature Trigger and Reset Detection

08 - 48	Fire mode selection
Scope	**[**0**]:** Disabled **[**1**]:** Enabled
08 - 49	Fire mode digital input type
Scope	**[**0**]**: Reset by Power-off **[**1**]**: Reset by Terminal Removal
08 - 50	Fire mode digital terminal status
Scope	**[**xxx0b**]**: S6 A-contact **[**xxx1b**]**: S6 B-contact
08 - 51	Fire mode motor rotation speed selection
Scope	**[**0**]: Fire Mode Speed** **[**1**]:PID Frequency Command** **[**2**]:AI2 Frequency Command**
08 - 52	Fire mode motor rotation speed
Scope	【0.00~100.00】**%**
08 - 59	Fire mode motor direction
Scope	**[**0**]**: Forward **[**1**]**: Reverse
08 - 60	Fire mode password
Scope	【00000 ~ 65534】

Fire Mode Selection (08-48):

- Adjust parameter 08-48 to enable or disable fire mode.

08-48 = 0: Fire mode disabled.
08-48 = 1: Fire mode enabled.

- When fire mode is enabled, terminal S6 is automatically designated as the digital input source for fire mode command (DI Function 47). Once this DI is triggered, fire mode is activated. Regardless of whether the inverter is stopped or running, the normal frequency source will be overridden by the fire mode frequency source, and the inverter will operate and output frequency accordingly. The panel will simultaneously display “FIRE”. Certain faults (see Table 4.3.35) will be masked and will not cause the inverter to stop. Except for fire mode input (DI Function 47) and external overload input (DI Function 69), all other digital inputs (DI) will be ignored. During this state, only parameter reading is allowed via communication and panel; all parameter write commands will be ignored.

Fire Mode Reset Method (08-49):

- Adjust parameter 08-49 to set the digital input type for fire mode reset.

08-49 = 0: Reset by power-off.

- Reset method: Power off, remove the external trigger signal, then power on to reset.

08-49 = 1: Reset by terminal removal.

- Reset method: No power-off required. Remove the external trigger signal and the inverter will return to normal mode. The fire mode frequency source will no longer override the normal frequency source.

Table 4.3.32 Faults masked during fire mode activation

0x2521H	Fault Descriptions
4	OH1 (Heat sink overheat)
5	OL1 (Motor overload)
6	OL2 (Frequency converter overload)
7	OT (Over-torque)
25	FB (PID feedback signal error)
26	Keypad Removed
28	CE (Communication error)
46	OH4 (Motor overheat)

0x2521H	Fault Descriptions
49	MtrSw (DI Motor Switch Fault)
58	PF (Protection fault)

! Danger:
Fire Mode: This mode is designed to ensure uninterrupted operation of the inverter. When this mode is enabled, most errors and warnings will not stop the inverter, to ensure maximum operational reliability and allow people to evacuate in a smoke-free environment. The inverter will attempt to operate until it is irreparably damaged. If the inverter is set to fire mode, the manufacturer assumes no responsibility for any resulting faults, errors, personal injuries, or damage to the inverter, its components, or any other property.

Fire Mode Digital Input Terminal State (08-50):
- Usually when using external terminals, switches need to be connected. There are different types of switches, including normally off switches and normally on switches, so pay attention when selecting because the working status of the two types of switches are different. This parameter determines whether normally open switch or normally closed switch input is required.

Each bit of parameter 08-50 represents the following:
08-50 = 0 0 0 0 0: Indicates normally open switch
s6 = 1: Indicates normally closed switch
User selects the type of switch input required
Note: Before configuring terminals for normally open/closed switches, set 08-48 = 0 to disable fire mode. Otherwise, unexpected motor operation from external terminal commands may cause injury.

Fire Mode Motor Speed Source Selection (08-51):
- Adjust parameter 08-51 to select the frequency reference for fire mode motor speed.

08-51 = 0: Frequency reference is based on parameter 08-52 (Fire Mode Motor Speed Setting).
- Set the speed as a percentage of the maximum frequency (parameter 01-02). When 08-52 = 100%, the inverter outputs its maximum frequency.

08-51 = 1: PID controller source.
- The frequency reference is based on the PID controller's output frequency command. When fire mode is activated, the PID controller's response can be adjusted using 10-47 Proportional Gain 3 (P), 10-48 Integral Time 3 (I), and 10-49 Derivative Time 3 (D).
  Refer to Group 10 for related PID controller settings.

08-51 = 2: AI2 analog input source.
- The frequency reference is based on analog input AI2. Input specification is defined in parameter 04-00 (default: 4–20 mA).

Fire Mode Motor Direction (08-59):
- Once fire mode is activated, the motor will run in the direction specified by parameter 08-59. This setting takes priority over the keypad and digital input terminals.

Fire Mode Password (08-60):
- When fire mode is enabled, users can configure a password in parameter 08-60. For password setup and removal, refer to parameter 13-07 in Group 13. To prevent unintentional modification of fire mode parameters, once a password is set in 08-60 (> 0), only parameters 08-48 to 08-60 will be visible and they will be read-only.

Note: Only one password can be set at a time—either 08-60 (Fire Mode Password) or 13-07 (General Parameter Password), not both.

08 - 53	Fire Mode PID Feedback Loss Detection Level
Scope	【0~100】%
08 - 54	Fire mode PID disconnection delay
Scope	【0.0~10.0】Sec
08 - 55	Fire mode PID disconnection action selection
Scope	**[0]:** Current speed **[1]:** Fire mode speed (08-52) **[2]:** Motor 1 maximum frequency (01-02)

When parameter 08-51 (Fire Mode Motor Speed Source Selection) is set to PID controller source, the PID feedback loss detection function will be automatically enabled, and settings 08-53 to 08-55 will be displayed.

Fire Mode PID Feedback Loss Action Selection (08-55):
08-55 = 0: The frequency reference is held at the PID controller's last output frequency at the moment of signal loss.
08-55 = 1: Frequency reference is based on parameter 08-52 (Fire Mode Motor Speed Setting).
08-55 = 2: The frequency reference switches to the maximum frequency set in 01-02 (Motor 1 Maximum Frequency).

If the PID feedback value drops below the level set in 08-53 (Fire Mode PID Feedback Loss Detection Level) and remains below this level for longer than the time set in 08-54 (Fire Mode PID Feedback Loss Delay), the inverter will continue to operate but the frequency reference will switch from the PID controller to the 08-55 setting. The output frequency will not fall below the value set in 08-52.
Refer to the timing chart below:

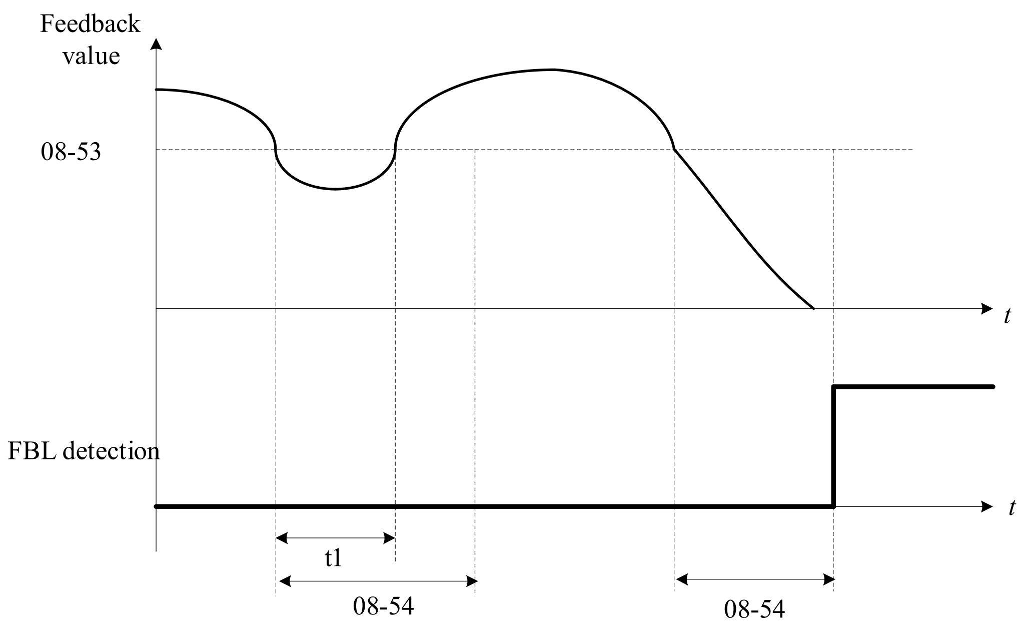


Figure 4.3.100 PID Feedback Loss Detection

Note: If no feedback signal is present and the detection level is also set to 0%, feedback loss detection will not be triggered.

08 – 56	Fire Mode AI2 Signal Loss Detection Level
Scope	【0~100】**%**
08 - 57	Fire Mode AI2 Signal Loss Delay
Scope	【0.0~10.0】**Sec**
08 - 58	Fire Mode AI2 Signal Loss Action Selection
Scope	**[0]:** Current speed **[1]:** Fire mode speed (08-52) **[2]:** Motor 1 maximum frequency (01-02)

When parameter 08-51 (Fire Mode Motor Speed Source Selection) is set to analog input AI2, the AI2 signal loss detection function will be automatically enabled, and settings 08-56 to 08-58 will be displayed.

Fire Mode AI2 Signal Loss Action Selection (08-58):
08-58 = 0: The frequency reference is held at the last output frequency of AI2 when the signal was lost.
08-58 = 1: Frequency reference is based on parameter 08-52 (Fire Mode Motor Speed Setting).
08-58 = 2: The frequency reference switches to the maximum frequency set in 01-02 (Motor 1 Maximum Frequency).

If the analog command source AI2 drops below the value set in 08-56 (Fire Mode AI2 Signal Loss Detection Level) within a 360 ms interval, the frequency reference is considered lost.
If the condition persists beyond the time set in 08-57 (Fire Mode AI2 Signal Loss Delay), the analog command source AI2 will continue to be compared with the previously sampled value recorded within the 360 ms window. Once frequency loss is confirmed, the inverter will operate based on the frequency reference set in 08-58.

Explanation of Frequency Loss Function:

When the inverter is operating and the selected analog command source AI2 signal disappears, the inverter responds according to the setting in 08-58.

The following diagram illustrates the behavior of the analog frequency command AI2 during frequency loss:

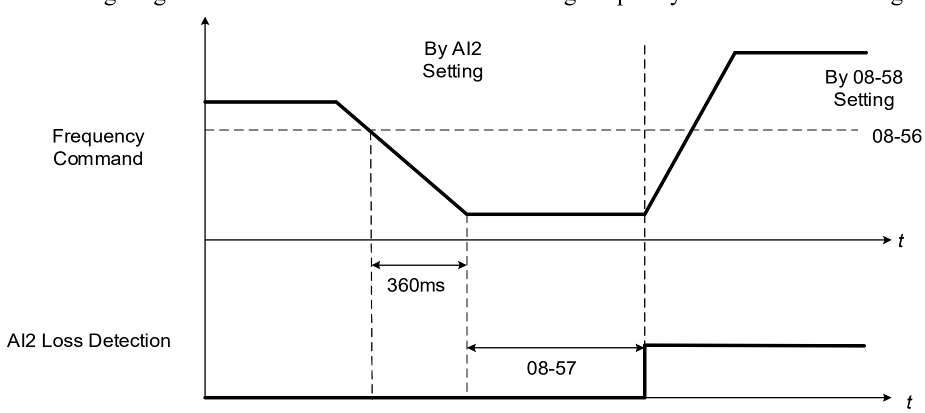


Figure 4.3.101 AI2 Frequency Reference Loss Operation

08 - 61	Capacitor maintenance setting
Scope	**[0]:** Disabled **[1]:** Enabled
08 - 65	Cooling fan maintenance setting
Scope	【0~9999】
08 - 66	IGBT maintenance setting
Scope	【0~150】

08-61 = 1: Enables capacitor lifespan monitoring.
08-65 Cooling Fan Maintenance Setting (Expected Fan Lifetime): Set the value (in units of 10 hours) to begin accumulating the inverter cooling fan's operating time.
Note: If 08-65 is set to 5000, the fan maintenance time will be calculated as 50,000 hours. The accumulated cooling fan runtime can be checked via monitoring parameter 13-51.
08-66 IGBT Maintenance Setting (Expected IGBT Lifetime): Set the expected maintenance threshold for the IGBT as a percentage value. 100% corresponds to 99,999 hours. The accumulated IGBT operating time can be checked via monitoring parameter 13-53.
Note: After replacing components or the inverter itself, be sure to restore factory settings. Failure to do so will result in continued lifespan tracking from the previous component, and the new component's lifespan will not be monitored correctly.

09 – Communication Function Group

09- 00	Inverter communication station	
Scope	【1~31】	
09- 01	Communication mode selection	
Scope	【0】 MODBUS [3] PUMP Parallel Communication	
09- 02	Serial Transmission Speed Setting **(bps)**	
Scope	【0】1200 【1】2400 【2】4800	【3】9600 【4】19200 【5】38400
09- 03	Stop bit selection	
Scope	**[0]** 1 stop bit **[1]** 2 stop bit	
09- 04	Parity bit selection	
Scope	**[0]** No parity **[1]** Even parity **[2]** Odd parity	
09- 05	Communication data bit selection	
Scope	**[0]** 8 data bits **[1]** 7 data bits	
09- 06	Communication abnormality detection time	
Scope	**[0.0~25.5]** Sec	
09- 07	Fault stop selection	
Scope	**[0]** Decelerates to stop using deceleration time 1 after communication failure **[1]** Free-run stop after communication failure **[2]** Decelerates to stop using deceleration time 2 after communication failure **[3]** Continues operation after communication failure	
09- 08	Communication fault tolerance count	
Scope	[1~20] times	
09- 09	Wait time	
Scope	【5~65】**mSec**	

- PUMP Parallel Communication Protocol
  (Refer to Group 23 for related details)
- The inverter includes a built-in Modbus (RS-485) communication port with an RJ45 connector, which can be used to monitor the inverter status, and to read and set parameters.
- Modbus communication enables the following operations, regardless of the settings for 00-05 (Reference Frequency Selection) and 00-02 (Run Command Selection):
  – Monitor operating status from a controller (PLC).
  – Set and read parameters (Note: Avoid continuous and frequent parameter writing via communication to prevent EEPROM damage).
  – Input multifunction commands.

The Modbus (RS-485) communication specifications are as follows:

Table 4.3.33 Modbus (RS-485) Communication Specifications

Item	Specifications
Interface	RS-485
Communication Cycle	Asynchronous (Start-Stop Synchronization)
Communication Parameters	Selectable Baud Rates: 1200, 2400, 4800, 9600, 19200, and 38400 bps Data Length: Fixed at 8 bits Parity Bit: Select no parity, even parity, or odd parity. Stop Bit: Fixed at 1 bit

Communication protocols	Modbus (supports both RTU and ASCII modes)
Number of Inverters	Up to 31 units.

For further details on Modbus communication, including supported function codes and related register addresses, please refer to Section CH4.5 Modbus Communication Protocol Description.

- Communication Setup with Controller
  (1) Turn off the power supply and connect the communication cable between the controller and the inverter.
  (2) Turn on the power supply.
  (3) Use the digital operator to configure the desired communication parameters (parameter [09-00]).
  (4) Turn off the power supply again and confirm that the digital operator display is completely off.
  (5) Turn the power supply back on.
  (6) Begin communication with the controller.

.

- Modbus (485) Communication Architecture
  (1) Modbus communication setup involves one master controller (e.g., PLC) and up to 31 slave inverters in a serial communication network.
  (2) The master controller connects directly to the inverter via the RS-485 interface. If the master controller does not have an RS-485 port, an RS-232 to RS-485 converter is required to connect the master controller to the inverter units.

  (3) Modbus can control up to 31 inverters using the standard Modbus communication protocol.
  · Parameter Definitions:
  (1) Inverter Station Address (09-00).
  · Sets the communication address of the inverter, with settable range from 1 - 31.
  (2) RS-485 Communication Baud Rate Setting (09-02).
  · 09-02 = 0: 1200 bps
  = 1: 2400 bps
  = 2: 4800 bps
  = 3: 9600 bps
  = 4: 19200 bps
  = 5: 38400 bps
  (3) RS-485 Communication Parity Bit Selection (Parameters (09-03, 09-04).
  ·09-03 = 0：1 stop bit
  = 1：2 stop bits
  ·09-04 = 0：No parity.
  = 1：even parity.
  = 2：odd parity.
  (4) Communication Data Bit Selection (09-05).
  ·09-05 = 0：8 bits data
  = 1：7 bits data
  (5) RS-485 Communication Error Detection Time (09-06).

  (6) RS-485 Communication Fault Stop Selection (09-07).
  = 0: Decelerate to stop using deceleration time 00-15
  = 1: Free-run stop
  = 2: Decelerate to stop using deceleration time 00-26 (emergency stop time)
  = 3: Continue running (displays a warning only; stops only when Stop key is pressed)

  (7) Communication Fault Tolerance Count (09-08).
  · The communication error message will only be displayed when the number of communication errors exceeds the value set in parameter (09-08).

  (8) Inverter Transmission Wait Time (09-09).
  · Sets the response wait time (refer to Figure 4.3.102). If a response is not received after a command is sent, additional time may be required to switch from receive mode to transmit

mode. This delay can be adjusted by setting 09-09.

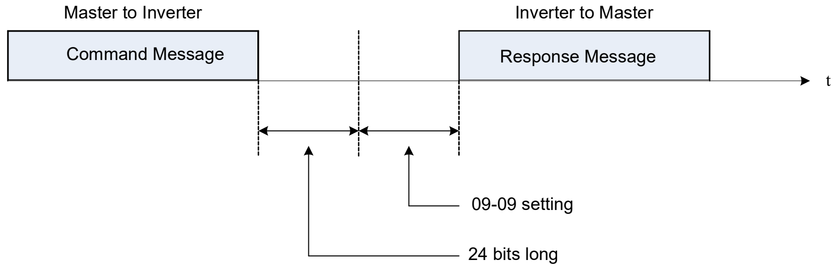


Figure 4.3.102 Message Timing Window

09- 11	Bluetooth communication selection
Scope	**[0]: Disabled** **[1]: Enabled**

- To enable Bluetooth communication, set inverter parameter 09-11 = 1 (Enabled). Afterward, even after power cycling, the inverter will automatically default to Bluetooth communication mode.

Refer to the figure below:

To disable Bluetooth communication, press the DSP/FUN button at the top right to switch to the parameter page and turn off the Bluetooth function.

- The Bluetooth app can be found by searching BT DriveLink in any app store.

09-15	Communication expansion card selection (Frame1 has no communication expansion card)
Scope	**[0]**: Disabled **[1]:** Enabled

If using an external communication expansion card, set inverter parameter 09-15 = 1.

10 – PID Function Group

10- 00	PID target value source setting	
Scope	**[0]** Assigned by PUMP function target (see Group 23) **[1]** Assigned via AI1 **[2]** Assigned via AI2 **[3]** Assigned via pulse input	**[4]** Assigned via parameter 10-02 **[5]** Reserved **[6]** Assigned via frequency command (00-05) **[8]** Assigned via panel VR

- When 10-00=0, this must be used in combination with 23-00=1 or 2 to activate PUMP function selection. Use parameter 23- 02 to set the working pressure, which acts as the PID target value.
- When 10-00 = 1 or 2, the PID target can be assigned through an analog input terminal. The signal is linearly scaled—for example, 0~10V corresponds to a 0~100% target. If 2V is applied, it represents a 20% target value.
- When 10-00 = 3, the PID target is a pulse input. The scaling and filtering of the pulse input are configured using related parameters from 03-30 (Pulse Input Scaling) to 03-34 (Pulse Input Filter Time).
- For general PID applications, set 10-00 = 4 and use parameter 10-02 to configure the PID target value.
- When 10-00 = 4, in addition to entering the percentage target via 10-02 (PID Target Value), you can monitor and adjust it from the main screen via parameter 12-38. The maximum target value can be set using 10-33 (PID Feedback Maximum Value). Decimal precision is determined by 10-34 (PID Decimal Width), and the display unit is defined by 10-35 (PID Unit).
  If 10-33 = 999, 10-34 = 1, and 10-35 = 3, and 10-02 is set to 10%, then the monitored value on the main screen (12-38) will display 9.9 PSI. Alternatively, the value can be edited directly through 12-38, but the maximum displayable value will be limited to 99.9 PSI (as constrained by the setting in 10-33).
- When 10-00 = 6, the current frequency command (main frequency reference) will be proportionally mapped to the PID target.
- When 10-00 = 8, the Keypad VR can be used to map its signal directly to the PID target.

10- 01	PID feedback value source setting
Scope	**[1]** Assigned via AI1 **[2]** Assigned via AI2 **[3]** Assigned via pulse input

Note: **10-00** and **10-01** cannot be assigned the same source. If the same value is set, the panel will display **SE05**.

10- 02	PID target value	
Scope	【0.00~100.00】%	
10- 03	PID control mode	
Scope	**[xxx0b]** PID disabled **[xxx1b]** PID enabled **[xx0xb]** PID with positive action **[xx1xb]** PID with negative action	**[x0xxb]** PID controls based on error value (D control) **[x1xxb]** PID controls based on feedback value (D control) **[0xxxb]** PID output only **[1xxxb]:** PID output + frequency command

PID Target Source Setting (10-00) / PID Feedback Source Setting (10-01)

When using AI2 as the PID target or feedback input, ensure that parameter [04-00] matches the required input type (0 V~10 V or 4 mA~20 mA). Also, switch SW2 (for standard models H & C type) or SW4 (for advanced models E & G type) on the control board to the appropriate input type (V or I). Please refer to the inverter wiring diagram for details.

PID Control Mode (10-03)

- When 10-03 is set to xxx0b, PID is disabled; when set to xxx1b, PID is enabled. The LCD operator will automatically switch: 16-00 (main screen) changes to PID Target Value (12-38); 16-01 (sub-monitor 1) changes to PID Feedback Value (12-39); 16-02 (sub-monitor 2) changes to Output Frequency (12-17). If the setting is invalid, the display will automatically revert to showing the frequency command as the main screen.

- When 10-03 is set to xx0xb, PID output is forward; when set to xx1xb, PID output is reversed. When PID output is set to reversed, if the PID input is negative, the PID output frequency increases. Conversely, when PID output is set to forward and the PID input is negative, the PID output frequency decreases.
- When 10-03 is set to x1xxb, the PID operates with derivative control based on the feedback value; when set to x0xxb, it performs standard PID control. See Figures 4.3.78 and 4.3.79 for detailed explanations.
- When set to 0xxxb, the PID output alone determines the frequency, with 100% corresponding to the frequency set in parameter 01-02. When set to 1xxxb, the PID output is combined with the frequency command. At the start of operation, the output adds a percentage of the main frequency command (as selected by 00-05/00-06), and PID control begins thereafter.

10- 04	Feedback gain	**10-14**	PID integral limit
Scope	【0.01~10.00】	**Scope**	【0.0~100.0】**%**
10- 05	Proportional gain (P)	**10-23**	PID Limits
Scope	【0.00~10.00】	**Scope**	【0.00~100.0】**%**
10- 06	Integral time (I)	**10-24**	PID output gain
Scope	【0.0~100.0】**Sec**	**Scope**	【0.0~25.0】
10- 07	Derivative time (D)	**10-25**	PID reverse output selection
Scope	【0.00~10.00】**Sec**	**Scope**	**[0]:** Reverse output not allowed **[1]:** Reverse output allowed
10- 09	PID bias voltage	**10-26**	PID target acceleration/deceleration time
Scope	【-100~100】**%**	**Scope**	【0.0~25.5】**Sec**
10- 10	PID First Delay Time		
Scope	【0.00~10.00】**%**		

Using PID Control

The PID control function, consisting of Proportional (P), Integral (I), and Derivative (D), is used to reduce the error between the target command and the actual feedback value.

PID Control Operation

The characteristics of PID control are outlined below:

- P Control: The error between the input command (target value) and the actual control value (feedback value). This error is amplified by a configurable gain (P) to reduce system error. Even with increased gain, the system may still become unstable.
- I Control: This control integrates the proportional gain (P) over time, allowing higher gain to be applied to smaller errors. Increasing the integral time (I) reduces system responsiveness.
- D Control: This control works in contrast to integral control by applying the error signal to derivative control to increase system response speed. Be aware that using this function may easily lead to system instability and must be adjusted with care.
- PID Control: By combining the best characteristics of P, I, and D control, system performance can be optimized.

Refer to Figure 4.3.103 PID Control Operation.

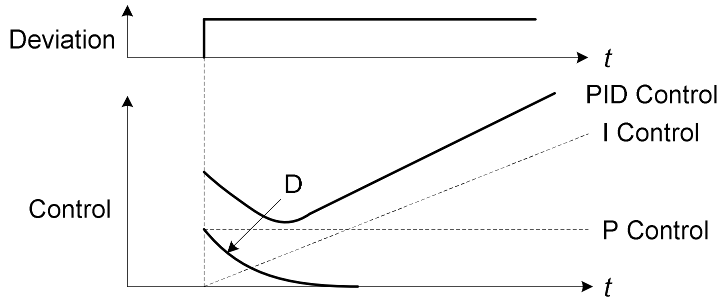


Figure 4.3.103 PID Control Operation

Types of PID Controllers

The inverter supports two types of PID control:

(a) Feedback-Derivative PID Control (when 10-03 = x1xxb)
In feedback-derivative PID control, the feedback value is differentiated. By adjusting the target value and the control logic, different responses can be achieved. PID parameters should be carefully tuned to maintain system stability. Refer to Figure 4.3.104 Feedback-Derivative PID Control.

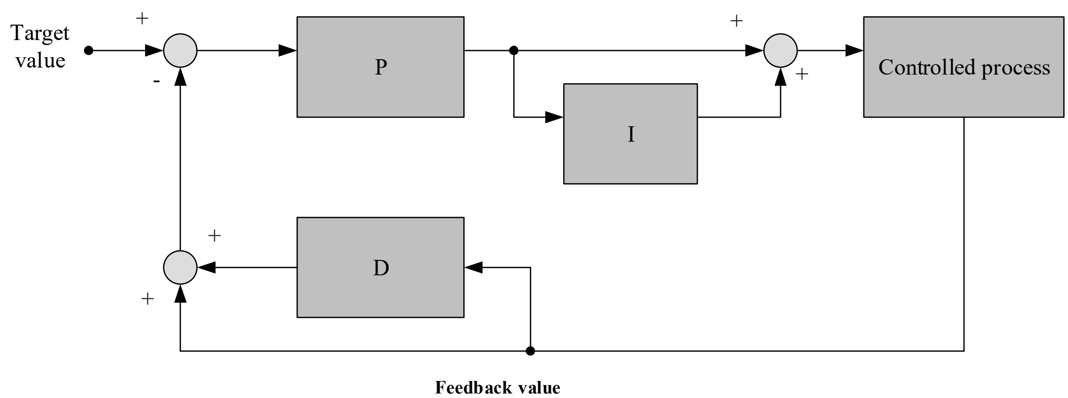


Figure 4.3.104 Feedback-Derivative PID Control

(b) Basic PID Control (when 10-03 = x0xxb)
This is the standard form of PID control. Refer to Figure 4.3.105 Basic PID Control.

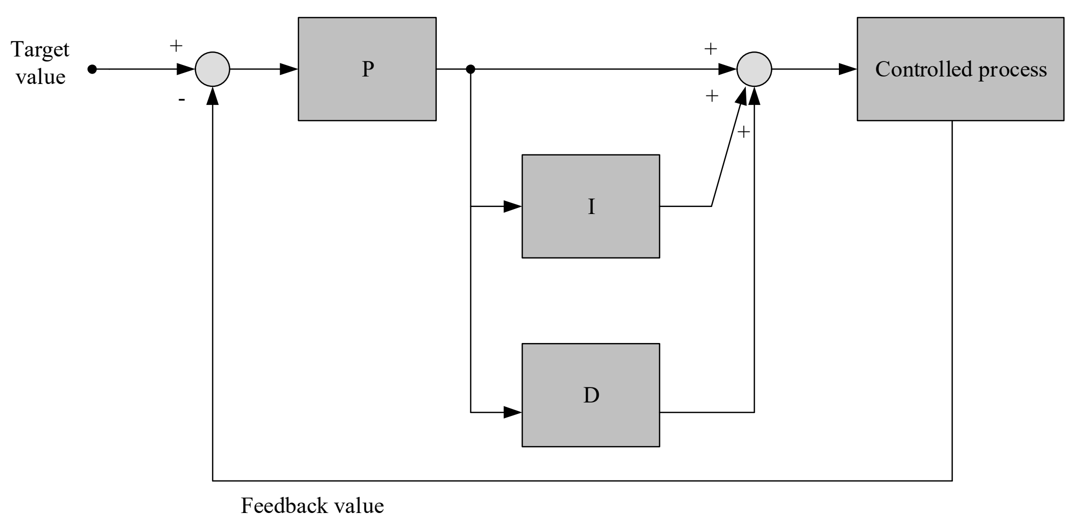


Figure 4.3.105 Basic PID Control

· PID Input Method:
To enable PID control, configure parameter 10-03 along with PID target value (10-00) and PID feedback value (10-01).

(1) PID Target Value Input Method:

· Select the input method for the PID target value using parameter 10-00 from the following options:

· 10-00 = 1: Analog input AI1 (default)
= 2: Analog input AI2
= 3: Pulse input
= 4: Assigned via 10-02
= 6: Frequency command (00-05)

(2) PID Feedback Value Input Method:

· Select the input method for the PID feedback value using parameter 10-01:

· 10-01 = 1: Analog input AI1
= 2: Analog input AI2
= 3: Pulse input

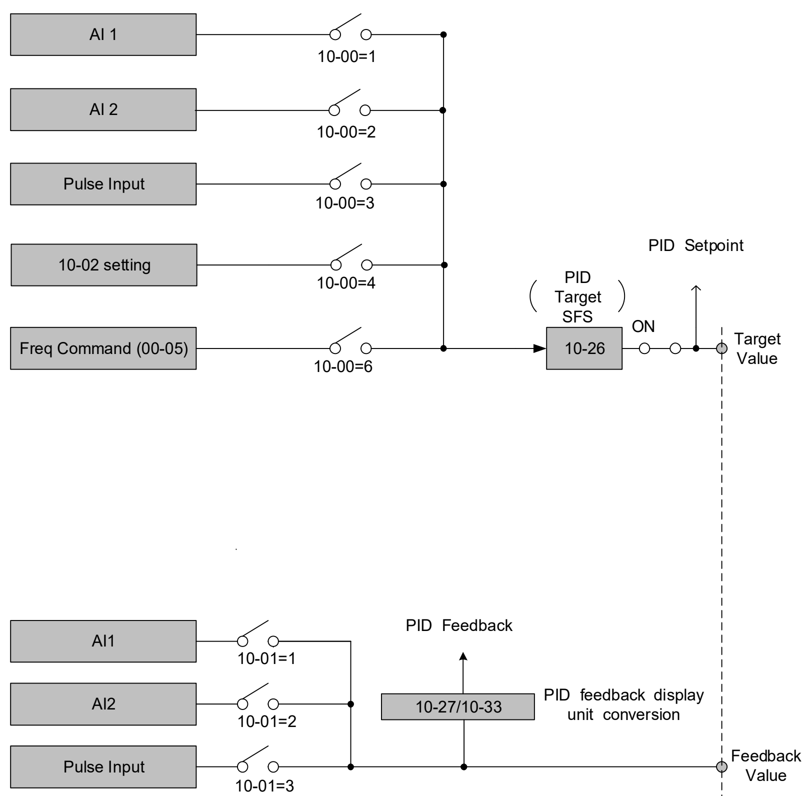


Figure 4.3.106 PID Input Method

PID Control Configuration

· PID Control Block Diagram

The following diagram illustrates the PID control block structure.

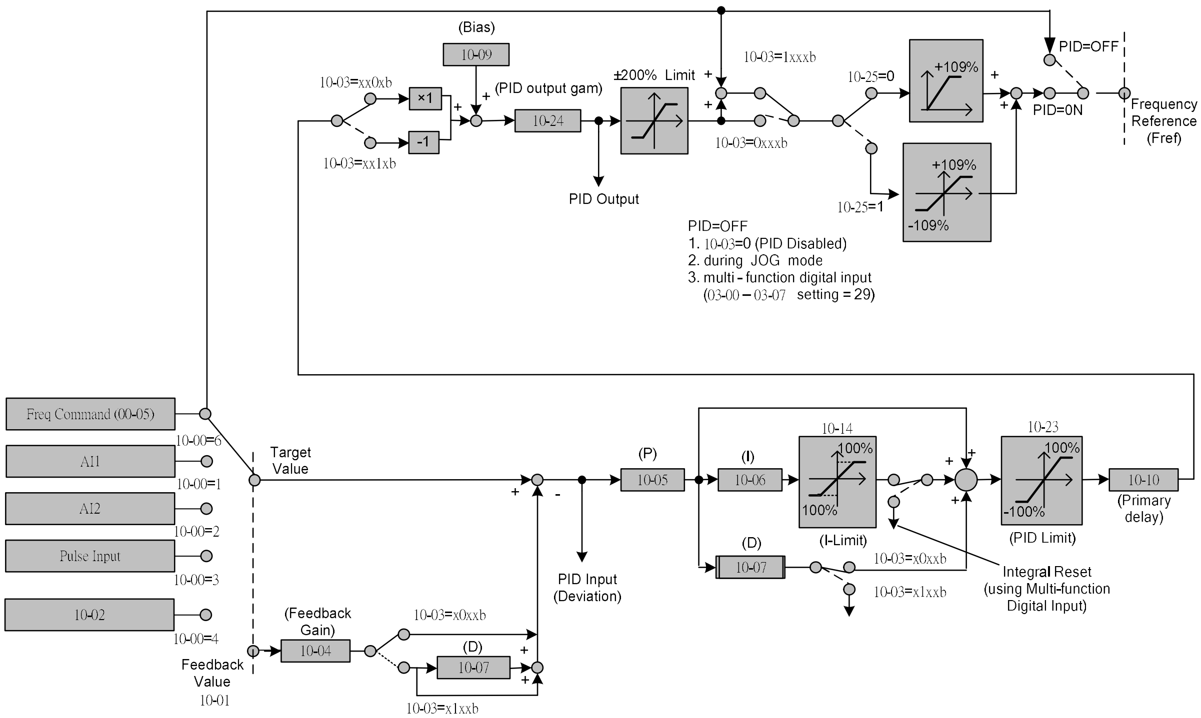


Figure 4.3.107 PID Control Block Diagram

PID Tuning Method

· Use the following procedure to start PID control:
  (1) Enable PID control (set 10-03 greater than "xxx0b").
  (2) Increase gain (10-05) as much as possible until just before oscillation occurs.
  (3) Decrease integral time (10-06) as much as possible until just before oscillation occurs.
  (4) Increase derivative time (10-07) as much as possible until just before oscillation occurs.

· The proportional (P), integral (I), and derivative (D) functions provide a usable system for closed-loop control or for adjusting variables such as pressure or temperature. Adjustment is performed by comparing the target and feedback values to generate an error signal.

· The polarity of PID output can be selected using parameter 10-03 (set to xx0xb for forward output, or xx1xb for reverse output). When PID output is set to reversed, if the PID input is negative, the PID output frequency increases. Conversely, when PID output is set to forward and the PID input is negative, the PID output frequency decreases.

· PID feedback can be adjusted via parameter 10-04 (PID Feedback Gain), and through the analog input gain and bias of the feedback source (AI1 or AI2). In PID control, parameter 10-14 (PID Integral Limit) is used to prevent excessive integral accumulation. When a sudden load change occurs, it may damage the machine or cause motor stalling. In such cases, reducing the value of 10-14 speeds up inverter response.

· Parameter 10-23 (PID Limit) prevents overshoot due to PID calculation, capping output at 100% of maximum frequency.

· Parameter 10-10 (PID Output Low-Pass Filter Time Constant) prevents load resonance or lack of stiffness during high-load resistance. If this occurs, increase the filter time beyond the resonance period. To improve inverter response, decrease the setting. · Parameter 10-09 (PID Bias) adjusts PID compensation. Increments are in 0.1% units.

· Parameter 10-24 (PID Output Gain) adjusts the compensation amount added to the frequency reference from the PID output.

· When PID output is negative, parameter 10-25 (PID Reverse Output Selection) can reverse inverter direction. However, if reverse output is disabled, PID output is limited to 0.

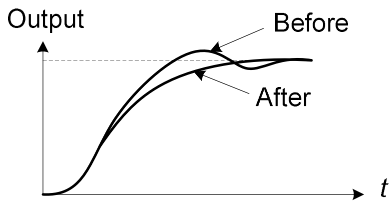
· 10-26 (PID Target SFS) sets rise/fall time for adjusting the PID target value. Inverter acceleration/deceleration is controlled by parameters 00-14~17 and 00-21~24. According to the settings of 00-14~17 to 00-21~24, use PID control when load resonance or instability occurs. If this occurs, reduce the acceleration/deceleration time (00-14~17 to 00-21~24) until the system stabilizes, and maintain the necessary acceleration/deceleration time.
  To disable this function, configure one of the multifunction digital inputs 03-00~03-07 to 36 (Disable PID Target SFS).

PID Fine Tuning

· All PID control parameters are interrelated and must be adjusted to appropriate values. Use the following procedure to tune the system to a more stable state.
  (1) Increase or decrease the proportional (P) gain until output fluctuation is minimized.
  (2) Increasing the integral (I) time, like increasing the proportional gain, reduces system stability. Therefore, the integral time should be adjusted to match the maximum usable proportional gain without compromising system stability. However, increasing the integral time will also increase system response time.
  (3) If deemed necessary, the derivative (D) time or the inverter acceleration/deceleration time can be adjusted to reduce overshoot during startup.

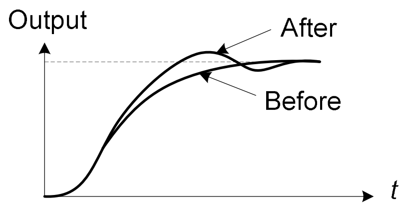
· Individual PID control parameters can be fine-tuned as follows:

(1) Reduce overshoot



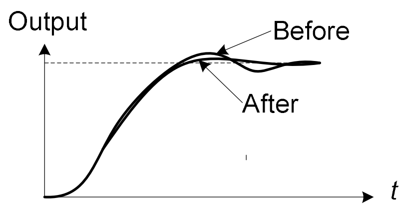
If overshoot occurs, shorten the derivative time (D) and lengthen the integral time (I).

(2) Stabilize control



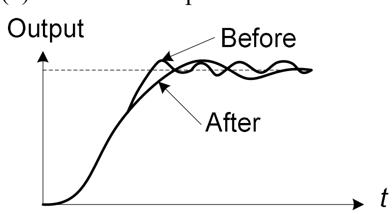
To stabilize the system quickly when overshoot occurs, shorten the integral time (I) and lengthen the derivative time (D).

(3) Reduce long-period oscillation



If periodic oscillation occurs, adjusting the integral time (I) can effectively reduce long-period oscillation.

(4) Reduce short-period oscillation



If short-period oscillation occurs, adjust both derivative (D) and proportional (P) gain to improve the response.
The derivative (D) and proportional (P) gains can be adjusted simultaneously to improve performance.

10-11	PID feedback disconnection detection
Scope	**[0]:** Disabled **[1]:** Warning **[2]:** Fault
10-12	PID feedback disconnection detection threshold
Scope	【0~100】**%**
10-13	PID feedback disconnection detection time
Scope	【0.0~10.0】**Sec**

- The PID control function provides a closed-loop control system. If the PID feedback is disconnected, the inverter output frequency may rise to the maximum frequency. Therefore, when using PID control, ensure the feedback disconnection detection feature is enabled.
- If parameter 10-11 (PID Feedback Disconnection Detection Option) is set to 1, and the feedback signal drops below the value set in 10-12 (Detection Threshold) for longer than the time set in 10-13 (Detection Time), a warning message "Pb" will appear on the digital operator, and the inverter will continue running.
- If parameter 10-11 = 2, a feedback disconnection fault message "Fb" will be displayed, the fault relay will activate, and the inverter will stop running.

- Refer to the operation timing diagram in Figure 4.3.108.

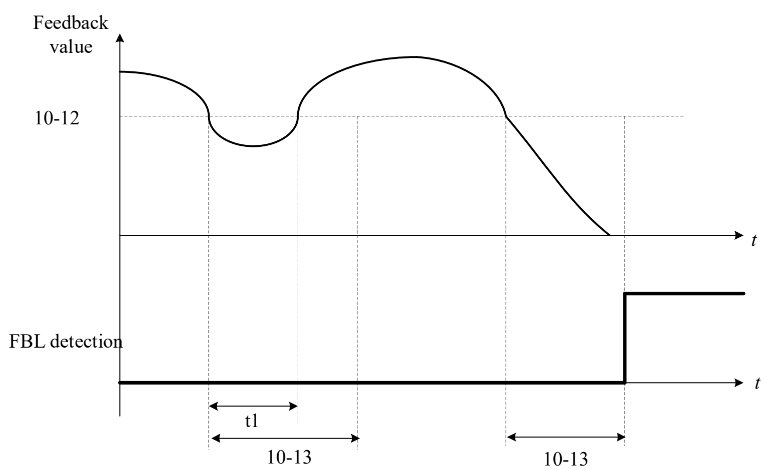
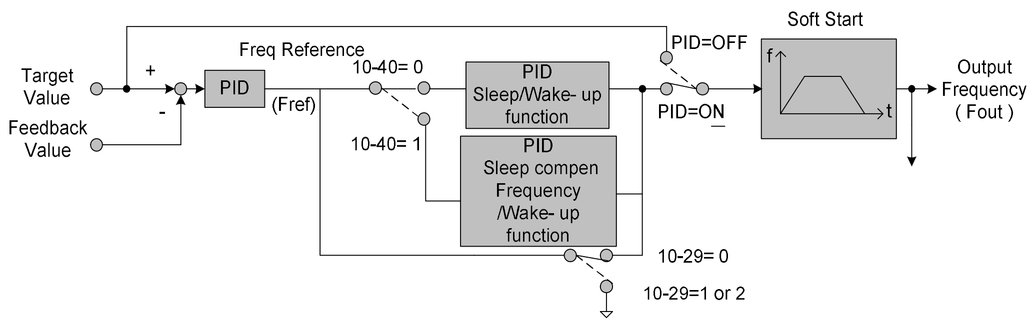


Figure 4.3.108 PID Feedback Loss Detection

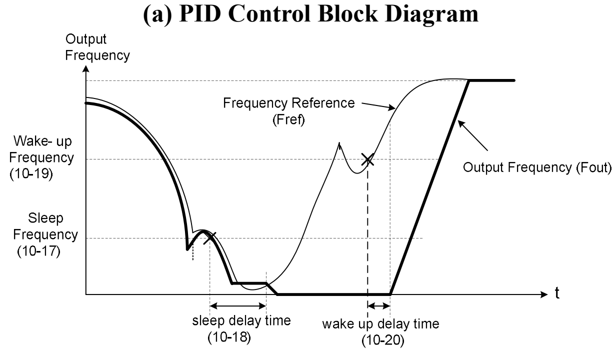
10-17	*PID sleep start frequency	10-20	PID wake-up delay time
Scope	【0.00~599.00】**Hz**	**Scope**	【0.0~255.5】**Sec**
10-18	PID sleep delay time	**10-29**	PID sleep selection
Scope	【0.0~255.5】**Sec**	**Scope**	**[0]:** Disabled **[1]:** Enabled **[2]:** Controlled via DI
10-19	*PID wake-up start frequency	**10-40**	PID forced sleep frequency operation selection
Scope	【0.00~599.00】**Hz**	**Scope**	**[0]:** Disabled **[1]:** Enabled

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

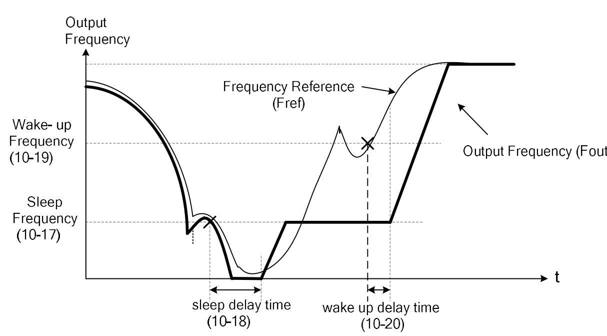
- Parameter 10-17 defines the sleep start frequency for general PID and is not shared with parameter 23-10 (Constant Pressure Sleep Frequency) used by the PUMP function.
- To improve energy efficiency, the PID sleep/wake function allows the motor to automatically start or stop
- Refer to Figure 4.3.109 PID Sleep/Wake Operation:



(a) PID Control Block Diagram



(b) PID Sleep/Wake Timing Diagram



(c) PID Sleep Compensation Frequency / Wake Timing Diagram

Figure 4.3.109 PID Sleep/Wake Operation

- If 10-40 = 0 (as shown in diagram b), when the output frequency (Fout) drops below the sleep frequency set in 10-17, the PID sleep mode timer starts. The output frequency follows the reference frequency (Fref) and decreases until it reaches the minimum frequency set in 01-08 (Fmin). After the delay time set in 10-18 (PID Sleep Delay Time) is reached, the inverter motor will gradually decelerate to a stop, and the inverter will enter sleep mode.
- If parameter 10-40 = 1 (as shown in diagram c), when the output frequency (Fout) drops below the PID sleep frequency set in 10-17, the PID sleep mode timer will activate. The output frequency will follow the reference frequency (Fref) and decrease until it reaches the minimum output frequency (Fmin) set in 01-08. Once the delay time set in 10-18 (PID Sleep Delay Time) elapses, the motor will ramp up to the sleep frequency defined in 10-17. (This is used in applications requiring a fixed frequency.)
- When the inverter enters sleep mode and stops the motor, the PID control function remains active. When the reference frequency increases and exceeds the wake frequency set in 10-19, and the delay time set in 10-20 elapses, the inverter motor will restart and ramp up to the reference frequency.

Example: If wake frequency < sleep frequency: startup will follow the sleep frequency; sleep will follow the wake frequency.
If wake frequency > sleep frequency: startup will follow the wake frequency; sleep will follow the sleep frequency.

Ex Sleep is only valid in the forward direction. If 10-25 = 1 (Allow Reverse Output), sleep must be disabled.

- **10-00** and **10-01** cannot be set to the same source. If the same value is assigned, the panel will display the “SE05” PID Selection Error message.
- If PID sleep is enabled or set via DI (10-29 = 1 or 2), and PID Reverse Output Selection (10-25) is set to 1 (Allow Reverse Output), the panel will display the “SE05” PID Selection Error message.
- If PID sleep is enabled or set via DI (10-29 = 1 or 2), and PID Control Mode 10-03 = 1xxxb (PID Output + Frequency Command), the panel will display the “SE05” PID Selection Error message.
- Use parameter 10-29 to enable/disable the PID sleep function.

10-29 = 0: PID sleep function (sleep mode) is disabled.
= 1: PID sleep behavior is controlled by parameters 10-17 and 10-18 as described above.
= 2: PID sleep mode is triggered via a multifunction digital input.

10-22	PID1/PID2 frequency switching point
Scope	【0.00~599.00】

If output frequency ≥ 10-22, PID1 (10-05~10-07) is used.
If output frequency < 10-22, PID2 (10-36~10-38) is used.

10-27	PID feedback display bias voltage
Scope	【0~9999】

· PID feedback value can be monitored via parameters. The display unit can be configured using 10-27 (PID Feedback Display Offset) and 10-33 (PID Feedback Maximum Value).
· For example, a 0–10V or 4–20mA feedback signal can be displayed as pressure. Use parameter 10-27 to set the baseline offset level for 0V or 4mA, and parameter 10-33 to define the corresponding value at 10V or 20mA.
· Refer to Figure 4.3.110 for display unit conversion.

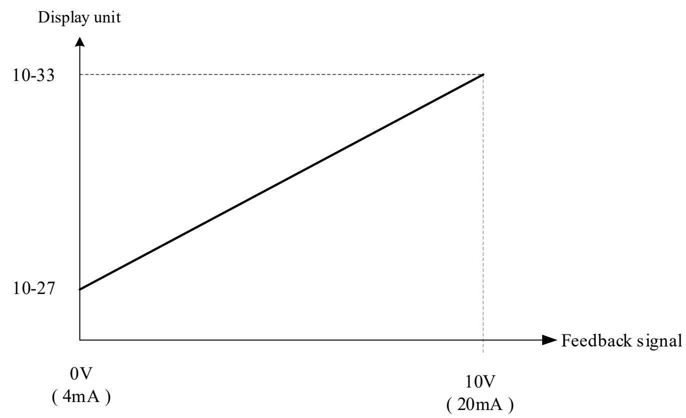


Figure 4.3.110 Display Unit Conversion

Example: Feedback signal: 0V = 0% = 1.0 PSI
10V = 100% = 20.0 PSI
Parameter settings: 10-27 = 10 (0% feedback value)
10-33 = 200 (100% feedback value)

10-30	PID target upper limit	10-31	PID target lower limit
Scope	【0 ~ 100】%	Scope	【0 ~ 100】%

The PID target value is constrained within the upper and lower limits set by these parameters.

10- 33	PID feedback maximum value	10- 34	PID decimal width	10- 35	PID unit
Scope	【1~10000】	Scope	【0~4】	Scope	【0~24】

- When 10-33**Feedback Maximum Value** is set, it becomes the 100% reference value for parameter 10-02.
- When 10-34 (PID Decimal Width) is set, it allows users to configure how values are displayed in decimal format. For example, setting it to 1 will display one decimal place (XXX.X), while setting it to 2 will display two decimal places (XX.XX).
- Parameter **10-35** (PID Unit) can be set according to user needs.

Note: When switching PID modes using the LED operator, 10-33 must be set to a value less than 1000 and 10-34 must be set to 1; otherwise, an “SE05” PID Setting Error will occur.

10- 39	PID Disconnection Output Frequency Setting
Scope	【0.00~599.00】**Hz**

When a PID feedback disconnection warning occurs, the frequency command will follow the value set in 10-39 (PID Disconnection Output Frequency Setting). Once the disconnection warning is cleared, PID control resumes as normal.

*: When the motor's maximum output frequency exceeds 300 Hz, the frequency resolution is 0.1 Hz.

10- 08	AI1 frequency limit	10- 16	PID change scale
Scope	【0.00~599.00】**Hz**	**Scope**	【0~100】
10- 15	PID change mode	**10- 41**	PID mode switch
Scope	【0~2】	**Scope**	**[0]:**Standard PID **[1]:**D-type PID

Signal Input Type and Processing:
When parameter 10-41 is set to 1 (D-type PID), external input signals can be proportionally converted, so that their minimum and maximum values correspond to the desired speed limits.

Corrected Signal Control Diagram:

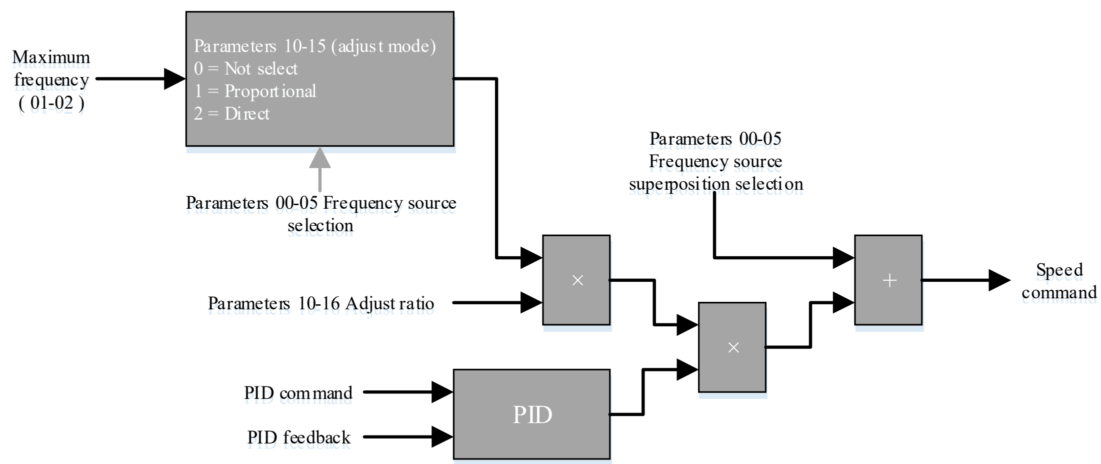


Figure 4.3.111 Corrected Signal Control Diagram for Input Signals

- Use the following procedure to activate D-type PID control:
  (1) 10-03: Set PID Control Mode to 1001b.
  (2) 10-00: Set PID Target Source to 4 (set via 10-02).
  (3) 10-01: Set PID Feedback Source to 2 (AI2).
  (4) 00-05: Set Primary Frequency Command Source to 1 (external analog input AI1).
  (5) 10-29: Set PID Sleep Selection to 0 (disabled).
- The maximum frequency is limited by parameter 10-08.
- Whether reverse is allowed is determined by parameter 10-25 (Reverse Output Restriction).
- Whether to superimpose the frequency source from 00-05 depends on the most significant bit of the value set in 10-03.
- PID controller responsiveness can be adjusted using 10-36: PID2 Proportional Gain; 10-37: PID2 Integral Time; 10-38: PID2 Derivative Time.
- When parameter 10-15 (PID Variation Mode) is set to 1 (Proportional), the PID correction multiplier is calculated by multiplying the ratio of the Maximum Frequency (01-02) to the Base Frequency (01-12) by the frequency from the source defined in 00-05, and then multiplying the result by 10-16 (PID Scaling Factor).
- When parameter 10-15 (PID Variation Mode) is set to 0 (Direct), the correction multiplier for PID is calculated by multiplying parameter 10-16 (PID Scaling Factor) by the Maximum Frequency (01-02).

10- 47	Proportional gain 3 (P)	10- 48	Integral time 3 (I)	10- 49	Derivative time 3 (D)
Scope	【0.00~10.00】	**Scope**	【0.0~100.0】**Sec**	**Scope**	【0.00~10.00】**Sec**

- For descriptions of Fire Mode PID functions, please refer to the Fire Mode features in Group 08.

11 – Auxiliary Function Group

11- 00	Motor direction locking command
Scope	**[0]:** Forward and reverse allowed **[1]:** Forward only **[2]:** Reverse only

- If the motor rotation direction is set to 1 or 2, the motor will only run in the specified direction and will not accept commands in the opposite direction.
- Forward or reverse commands can be given via control terminals or the LED digital keypad.
- This parameter is suitable for applications involving pumps or fans that rotate in reverse.

11- 01	Carrier frequency
Scope	**【2~16】:**2~16 KHz

① When 11-01 = 2 to 16, the PWM carrier frequency is set in kHz.
② In SLV and SV modes, the minimum value for 11-01 is 2. Due to sampling rate, a setting of 4 kHz is recommended, and motor cable length should ideally be within 100 meters.
③ The available setting range depends on the inverter capacity (13-00).

When the carrier frequency is set low, motor noise increases, but RFI, EMI, and leakage current are reduced. Refer to Table 4.3.34 for carrier frequency effects.

Table 4.3.34 Carrier Frequency Effects

Carrier frequency	1KHz--6KH—10KHz—16KHz
Motor Noise	High -------------- Low
Output Current Waveform	Poor ------- Good ----- Poor
Interface Noise	Low ---------------- High
Leakage Current	Low ---------------- High
Heat Loss	Low ---------------- High

- The available range and default value for this parameter depend on inverter capacity. Please refer to Chapter 3 – Factory Default Specifications for the maximum selectable limit of this parameter.
- Inverters with lower capacity can support higher carrier frequencies. Refer to Chapter 3 – Derating Curve.
- Lowering the setting reduces motor loss and temperature; increasing it will result in greater loss and heat.
- If the cable length between the inverter and the motor is too long, high-frequency leakage current may increase inverter output current and interfere with peripheral equipment. To avoid such conditions, adjust the carrier frequency according to Table 4.3.35.

Table 4.3.35 Cable Length and Carrier Frequency

Cable Length	< 30 meters	30 meters – 50 meters	50 meters – 100 meters	> 100 meters
Carrier frequency (11-01 setting value)	Maximum 16 kHz (11-01 = 16 kHz)	Maximum 10 kHz (11-01 = 10KHz)	Maximum 5 kHz (11-01 = 5KHz)	Maximum 2 kHz (11-01 = 2KHz)

- A larger energy-saving coefficient (11-24) results in a higher output voltage.

11- 02	Soft modulation selection
Scope	**[0]:** Disabled **[1]:** Soft Modulation 1 **[2]:** Soft Modulation 2

Set 11-02 = 1 to enable Soft Modulation 1, which improves motor noise quality. Soft modulation control can reduce the metallic sound generated by the motor, making it more comfortable to the human ear, while also minimizing RFI noise. The factory default setting has soft modulation disabled. When Soft Modulation 1 is enabled, the maximum carrier frequency is limited to 8 kHz.

Set 11-02 = 2 to enable Soft Modulation 2. Users can adjust it according to acoustic preferences via 11-66 (Modulation Mode Switching Frequency), 11-67 (Soft Modulation 2 Detection Range), and 11-68 (Soft

Modulation 2 Detection Start Frequency).

11- 66	Modulation mode switching starting frequency
Scope	**【6.00~60.00】**

Modulation Mode Switching Start Frequency (11-66): When the inverter output frequency exceeds the value set in parameter 11-66, the modulation mode will switch.

11- 67	Soft modulation 2 detection range
Scope	**【0~12000】**
11- 68	Soft modulation 2 detection starting frequency
Scope	**【6.00~60.00】**

When the inverter output frequency exceeds the value set in parameter 11-68, the noise detection function is triggered. Based on the value of 11-67, the electromagnetic noise generated during motor operation is adjusted accordingly.
Note: When Soft Modulation is set to 11-02 = 2, it cannot be enabled simultaneously with Estimator Mode 22-26 and Speed Search Mode Selection 07-32. Please verify the status of these two parameters.

Note: When 11-02 = 2, the total value of parameters 11-01 and 11-67 must not exceed the carrier frequency upper limit of the inverter model. To ensure proper operation, the following interlock mechanisms apply:

- If a parameter setting error occurs while configuring 11-01, and 11-02 = 2 with 11-01 + 11-67 > the model's carrier frequency upper limit, adjust either 11-02 or 11-67 to an appropriate value first.
- If a parameter setting error occurs while configuring 11-67, and 11-02 = 2 with 11-01 + 11-67 > the model's carrier frequency upper limit, adjust either 11-02 or 11-01 to an appropriate value first.
- If a parameter setting error occurs while configuring 11-01 or 11-67 under the condition 11-02 = 2, check whether the attempted combination exceeds the carrier frequency upper limit (i.e., 11-01 + 11-67 > model limit).
- If a parameter setting error occurs while attempting to set 11-02 = 2, it indicates that the sum of 11-01 and 11-67 exceeds the carrier frequency limit for the inverter model. Adjust 11-01 or 11-67 to a suitable range before setting 11-02 = 2.

11- 03	Automatic carrier reduction selection
Scope	**[0]:** Disabled **[1]:** Enabled

If the inverter's internal protection detects overheating, the carrier frequency will automatically decrease. Once the temperature returns to normal, the carrier frequency will automatically return to the value set in parameter (11-01).

(1). 11-03 = 0
When the automatic carrier frequency adjustment function is disabled, the carrier frequency operates according to the value set in 11-01.

(2). 11-03 = 1
When the automatic carrier frequency adjustment function is enabled, if the heat sink temperature exceeds the set value, the inverter will automatically reduce the carrier frequency to minimize heat loss and prevent tripping due to overheating. This also helps extend the service life of the inverter.

11- 04	Acceleration start S curve time setting
11- 05	Acceleration end S curve time setting
11- 06	Deceleration start S curve time setting

11- 07	Deceleration end S curve time setting
Scope	【0.00~2.50】**Sec**

Using S-curve characteristics for acceleration and deceleration helps reduce mechanical shocks generated at the start or stop of load operation. For the E710 inverter, the S-curve times can be set independently for acceleration start (11-04), acceleration end (11-05), deceleration start (11-06), and deceleration end (11-07). The relationship between the parameters is illustrated in Figure 4.3.112.

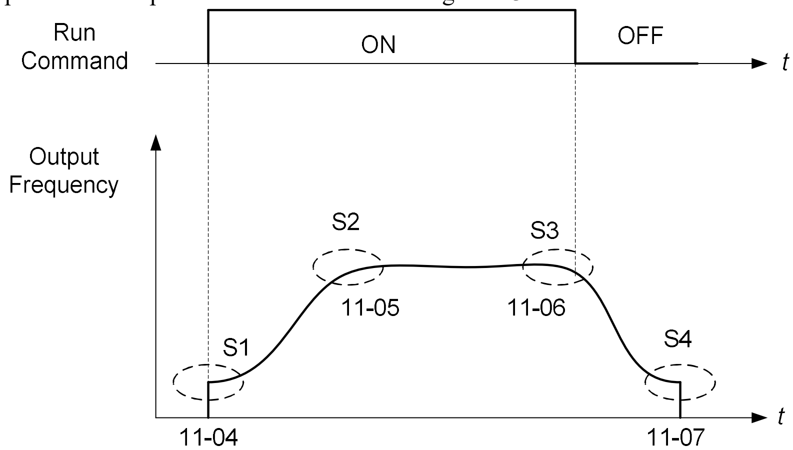


Figure 4.3.112 S-Curve Characteristics

- After setting the S-curve times, the acceleration and deceleration characteristics are as follows:
- Acceleration Time = Acceleration Time 1 (or 2) + $\frac{(11\text{-}04) + (11\text{-}05)}{2}$
- Deceleration Time = Deceleration Time 1 (or 2) + $\frac{(11\text{-}06) + (11\text{-}07)}{2}$

11- 08	Jump frequency 1
11- 09	Jump frequency 2
11- 10	Jump frequency 3
Scope	【0.0~599.0】**Hz**
11- 11	Jump frequency width
Scope	【0.0~25.5】**Hz**

- These settings allow for designated "jump" frequencies within the output frequency range of the inverter, enabling the motor to operate without interference from mechanical system resonance.
- Within the jump frequency range, operation is prohibited; however, frequency increase/decrease during acceleration and deceleration is continuous and does not skip.
- To disable this function, set Frequency Jump Points 1–3 (11-08 to 11-10) to 0.0 Hz.
- For Frequency Jump Points 1–3 (11-08 to 11-10), the center frequencies can be designated as jump frequencies.
- For parameter 11-11, set the frequency jump width. The jump range is defined as: Jump Frequency ± Frequency Jump Width.
- The relationship between output frequency and jump frequencies is shown in Figure 4.3.113.

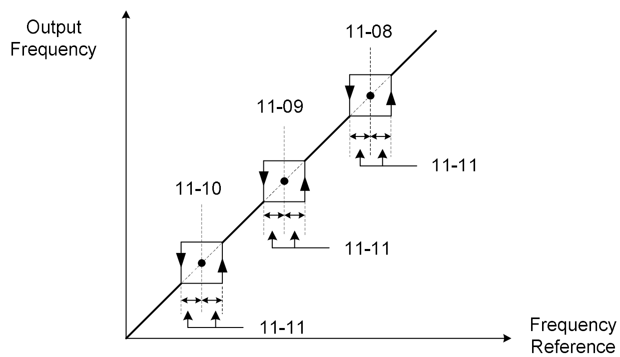


Figure 4.3.113 Frequency Jump Operation.

- When parameter 04-05 (Multi-function Analog Input AI2 Function Selection) is set to 9 (Jump Frequency Setting 4), a fourth jump frequency point can be configured. For Jump Frequency Setting 4 operation, refer to Figure 4.3.66.
- When the configured jump speeds overlap, the total is treated as a combined jump frequency range. Refer to Figure 4.3.114.

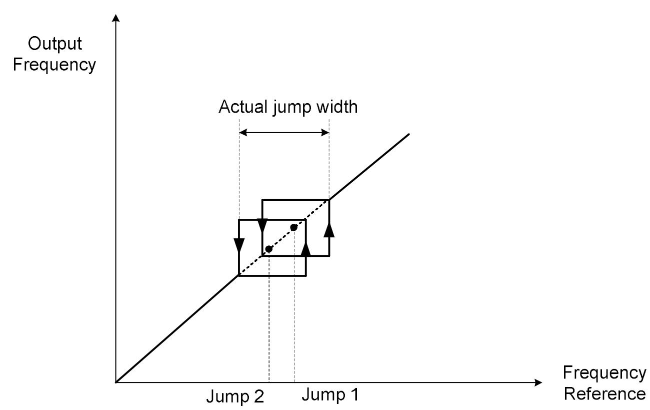


Figure 4.3.114 Overlapping Jump Frequencies

11- 13	Automatic return time
Scope	**【0~120】Sec**

- If no key is pressed on the digital operator within the time set in parameter 11-13 (Auto Return Key Time), the digital operator will automatically return to the main mode screen.
- When set to 0, the auto return function is disabled. Pressing the return key returns to the previous menu.

11- 12	Manual energy-saving gain
Scope	【0~100】**%**
11- 18	Manual energy-saving frequency
Scope	【0.0~599.0】**Hz**

- When the manual energy-saving command is activated via multi-function digital input (03-00 to 03-07 = 20), the Manual Energy Saving (MES) control function starts.
- When operating under light load, the inverter reduces output voltage to achieve energy saving. Therefore, under general load conditions, the manual energy-saving command should be turned off.

(1) Manual Energy Saving Gain (11-12)

· When the manual energy-saving command is input, parameter 11-12 determines the inverter output voltage.

· When MES control is turned on or off, the voltage recovery time (07-23) depends on the change ratio of the output voltage.

(2) Manual Energy Saving Frequency (11-18)

· When the reference frequency exceeds 11-18 and the motor speed is within the allowable range, the manual energy saving command is activated. Refer to Figure 4.3.115 Manual Energy Saving Operation.

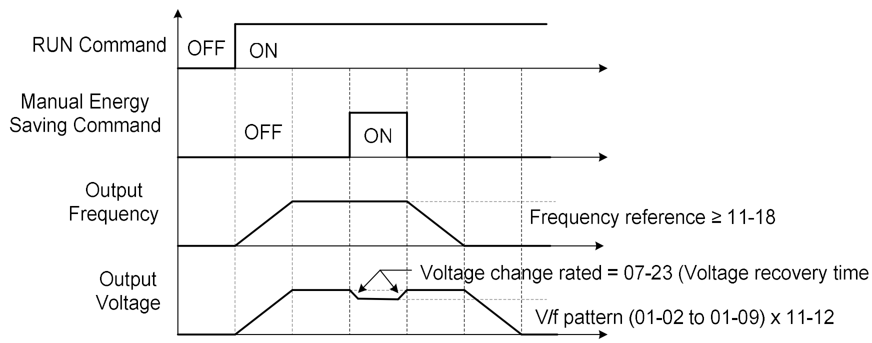


Figure 4.3.115 Manual Energy Saving Operation.

11- 19	Automatic energy-saving function	**11- 22**	Energy-saving adjustment time
Scope	**[**0**]:** Auto Energy Saving Disabled **[**1**]:** Auto Energy Saving Enabled	**Scope**	【0~5000】**mSec**
11- 20	Automatic energy-saving filter time	**11- 23**	Energy-saving detection threshold
Scope	【0~200】**mSec**	**Scope**	【0~100】**%**
11- 21	Energy-saving adjustment voltage upper limit	**11- 24**	Automatic energy-saving coefficient
Scope	【0~100】**%**	**Scope**	【0.00~655.34】

- In V/F control mode, the automatic energy saving function (AES) automatically adjusts the optimal output voltage based on the load, reducing inverter output current, and the output power varies proportionally with the load. When the load exceeds 70%, energy saving is minimal; as the load decreases, energy saving increases.
- The parameters of the automatic energy saving function are pre-configured at the factory and typically do not require adjustment. If the motor characteristics differ significantly from TECO's standards, adjust the parameters as follows:

(1) Auto Energy Saving Control Mode (11-19)
Enable auto energy saving by setting 11-19 to 1.

(2) Auto Energy Saving Filter Time (11-20)
Sets the output filter time for the AES function. Typically does not require adjustment.

(3) AES Tuning Parameters (11-21 to 11-22)
In AES Control Mode, the optimal voltage is calculated based on the load power demand. However, the calculated value may vary due to temperature and motor characteristics. In some cases, the optimal voltage must be adjusted accordingly. To obtain the optimal voltage, configure the following AES tuning parameters:

a. AES Tuning Voltage Limit (11-21)
· Sets the voltage limit range during tuning.
· Configure corresponding ranges for 220V and 440V models (100% = 220V or 440V).
· Close tuning operation.
· Refer to Figure 4.3.116.

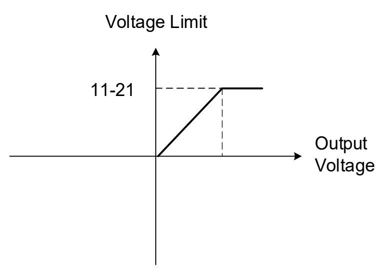


Figure 4.3.116 Voltage Limit for Tuning Operation.

b. AES Tuning Control Cycle Time (11-22)
· Time constant for detecting output power.
· When load variation is high, reduce the setting of 11-22 to improve response.
· If the load becomes lighter and 11-22 is set too low, the motor may become unstable.

(4) Energy Saving Detection Level (11-23)
When output power variation is less than the detection level, energy saving efficiency improves.

(5) Energy Saving Coefficient (11-24).
· Calculates the optimal value when motor efficiency is maximized; the result is used as a voltage reference.
· The factory sets 11-24 based on the matching capacity of the motor and inverter. If the motor capacity differs, adjust parameter 13-00 (Motor Rated Output Power) and fine-tune 11-24 to reach the minimum required output voltage.
· A larger energy-saving coefficient (11-24) results in a higher output voltage.

11- 29	Automatic output frequency reduction selection
Scope	**[0]:** Disabled **[1]:** Enabled

If the inverter detects excessive internal temperature and the automatic carrier frequency adjustment is not enabled (11-03 = 0), or is enabled (11-03 = 1) but the carrier frequency has already dropped to its minimum value, the inverter will automatically reduce the output frequency by 30% of its rated speed.

(1) 11-29=0: Automatic output derating function is disabled. Carrier frequency follows 11-01 or 11-03 settings.

(2) 11-29=1: Automatic output derating function is enabled. When the heatsink temperature is too high, the output frequency will be reduced to 70% of the rated speed.

11- 28	Over-voltage prevention 2 frequency gain	**11- 37**	* Over-voltage prevention frequency limit
Scope	【1~200】**%**	**Scope**	【0.00~599.00】**Hz**
11- 33	DC voltage filter rise rate	**11- 38**	Over-voltage prevention deceleration start voltage
Scope	**[0.1~10.0]**V	**Scope**	**200V :【200~400】V** **400V :【400~800】V**
11- 34	DC voltage filter drop rate	**11- 39**	Over-voltage prevention deceleration stop voltage
Scope	【0.1~10.0】**V**	**Scope**	**200V :**【300~400】**V** **400V :**【600~800】**V**
11- 35	DC voltage filter dead zone threshold	**11- 40**	Over-voltage prevention selection
Scope	【0.0~99.0】**V**	**Scope**	**[0]:** Disabled **[1]:** Over-voltage Prevention Mode 1 **[2]:** Over-voltage Prevention Mode 2 **[3]:** Over-voltage Prevention Mode 3 **[4]:** Over-voltage Prevention Mode 4
11- 36	Over-voltage prevention frequency gain		
Scope	【0.000~1.000】		

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

Over-voltage suppression can be used in applications where energy feedback into the inverter is likely.

Example: In stamping applications, there are two scenarios that cause excessive energy feedback into the inverter.

(1) When the cam clutch is disengaged, the motor accelerates and drives the flywheel. As the motor decelerates, the large inertia of the flywheel causes it to spin faster than the motor, feeding energy back into the inverter.

(2) When the cam clutch is engaged, the motor drives the flywheel and compresses the spring. Once the cam passes its peak, the spring releases energy to the flywheel, generating excessive feedback into the inverter.

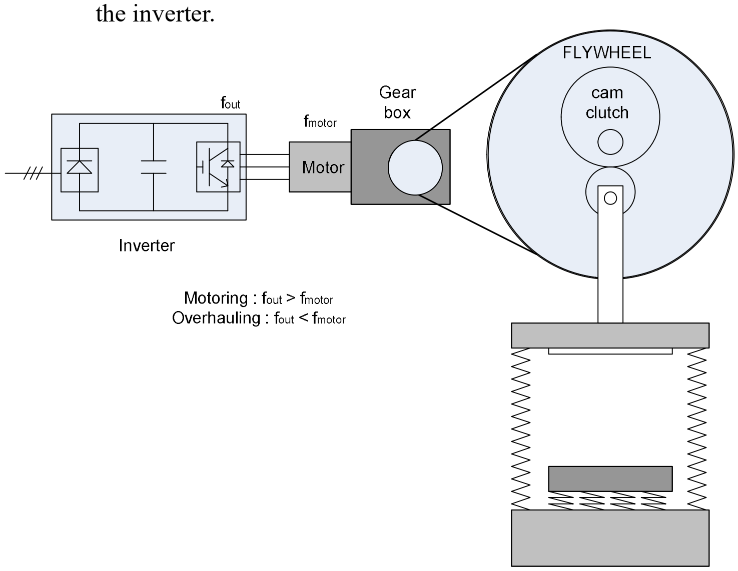


Figure 4.3.117 Stamping Operation

The over-voltage protection (OVP) function monitors and adjusts energy feedback by modifying motor acceleration/deceleration rates. When speed reference is decreased, the motor begins to decelerate. Conversely, if the frequency is fixed and regenerative energy is detected, the inverter accelerates the motor to reduce the regenerated voltage.

Refer to Figure 4.3.119 Over-voltage Protection (OVP) Operation.

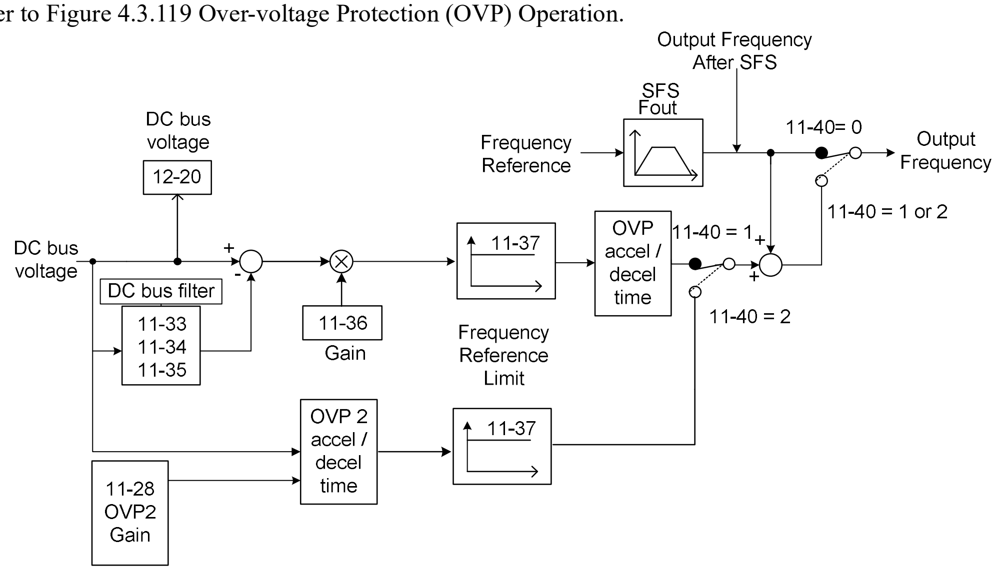


Figure 4.3.118 OVP Operation

When 11-40 is set to Over-voltage Prevention Mode 1

1) A DC voltage filter provides a stable reference value to determine voltage variation during energy regeneration.
   · 11-33 (DC Voltage Filter Rise Rate) adjusts the filter's gain. When the DC voltage exceeds 11-33 + 11-35 (DC voltage filter deadband), the filter output increases.
   · 11-34 (DC Voltage Filter Fall Rate) adjusts the rate of descent of the DC voltage filter. When the DC voltage drops below 11-33 + 11-35 (DC voltage filter deadband), the filter output decreases.
   · 12-20 (DC Voltage Filtered Value) allows monitoring of the filtered DC voltage output.
   · The fall rate of the DC voltage filter can be set faster than the rise rate. For example, by setting 11-34 higher than 11-33.
2) When the inverter is running and the frequency reference is fixed, the OVP function monitors excessive DC voltage.
   · The excessive DC voltage is multiplied by 11-36 (OVP Frequency Gain) and converted into a frequency, causing the inverter to accelerate and suppress regenerative energy.

   · When regenerative energy decreases, the inverter output returns to the input frequency reference, and the deceleration rate is determined by the DC voltage, as shown in Figure 4.3.120.

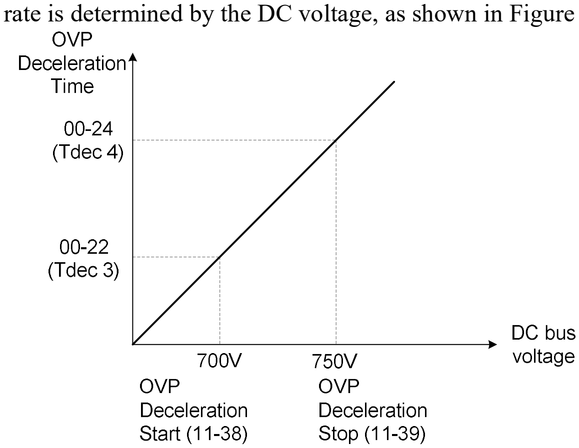


Figure 4.3.119 OVP Deceleration Timing

3) When the inverter is stopped, the deceleration rate is determined by 00-15 (Tdec1). If DC voltage is too high, the inverter decelerates based on the OVP deceleration timing shown in the above Figure 4.3.120.
· 11-38 (OVP Deceleration Start Voltage) defines the starting voltage for OVP deceleration, and 00-22 (Tdec3) sets the low deceleration slope.
· When the DC voltage rises to this level, immediate and faster deceleration is necessary to prevent large fluctuations in DC voltage.
· When the DC voltage reaches 11-39 (OVP Deceleration Stop Voltage), the inverter decelerates according to the value set in 00-24 (Tdec4).
· The deceleration slope transitions linearly between the starting point (11-38) and the stopping point (11-39).

4) The OVP function can be enabled or disabled via parameter 11-40. When the OVP function is enabled (11-40 = 1 or 2), the following parameters are changed to new default values:
00-14 (Tacc1) = 5.0 sec (acceleration rate when DC voltage is high)
00-22 (Tdec3) = 20.0 sec (lower deceleration slope for OVP)
00-24 (Tdec4) = 100.0 sec (upper deceleration slope for OVP)

11-04 = 0.0 Sec
11-05 = 0.0 sec
11-06 = 0.0 sec
11-07 = 0.0 sec
(S-curve must be disabled when OVP is enabled)

When 11-40 is set to Over-voltage Prevention Mode 2, its operation is the same as Mode 1 but enhances the response when the DC BUS voltage exceeds 11-39 (OVP Deceleration Stop Voltage) shown in Figure 4.3.120. By increasing 11-28 (OVP Mode 2 Frequency Gain), the system accelerates frequency compensation to prevent over-voltage (OV) faults.

When 11-40 is set to Over-voltage Prevention Mode 3, the inverter avoids OV by temporarily increasing output frequency. This frequency will not exceed Motor 1's maximum output frequency, so please adjust 01-02 (Motor 1 Max. Output Frequency) according to your application.
Adjustment Method
If OV still occurs in Over-voltage Prevention Mode 3, increase 11-64 in increments of 0.1.

11- 64	Acceleration/Deceleration Adjustment Gain
Scope	【0.1~10.0】
11- 65	Target main circuit voltage
Scope	**200V :[**200~400**] V** **400V :[**400~800**] V**

If the value of 11-64 is too large, it will increase speed and current ripple.
11-65 defines the target voltage for Over-voltage Prevention Mode 3 and should be set to suppress voltage within the specified level as much as possible.

11- 41	Reference frequency loss detection selection
Scope	**[0]:** Decelerate and stop when reference frequency is lost **[1]:** Operate according to the setting of 11-42 when reference frequency is lost
11- 42	Frequency command when the reference frequency is lost
Scope	【0.0~100.0】**%**

- If the main frequency command drops by 90% within 360 ms, it is considered a reference frequency loss.
- When 11-41 is set to 1, the main frequency command is continuously compared to the value within the preceding 360 ms. Once the loss is confirmed, the inverter estimates the current frequency command using the following formula:

  Frequency command after disconnection = Motor 1 Max. Output Frequency (01-02) × 11-42

- Explanation of Frequency Loss Function:
  When the inverter is running and the selected analog frequency command source is lost, the command will follow the proportion set in 11-42. Once the reference command returns to the pre-disconnection level, the inverter will resume its previous state.

- Note: 1. The frequency command when reference frequency is lost (11-42) corresponds to Motor 1 Max. Output Frequency (01-02).
  2. This function currently only applies when 00-05 (Primary Frequency Command Source) is set to analog signal (selection 1: AI1 or 7: AI2).
- Refer to the diagram below (Figure 4.3.121) for the behavior of multi-function digital outputs (03-11~03-12) when the analog frequency command is lost.

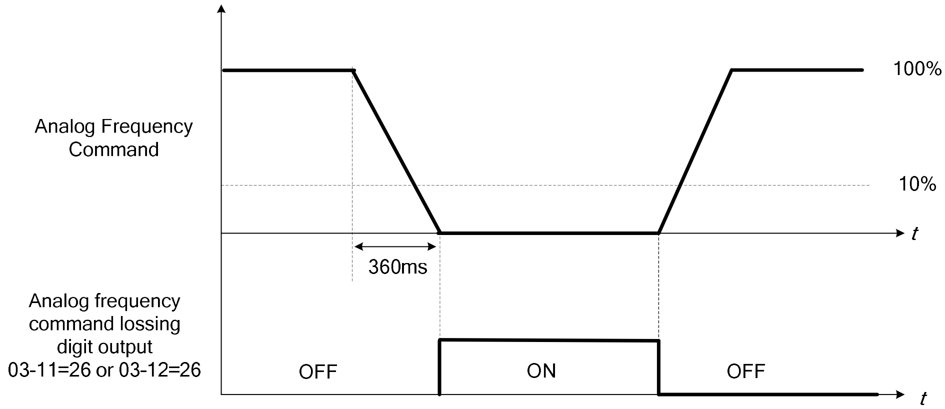


Figure 4.3.120 Frequency Reference Loss Operation

11- 43	Lock frequency during startup
Scope	【0.0~599.0】**Hz**
11- 44	Start-Up Frequency Hold Time
Scope	【0.0~10.0】**Sec**
11- 45	Lock frequency when stopped
Scope	【0.0~599.0】**Hz**
11- 46	Lock time of frequency when stopped
Scope	【0.0~10.0】**Sec**

- The hold function is used to temporarily maintain the reference frequency, preventing stalling caused by the load during inverter start-up or stop.
- The inverter accelerates the motor using 11-44 (Hold Time, for flux generation) and 11-43 (Start Frequency).
- The acceleration of the deceleration time does not include the start and stop of the hold time. Refer to Figure 4.3.122 below.

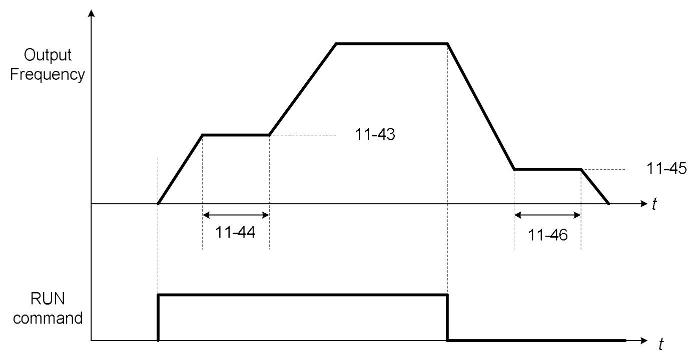


Figure 4.3.121 Hold Function

· When there is a high-inertia load, the hold function can be used to reduce over-current during acceleration.
· While the inverter is in stop mode, this function can also prevent wear on windmill-type loads. In addition, it allows the inverter to retain output frequency and extend voltage decay, enabling the motor to stop smoothly. You may also refer to the DC braking parameter at startup (07-16).
· If the startup hold frequency (11-43) or stop hold frequency (11-45) is set below Fmin (01-08), the hold function will be invalid.

11- 47	KEB deceleration time
Scope	【0.0~25.5】**Sec**
11- 48	KEB detection threshold
Scope	**200V :**【190~210】**V** **400V :**【380~420】**V**

· To prevent the motor from coasting for an extended period during operation due to instantaneous power loss or power failure under low voltage, the drive immediately detects such events and continues control using regenerative energy to decelerate the motor to a stop.
(1) KEB Deceleration Time (11-47).
· The KEB function is disabled if 11-47 is set to 0.0.
· 11-47 can be set from 0.0 to 25.5 to specify the KEB deceleration time.

(2) KEB Detection Level (11-48).
· If 11-47 is not 0.0, the KEB function will activate when the DC voltage falls below the value set in 11-48. · The KEB function will initiate deceleration per 11-47 until the DC voltage exceeds 11-48 + 10V (220V series: +10V, 440V series: +20V). The digital input command (03-00 to 03-07) will then allow the drive to resume acceleration to the original frequency. Refer to Figure 4.3.123.

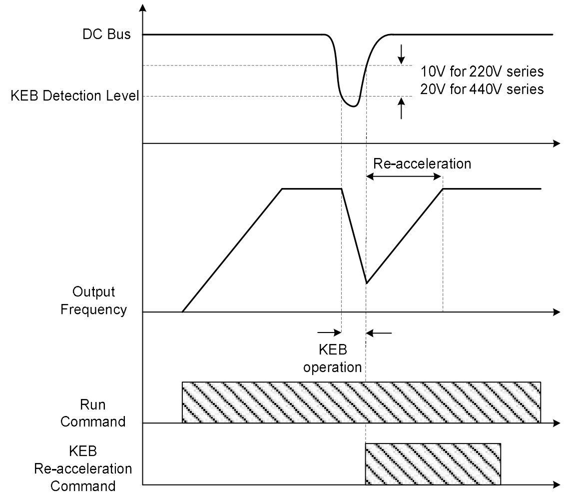


Figure 4.3.122 KEB Operation

11- 49	Zero servo gain	11- 50	Zero servo count	11- 51	Zero speed brake selection
Scope	【0.01~5.00】	**Scope**	【0~4096】	**Scope**	**[0]:** Zero-speed DC braking disabled **[1]:** Zero-speed DC braking enabled

- When the motor is stopped, the zero servo function can be used to hold the motor shaft position.
- Refer to Figure 4.3.124 Zero Servo Operation.

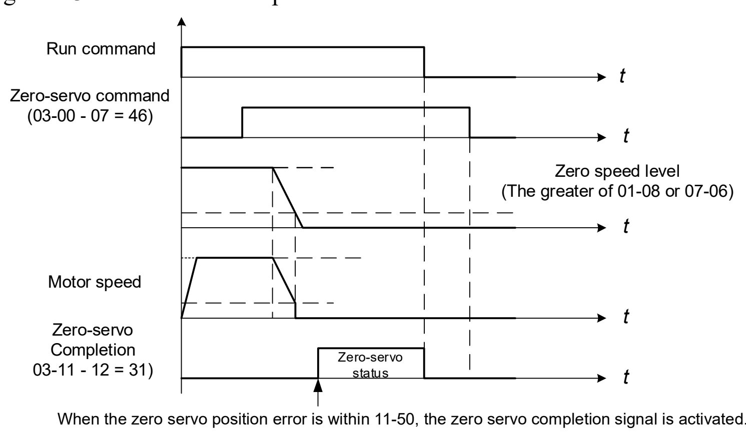


Figure 4.3. 123 Zero Servo Operation.

- Zero servo command is executed via multifunction digital input (03-00 to 03-07 = 46).
- When the frequency reference is below the zero-speed threshold (whichever is greater between 01-08 and 07-06, the DC braking start frequency), the zero servo state begins (zero servo start position), and the motor shaft position will be held even if the analog reference signal is not zero.
- If the run command is turned off during zero servo mode, the zero servo function becomes invalid.
- Zero servo completion can be signaled via multifunction digital output (03-11 or 03-12 = 31).
  – When any multifunction digital output is set to 31 (Zero Servo Complete signal), the zero servo count (11-50) is enabled.
  – The zero servo complete signal activates when the DC motor rotor position is within ± the value set in 11-50 from the zero servo start position.
  – The zero servo complete signal turns off when the zero servo or run command is activated.

(1) Zero Servo Gain Setting (11-49).
  · Use parameter 11-49 to adjust the holding torque of the zero servo operation.

· The holding torque increases with higher values, which may lead to instability.
· The zero-servo gain parameter 11-49 is defined such that when the parameter is set to 1, a position error of one revolution will generate one rated motor speed.
· Do not use the zero-servo function at 100% of the inverter's rated current, or it may trigger fault OH1 (heatsink overtemperature). For prolonged zero-servo holding torque, ensure that the output current stays below 50% to 60% of the inverter's rated current, or increase the inverter capacity.

(2) Zero Servo Count (11-50).

· The zero servo count is set to allow for position deviation at the zero-servo start position.

· Set the zero servo count (11-50) to four times the number of PG pulses (taking into account both the rising and falling edges of phases A and B, resulting in 4× PG resolution).

(3) Zero-Speed Brake Operation Selection (11-51).

· In V/F control mode, DC braking (without PG feedback) can be used to generate holding torque.

· Set 11-51 to select the zero-speed braking operation.

11-51 = 0: Disabled;
= 1: Enabled.

· By setting 00-02 (Run Command Selection) to 1 and 00-05 (Frequency Reference Selection) to 1, both the run command and frequency reference are input via the control terminals. When the frequency reference is 0V (or less than 4mA) and the run command is enabled, the zero-speed braking function is activated (11-51 = 1), and holding torque will be generated in DC braking mode.

Refer to Figure 4.3.125 Zero-Speed Braking Operation for operation details. DC braking (07-07) is limited to 20% of the inverter's rated current.

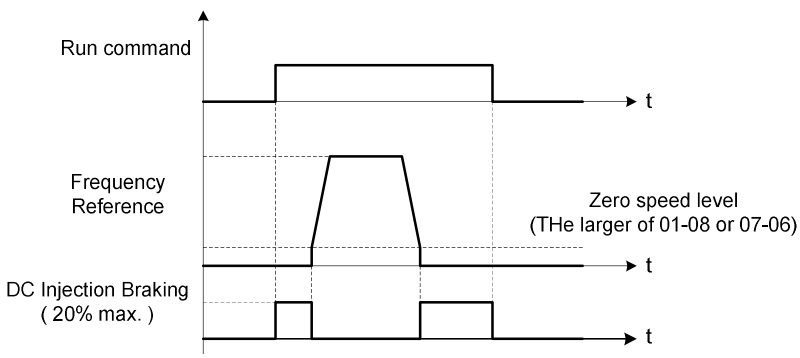


Figure 4.3. 124 Zero-Speed Braking Operation

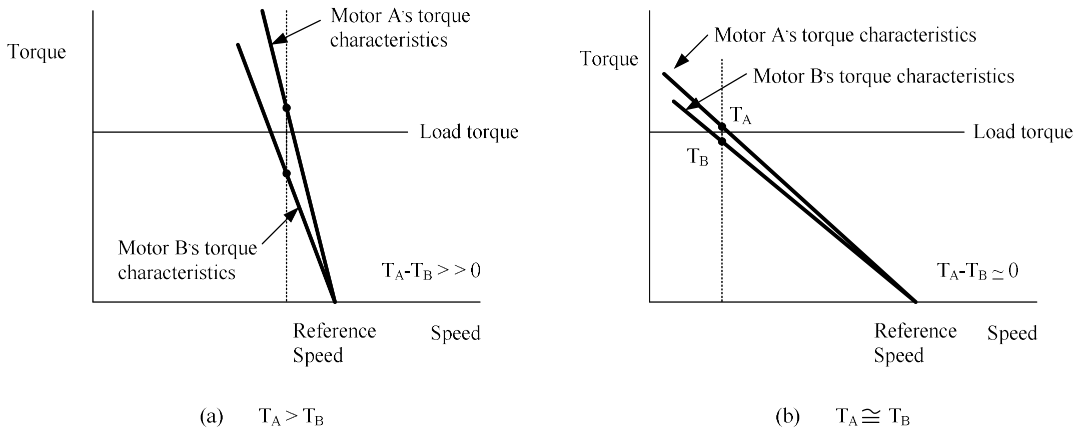
11- 52	Droop control threshold
Scope	【0.0~100.0】**%**
11- 53	Droop control delay
Scope	【0.01~2.00】**Sec**
11- 76	Droop frequency threshold 1
Scope	【0.00~599.00】**Hz**
11- 77	Droop frequency threshold 2
Scope	【0.00~599.00】**Hz**
11- 78	Droop torque offset
Scope	【0.00~100.00】**%**

When two motors drive the same load (e.g., crane or conveyor applications), high-slip motors are often used to achieve load balance. By using the droop function, standard motors can be configured to simulate high-slip motor characteristics. The droop function also helps mitigate torque fluctuations that may occur when two motors drive the same load.

– (a) Load balancing using general-purpose motors.

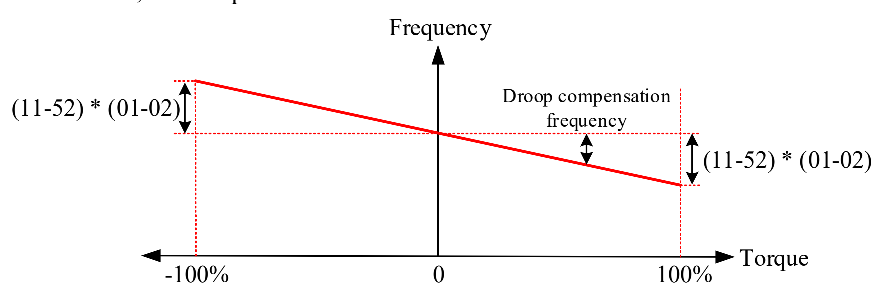
Motor A torque T_A > Motor B torque T_B

– (b) Load balancing using high-slip motors:
Motor A torque $T_A \approx$ Motor B torque T_B



Refer to Figure 4.3.125 Load Balancing Status.

- The droop function simulates the slip characteristics of a motor. Set 11-52 to define the percentage of maximum frequency (01-02) by which speed decreases when 100% motor torque is reached.
- If 11-52 is set to 0.0%, the droop function is disabled.



Refer to Figure 4.3.126 Droop Function Characteristics.

- Parameter 11-53 adjusts the response speed of the droop function. Increase the value if current oscillation occurs.
- Parameters 11-76 and 11-77 define the frequency threshold above which the droop function becomes active. The speed gain adjustment curve is shown below:

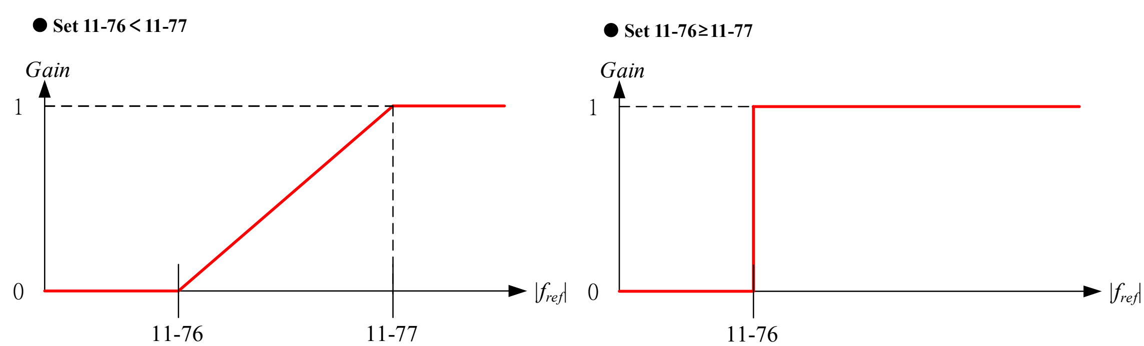


Figure 4.3.127 Droop Function Speed Gain Adjustment Curve.

- Parameter 11-78 defines the torque offset level above which the droop function becomes active. The torque command adjustment curve is shown below:

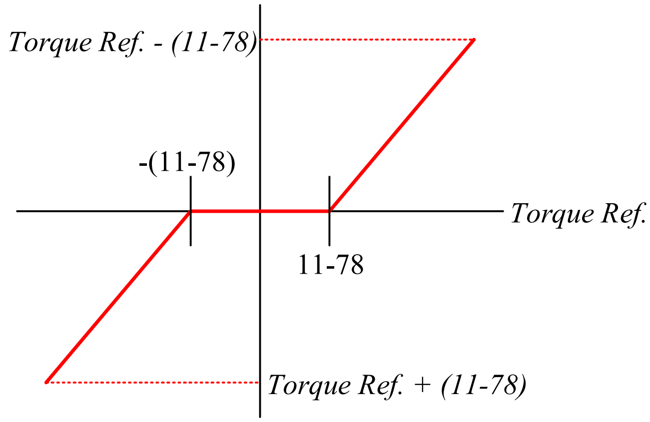


Figure 4.3.128 Droop Function Torque Command Adjustment Curve.

11- 54	Cumulative energy initialization
Scope	**[0]:** Do not reset accumulated energy **[1]:** Reset accumulated energy

Use parameter 11-54 Accumulated Energy Initialization to reset the accumulated energy (KWHr) (12-67) and accumulated energy (MWHr) (12-68).

11- 55	STOP button selection
Scope	**[0]:** When the run command is not issued via the digital operator, the STOP key is disabled **[1]:** When the run command is not issued via the digital operator, the STOP key is enabled

This parameter enables or disables the STOP key on the digital operator when the run command is issued via terminal (00-02 = 1) or communication (00-02 = 3).
11-55 = 0: Disabled (STOP key is disabled when the run command comes from terminal or communication).
= 1: Enabled (STOP key is always active regardless of command source).

11- 56	UP/DOWN selection
Scope	**[0]:** UP/DOWN on digital operator is disabled; frequency change takes effect only after pressing ENTER **[1]:** UP/DOWN on digital operator is enabled; frequency change takes effect immediately

11-56 = 0: When adjusting the frequency via the UP/DOWN keys, the change takes effect only after pressing ENTER.
= 1: When adjusting the frequency via the UP/DOWN keys, the change takes effect immediately without needing to press the ENTER key.

- The output frequency can be changed (up or down) via the digital operator or through multifunction digital input terminals (03-00 to 03-07) set to 8 or 9. Refer to the description for (03-00~03-07 = 8 or 9).

11- 58	Record reference frequency
Scope	**[0]:** Disabled **[1]:** Enabled

This function is only effective when paired with the ACC/DEC inhibit function (multifunction digital input terminal function 11), as described below.
When 11-58=0:
When ACC/DEC prohibited is ON during the motor acceleration/deceleration process, the motor will stop at the output frequency at that moment and use the output frequency as the frequency command. When ACC/DEC prohibited is changed to OFF or when a shutdown command is given, the frequency command will be restored to the frequency originally set.

In addition, when the stop command and power-off is reset, the frequency command will be set to 0 Hz.
Note: If ACC/DEC prohibited is ON before operating, STP0 will appear after operation starts because there is no recorded reference frequency.

When 11-58=1:
When ACC/DEC prohibited is ON during the motor acceleration/deceleration process, the motor will stop at the output frequency at that moment and use the output frequency as the frequency command. If switched to the stop status or cut the power of the inverter to reset at this time, when ACC/DEC prohibited is still ON, the output frequency will still be saved, and the frequency command will be set as the saved frequency. Refer to the figure below:

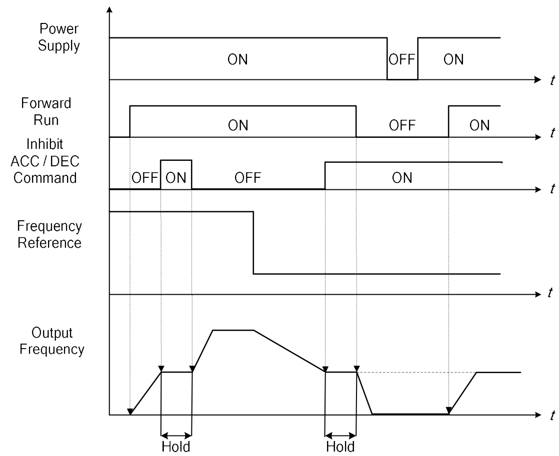


Figure 4.3.129 Reference Frequency Record Example

11- 59	Prevent oscillation gain
Scope	**【0.00~2.50】**

Used to adjust the effectiveness of the anti-vibration function.
If vibration occurs while driving the motor under light load, gradually increase the setting in increments of 0.01.

11- 60	Prevent oscillation upper limit
Scope	**【0~100】%**

Limits the upper threshold of the anti-vibration function.

11- 61	Prevent oscillation time parameter
Scope	**【0~100】**

Adjusts the responsiveness of the anti-vibration function. (This is the first-order delay time constant for the anti-vibration function).

11- 62	Prevent oscillation selection
Scope	**[0]: Mode 1** **[1]: Mode 2** **[2]: Mode 3**

Set parameter 11-62 to 0 for Mode 1 and 2 to achieve slower response.
Set parameter 11-62 to 2 for Mode 3 to achieve faster response.

11- 63	Strong magnetic selection
Scope	**[0]: Disabled** **[1]: Enabled**

When 11-63 is set to 0, strong magnet function is disabled, resulting in uniform no-load current across high and low speeds.
When 11-63 is set to 1, strong magnet function is enabled, producing greater torque at low speeds but with higher no-load current—suitable for heavy loads at low speeds.

11- 69	Anti-Vibration 3 Gain
Scope	【0.00~200.00】**%**

Adjusts the responsiveness of the Anti-Vibration 3 function.
If vibration occurs while driving the motor under light load, gradually increase the setting in increments of 0.01.

11- 70	Anti-Vibration 3 Limit
Scope	**【0.01~100】%**

Limits the upper threshold of the Anti-Vibration 3 function.

11- 71	Anti-Vibration 3 Time Constant
Scope	【0~30000】**mSec**

Adjusts the responsiveness of the Anti-Vibration 3 function. (This is the first-order delay time constant for the anti-vibration function).

11- 72	Anti-Vibration 3 Frequency 1
Scope	【0.01~300.00】**Hz**
11- 73	Anti-Vibration 3 Frequency 2
Scope	【0.01~300.00】**Hz**

Parameters 11-72 and 11-73 are used to set Anti-Vibration Gain Switching Frequencies 1 and 2 respectively.

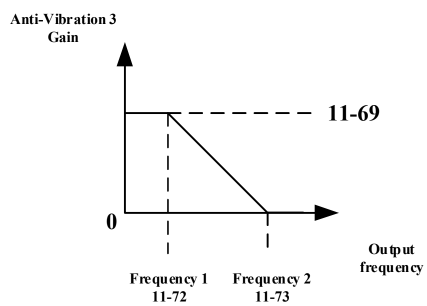


Figure 4.3.130 Anti-Vibration Gain Switching Frequency Setting

11- 79	LOC/REM Panel Key Function Selection
Scope	**[0]: Forward/Reverse Control** **[1]: Local/Remote Control**

Users can configure the LOC/REM key function as needed. Set the parameter to **[0]:** Forward/Reverse Control Key to define the panel's operation direction. Set the parameter to **[1]:** Local/Remote Control to directly switch between panel and external control, in coordination with external control logic parameters for adjustment.

11- 80	Local/remote selection mode
Scope	**[0]: Switching allowed directly** **[0]Switching prohibited during operation** **[2]: Stop after switching**

When users switch between local and remote modes based on operational needs, to protect personnel and equipment, switching restrictions can be configured via protection levels between modes to ensure safety during the transition process.

11- 81	OVP4 threshold (%)
Scope	**【100~200】%**

11- 82	OVP4 gain
Scope	**【0~256】**

OVP mode is mainly used to suppress regenerative voltage generated during deceleration, which could otherwise exceed protection limits and trigger OV fault signals in the drive.
OVP Mode 4 dissipates regenerative voltage by returning the energy to the motor as reactive power, thus reducing voltage levels and ensuring the drive continues to operate properly during rapid deceleration. However, since this method redirects energy back to the motor, it may impact motor lifespan. Evaluate the suitability of this mode for the application before enabling it.

12 - Monitoring Function Group

12- 00	Display screen selection (LED)
Scope	0 0 0 0 0 **Highest bit** **Lowest bit** Each bit from highest to lowest has a value range of **0~7** **[0]:** Do not display **[1]:** Output current **[2]:** Output voltage **[3]:** DC bus voltage **[4]:** Heatsink temperature **[5]:** PID feedback **[6]:** AI1 value **[7]:** AI2 value

Note: The highest bit is the default screen upon startup. The remaining four bits are user-defined display bits that can be selected according to display preferences. (Refer to diagram on page P4-4)

12- 01	PID feedback display mode (LED)
Scope	**[0]:** Display feedback as integer (xxx) **[1]:** Display feedback with 1 decimal place (xx.x) **[2]:** Display feedback with 2 decimal places (x.xx)
12- 02	PID feedback display unit setting (LED)
Scope	**[0]:** xxxxx (No unit) **[1]:** xxxPb (Pressure) **[2]:** xxxFL (Flow)

When 12-00 = xxx5, the default LED screen displays the PID feedback. Parameter 12-01 uses the value from 10-33, converting it to a five-digit display in the format XXX.XX.
Example: If 10-33 is set to 9999, 12-01 = 0 displays 99; 12-01 = 1 displays 99.9; 12-01 = 2 displays 99.99. When used in conjunction with 12-02, if 12-01 = 1 and 12-02 = 1, the display reads 99.9Pb; if 12-01 = 2 and 12-02 = 2, it reads 9.99FL, with the tens digit “9” hidden.

12- 03	Linear speed display (LED)
Scope	**[0~60000]** RPM
12- 04	Linear speed display mode (LED)
Scope	**[0]:** Display inverter output frequency **[1]:** Display line speed as integer (xxxxx) **[2]:** Display line speed with 1 decimal place (xxxx.x) **[3]:** Display line speed with 2 decimal places (xxx.xx) **[4]:** Display line speed with 3 decimal places (xx.xxx)

When 12-04 is set to a value other than 0, the inverter displays the line speed during stop mode or when frequency is being modified. 12-03 is the maximum value for line speed and corresponds to the maximum output frequency.
Example: If 12-03 = [1800], when the output frequency is 30Hz, the display shows [900].

12- 05	Display of Digital Input Terminal Status (LED/LCD)
Scope	Read-only (panel display only)

- When any of the terminals **S1~S7** is ON, the corresponding segment on **12-05** will light up; otherwise, it remains off.
- If the relay is active, the corresponding segment lights up; otherwise, it remains off.
- When the run command is switched to PLC mode and the RUN button is pressed, the display lights up; otherwise, it remains off.

Example 1: The diagram below shows **S1~S7** as **ON**, and **RY1/DO1/DO2** are outputting, **12-05** displays on the LED panel.

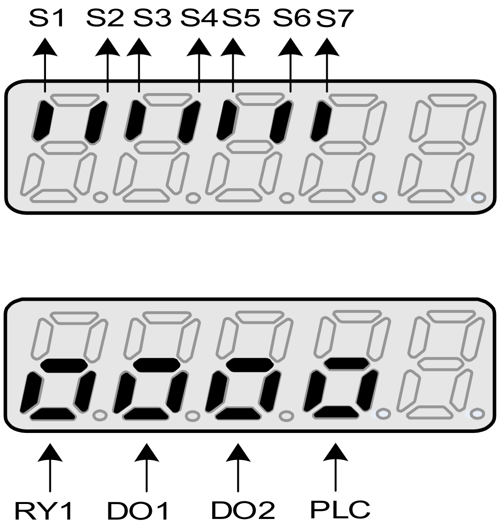


Figure 4.3.131 LED Panel Display Example

Example 2: The diagram below shows **S1~S7** as **OFF**, and **RY1/DO1/DO2** are not outputting, **12-05** displays on the LCD panel.

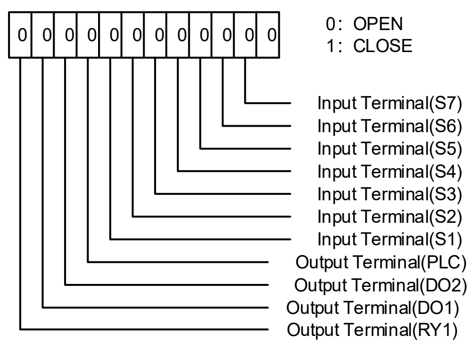


Figure 4.3.132 LCD Panel Display Example

■ Other monitoring parameters (12-11~12-64): Refer to Chapter 4.2 for simplified explanation.

Monitoring parameter 12-34 is available only for J7-PG-L, JN7-PG-O, JN7-PG-PM encoder options * **PG cards are limited to special projects.**

Monitoring parameter 12-66 (Encoder Angle): With correct PG Pulse Count (20-27) settings and wiring, rotating the motor one full turn forward while stopped will accumulate 360 degrees twice. Rotating it one full turn in reverse will decrement 360 degrees twice.

Monitoring Parameter 12-67 (Accumulated Energy in KWHr) and 12-68 (in MWHr) display the accumulated energy consumption. (Use 11-54 Accumulated Energy Initialization to reset these monitoring parameters)

Monitoring Parameter 12-38 allows PID setting (can be configured directly via the panel), and 12-39 displays PID feedback. Please refer to the settings of 10-33~10-35 to configure how the values are displayed.

Monitoring Parameter 12-76 displays the no-load voltage and should be used in conjunction with Parameter 02-09 (Motor 1 Excitation Current) and Parameter 17-09 (Motor Excitation Current).

Monitoring Parameter 12-78 (Z-Phase Deviation Value) is used in conjunction with Parameter 21-43 (Offset Angle).

Monitoring Parameter 12-79 (Pulse Input Percentage) corresponds to Parameter 03-30 (Pulse Input Selection).

Monitoring Parameter 12-87 allows monitoring of the capacitor lifespan as a percentage of usage time.

* When viewing monitoring parameters (12-05~12-87), it is possible to execute the run command simultaneously.

13 – Maintenance Function Group

13- 00	Inverter horse power
Scope	----

Inverter Model:	**13- 00**Display	Inverter Model:	**13- 00**Display
E710-201-XXX	**201**	**E710-401-XXX**	**401**
E710-202-XXX	**202**	**E710-402-XXX**	**402**
E710-203-XXX	**203**	**E710-403-XXX**	**403**
E710-205-XXX	**205**	**E710-405-XXX**	**405**
E710-208-XXX	**208**	**E710-408-XXX**	**408**
		E710-410-XXX	**410**

13- 01	Software version
Scope	----

13- 02	Cumulative working time clearing function
Scope	**[0]:** Do not clear cumulative operation time **[1]:** Clear cumulative operation time
13- 03	Cumulative working time 1
Scope	[0~23] **hours**
13- 04	Cumulative working time 2
Scope	[0~65534]**days**
13- 05	Cumulative working time selection
Scope	**[0]:** Cumulative time while powered on **[1]:** Cumulative time only while running

- If 13-02 is set to 1, then 13-03 and 13-04 (accumulated time values) will be cleared.
- The time selected by 13-05 corresponds to 13-03/13-04 (historical runtime).

  13-05 = 0: Time is accumulated while the inverter is powered on

  = 1: Time is accumulated only during inverter operation

13- 06	Parameter lock
Scope	**[0]:** All parameters are read-only except 13-06 and the main frequency setting on the home page **[1]:** Only user-defined parameters are writable **[2]:** All parameters are writable

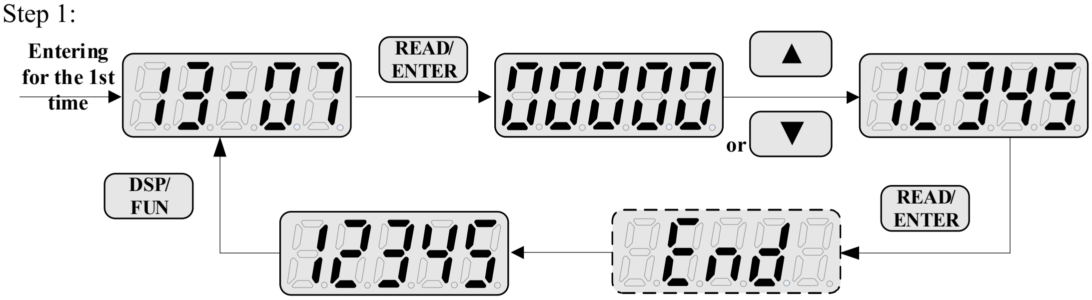
When 13-06 = 0, only 13-06 and the main frequency command on the home page can be edited; all other parameters are locked.
When 13-06 = 1, only user-defined parameters (00-41~00-56) are editable. Please refer to the description of parameters 00-41~00-56 for use. This option is only available on the LCD operator and not on the LED operator.
When 13-06 = 2, parameters can be written normally, except those that are inherently read-only.

Note: The main frequency setting parameter for the LCD operator is 12-16, which corresponds to Segment 0 Frequency Command (05-01). The main frequency for the LED operator can be set on the main frequency screen.

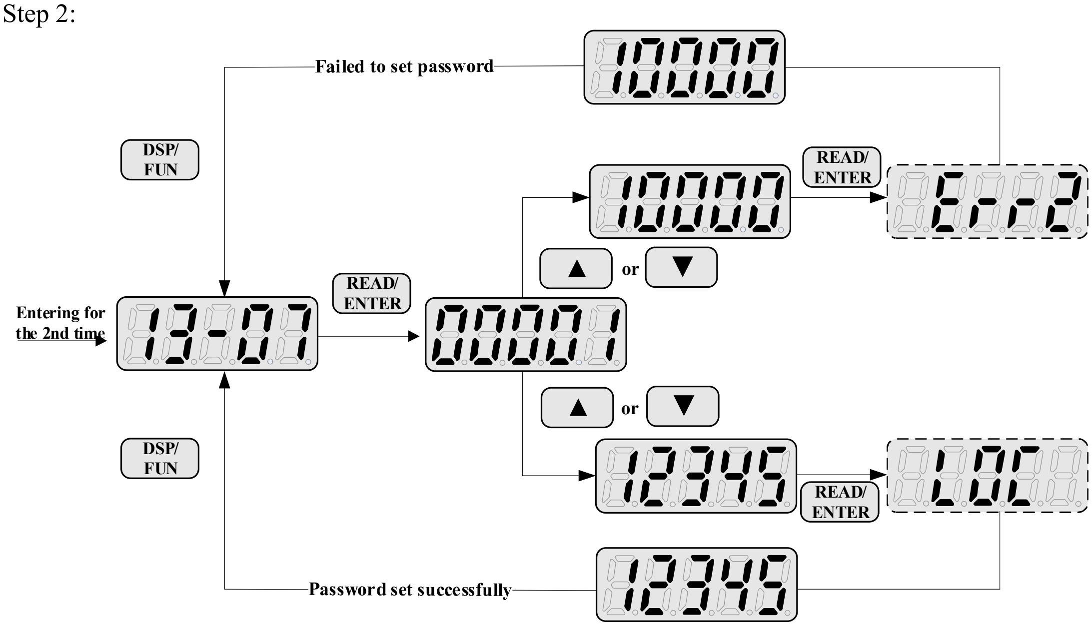
13- 07	Parameter Password Function
Scope	**【00000~65534】**

- When **13-07** is set to a valid password (>**0**), all parameters except the main screen frequency setting cannot be modified. Only by unlocking the password can parameters be edited.
- To Set a Password:

Step 1:



Step 2:



To Unlock the Password:

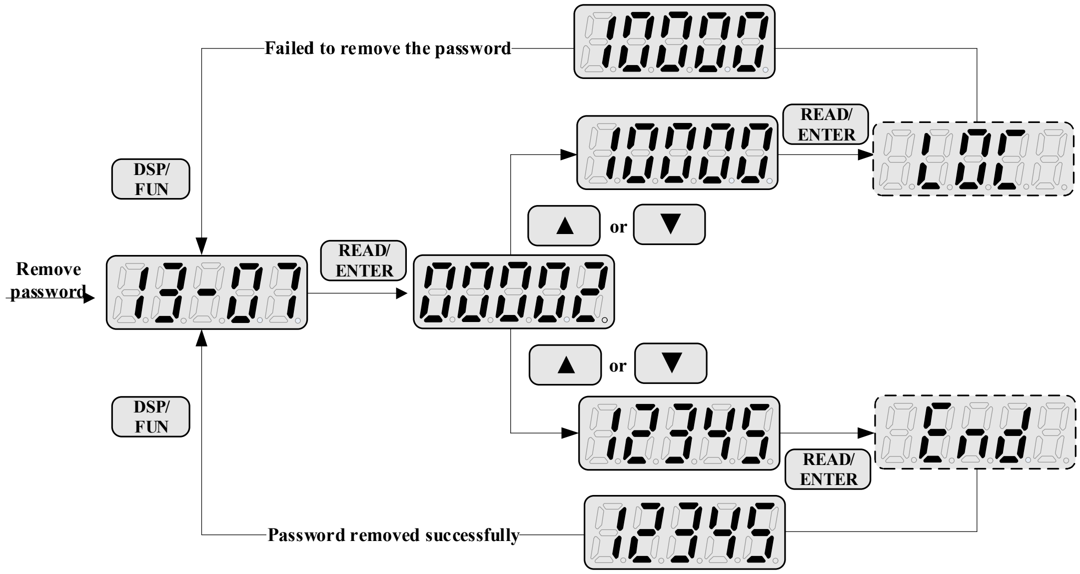


Figure 4.3.133 Password Setup/Unlock

13- 08	Restore factory settings	
Scope	**[0]**Do not initialize **[1]** Reserved **[2]** 2-wire initialization (220/440V) [60Hz] **[3]** 3-wire initialization (220/440V) [60Hz] **[4]** 2-wire initialization (230/415V) [50Hz] **[5]** 3-wire initialization (230/415V) [50Hz] **[6]** 2-wire initialization (200/380V) [50Hz] **[7]** 3-wire initialization (200/380V) [50Hz] **[8]** PLC initialization*	**[9]** 2-wire initialization (230/460V) [60Hz]**[10]**3-wire initialization (230/460V) [60Hz] (230/400V) [60Hz] **[12]** 3-wire initialization (230/400V) [60Hz] **[13]** 2-wire initialization (230/400V) [50Hz] **[14]** 3-wire initialization (230/400V) [50Hz] **[15]** 2-wire initialization (220/380V) [50Hz] **[16]** 3-wire initialization (220/380V) [50Hz] **[17]** 2-wire initialization (200/380V) [60Hz] **[18]** 3-wire initialization (200/380V) [60Hz]

Use parameter 13-08 to initialize inverter parameters. Once initialization is complete, the inverter will return to its factory default values. It is recommended that users record any modified parameter settings prior to initialization. After initialization, the value of 13-08 will automatically revert to 0.

13-08=2: 2-wire initialization (220V/440V)

- Multifunction digital input terminal S1 controls the forward run/stop command, and S2 controls the reverse run/stop command. Please refer to Figure 4.3.1.
- Inverter input voltage (01-14) is automatically set to 220V (200V class) or 440V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 60Hz.

13-08=3: 3-wire initialization (220V/440V)

- Multifunction digital input terminal S7 controls the forward/reverse run command, while S1 and S2 terminals are assigned for 3-wire control to individually manage run and stop commands. Refer to Figure 4.3.2 and Figure 4.3.3 for 3-wire operation mode.
- Inverter input voltage (01-14) is automatically set to 220V (200V class) or 440V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 60Hz.

13-08=4: 2-Wire Initialization (230V/415V)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 415V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 50Hz.

13-08=5: 3-Wire Initialization (230V/415V)

- Same as 3-wire operation mode (13-08 = 3). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 415V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 50Hz.

13-08=6: 2-wire initialization (200V/380V)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 200V (200V class) or 380V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 50Hz.

13-08=7: 3-wire initialization (200V/380V)

- Same as 3-wire operation mode (13-08 = 3). Inverter input voltage (01-14) is automatically set to 200V (200V class) or 380V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 50Hz.

  If operating in PMSV mode (00-00 = 4), and 13-08 is set to 2 through 7, the motor maximum frequency will be automatically set according to the specific inverter model.

13-08=8: PLC Initialization

– Clears the internal PLC program and values stored in the inverter.

13-08=9: 2-Wire Initialization (230V/460V)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 460V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 60Hz.

13-08=10: 3-Wire Initialization (230V/460V)

- Same as 3-wire operation mode (13-08 = 3). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 460V (400V class).
- When 01-00 (V/F Curve Setting) = F, the motor maximum frequency (01-02) is automatically set to 60Hz.

13-08=11: 2-Wire Initialization (230/400V, 60Hz)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 400V (400V class).
- When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 60Hz.

13-08=12: 3-Wire Initialization (230/400V, 60Hz)

- Same as 3-wire operation mode (13-08 = 3). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 400V (400V class).
- When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 60Hz.

13-08=13: 2-Wire Initialization (230/400V, 50Hz)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 400V (400V class).
- When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 50Hz.

13-08=14: 3-Wire Initialization (230/400V, 50Hz)

- Same as 3-wire operation mode (13-08 = 3). Inverter input voltage (01-14) is automatically set to 230V (200V class) or 400V (400V class).
- When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 50Hz.

13-08=15: 2-Wire Initialization (220/380V, 50Hz)

- Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set

to 220V (200V class) or 380V (400V class).
– When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 50Hz.

13-08=16: 3-Wire Initialization (220/380V, 50Hz)
– Same 3-wire operation mode as [13-08 = 3], and the inverter input voltage (01-14) will be automatically set to 220V (200V class) or 380V (400V class).
– When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 50Hz.

13-08=17: 2-Wire Initialization (200/380V, 60Hz)
– Same as 2-wire operation mode (13-08 = 2). Inverter input voltage (01-14) is automatically set to 200V (200V class) or 380V (400V class).
– When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 60Hz.

13-08=18: 3-Wire Initialization (200/380V, 60Hz)
– Same 3-wire operation mode as [13-08 = 3], and the inverter input voltage (01-14) will be automatically set to 200V (200V class) or 380V (400V class).
– When 01-00 V/F curve is set to F, the inverter's maximum frequency (01-12) will be automatically set to 60Hz.

Table 4.3.36 Parameters Not Affected by Initialization

No.	Name
00-00	Motor control mode
00-04	Language selection
01-00	V/F curve selection
01-26	Motor 2 V/F curve selection
13-00	Inverter horse power
13-03	Cumulative working time 1
13-04	Cumulative working time 2
13-05	Cumulative working time selection

13- 09	Failure history clearing function
Scope	**[0]:** Do not clear fault history **[1]:** Clear fault history

If 13-09 = 1, the fault trace/fault history (12-11 to 12-15 / 12-45 to 12-64) will also be cleared.

13- 11	CB2 Software Version
Scope	【0.00~9.99】

Only available for Frame2/3 models to view the CB2 control board version.

13- 12	Optional Card ID
Scope	【0~255】

· This parameter displays the ID of the optional card installed on the control board. It is only shown when an optional card is in use.

【0】: **none**

【1】: **PG-L**

【2】: **PG-O**

【3】: **PG-PM**

【4】: **PG-PMS**

【5】: **PG-PMR**

13- 13	Optional Card CPLD Software Version
Scope	【0.00~9.99】

· This parameter shows the CPLD software version of the optional card on the control board. It is only displayed when an optional card is installed.

13- 14	Failure saving selection
Scope	**[0]:** Fault messages during auto-restart will not be stored in the fault history **[1]:** Fault messages during auto-restart will be stored in the fault history

When parameter 13-14 is set to 0, fault messages that occur during the auto-restart process will not be stored in the fault history (12-46 to 12-49 & 13-21 to 13-50).
When parameter 13-14 is set to 1, fault messages that occur during the auto-restart process will be stored in the fault history (12-46 to 12-49 & 13-21 to 13-50).

13- 51	Cooling fan cumulative operation time
Scope	【0~99999】
13- 52	Cooling fan life inspection percentage
Scope	【0~150】
13- 53	IGBT life inspection percentage
Scope	【0~150】

Parameters 13-51 and 13-52 can be redefined via 08-65 [Cooling Fan Maintenance Setting]. Parameter 13-52 displays the accumulated operating time of the cooling fan as a percentage, with 100% representing the expected lifespan of the cooling fan.
Parameter 13-53 can be redefined via 08-66 [IGBT Maintenance Setting]. Parameter 13-53 displays the accumulated operating time of the IGBT as a percentage (%), with 100% representing the expected lifespan of the IGBT.
Note: 1. 90% is the recommended reference value for replacing the cooling fan and IGBT.
2. The actual maintenance period may vary depending on the operating environment of the inverter.

14- PLC Settings Group

Scope	【0~9999】		
14- 00	**T1** setting value **1**	**14- 08**	**T5** setting value **1**
14- 01	**T1** setting value **2** (Mode 7)	**14- 09**	**T5** setting value **2** (Mode 7)
14- 02	**T2** setting value **1**	**14- 10**	**T6** setting value **1**
14- 03	**T2** setting value **2** (Mode 7)	**14- 11**	**T6** setting value **2** (Mode 7)
14- 04	**T3** setting value **1**	**14- 12**	**T7** setting value **1**
14- 05	**T3** setting value **2** (Mode 7)	**14- 13**	**T7** setting value **2** (Mode 7)
14- 06	**T4** setting value **1**	**14- 14**	**T8** setting value **1**
14- 07	**T4** setting value **2** (Mode 7)	**14- 15**	**T8** setting value **2** (Mode 7)

Scope	【0~65535】		
14- 16	**C1** setting value	**14- 20**	**C5** setting value
14- 17	**C2** setting value	**14- 21**	**C6** setting value
14- 18	**C3** setting value	**14- 22**	**C7** setting value
14- 19	**C4** setting value	**14- 23**	**C8** setting value

Scope	【0~65535】		
14- 24	**AS1** setting value **1**	**14- 30**	**AS3** setting value **1**
14- 25	**AS1** setting value **2**	**14- 31**	**AS3** setting value **2**
14- 26	**AS1** setting value **3**	**14- 32**	**AS3** setting value **3**

14- 27	**AS2** setting value **1**	**14- 33**	**AS4** setting value **1**
14- 28	**AS2** setting value **2**	**14- 34**	**AS4** setting value **2**
14- 29	**AS2** setting value **3**	**14- 35**	**AS4** setting value **3**

Scope	**【0~65535】**		
14- 36	**MD1** setting value **1**	**14- 42**	**MD3** setting value **1**
14- 37	**MD1** setting value **2**	**14- 43**	**MD3** setting value **2**
14- 38	**MD1** setting value **3**	**14- 44**	**MD3** setting value **3**
14- 39	**MD2** setting value **1**	**14- 45**	**MD4** setting value **1**
14- 40	**MD2** setting value **2**	**14- 46**	**MD4** setting value **2**
14- 41	**MD2** setting value **3**	**14- 47**	**MD4** setting value **3**

Please refer to Chapter 4.4 for a detailed explanation of the built-in PLC functions.

15 – PLC Monitoring Group

Scope	【0~9999】		
15- 00	**T1** current value **1**	**15- 08**	**T5** current value **1**
15- 01	**T1** current value **2** (Mode 7)	**15- 09**	**T5** current value **2** (Mode 7)
15- 02	**T2** current value **1**	**15- 10**	**T6** current value **1**
15- 03	**T2** current value **2** (Mode 7)	**15- 11**	**T6** current value **2** (Mode 7)
15- 04	**T3** current value **1**	**15- 12**	**T7** current value **1**
15- 05	**T3** current value **2** (Mode 7)	**15- 13**	**T7** current value **2** (Mode 7)
15- 06	**T4** current value **1**	**15- 14**	**T8** current value **1**
15- 07	**T4** current value **2** (Mode 7)	**15- 15**	**T8** current value **2** (Mode 7)

Scope	【0~65535】		
15-16	**C1** current value	**15-20**	**C5** current value
15-17	**C2** current value	**15-21**	**C6** current value
15-18	**C3** current value	**15-22**	**C7** current value
15-19	**C4** current value	**15-23**	**C8** current value

Scope	【0~65535】		
15-24	**AS1** current value	**15-29**	**MD2** current value
15-25	**AS2** current value	**15-30**	**MD3** current value
15-26	**AS3** current value	**15-31**	**MD4** current value
15-27	**AS4** current value	**15-32**	**TD** current value
15-28	**MD1** current value		

16 – LCD Function Group

16- 00	Main screen monitoring
Scope	【5~82】
16- 01	Sub-screen monitoring 1
Scope	【5~82】
16- 02	Sub-screen monitoring 2
Scope	【5~82】

· When the power is turned on, two monitoring items are displayed: Main Monitoring and Secondary Monitoring.
· Use parameter 16-00 to select the item to be displayed on the main monitoring screen, and use parameters 16-01 and 16-02 to select secondary monitoring items to monitor parameters 12-5 to 12-82.

16- 03	Display unit selection
Scope	**[**0**]:** Display unit in 0.01 Hz **[**1**]:** Display unit in 0.01% **[**2**]:** Display unit in rpm **[**3~39**]:** Reserved **[**40~9999**]:** User-defined format. Entering 0XXXX means displayed as XXXX when 100% **[**10001~19999**]:** User-defined format. Entering 1XXXX means displayed as XXX.X when 100% **[**20001~29999**]:** User-defined format. Entering 2XXXX means displayed as XX.XX when 100% **[**30001~39999**]:** User-defined format. Entering 3XXXX means displayed as X.XXX when 100%

16- 04	Engineering unit selection		
Scope	**[**0**]:** Do not use engineering unit 【1】: FPM 【2】: CFM 【3】: PSI 【4】: GPH 【5】: GPM 【6】: IN 【7】: FT 【8】: /s	【9】: /m 【10】: /h 【11】: °F 【12】: inW 【13】: HP 【14】: m/s 【15】: MPM 【16】: CMM 【17】: W	【18】: KW 【19】: m 【20】: °C 【21】: RPM 【22】: Bar 【23】: Pa 【24】: Kpa 【25】: PRS 【26】: SPM

(1) Display Unit Selection (16-03)
- The following items can be configured to display with user-defined units: Stage 0 speed setting (05-01), jog frequency (00-18), stage 1–15 speed settings (06-01 to 06-15), frequency command (12-16), and output frequency (12-17).

(2) Engineering Unit Selection (16-04)
- Users can use parameters 16-03 and 16-04 to change display and engineering units. When the display unit selection (16-03) is set to a value between 00040 and 39999, the display unit range and engineering unit shown on the digital operator will change. The parameters affected by the settings of 16-03 and 16-04 include: stage 0 speed setting (05-01), jog frequency (00-18), stage 1–15 speed settings (06-01 to 06-15), frequency command (12-16), and output frequency (12-17).

Table 4.3.37 16-03 Unit Setting and Display

<table>
<tr><th>16-03</th><th colspan="4">Setting / Display Content</th></tr>
<tr><td>0</td><td colspan="4">0.01 Hz</td></tr>
<tr><td>1</td><td colspan="4">0.01% (Maximum Output Frequency 01-02 = 100%)</td></tr>
<tr><td>2</td><td colspan="4">Frequency display unit in rpm</td></tr>
<tr><td>3- 39</td><td colspan="4">Reserved</td></tr>
<tr><td rowspan="6">00040 - 39999</td><td colspan="4">Decimal point set to the fifth digit.
i.e. □ □□□□
Set 4 digits excluding the decimal point
Define number of decimal places
00040 - 09999 : □□□□ (Decimal place:0digit)
10001 - 19999 : □□□. □ (Decimal place:1digit)
20001 - 29999 : □□. □□ (Decimal place:2digits)
30001 - 39999 : □. □□□ (Decimal place:3digits)
<Example></td></tr>
<tr><td>16-03 Setting</td><td>Display</td><td>Display Unit</td><td>Display Examples</td></tr>
<tr><td>00040 - 09999</td><td>□□□□</td><td rowspan="4">Following the setting of 16-04</td><td>To display 100% speed as “0200”
→ Set 16-03 = 00200 (for 05-01, 06-01 to 06-15, setting range: 0040 to 9999).
→ Set 16-04 = 0 (no unit).</td></tr>
<tr><td>10001 – 19999</td><td>□□□. □</td><td>To display 100% speed as “200.0 CFM”
→ Set 16-03 = 12000 (for 05-01, 06-01 to 06-15, setting range: 0000 to 9999)
→ Set 16-04 = 2 (CFM)
→ In this case, when speed is 60%, it will display as 120.0 CFM.</td></tr>
<tr><td>20001 – 29999</td><td>□□. □□</td><td>To display 100% speed as “65.00°C”
→ Set 16-03 = 26500 (for 05-01, 06-01 to 06-15, setting range: 0000 to 9999)
→ Set 16-04 = 20 (°C)
→ In this case, when speed is 60%, it will display as 39.00°C.</td></tr>
<tr><td>30001 - 39999</td><td>□. □□□</td><td>To display 100% speed as “2.555 m/s”
→ Set 16-03 = 32555
→ Set 16-04 = 14 (m/s)
→ In this case, when speed is 60%, it will display as 1.533 m/s.</td></tr>
</table>

16- 05	LCD backlight
Scope	【0~7】

Adjusting the screen contrast of the digital operator: When set to 0, the screen backlight is turned off.

16- 07	Copy function selection
Scope	[0]**:** Do not perform parameter copying [1] Read inverter parameters to the digital operator [2]**:** Write operator parameters to the inverter [3]**:** Compare inverter and operator parameters
16- 08	Allow read selection
Scope	[0]**:** Do not allow reading inverter parameters to the digital operator [1]**:** Allow reading of inverter parameters to the digital operator

· The LCD digital operator has built-in memory (EEPROM) and supports the following functions:
(1) Read: Store inverter parameters in the operator (INV → OP).
(2) Write: Write parameter settings from the operator into the inverter (OP → INV).
(3) Confirm: Compare the parameters stored in the operator with those in the inverter.

· 16-07= 0: Do not perform parameter copy
= 1: Read (all parameters will be copied from the inverter to the digital operator)
= 2: Write (all parameters will be copied from the digital operator to the inverter)
= 3: Confirm (the parameters in the inverter will be compared with those in the digital operator)

· Set 16-08 = 0 to prevent accidental overwriting of data stored in the digital operator. If 16-07 = 1 and a read operation is executed (copying inverter parameter settings to the digital operator), a "RDP Read Prohibited" warning will appear on the operator screen and the read process will be terminated.

· Follow the steps below to operate the parameter copy function:
─ When using the write function, verify that the following settings are consistent:

① Inverter model
② Inverter capacity

Note 1: From version V1.20 onward, inverter data from an older version can be written into a newer inverter. After copying, cycle the power to complete the update.
Note 2: From version V1.20 onward, the copy function is not restricted by parameter 00-00 (Control Mode Selection).

■**READ: Follow the steps below to store inverter parameter settings to the digital operator interface.**

Steps	Screen Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	From the group menu, select the Copy Function Parameter Group (Group 16).
2	PARA 16 -07 : Copy Sel -08 : READ Sel -09 : Keypad Loss Sel	Press the DATA/ENTER key and navigate to the Copy Function Selection parameter (16-07).
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the DATA/ENTER key again to display the data setting/read screen (the number will be highlighted and blinking).
4	Edit 16-07 Copy Sel 1 READ (0 – 3) < 0 >	Use the UP key to change the setting value to 1 (Read).
5	-ADV- READ INV → OP	· Begin the read operation by pressing the DATA/ENTER key; the screen will display as shown on the left. · A progress bar will appear at the bottom of the LCD screen to indicate the read status.
6	-ADV- READ COMPLETE	If the read is successful, “READ COMPLETE” will appear on the digital operator interface.
	RDP Read Prohibited	· If the message “RDP Read Prohibited” appears, it indicates the inverter parameters could not be saved to the memory of the digital operator interface. · If an error is displayed, press any key to clear the error and return to the 16-07 screen.
7	Edit 16-07 Copy Sel 1 READ (0 – 3) < 0 >	· Press the DSP/FUN key to return to the submenu (16-07).

■ **WRITE: Follow the steps below to write parameter settings stored in the digital operator interface to the inverter.**

Steps	LCD Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	From the group menu, select the Copy Function Parameter Group (Group 16).
2	PARA 16 -07 : Copy Sel -08 : READ Sel -09 : Keypad Loss Sel	Press the DATA/ENTER key and navigate to the Copy Function Selection parameter (16-07).
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the DATA/ENTER key to display the setting/read screen (the number will be highlighted and blinking).
4	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	Use the UP key to change the setting value to 2 (Write).
5	-ADV- WRITE INV → OP	· Press the DATA/ENTER key to begin the read operation. · A progress bar will appear at the bottom of the screen to indicate the writing progress.
6	-ADV- WRITE COMPLETE	· When the write is successful, “WRITE COMPLETE” will appear on the digital operator. · Afterward, “SysInit” will be displayed. At this point please power off and restart the system.
	WRE Write Error	· The error message “WRE Write Error” may appear if writing the parameter settings from the digital operator to the inverter fails. · If an error is displayed, press any key to clear the error and return to the 16-07 screen.
7	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	· Press the DSP/FUN key to return to the submenu (16-07).

■ **WRITE: Follow the steps below to write parameter settings stored in the digital operator interface to the inverter.**

Steps	LCD Display (English)	Description
1	Group 14 PLC Setting 15 PLC Monitor 16 LCD Keypad Func.	From the group menu, select the Copy Function Parameter Group (Group 16).
2	PARA 16 -07：Copy Sel -08：READ Sel -09：Keypad Loss Sel	Press the DATA/ENTER key and navigate to the Copy Function Selection parameter (16-07).
3	Edit 16-07 Copy Sel 0 Normal (0 – 3) < 0 >	Press the DATA/ENTER key to display the setting/read screen (the number will be highlighted and blinking).
4	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	Use the UP key to change the setting value to 2 (Write).
5	-ADV- WRITE INV → OP	· Press the DATA/ENTER key to begin the read operation. · A progress bar will appear at the bottom of the screen to indicate the writing progress.
6	-ADV- WRITE COMPLETE	· When the write is successful, "WRITE COMPLETE" will appear on the digital operator. · Afterward, "SysInit" will be displayed. At this point please power off and restart the system.
	WRE Write Error	· The error message "WRE Write Error" may appear if writing the parameter settings from the digital operator to the inverter fails. · If an error is displayed, press any key to clear the error and return to the 16-07 screen.
7	Edit 16-07 Copy Sel 2 WRITE (0 – 3) < 0 >	· Press the DSP/FUN key to return to the submenu (16-07).

16- 09	Operator disconnection selection
Scope	[0]: Continue operation when the LCD operator is disconnected [1]: Display a fault when the LCD operator is disconnected

If parameter 00-02 is set to 0 (Run/Stop command is controlled by the operator), this parameter determines whether the inverter will stop when the digital operator is removed.

16- 10	RTC Time Display Setting
Scope	[0]**: Hide** [1]**: Show**
16- 11	RTC date setting
Scope	【12.01.01 ~ 99.12.31】
16- 12	RTC time setting
Scope	【00:00 ~ 23:59】

- Before using the real-time clock (RTC) function, the internal clock must be configured.
- Year, month, and day are set via parameter 16-11 (RTC Date Setting), while hour and minute are set via parameter 16-12 (RTC Time Setting).
- To use the RTC function, the digital operator must be connected to the inverter; the RTC only operates when the operator is attached.
- Parameter 16-10 RTC Time Display Setting Hide/Show determines whether the RTC appears on the operator screen. This does not affect the RTC's timekeeping. The RTC time appears at the top of the digital operator when parameter 16-10 is set to 1. Refer to Figure 4.3.135.

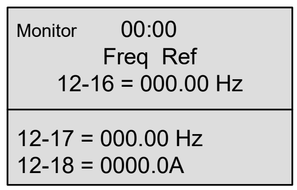


Figure 4.3.134 RTC Display (Example)

- You may also monitor current RTC date and time using monitoring parameters 12-72 and 12-73.
- RTC Features:
  - — Up to 4 activations per day.
  - — 4-week scheduling.
  - — Timer offset function (preset time).
  - — Timer activation via multi-function digital inputs.
  - — Fixed-speed operation selection.
  - — Multi-function digital output driven by timer.

16- 13	RTC timer function
Scope	[0]: Disabled [1]: Enabled [2]: Controlled via DI

Scope	[00:00 ~ 23:59]		
16- 14	P1 Start Time	**16- 22**	P3 Start Time
16- 15	P1 end time	**16- 23**	P3 end time
16- 18	P2 Start Time	**16- 26**	P4 Start Time
16- 19	P2 end time	**16- 27**	P4 end time

Scope	[1]: Monday [2]: Tuesday [3]: Wednesday [4]: Thursday [5]: Friday [6]: Saturday [7]: Sunday		
16- 16	P1 Start Day	**16- 24**	P3 Start Day
16- 17	P1 end day	**16- 25**	P3 end day
16- 20	P2 Start Day	**16- 28**	P4 Start Day
16- 21	P2 end day	**16- 29**	P4 end day

16- 30	RTC offset selection
Scope	[0]: Disabled [1]: Enabled [2]: Controlled via DI

16- 31	RTC offset time setting
Scope	【00：00 ~ 23：59】

Scope	[0 ~ 31] Refer to Table 4.3.38		
16- 32	Timer Source 1	**16- 34**	Timer Source 3
16- 33	Timer Source 2	**16- 35**	Timer Source 4

16- 36	RTC speed selection	
Scope	[0]: Disabled [1]: Selected by Timer 1 [2]: Selected by Timer 2	[3]: Selected by Timer 3 [4]: Selected by Timer 4 [5]: Selected by Timer 1 + Timer 2

16- 37	RTC operation direction selection	
Scope	[xxx0 B]: RTC Operation 1 Forward [xx0x B]: RTC Operation 2 Forward [x0xx B]: RTC Operation 3 Forward [0xxx B]: RTC Operation 4 Forward	[xxx1 B]: RTC Operation 1 Reverse [xx1x B]: RTC Operation 2 Reverse [x1xx B]: RTC Operation 3 Reverse [1xxx B]: RTC Operation 4 Reverse

Using the RTC Timer Function:

- A single timer source can be linked to multiple time periods, and each time period can be assigned to multiple timers.

- Timers can be set up through the following steps:

  ① Step 1: Enable the timer – the timer can be enabled via parameter 16-13 [RTC Timer Function Setting].

② Step 2: Set the time periods — You may configure the start/end time and date for each period using parameters 16-14 through 16-31. If the start time is equal to the end time, the timer period will be disabled.

③ Step 3: Assign timers — Allocate time periods to a specific timer using parameters 16-32 to 16-35.

④ Step 4: Link to parameters — Timers can be linked to relay outputs. Each relay output may be linked to only one timer (e.g., parameters 03-11, 03-12, 03-28, and 16-36).

・ Refer to the RTC system architecture below.

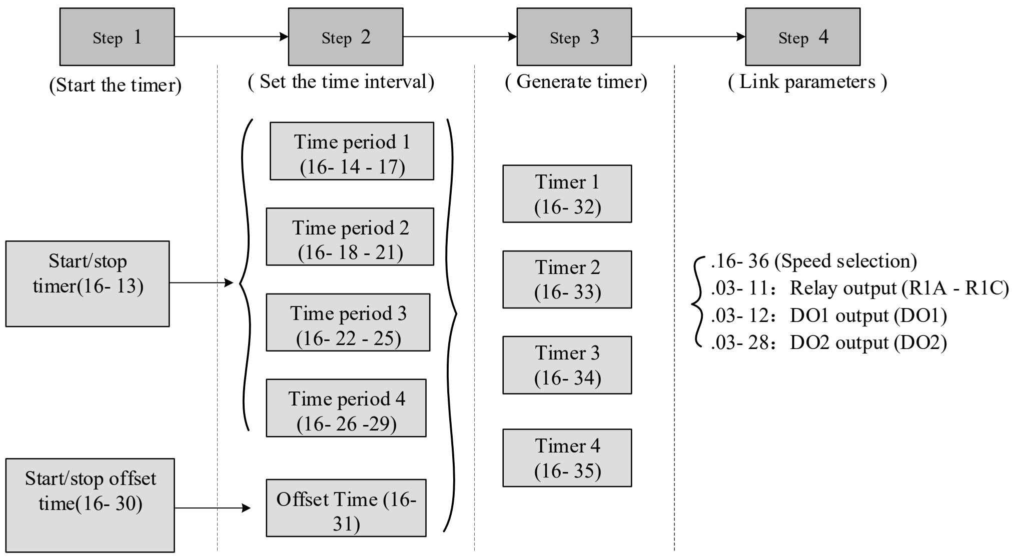


Figure 4.3.135 RTC Structure

・ Timer Configuration (Parameters 16-32 to 16-35)
・ Assign the desired operation period based on Table 4.3.38.

Table 4.3.38 Assigning Time Periods to Timers

16-32 to 16-35 Settings	O	P4	P3	P2	P1	Timer Function	Display
0	0	0	0	0	0	No Timer Selected	None
1	0	0	0	0	1	Time Period 1	P1
2	0	0	0	1	0	Time Period 2	P2
3	0	0	0	1	1	Time Periods 1 & 2	P1+P2
4	0	0	1	0	0	Time Period 3	P3
5	0	0	1	0	1	Time Periods 1 & 3	P1+P3
6	0	0	1	1	0	Time Periods 2 & 3	P2+P3
7	0	0	1	1	1	Time Periods 1, 2 & 3	P1+P2+P3
8	0	1	0	0	0	Time Period 4	P4
9	0	1	0	0	1	Time Periods 1 & 4	P1+P4
10	0	1	0	1	0	Time Periods 2 & 4	P2+P4
11	0	1	0	1	1	Time Periods 1, 2 & 4	P1+P2+P4
12	0	1	1	0	0	Time Periods 3 & 4	P3+P4
13	0	1	1	0	1	Time Periods 1, 3 & 4	P1+P3+P4
14	0	1	1	1	0	Time Periods 2, 3 & 4	P2+P3+P4
15	0	1	1	1	1	Time Periods 1, 2, 3 & 4	P1+P2+P3+P4
16	1	0	0	0	0	Offset Selection	Offset(O)
17	1	0	0	0	1	Offset + Time Period 1	O+P1
18	1	0	0	1	0	Offset + Time Period 2	O+P2
19	1	0	0	1	1	Offset + Time Periods 1 & 2	O+P1+P2
20	1	0	1	0	0	Offset + Time Period 3	O+P3
21	1	0	1	0	1	Offset + Time Periods 1 & 3	O+P1+P3
22	1	0	1	1	0	Offset + Time Periods 2 & 3	O+P2+P3
23	1	0	1	1	1	Offset + Time Periods 1, 2 & 3	O+P1+P2+P3
24	1	1	0	0	0	Offset + Time Period 4	O+P4
25	1	1	0	0	1	Offset + Time Periods 1 & 4	O+P1+P4
26	1	1	0	1	0	Offset + Time Periods 2 & 4	O+P2+P4
27	1	1	0	1	1	Offset + Time Periods 1, 2 & 4	O+P1+P2+P4
28	1	1	1	0	0	Offset + Time Periods 3 & 4	O+P3+P4
29	1	1	1	0	1	Offset + Time Periods 1, 3 & 4	O+P1+P3+P4
30	1	1	1	1	0	Offset + Time Periods 2, 3 & 4	O+P2+P3+P4
31	1	1	1	1	1	Offset + Time Periods 1, 2, 3 & 4	O+P1+P2+P3+P4

- RTC Speed Selection (Parameter 16-36)
  16-36 = 0: Off
  = 1: Reference frequency = Frequency for Step 0 (Parameter 05-01) when Timer 1 is active.
  = 2: Reference frequency = Frequency for Step 0 (Parameter 05-01) when Timer 2 is active.
  = 3: Reference frequency = Frequency for Step 0 (Parameter 05-01) when Timer 3 is active.
  = 4: Reference frequency = Frequency for Step 0 (Parameter 05-01) when Timer 4 is active.
  = 5: Reference frequency is selected via Timer 1 + Timer 2 combination.
- The reference frequency and motor rotation direction can be controlled via the RTC function.
  1. When the designated timer is triggered, the inverter will start running. Other timers will not affect the operation.
  2. When parameter 16-36 (RTC Speed Selection) is set to Timer 1 through 4, the actions of P1 to P4 correspond to parameter 16-37 Operation Direction Selection (RTC Operation 1 to 4).
  3. When RTC Speed Selection is set to 5 (selected by Timer 1 + 2), both 00-02 (Run Command Source) and 00-05 (Frequency Command Source) must be set to RTC. The reference frequency will be controlled by RTC Timer 1 and 2, and the inverter will continue executing the run command.
- For details on the control of frequency sources, please refer to Table 4.3.39.

* Parameter 11-00 (Motor Direction Lock) restricts the operation direction selection set in parameter 16-37.

* When using offset, parameter 16-37 will follow the operation direction of Timer 1.

Table 4.3.39 Reference Frequency Selected by Timer 1 and 2

Timer 2	Timer 1	Primary Frequency Command Source (00-05)	Frequency Source	Operation Direction Selection
0	0	6(RTC)	Parameter 05-01 0th Step Speed Setting	Based on Parameter 16-37 (RTC 1)
0	1	6(RTC)	Parameter 05-02 1st Step Speed Setting	Based on Parameter 16-37 (RTC 2)
1	0	6(RTC)	Parameter 05-03 2nd Step Speed Setting	Based on Parameter 16-37 (RTC 3)
1	1	6(RTC)	Parameter 05-04 3rd Step Speed Setting	Based on Parameter 16-37 (RTC 4)

RTC function will not operate correctly under the following conditions:
1. Fire Mode is triggered via digital input terminal.
2. KEB function is active.

(1) The main frequency command source for RTC function is primarily determined based on Table 4.3.39 above. However, you may also use frequency source combination mode selection (00-07) to apply a combination of primary and secondary frequency sources.
(2) If the main run command source for RTC is set to 0–3 (0: Keypad, 1: External Control, 2: Communication Control, 3: PLC), the relationship between the main run command and RTC timer status is shown in Table 4.3.40 below.

Table 4.3.40 Main Run Command and RTC Timer Status

Main Run Command 00-02	RTC Timer x Status	Inverter status
0~3	0	The inverter will not operate (no run command).
0~3	1	The inverter will not operate (no run command).
4	0	The inverter will not operate (RTC timer disabled).
4	1	Inverter operating. The operation direction is determined by parameter 16-37 (Operation Direction Selection).

- 00-02=0~3 (0: Keypad, 1: External Control, 2: Communication Control, 3: PLC), while 4 indicates RTC.
- Application Example:
  The following example illustrates how the RTC timer can be linked to different parameters. In this example, the motor operates from 6:00 AM to 10:00 PM on Monday, from 8:00 AM to 8:00 PM from Tuesday to Friday, from 8:00 AM to 6:00 PM on Saturday, and from 8:00 AM to 12:00 PM on Sunday. The motor runs at Speed 1 on weekdays (Monday through Friday), and at Speed 2 on weekends (Saturday and Sunday).

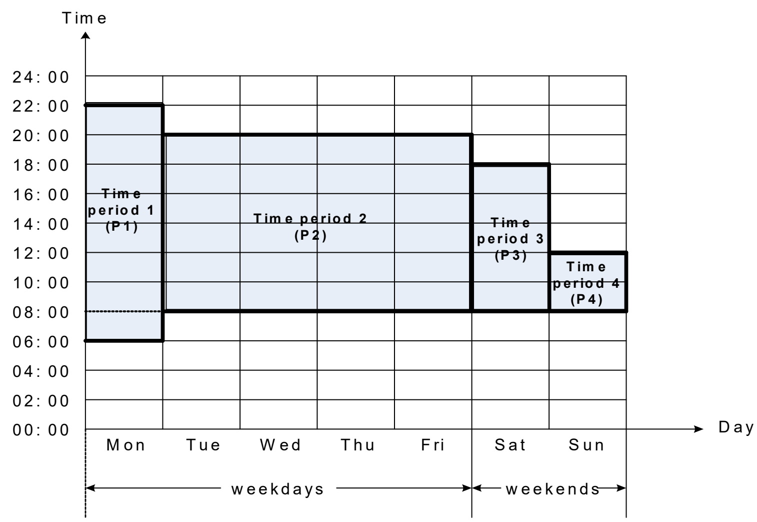


Figure 4.3.136 RTC Timer Application Example

①. Go to parameter group 16 to enable the timer (to use the RTC timer function, the internal time must be set first).
First, set parameters 16-11 and 16-12 to the correct date and time, then set parameter 16-13 (RTC timer function) to [1]: Enable.

②. Set Time Period 1 (P1)
Start Time 1: Parameter 16-14 = 06:00:00 (6 AM)
End Time 1: Parameter 16-15 = 22:00:00 (10 PM)
Start Day 1: Parameter 16-16 = 1 (Monday)
End Day 1: Parameter 16-17 = 1 (Monday)

③. Set Time Period 2 (P2)
Start Time 2: Parameter 16-18 = 08:00:00 (8 AM)
End Time 2: Parameter 16-19 = 20:00:00 (8 PM)
Start Day 2: Parameter 16-20 = 2 (Tuesday)
End Day 2: Parameter 16-21 = 5 (Friday)

④. Set Time Period 3 (P3)
Start Time 3: Parameter 16-22 = 08:00:00 (8 AM)
End Time 3: Parameter 16-23 = 18:00:00 (6 PM)
Start Day 3: Parameter 16-24 = 6 (Saturday)
End Day 3: Parameter 16-25 = 6 (Saturday)

⑤. Set Time Period 4 (P4)
Start Time 4: Parameter 16-26 = 08:00:00 (8 AM)
End Time 4: Parameter 16-27 = 12:00:00 (12 AM)
Start Day 4: Parameter 16-28 = 7 (Sunday)
End Day 4: Parameter 16-29 = 7 (Sunday)

⑥· Use Parameter 16-32 (Timer 1)
Assign all time periods (P1, P2, P3, P4) to the timer
Set Parameter 16-32 = 15 (Timer 1 Source = P1 + P2 + P3 + P4)

⑦· 16-36 RTC Speed Selection via Timer 1: Set Parameter 16-36 (Speed Selection) to 1: Selected by Timer 1. When Timer 1 is active, the frequency corresponds to Preset Speed 0. Set Parameter 16-37 (Run Direction Selection) to 0000b, so the run direction for Time Periods 1 to 4 (P1~P4) corresponds to the settings of 16-37.

⑧· To select two preset speeds (Speed 1 and Speed 2), set Parameter 16-36 (RTC Speed Selection) to 5: Selected by Timers 1 + 2. When Timer 1 is active, the frequency corresponds to Preset Speed 1 (Parameter 05-02); when Timer 2 is active, it corresponds to Preset Speed 2. Set Parameter 16-37 (Run Direction Selection) to 0000b, so when Timers 1 and 2 are active, the motor will run forward.

· Before using the offset time function, make sure to select RTC Offset (Parameter 16-30) and set the RTC Offset Time (Parameter 16-31). The inverter will follow the configuration defined by the time period-to-counter assignment function, which varies depending on the setup. Refer to Figure 4.3.138 below for the configuration of time period assignment to counters.

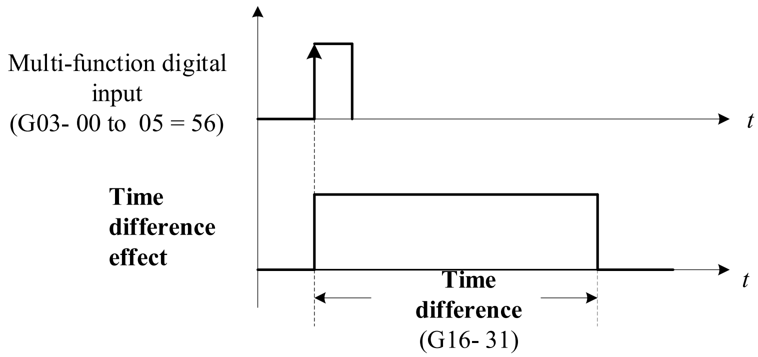


Figure 4.3.137 Operation with Offset Time

· **Example:**

· If Parameter 16-36 (RTC Speed Selection) is currently set to Timer 1, and Parameter 16-32 (Timer Source 1) is set to [17] Offset (O) + P1, and Parameter 16-30 (RTC Offset Selection) is set to "Triggered by DI." When the DI switch is turned ON, the RTC will activate immediately according to the offset time specified in Parameter 16-31 (RTC Offset Time). This function is especially useful when operation is needed outside of the scheduled P1 period.

· If the timer source is set to [15] (P1 + P2 + P3 + P4) and the STOP key is pressed during Time Period 1 (P1), normally the RTC function would wait until the next time period (P2) to resume operation. However, it is also possible to configure Parameter 16-30 (RTC Offset Selection) to "Triggered by DI." If the DI switch is turned on, the RTC function will be immediately activated, allowing the inverter to resume operation.

· Regardless of the timer source setting, if the STOP key is pressed during a scheduled time period and the inverter needs to resume operation within that same period, there are two options:

1. Set Parameter 16-30 (RTC Offset Selection) to "Triggered by DI," and assign DI function 56 to enable the offset.
2. As long as the RTC offset selection (16-30) has been toggled from OFF to ON, the RTC function will be reactivated.

★Remarks:

RTC accuracy:

Temperature	Deviation
+25°C	±3 seconds/day
-20°C / +50°C	±6 seconds/day

17- Auto-Tuning Function Group

17- 00	Auto-Tuning Mode Selection	
Scope	**[**0**]:** Rotational automatic tuning **[**1**]:** Static automatic tuning **[**2**]:** Stator resistance measurement **[**3**]:** Reserved	**[**4**]:** Loop tuning **[**5**]:** Integrated rotational automatic tuning (Options: 4 + 2 + 0) **[**6**]:** Integrated static automatic tuning (Options: 4 + 2 + 1)
17- 01	Motor rated output power	
Scope	【0.00~600.00】**KW**	
17- 02	Motor rated current	
Scope	25%~120% inverter rated current	
17- 03	Motor rated voltage	
Scope	**200V :**【50.0~240.0】**V**	**400V :**【100.0~480.0】**V**
17- 04	Motor rated frequency	
Scope	【4.8~599.00】 **Hz**	
17- 05	Motor rated speed	
Scope	【0~24000】**rpm**	
17- 06	Motor number of poles	
Scope	【2~16】**pole**	
17- 07	PG pulse count	
Scope	【0~60000】**PPR**	
17- 08	Motor no-load voltage	
Scope	**200V :**【50~240】**V**	**400V :**【100~480】**V**
17- 09	Motor excitation current	
Scope	[15~70]**%** motor rated current	
17- 10	Automatic tuning start	
Scope	**[0]:** Disabled	**[1]:** Enabled
17- 11	Automatic tuning error history	
Scope	**[0]:** No error **[1]:** Motor data error **[2]:** Stator resistance tuning error **[3]:** Leakage inductance tuning error **[4]:** Rotor resistance tuning error	**[5]:** Mutual inductance tuning error **[6]:** Encoder error **[7]:** DT error **[8]:** Motor acceleration error **[9]:** Warning
17- 12	Motor leakage inductance ratio	
Scope	**【0.1~15.0】%**	
17- 13	Motor slip frequency	
Scope	**【0.10~20.00】Hz**	
17- 14	Rotational tuning mode selection	
Scope	**[**0**]:** VF-based rotational auto-tuning	**[**1**]:** Vector-based rotational auto-tuning

*1. The motor rated voltage setting value is based on 220V class; doubling this gives the value for 440V class.
*2. The setting range for the motor rated frequency is 0.0 to 599.0 Hz.

Set the following parameters before performing auto-tuning: Motor Rated Output Power (17-01), Motor Rated Current (17-02), Motor Rated Voltage (17-03), Motor Rated Frequency (17-04), Motor Rated Speed (17-05), and Number of Motor Poles (17-06).

■ Auto-Tuning Mode Selection (17-00)

· When using rotation-based auto-tuning (17-00=0), higher performance can be achieved.
After completing the rotational auto-tuning, the following parameters will be automatically updated with the measured values: Motor 1 Magnetizing Current (02-09), Motor 1 Core Saturation Coefficient 1 (02-10), Motor 1 Core Saturation Coefficient 2 (02-11), and Motor 1 Core Saturation Coefficient 3

(02-12).

- Static Auto-Tuning (17-00 = 1): During static auto-tuning, the motor does not rotate.

After completing the stationary auto-tuning, the Motor Leakage Inductance Ratio (02-33) and the Motor Slip (02-34) will be populated with the automatically measured values.

- Stator Resistance Measurement (17-00 = 2) is intended for applications with long motor cables (over 50 meters).

After the measurement, the Motor 1 Line-to-Line Resistance (02-15) will be automatically filled with the measured value.

- Loop Tuning (17-00 = 4): This function optimizes the current loop response, improving the bandwidth of both current and torque control.
- Integrated Rotational Auto-Tuning (17-00 = 5): A three-in-one process that includes Loop Tuning (17-00 = 4), Stator Resistance Measurement (17-00 = 2), and Rotational Auto-Tuning (17-00 = 0).
- Integrated Static Auto-Tuning (17-00 = 6): Also a three-in-one process including Loop Tuning (17-00 = 4), Stator Resistance Measurement (17-00 = 2), and Static Auto-Tuning (17-00 = 1).

■ Motor Rated Output Power (17-01)

- The initial value is based on the inverter capacity (13-00). Please configure this according to the motor nameplate specifications.

■ Motor Rated Current (17-02)

- The initial value is based on the inverter capacity (13-00). Please configure this according to the motor nameplate specifications.
- The setting range is from 10% to 120% of the inverter's rated current.
- For SLV and SV modes, the setting range is from 25% to 120% of the inverter's rated current.

■ Motor Rated Voltage (17-03)

The initial value is determined by the inverter capacity (13-00). Please set it according to the motor nameplate specifications.

If the motor rated voltage exceeds the inverter input voltage, you must prevent inverter output voltage saturation (see Example 1).

■ Motor Rated Frequency (17-04)

Set according to the motor nameplate specifications.

■ Motor Rated Speed (17-05)

Set according to the motor nameplate specifications.

■ Number of Motor Poles (17-06)

Set the number of poles for the motor. The available settings are 2, 4, 6, and 8 poles.

■ PG Pulse Count (17-07) ***(V/F+PG, SV, PMSV** are only for special projects)

Set the number of pulses per revolution. When operating in SV mode or V/f+PG mode, the encoder must be mounted directly on the motor shaft without any gear reduction ratio.

■ Motor No-Load Voltage (17-08)

- Motor no-load voltage is primarily for use in SV or SLV modes. Set the value to approximately 10–50V below the input voltage to ensure torque performance at the rated frequency.
- The no-load voltage (17-08) is typically set to 85–95% of the motor's rated voltage. In general, the higher the motor's horsepower, the closer the no-load voltage setting can be to the rated voltage—however, it must not exceed the rated voltage.
- It is permissible to set the motor no-load voltage higher than the actual inverter input voltage, but in such cases, it is recommended to operate the motor at a lower frequency. Running at rated frequency may easily trigger over-voltage faults.
- The larger the motor capacity, the higher the no-load voltage.
- A lower no-load voltage reduces no-load current, but once the load is applied, it weakens the flux and increases the current.
- The higher the no-load voltage, the greater the no-load current. When a load is applied, magnetic flux increases and current decreases. Increasing magnetic flux may result in a stronger counter-electromotive force (back EMF), which can cause torque control failure.

- Motor Excitation Current (17-09)
  - · This parameter can only be set when performing static auto-tuning or stator resistance measurement (17-00 = 1 or 2).
  - · In rotational auto-tuning, the excitation current is automatically measured, so this parameter will not appear.
  - · The typical setting for motor excitation current is approximately 33%. During test operation, the display will show the message “Atune”. Once auto-tuning is complete, it will display “AtEnd.”
- Auto-Tuning Error History (17-11)
  - · If an error occurs during the auto-tuning process, the message “AtErr” will appear. The specific error code can be found in parameter 17-11.
  - · For details on error causes and troubleshooting, please refer to Chapter 5.

  Note: Motor tuning error history (17-11) stores the result of the most recent tuning failure.
- Motor Leakage Inductance Ratio (17-12)
  - · This parameter is only available when performing stator resistance measurement auto-tuning (17-00 = 2).
  - · In static and rotational auto-tuning modes, the leakage inductance ratio is automatically measured, so this parameter will not appear.
  - · Typical setting value is 4%. During test operation, adjust according to the instructions under parameter 02-33 Motor Leakage Inductance Ratio.

- Motor Slip (17-13)
  - · This parameter is only available when performing stator resistance measurement auto-tuning (17-00 = 2).
  - · In static and rotational auto-tuning modes, the leakage inductance ratio is automatically measured, so this parameter will not appear.
  - · The setting value should be calculated according to the explanation for parameter 02-34 Motor Slip.

Example 1: Motor rated voltage (440V/60Hz) is higher than inverter input voltage (380V/50Hz).

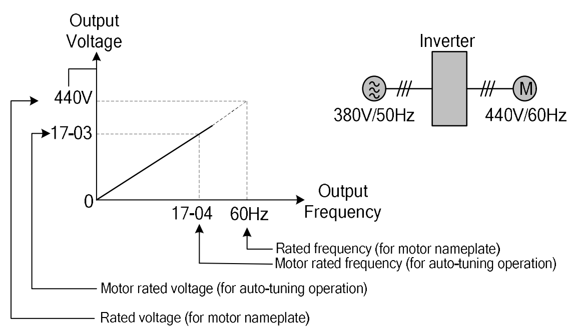


Figure 4.3.138 Rated Voltage and Frequency Settings

Step 1: Set the Auto-Tuning Mode Selection (17-00) and, based on the motor nameplate, set Motor Rated Output Power (17-01) and Motor Rated Current (17-02).

Step 2: Set Motor Rated Voltage (17-03) = 440V according to the motor nameplate.

Step 3: Set Motor Rated Frequency (17-04) = 60Hz according to the motor nameplate.

Step 4: Set Motor Rated Speed (17-05), Motor Pole Number (17-06), and PG Pulse Count (17-07) according to the motor nameplate.

PG Pulse Count (17-07) can be set in V/F+PG and SV modes.

Step 5: Set Motor No-Load Voltage (17-08) = 360V; for torque control, this value should be 20V below the inverter input voltage.

Step 6: Perform auto-tuning.

After setting Auto-Tuning Start (17-10) to enable [1], the system will enter the preparation screen. Press the Run key to begin auto-tuning.

If a PG card is installed, the PG Rotation Direction Selection (20-28) will be automatically adjusted during the tuning process.

During auto-tuning, the Motor Rated Frequency (17-04) will be automatically assigned as Motor 1 Base Frequency (01-12).

If Motor 1 Maximum Output Frequency (01-02) is different from Motor 1 Base Frequency (01-12), upon completion of the auto-tuning process, the system will automatically update Motor 1 Maximum Output Frequency (01-02) to match the value of Motor 1 Base Frequency (01-12).

· When the inverter input voltage (or frequency) is higher than the motor rated voltage (or frequency), the Motor Rated Voltage (17-03) and Motor Rated Frequency (17-04) should be configured according to the motor nameplate.

Example *2:* If the inverter input voltage and frequency are 440V/50Hz, and the motor rated voltage and frequency are 380V/33Hz, set 17-03 = 380V (motor rated voltage) and 17-04 = 33Hz (motor rated frequency).

■ Long Motor Cables between Inverter and Motor

· When the wiring length between the motor and inverter exceeds 50 meters, be sure to perform Long Cable Static Auto-Tuning (17-00 = 2). For optimal vector control performance, first perform Rotational Auto-Tuning with a short cable (17-00 = 0), then follow up with Long Cable Static Auto-Tuning (17-00 = 2).
· If Rotational Auto-Tuning (17-00 = 0) cannot be executed, manually input values for Motor 1 Mutual Inductance (02-18), Motor 1 Magnetizing Current (02-09), and Motor 1 Core Saturation Compensation Coefficients 1–3 (02-11 to 02-13).
· In V/F control applications using long cables, it is essential to perform Long Cable Static Auto-Tuning (17-00 = 2).

■ Rotational Auto-Tuning Type Selection (17-14)

· This parameter is only available when Rotational Auto-Tuning (17-00 = 0) or Integrated Rotational Auto-Tuning (17-00 = 5) is selected.
· V/F-Type Rotational Auto-Tuning (17-14=0) is applicable under VF mode for general standard induction motors that can operate stably without oscillation under no-load conditions. This option provides the highest versatility.
· Vector-Type Rotational Auto-Tuning (17-14=1) is applicable under V/F mode for special induction motors that are prone to oscillation under no-load conditions. These motors are often high-speed types. · If the V/F-Type Rotational Auto-Tuning (17-14 = 0) fails, retry using Vector-Type Rotational Auto-Tuning (17-14 = 1).
· Vector-Type Rotational Auto-Tuning (17-14 = 1) uses an internal current vector control method to measure the motor's no-load current, helping to avoid current oscillation issues under V/F mode with special induction motors.

18- Slip Compensation Function Group

18- 00	Low-speed slip compensation gain
Scope	Range: **[**0.00~2.50**]**
18- 01	High-speed slip compensation gain
Scope	【-1.00~1.00】
18- 02	Slip compensation limit
Scope	【0~250】**%**
18- 03	Slip compensation filter time
Scope	【0.0~10.0】**Sec**
18- 04	Regenerative slip compensation selection
Scope	**[**0**]:** Disabled **[**1**]:** Enabled
18- 05	FOC delay time
Scope	【1~1000】**mSec**
18- 06	FOC gain
Scope	【0.00~2.00】

· Regardless of load variation, the slip compensation function calculates motor torque based on output current and maintains constant motor speed.

· When operating under varying loads, slip compensation is used to enhance speed accuracy, primarily in V/F control mode.

V/F Mode Adjustment

(1) Low-Speed Slip Compensation Gain (18-00).

The factory default for 18-00 is 0.0 (When 18-00 = 0.0, the slip compensation function is disabled).

· Adjustment procedure for low-speed slip compensation gain (18-00):

① Properly set the rated slip and no-load current (02-00).

② Set the low-speed slip compensation gain (18-00).

③ When operating the motor under load, measure speed, and adjust the slow-speed slip compensation gain (18-00) by increasing in increments of 0.1.

— If the motor speed is lower than the target speed, increase the low-speed slip compensation gain (18-00).

— If the motor speed is higher than the target speed, decrease the low-speed slip compensation gain (18-00).

When the output current (12-18) exceeds the motor 1 no-load current (02-00), slip compensation activates, and the output frequency increases from f1 to f2. Refer to Figure 4.3.140. Slip compensation values follow the formula shown below:

$$\text{Slip compensation value} = \text{Motor rated slip frequency} \times \frac{[\text{ Output current (12-18) } - \text{ Motor 1 no-load current (02-00) }]}{[\text{ Motor 1 rated current (02-01) } - \text{ Motor 1 no-load current (02-00) }]}$$

$$\text{Motor rated slip frequency (f)} = \frac{(\text{Motor no-load synchronous rotation speed) (N)} \times \text{Number of motor poles (P)}}{120}$$

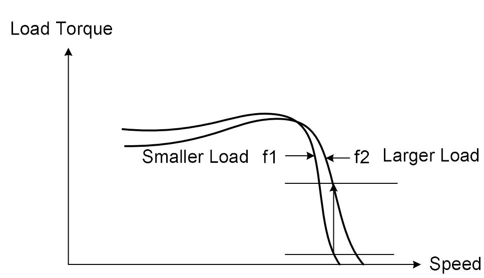


Figure 4.3. 139 Output Frequency with Slip Compensation

(2) Slip Compensation Limit (18-02)
· Slip compensation limit 18-02 defines the torque and power limits, as shown in Figure 4.3.141.
· If 18-02 is set to 0%, the slip compensation function is disabled.

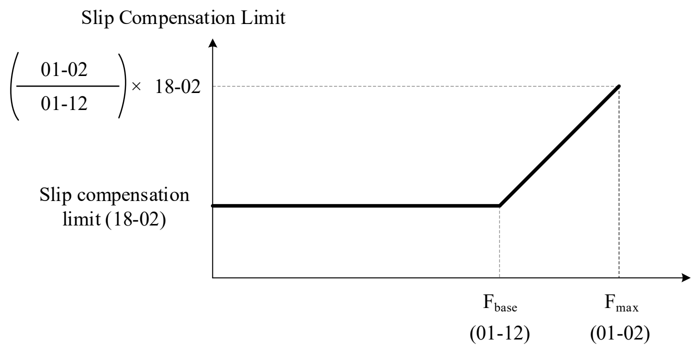


Figure 4.3. 140 Slip Compensation Limit

When adjusting the low-speed slip compensation gain 18-00, if the actual motor speed is still lower than the target speed, the motor may have reached the slip compensation limit.
Ensure that the slip compensation limit (18-02) and reference frequency do not exceed the mechanical limitations of the equipment.

(3) Slip Compensation Filter Time (18-03).
· Filter time for slip compensation under V/F mode.

(4) Slip Compensation Selection during Regeneration (18-04)
· Select to enable or disable slip compensation during regenerative (deceleration) periods.
· In SLV mode, if speed accuracy is required during regeneration (deceleration), set 18-04 to 1 (enable).
· When slip compensation is enabled, regenerative energy may spike briefly (18-04 = 1), and a braking module (brake resistor) may be required.

SLV Mode Adjustment
(1) Slip Compensation Gain
· For coupled loads, this gain can be used to maintain speed control accuracy across the full range.
· If speed drops below 2Hz and the motor slows down, increase 18-00.
· If speed drops below 2Hz and the motor speeds up, decrease 18-00.
Since 18-00 is a fixed value across the full speed range, even if accuracy is adjusted at low speed, there may still be minor errors at high speed. If high-speed error is unacceptable, 18-01 (external compensation value) can be used, or continue fine-tuning 18-00—though this may compromise low-speed precision.
The effect of 18-00 on torque-speed characteristics is illustrated in the figure below:

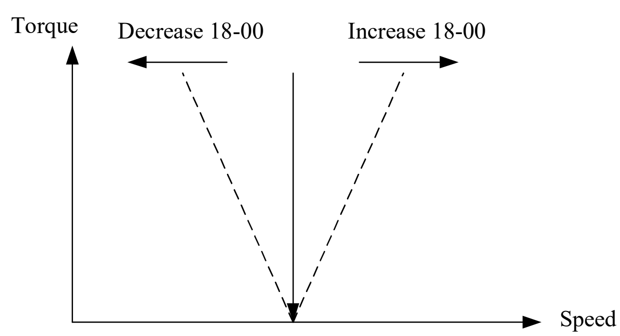


Figure 4.3. 141 Effect of 18-00 on Torque vs. Speed

(2) High-Speed Slip Compensation Gain (18-01)
· When the load is coupled, this parameter is used to control speed accuracy during medium to high-speed operation. In most cases, no adjustment is necessary.
· After adjusting 18-00, increase the reference frequency and observe any speed error. If speed error persists, increase the 18-01 setting to compensate.

· To reduce speed error, increase the motor rated frequency (01-12 base frequency) and increase 18-01.
· If speed accuracy is degraded due to high motor temperature, it is recommended to adjust both 18-00 and 18-01 accordingly.
· Compared with 18-00, 18-01 differs in that it is a variable gain across the entire speed range.

18-01 defines the slip compensation at the motor rated speed. The formula is as follows:

$$\text{Slip Compensation Gain} = (\text{Low-Speed Slip Compensation Gain} + \text{High-Speed Slip Compensation Gain}) \times \frac{\text{Reference Frequency}}{\text{Motor Rated Frequency (01-12)}}$$

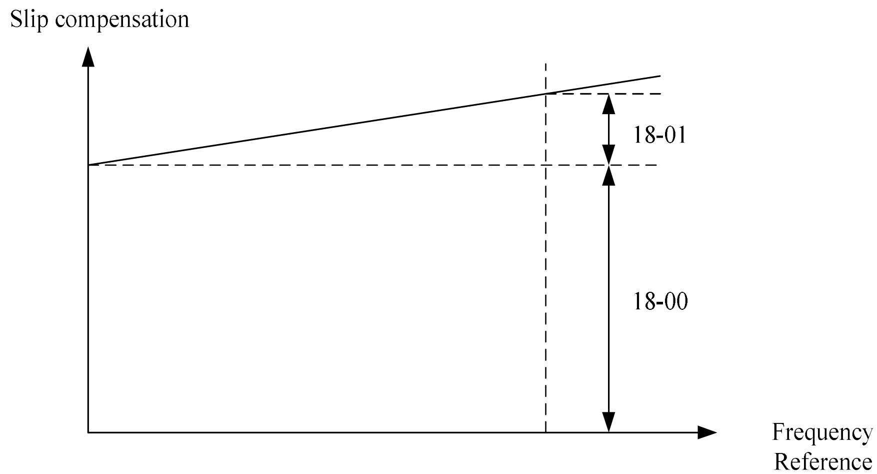


Figure 4.3. 142 18-00 / 18-01 Slip Compensation Gain vs. Frequency Reference

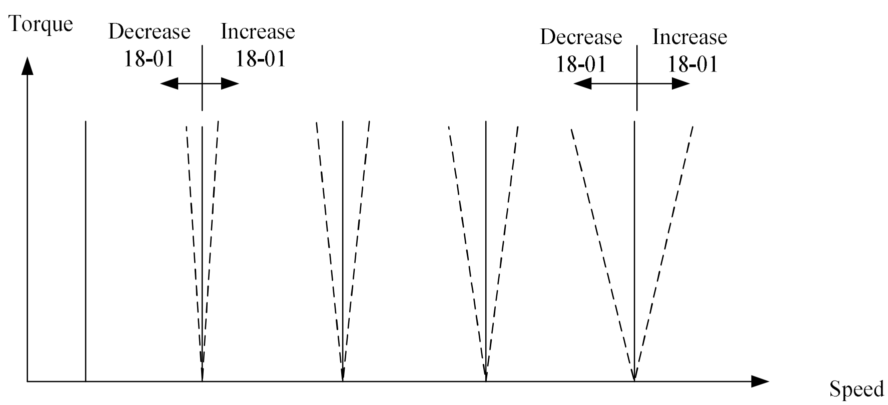


Figure 4.3. 143 Effect of 18-01 on Torque-Speed Curve

(3) FOC (Flux-Oriented Control) Delay Time (18-05)
· In SLV mode, magnetic flux slip compensation depends on torque current and excitation current.
· When the motor is subjected to over 100% load at rated frequency, the voltage drop across the inductance and resistance may cause inverter output saturation and result in current oscillation. Flux slip compensation decouples torque current from excitation current, thereby resolving current oscillation issues.
· Parameter 18-05 defines the delay time for flux slip compensation.
· Increase 18-05 for slow or steady-state operation; adjust 18-06 for fast operation.
(4) Slip Compensation Gain Adjustment (18-06)
· If the motor vibrates at rated frequency and full load, gradually reduce the 18-06 setting value to zero until the vibration subsides.

SLV2 Mode Adjustment

The factory default for 18-00 is 0.0 (When 18-00 = 0.0, the slip compensation function is disabled).

· Adjustment procedure for Slip Compensation Gain (18-00) is indicated below:

① Properly set the rated slip and no-load current (02-00).

② Set the Slip Compensation Gain (18-00)

③ When operating the motor under load, measure speed, and adjust the slip compensation gain (18-00) by increasing in increments of 0.1.

— If the motor speed is lower than the target speed, increase the low-speed slip compensation gain (18-00).

— If the motor speed is higher than the target speed, decrease the low-speed slip compensation gain (18-00).

19 – Wobble Function Group

19- 00	Frequency skipping center frequency	**19- 04**	Frequency skipping cycle
Scope	【5.00~100.00】**%**	**Scope**	【0.0~1000.0】**Sec**
19- 01	Frequency skipping amplitude	**19- 05**	Frequency skipping ratio
Scope	【0.1~20.0】**%**	**Scope**	【0.1~10.0】**mSec**
19- 02	Frequency skipping oscillation frequency	**19- 06**	Frequency skipping upper offset amplitude
Scope	【0.0~50.0】**%**	**Scope**	【0.0~20.0】**%**
19- 03	Frequency skipping oscillation time	**19- 07**	Frequency skipping lower offset amplitude
Scope	【0~50】**mSec**	**Scope**	【0.0~20.0】**%**

· Wobble operation is only available in V/F and V/F+PG control modes. To compensate for rapid frequency changes in systems with inertia, frequency jumps can be incorporated.* **(V/F+PG, SV, PMSV** are only for special projects).

· Refer to Figure 4.3.145 for wobble operation and related parameter settings.

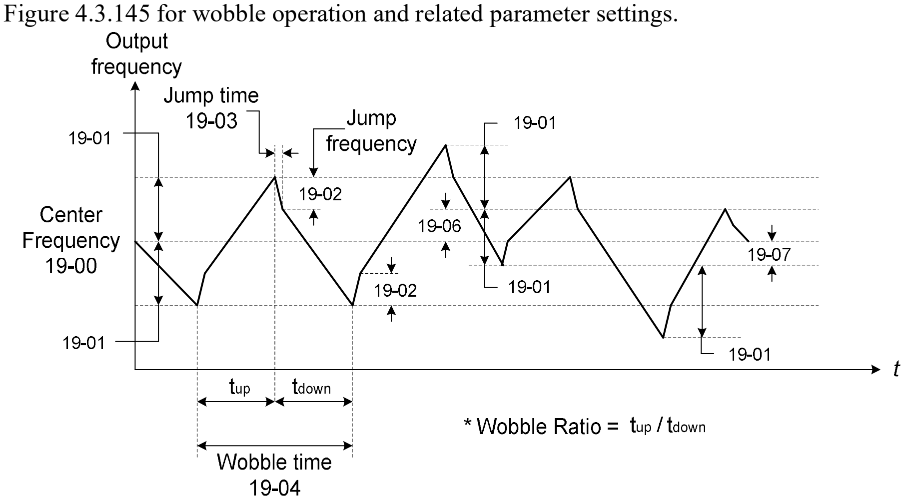


Figure 4.3. 144 Wobble Operation and Parameter Settings

· During wobble operation, the wobble run command input source for the inverter is a multi-function digital input (set 03-00 to 03-07 to 37: Wobble Run).

Before the inverter output frequency reaches the wobble center frequency (19-00), the acceleration time will follow the default Acceleration Time 1 (00-14). When the wobble function is turned off or the run command is removed, the deceleration time will follow the default Deceleration Time 1 (00-15). However, during wobble operation, the acceleration and deceleration times are affected by the wobble period (19-04, tup + tdown) and wobble ratio (19-05, tup / tdown).

· Wobble activity can be monitored using relay output (R1A-R1C, DO1) set to 28: Wobble Upward Offset Status and 29: Wobble Active (set via 03-11 and 03-12).

· Refer to Figure 4.3.146 for wobble ON/OFF control.

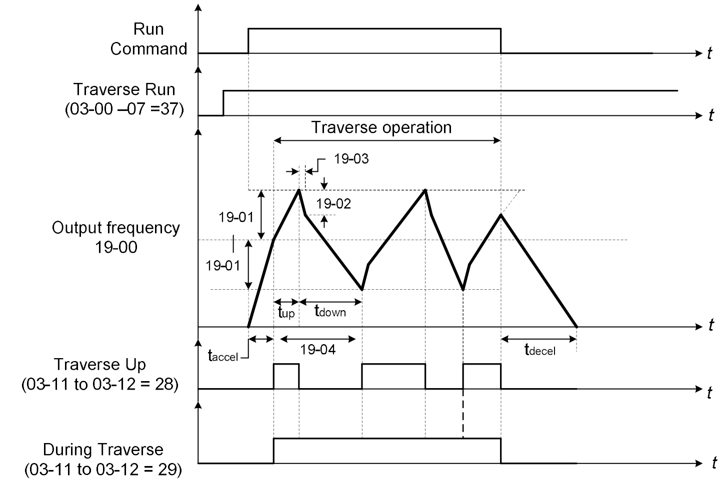


Figure 4.3. 145 Wobble ON/OFF Control

· During wobble operation, the center frequency can be shifted upward or downward via multi-function digital input. The amplitudes for up/down offset are configured via 19-06 Wobble Upward Offset Amplitude and 19-07 Wobble Downward Offset Amplitude.
However, the upward offset command (set 03-00 to 07 to 38: Wobble Upward Offset) and downward offset command (set 03-00 to 07 to 39: Wobble Downward Offset) must not be input simultaneously, or the inverter will maintain the previous center frequency (19-00). Refer to Figure 4.3.147 below.

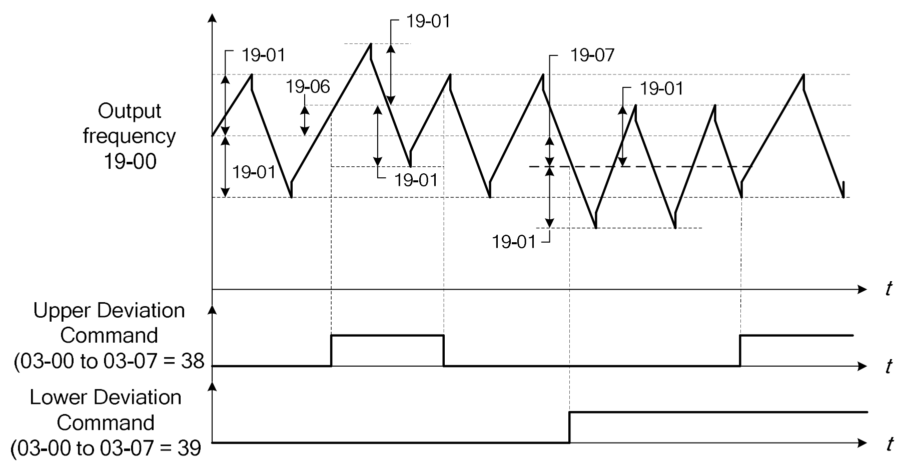


Figure 4.3. 146 Up/Down Offset Operation

· During the acceleration and deceleration periods of wobble operation, the stall prevention function is disabled. Therefore, it is necessary to select an appropriate inverter capacity to meet the actual application needs.
· The frequency range of wobble operation spans from Motor 1 Minimum Output Frequency (01-08) to Motor 1 Maximum Output Frequency (01-02). If the Wobble Center Frequency (19-00) + Wobble Amplitude (19-01) exceeds the Maximum Output Frequency (01-02), the maximum output frequency will be limited to 01-02.
If the Wobble Center Frequency (19-00) - Wobble Amplitude (19-01) is below the Minimum Output Frequency (01-08), the minimum output frequency will be limited to 01-08.
· All parameters within the Wobble Function Group (19-00 to 19-07) can be modified during wobble operation.

20 – Speed Control Function Group

20- 00	ASR gain 1		
Scope	【0.00~250.00】		
20- 01	ASR integral time 1	**20- 04**	ASR integral time limit
Scope	【0.001~10.000】**Sec**	**Scope**	【0~300】**%**
20- 02	ASR gain 2	**20- 05**	ASR positive limit
Scope	【0.00~250.00】	**Scope**	【0.1 ~ 10】**%**
20- 03	ASR integral time 2	**20- 06**	ASR negative limit
Scope	【0.001~10.000】**Sec**	**Scope**	【0.1 ~ 10】**%**
20- 07	Acceleration/deceleration P/PI selection		
Scope	**[**0**]:** PI speed control is only effective during constant speed; only P control is used during acceleration and deceleration **[**1**]:** PI speed control is effective during both constant speed and acceleration/deceleration		
20- 08	ASR delay time	**20- 14**	Speed feedback low filter constant 2
Scope	【0.000~0.500 】**Sec**	**Scope**	【1~1000】**mSec**
20- 09	Speed observer gain 1	**20- 15**	ASR gain change frequency 1
Scope	【0.00~2.55】	**Scope**	【0.0~599.0】**Hz**
20- 10	Speed observer integral time 1	**20- 16**	ASR gain change frequency 2
Scope	【0.01~10.00】**Sec**	**Scope**	【0.0~599.0】**Hz**
20- 11	Speed observer gain 2	**20- 17**	Low-speed torque compensation gain
Scope	【0.00~2.55】	**Scope**	【0.00~2.50】
20- 12	Speed observer integral time 2	**20- 18**	High-speed torque compensation gain
Scope	【0.01~10.00】**Sec**	**Scope**	【-10~10】**%**
20- 13	Speed feedback low filter constant 1	**20-33**	Constant speed detection threshold
Scope	【1~1000】**mSec**	**Scope**	【0.1~5.0】**%**

Use of parameter 20-07 (P/PI selection during acceleration/deceleration)
Parameter 20-33 (Constant Speed Detection Threshold) is primarily used when 20-07 is set to 0 and the frequency command source is analog input. Because analog signals can be affected by noise, the system may incorrectly judge that the motor has not reached constant speed, resulting in issues. Therefore, adjusting parameter 20-33 can help prevent such occurrences.

· The diagram below shows the speed control loop structure (ASR).* **(V/F+PG, SV, PMSV** are only for special projects)

(a) V/F + PG Control Mode:
· The speed control system (ASR) adjusts the output frequency so that the feedback speed follows the speed command (to reach zero error).

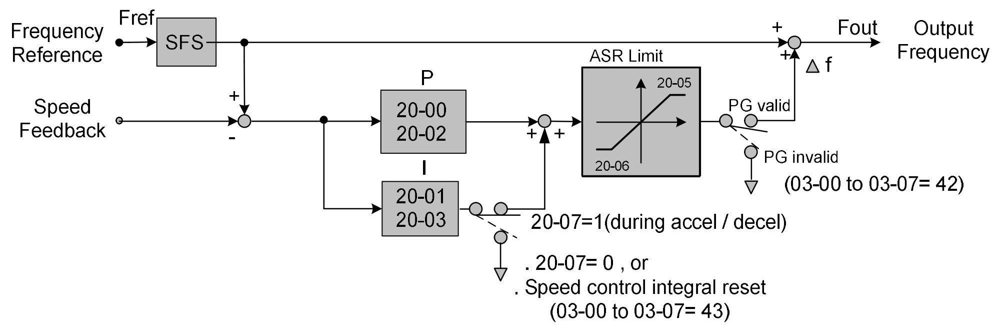


Figure 4.3.147 Speed Control Structure (V/F + PG)

· When a multi-function digital input terminal (03-00 to 03-07) is set to 42 (Speed command without PG), the input can be used to enable or disable the ASR system.

(b) SLV Control Mode:

· The SLV control mode uses a speed estimator output as the feedback value.

· The speed control system (ASR) adjusts the output frequency so that the feedback speed follows the speed command (to reach zero error).

· The SLV mode includes a speed estimator used to estimate motor speed. To reduce noise interference, a low-pass filter and speed feedback compensator are added.

· The ASR integrator output can be cleared (03-00 to 03-07 = 43). The ASR controller output passes through a low-pass filter and limiter before generating the torque command.

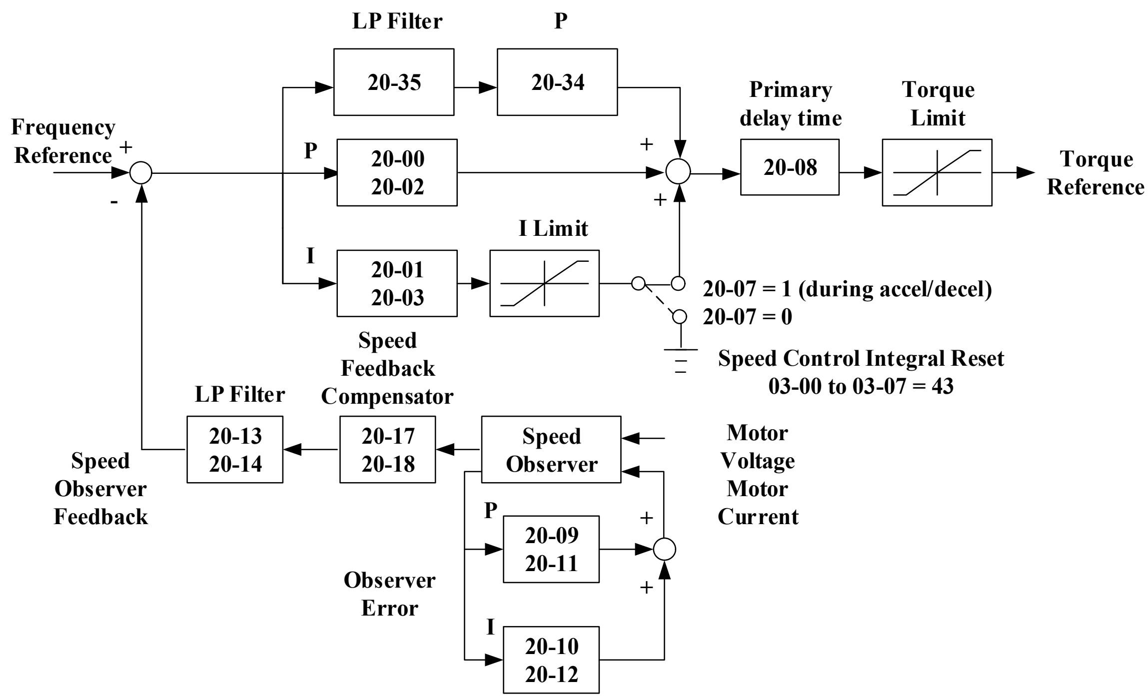


Figure 4.3.148 Speed Control Structure (SLV Mode)

(c) SV and PMSV Control Modes:

· The speed control system (ASR) adjusts the output frequency so that the feedback speed follows the speed command (to reach zero error).

· The ASR integrator output can be cleared (03-00 to 03-07 = 43). The ASR controller output passes through a low-pass filter and limiter before generating the torque command.

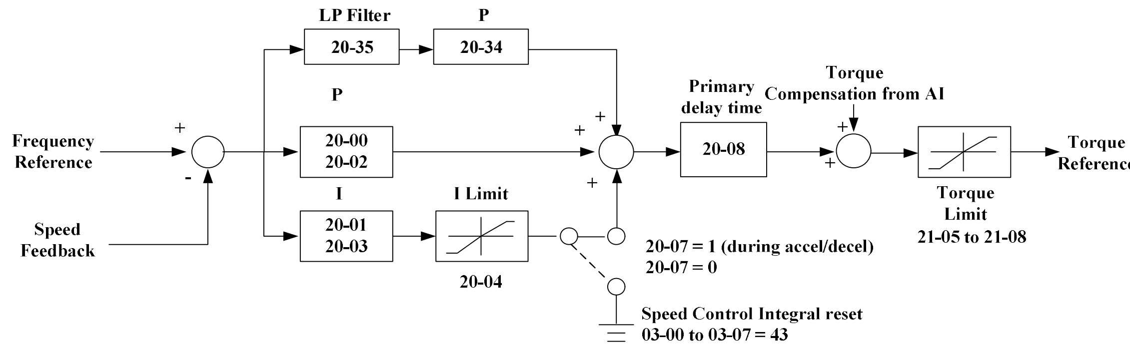


Figure 4.3.149 Speed Control Structure (SV and PMSV Modes)

*** (V/F+PG, SV, PMSV** are only for special projects)

A. ASR Settings in V/F + PG Control Mode

(1) In V/F + PG mode, the proportional (P) gain and integral (I) time are set for both the minimum output frequency (parameters 20-02 and 20-03) and maximum output frequency (parameters 20-00 and 20-01). Refer to Figure 4.3.151.

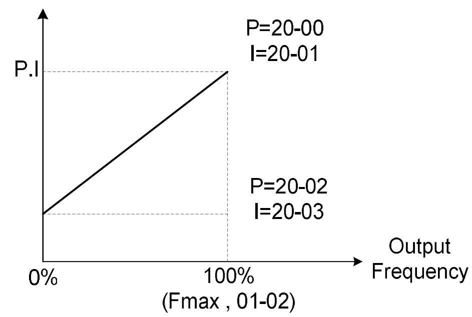


Figure 4.3.150 ASR Gain Settings (V/F + PG)

(2) Adjusting the ASR Gain:

Use the following steps to adjust the ASR Gain:

a. Gain Adjustment for Minimum Output Frequency.

· Run the motor at the minimum output frequency (Fmin, 01-08).

· Increase the ASR proportional gain 2 (20-02) as much as possible without causing instability.

· Decrease the ASR integral time 2 (20-03) as much as possible without causing instability.

· Ensure that the output current is below 50% of the inverter rated current. If the output current exceeds 50% of the inverter rated current, reduce 20-02 and increase 20-03.

b. Gain Adjustment for Maximum Output Frequency.

· Run the motor at the maximum output frequency (Fmax, 01-02).

· Increase the ASR proportional gain 1 (20-00) as much as possible without causing instability.

· Decrease the ASR integral time 1 (20-02) as much as possible without causing instability.

c. Gain Adjustment for Acceleration/Deceleration PI Control (20-07).

· When 20-07 = 1, PI speed control is enabled during both constant speed and acceleration/deceleration, activating integral control.

· Integral control helps the motor reach the target speed more quickly but may cause overshoot or oscillation, as shown in Figures 4.3.154 and 4.3.155.

· If one of the multi-function digital inputs (03-00 to 03-07) is set to 43, it can be used to reset the speed control integrator.

When 20-07 is set to 1, both proportional (P) and integral (I) control of the ASR are active during acceleration/deceleration and steady-state operation. When set to 0, only P+I control is used during steady-state, while only P control is applied during acceleration/deceleration.

– If speed overshoot occurs, decrease 20-00 (ASR Proportional Gain 1) and increase 20-01 (ASR Integral Time 1).

– If speed undershoot occurs, decrease 20-02 (ASR Proportional Gain 2) and increase 20-03 (ASR Integral Time 2).

– If overshoot or undershoot cannot be resolved through gain tuning alone, adjust ASR Positive/Negative Limits (20-05 / 20-06) accordingly to increase or reduce the reference frequency compensation (Δf) range for better speed response. Since parameters 20-05 and 20-06 cannot be modified during operation, the inverter must be stopped before adjusting the ASR positive/negative limits.

· Observe the motor speed waveform and adjust gains simultaneously as shown in Figure 4.3.152.

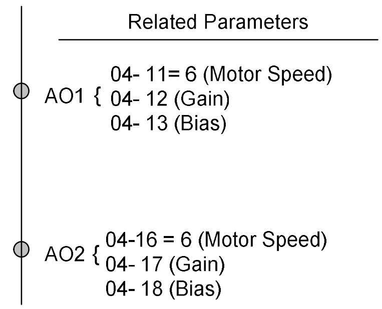


Figure 4.3.151 Analog Output Settings

d. ASR Positive/Negative Limits (20-05, 20-06)

· The ASR positive/negative limits define the frequency compensation boundaries for speed control. Set this frequency limit as a percentage of the maximum output frequency (01-02).

· If the frequency limit is set too low, the actual motor speed may fail to reach the target speed.

B. ASR Settings (SV / SLV / PMSV Control Modes)

(1) SLV Mode:

· In SLV mode, the speed controller provides separate high-speed and low-speed gain settings—parameters 20-00/20-01 for high speed and 20-02/20-03 for low speed. The switching between high-speed and low-speed gains is defined by parameters 20-15 and 20-16.

· Similar to ASR gain settings, the speed estimator provides high-speed gains (20-09/20-10) and low-speed gains (20-11/20-12). The switching points for these gains are also set using parameters 20-15 and 20-16.

· The speed estimator includes a low-pass filter to reduce noise interference in the speed feedback. Parameters 20-13 and 20-14 define the low-pass filter time constants for high-speed and low-speed operation, respectively. The switching points for these gains are also set using parameters 20-15 and 20-16.

· Parameter 20-17 sets the low-speed compensation gain for speed feedback.

· Parameter 20-18 sets the high-speed compensation gain for speed feedback.

· When the reference frequency exceeds the value set in parameter 20-16, the high-speed ASR/estimator gains and low-pass filter time constants are fully applied. When the reference frequency is lower than the value set in parameter 20-15, the low-speed ASR/estimator gains and time constants are fully applied. When the speed command is between the values of 20-15 and 20-16, the gains and time constants transition smoothly and linearly.

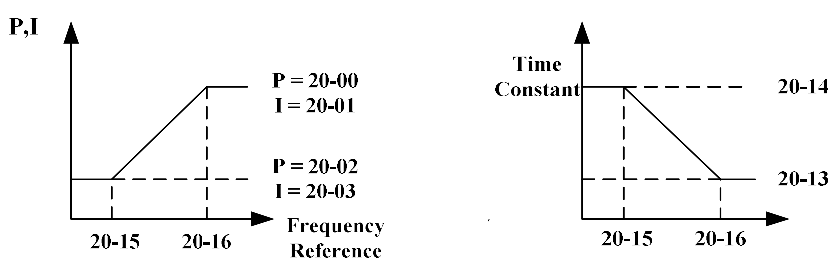


Figure 4.3.152 ASR Gain Settings in SLV Mode

(2) Gain settings in SV and PMSV modes

· In SV and PMSV modes, separate ASR gains are provided for high-speed (20-00/20-01) and low-speed (20-02/20-03) ranges.

(3) Speed control gain adjustment

· During gain adjustment, multi-function analog output terminals (AO1 and AO2) can be used to monitor output frequency and motor speed (see Figure 4.3.153).

➢ For full-speed-range ASR gain tuning in SV and PMSV modes (20-00 to 20-03):

· Adjust parameters during normal operation.

· Increase ASR proportional gain 1 (20-00) and gain 2 (20-02) as much as possible, but avoid system instability.

— Parameters 20-00 and 20-02 affect the response of the speed control loop.

— Adjusting the settings of 20-00 and 20-02 can improve system responsiveness but may also cause the entire system to become oscillatory. Please refer to the diagram below:

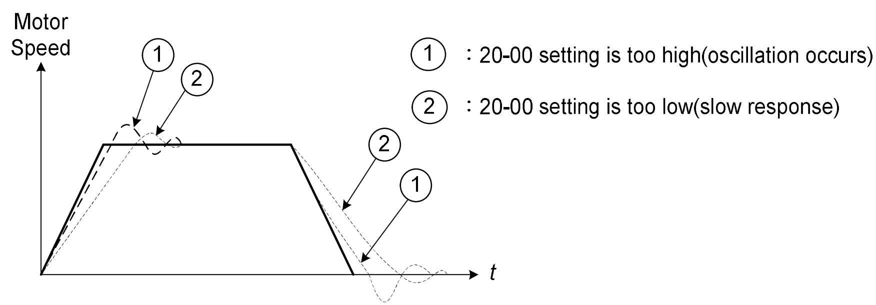


Figure 4.3.153 System Response of ASR Proportional Gain

· Reduce ASR integral time 1 (20-01) and ASR integral time 2 (20-02) with caution to avoid instability.

— Longer integral times result in slower system response.

— Excessively short integral times may cause system oscillation. Refer to the figure below.

· If system overshoot occurs while adjusting PI gain, over-voltage protection may be triggered. To prevent this issue, a braking unit (braking resistor) may be used.

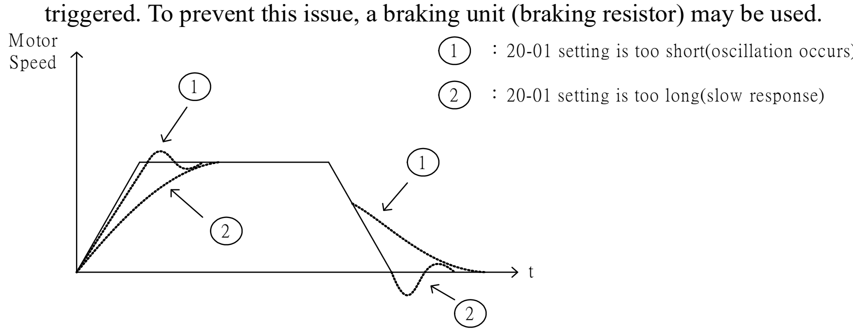


Figure 4.3.154 ASR Integral Time Response

➢ SLV Mode Gain Adjustment (20-00 to 20-03, 20-09 to 20-18) and SLV2 Mode Gain Adjustment (20-15, 20-16)

· Adjust low-speed ASR PI gains 20-02 to 20-03 when the reference speed is lower than 20-15. The adjustment method for proportional gain (P) and integral time (I) is similar to 20-00 and 20-01 in SV mode.

· Adjust high-speed ASR PI gains 20-00 to 20-01 when the reference frequency is higher than 20-16. The adjustment method for proportional gain (P) and integral time (I) is similar to 20-00 and 20-01 in SV mode.

· Generally, low-speed ASR gain can be set equal to the high-speed gain. If mechanical resonance causes oscillation, adjust either the low-speed or high-speed gain accordingly.

· If adjusting ASR PI gains 20-00 to 20-03 does not improve system response, reduce the low-pass filter time constants 20-13 to 20-14 to increase feedback bandwidth, then readjust the ASR gains.

· Adjust low-speed low-pass filter time constant 20-14 when the reference frequency is below 20-15.

· Adjust high-speed low-pass filter time constant 20-13 when the reference frequency is above 20-16.

· Increasing the low-pass filter time constant limits the speed feedback bandwidth and reduces overall system responsiveness. This approach reduces interference in the speed feedback signal but may hinder response to sudden load changes. It is suitable when load fluctuation is minimal and stable operation is desired. Low feedback bandwidth must be paired with low

ASR gain to ensure stable operation.

· Decreasing the low-pass filter time constant increases the speed feedback bandwidth and overall responsiveness. While this improves the system's ability to react to rapid load changes, it also increases susceptibility to feedback noise. Use this method when rapid response is required and load fluctuations are frequent. High feedback bandwidth allows for higher ASR gain settings.

· If adjusting 20-00 to 20-03 and filter time constants 20-13 to 20-14 still does not yield a satisfactory response, the PI gain of the speed estimator (20-09 to 20-12) may need to be tuned.

· High estimator gain (larger P, shorter I) increases bandwidth but can lead to system instability due to noise.

· Low estimator gain (smaller P, longer I) reduces bandwidth but improves noise immunity and overall stability.

· Typically, default ASR settings are suitable for most applications. Adjusting low-pass filter constants and estimator gain is complex and risky; excessive tuning by the user is not recommended. If stable and high-speed response cannot be achieved in SLV mode, switch to SV mode.

· Parameter 20-15 defines the frequency threshold for switching to low-speed gain; 20-16 defines the high-speed gain threshold.

· When the reference speed is lower than 20-15, the inverter outputs a higher magnetizing current to improve low-speed control accuracy. When the frequency reference exceeds 20-16, the inverter outputs the rated magnetizing current at no-load voltage (02-19).

· As a general guideline, 20-15 should be set at 5–50% of the motor base frequency. If set too high, the inverter output may saturate. 20-16 should be set at 4 Hz or above and higher than 20-08.

· If the motor operates stably under heavy load (above 100%) at mid-speed but oscillates at high speed, reduce the no-load voltage (02-19) or adjust FOC parameters (18-05 to 18-06).

· Parameters 20-17 and 20-18 compensate for speed feedback under low- and high-speed conditions, respectively.

· Parameter 20-17 is used to adjust no-load speed below 2 Hz. Adjusting 20-17 is similar to adding an offset to the torque-speed curve. When the no-load speed is below the frequency reference, increase 20-17. When the no-load speed is above the frequency reference, decrease 20-17. The effect of 20-17 on the torque-speed curve is illustrated below:

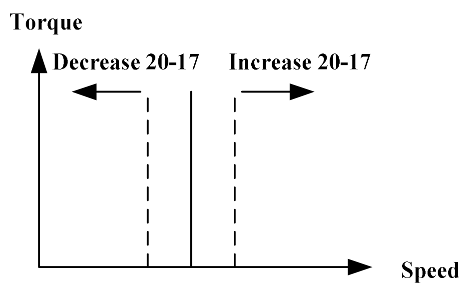


Figure 4.3.155 Effect of 20-17 on Torque-Speed Curve

Parameter 20-18 is used to adjust no-load speed in the mid- to high-speed range. Adjustment is typically unnecessary. Parameter 20-18 functions similarly to 20-17; its torque-speed curve is as follows:

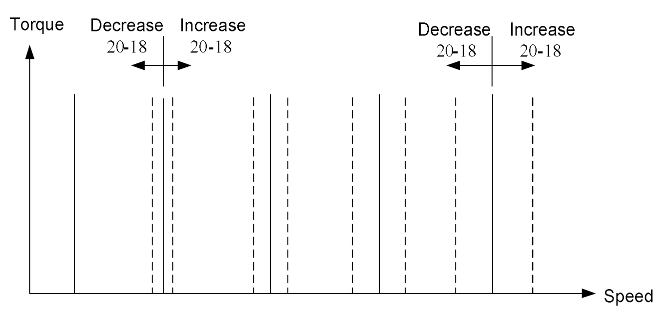


Figure 4.3.156 Effect of 20-18 on Torque-Speed Curve

- ➢ Main ASR Delay Time (20-08).

  · Normally, adjustment is not required.

  · A higher 20-08 setting reduces the speed response but improves system stability and reduces the likelihood of oscillation.

- ➢ ASR Integral Limit (20-04)

  · Setting a smaller value helps prevent sudden load variations.

Note: Open-loop speed bandwidth specifications for vector control modes:

1. SV / PMSV control mode: 50 Hz
2. SLV / PMSLV control mode: 10 Hz

Speed response may be affected by factors such as proportional gain (kp) tuning, system inertia, load, and motor temperature. Therefore, the practical bandwidth may be slightly reduced in real-world applications.

20- 19	Overspeed (OS) selection		
Scope	[0]**:** Decelerate to stop	[1]**:** Free-run stop	[2]**:** Continue operation
20- 20	Overspeed (OS) detection threshold		
Scope	【0~120】**%**		
20- 21	Overspeed (OS) detection time		
Scope	【0.0~2.0】**Sec**		
20- 22	Speed deviation (DEV) selection		
Scope	[0]**:** Decelerate to stop	[1]**:** Free-run stop	[2]**:** Continue operation
20- 23	Speed deviation (DEV) detection threshold		
Scope	【0~50】**%**		
20- 24	Speed deviation (DEV) detection time		
Scope	【0.0~10.0】**Sec**		
20- 25	PG disconnection selection		
Scope	[0]**:** Decelerate to stop	[1]**:** Free-run stop	[2]**:** Continue operation
20- 26	PG disconnection detection time		
Scope	【0.0~10.0】**Sec**		
20- 27	PG pulse count		
Scope	【0~9999】**PPR**		
20- 28	PG rotation direction selection		
Scope	[0]**:** Forward is counterclockwise	[1]**:** Forward is clockwise	
20- 29	PG pulse frequency division ratio		
Scope	【001~132】		
20- 30	PG gear ratio 1		
Scope	【1~1000】		
20- 31	PG gear ratio 2		
Scope	【1~1000】		

- PG interface card is required (JN7-PG-O / JN7-PG-L / JN7-PG-PM) ***PG card is for special projects only**
- The PG pulse division ratio can be configured via 20-29.
- PG Feedback Settings

(1) Overspeed Operation Settings (20-19 to 20-21)

· An error is detected when the motor speed exceeds the configured limit.

· An overspeed (OS) fault is triggered if the motor speed feedback exceeds the setting of 20-20 (Overspeed Detection Level) and persists longer than the time set in 20-21 (Overspeed Detection Delay Time).

· When an overspeed (OS) is detected, the inverter stops operation according to the setting in 20-19.

· Refer to the block diagram in Figure 4.3.158 for PG feedback fault detection.

(2) PG Speed Deviation Settings (20-22 to 20-24)

· An error is detected when the speed deviation (i.e., the difference between the command speed and the actual motor speed) exceeds the configured limit.

· Speed deviation (DEV) fault detection is triggered when the output frequency is outside the reference frequency ± the deviation detection tolerance (20-22), and the deviation exceeds the setting in 20-23 (Deviation Detection Level) or lasts longer than the time set in 20-24 (Deviation Detection Delay Time).

· Upon detecting a speed deviation, the inverter will stop according to the setting in 20-22.

· Refer to the block diagram in Figure 4.3.158 for PG feedback fault detection.

(3) PG Detection Settings (20-25 to 20-26).

· A PG (PGO) disconnection fault is detected if it lasts longer than the time specified by parameter 20-26 (PG Open Circuit Detection Time).

· The inverter will stop according to the setting of parameter 20-25.

· Refer to the PG feedback fault detection block diagram in Figure 4.3.158.

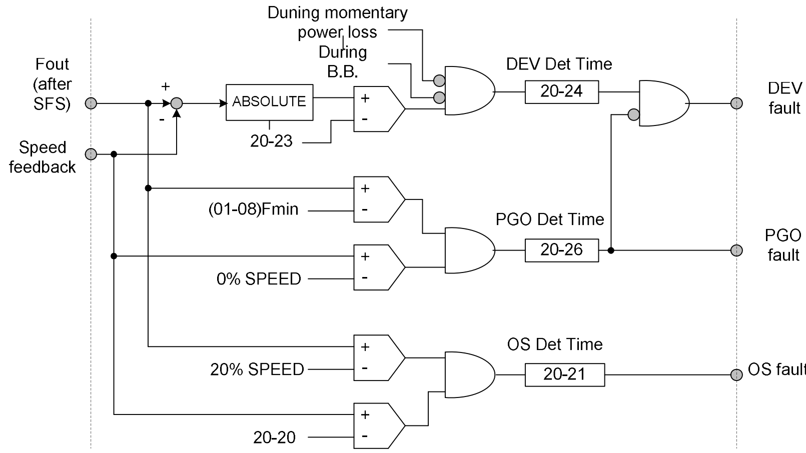


Figure 4.3. 157 PG Feedback Fault Detection Block Diagram

(4) PG Pulse Setting (20-27).
- · Sets the number of pulses from the PG or encoder.
- · Parameter 20-27 specifies the number of A-phase or B-phase pulses per motor revolution.
- · If a reduction gear is used between the motor and PG, configure the gear ratio using parameters 20-30 and 20-31.

(5) PG Rotation Direction (20-28)
- · This parameter sets the PG rotation direction relative to the motor rotation direction.
- · When the motor rotates forward, it defines which phase (A or B) leads.

    20-28 = 0: A-phase leads during forward (B-phase leads during reverse).

    20-28 = 1: B-phase leads during forward (A-phase leads during reverse).

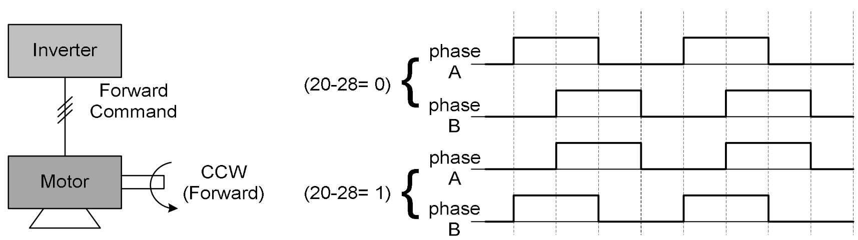


Figure 4.3. 158 PG and Motor Rotation Direction Signals

Motor direction is determined as follows:
– Forward: When the motor shaft rotates counterclockwise in response to the inverter's forward run command. Refer to Figure 4.3.160 below.

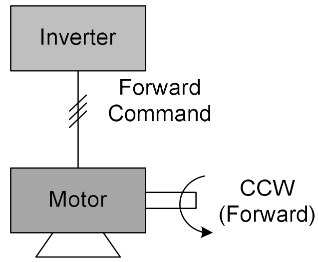


Figure 4.3. 159 Motor Rotation Direction

– Reverse: When the motor shaft rotates clockwise in response to the inverter's run command. A typical PG signal is shown below in Figure 4.3.161.

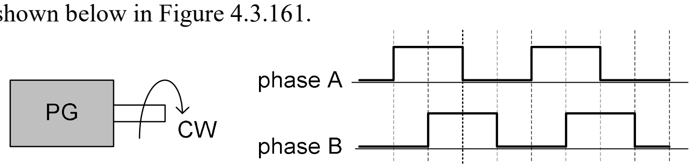


Figure 4.3. 160 PG Rotation Direction

(6) PG Pulse Frequency Division Ratio (20-29)
Use parameter 20-29 to set the pulse division ratio when the pulse output signal is connected to a pulse input device.

· The value of 20-29 is expressed by the first digit n (0 or 1) and the next two digits k (001 to 320). The output division ratio is calculated using the formula:

– 20-29 = □ □□, valid ranges: n = 0 to 1
n k k :01 to 32
– Output ratio = (1 + n) / k

e.g. 20-29=001 → n=0, k=1 · Ratio = (1+0)/1=1

①. 20-29=032 → n=0, k=32 · Ratio = (1+0)/32=1/32

②. 20-29=132 → n=1, k=32 · Ratio = (1+1)/32=1/16

(7) PG and Motor Gear Ratio Settings (20-30, 20-31)
· In V/F+PG control mode, if a transmission mechanism exists between the motor and PG (Note: the speed response in V/F+PG mode is lower than in SV mode).

· Configure the gear ratio between the motor and PG as follows:
– Set parameter 20-31 to define the gear ratio on the load side.
– Set parameter 20-30 to define the gear ratio on the motor side.
– The motor speed is calculated using the following formula:

$$\text{Motor Speed(RPM)} = \frac{\text{No. of input pulses from PG} \times 60}{\text{PG pulses (20-27)}} \times \frac{\text{No. of PG gear teeth 2 (20-31)}}{\text{No. of PG gear teeth 1 (20-30)}}$$

20- 32	Special encoder selection
Scope	**[**0**]:** None **[**1**]:** Resolver

If using a resolver, set this parameter to 1.
Note: Resolver cards do not support position control mode.

20- 34	Speed reduction compensation gain
Scope	【0 ~25600】
20- 35	Speed reduction compensation time
Scope	【0~30000】**mSec**

Refer to Figures 4.3.149 and 4.3.150. The deceleration torque compensation function reduces ASR drop characteristics under sudden load conditions. Details are as follows:

- 20-34 Deceleration Compensation Gain: This gain functions similarly to the ASR proportional gain (20-00, 20-02). When used together with the low-pass filter time constant (20-35), it can help prevent oscillation.
- 20-35 Deceleration Compensation Time: This time constant is used to suppress oscillations caused by the deceleration compensation gain (20-34). However, if the time constant is set too high, the output response may become too slow, which is counterproductive to drop compensation.
- Recommended values for 20-34: 30 to 50,   20-35: 50 to 100 ms.

20- 43	Speed multiplier
Scope	【1 ~ 500】
20- 44	Speed command limit
Scope	【0.1 ~ 30.0】**Hz**

In handwheel mode, the speed calculated from the handwheel pulse input is multiplied by the speed ratio set in parameter (20-43), and then limited by the maximum speed command defined in parameter (20-44).

21- 00	Torque control selection
Scope	[0]**:** Speed control [1]**:** Torque control
21- 01	Torque reference filter time
Scope	【0~1000】**mSec**
21- 02	Speed limit selection
Scope	[0]**:** Based on AI input [1]**:** Based on parameter 21-03 [2]**:** Based on communication position input (2502H)
21- 03	Speed limit value
Scope	【-120~120】**%**
21- 04	Speed limit bias voltage
Scope	【0~120】**%**

(1) Torque Control Selection (21-00)

· In SV or PMSV control mode, switching between speed and torque control is available:

· Use one of the multi-function digital input terminals 03-00 to 03-08 and set it to 44 (Speed/Torque Control Switch).

· When the terminal input is OFF, speed control is activated. When the terminal input is ON, torque control is activated.

· Use parameter 21-00 to select between speed control or torque control.

21-00 = 0: Speed control (parameters 20-00 to 20-08); ASR settings. Refer to Figure 4.3.149 Speed Control Block Diagram.

= 1: Torque control (21-01 to 21-08); torque control settings. Refer to Figure 4.3.162 Torque Control Block Diagram.

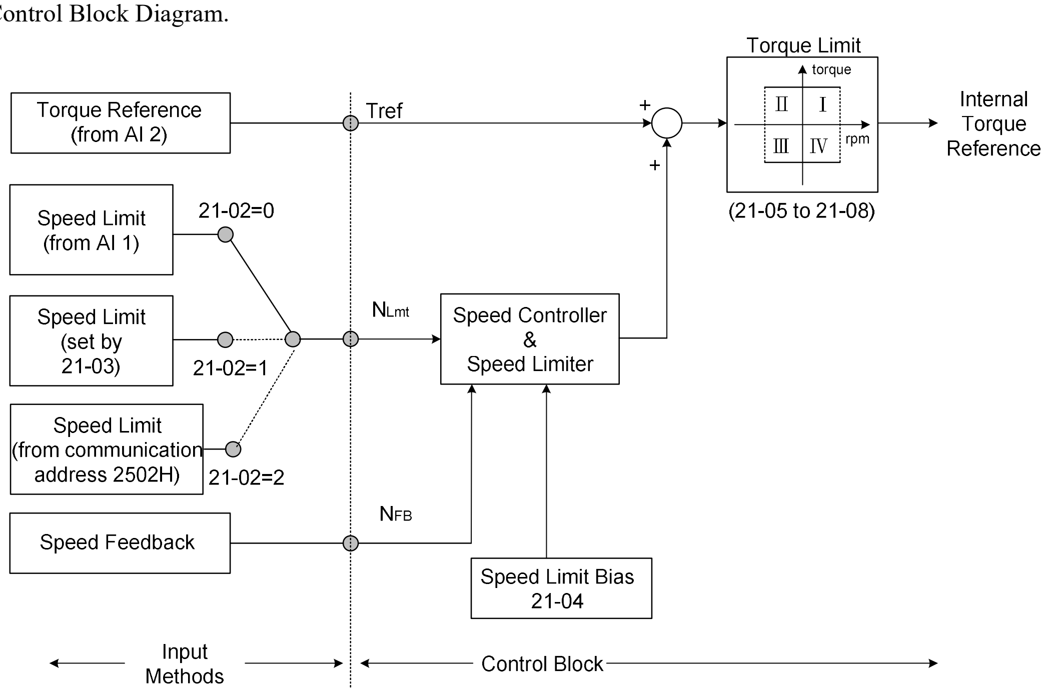


Figure 4.3.161 Torque Control Block Diagram

(2) Torque Settings

(a) Torque Command (Tref) Input (AI2: 04-05)

· The torque command (Tref) cannot be set from the digital operator; it must be adjusted via multi-function analog input.

· Set 04-05 (AI2 Function Selection) to 15 (Torque Command) or 16 (Torque Compensation).

– The motor torque output direction is determined by the polarity of the analog input signal (AI2), not by the direction of the run command.

– When the analog input signal AI2 is a positive voltage (or current), a positive torque signal can be input (motor output shaft rotates counterclockwise).

– To use negative torque, set one of the digital inputs 03-00 to 03-07 to parameter 45 (Negative Torque Command), and turn the corresponding digital input ON. (motor output shaft rotates clockwise)

Table 4.3.41 Torque Input Methods

Input Method	Input terminal	Related Parameter Settings	Description
Voltage Input (0–10 V)	AI2 Select "V"	04-00=0,2	Terminal AI2 signal level: 0–10 V
		04-05=15	AI2 serves as torque input
Current Input (4 - 20mA)	AI2 Select "I"	04-00=1,3	Terminal AI2 signal level: 4 - 20mA
		04-05=15	AI2 serves as torque input

(3) Torque Filter Time (21-01)

· The time constant is used to eliminate noise in the torque signal and to adjust response.

· If the system becomes unstable during control, increase this setting value.

(4) Speed Limit Input Settings (21-02 and 21-03): These parameters define a speed limit as a percentage of the maximum output frequency (01-02).

· During torque control, if the torque command exceeds the load, the motor may accelerate endlessly. The speed limit function prevents this, avoiding damage to the system or mechanical structure.

· There are two ways to set speed limits: through parameters or analog input. Refer to Table 4.3.42 Speed Limit Input Methods.

Table 4.3.42 Speed Limit Input Methods

Input Method		Input terminal	Related Parameter Settings	Description
1	Voltage Input (-10V - 10V)	AI1	21-02=0	Use analog input as speed limit
			00-05=1	Use analog input as reference frequency input
			04-00=2,3	Terminal AI1 signal level: -10V - 10V (If the speed limit is a positive value, set 04-00=0, 1)
2	Parameter 21-03 setting	—	21-02=1	Set the speed limit controlled by parameter 21-03
			21-03	Set the speed limit
3	Communication input (2502H)	S+ and S-	21-02=2	Use communication as speed limit

— The running direction in speed control depends on the speed limit signal:

· Positive torque: Forward, speed limit = (21-03) + (21-04). Reverse, speed is limited to zero or reverse direction (21-04).

· Negative torque: Reverse, speed limit = (–21-03) – (21-04). Forward, speed limit at Zero or in the Forward Direction (-21-04)

— If the speed limit bias is set to 0, and the motor's direction is opposite to the speed limit direction, the motor speed will be limited to 0. For example, if the speed limit signal is a positive voltage and the motor is operating in forward, the valid speed range for torque control is from 0 to the forward speed limit value.

(5) Speed Limit Bias Setting (Parameter 21-04):This parameter sets the speed limit bias as a percentage of the maximum output frequency (01-02).

·The speed limit bias (21-04) is used to adjust the boundary of the speed limit.

·The speed limit bias (21-04) can be set to define the bias values for both forward and reverse motor speeds.

Example 1 – Set 30% speed limit for both forward and reverse directions

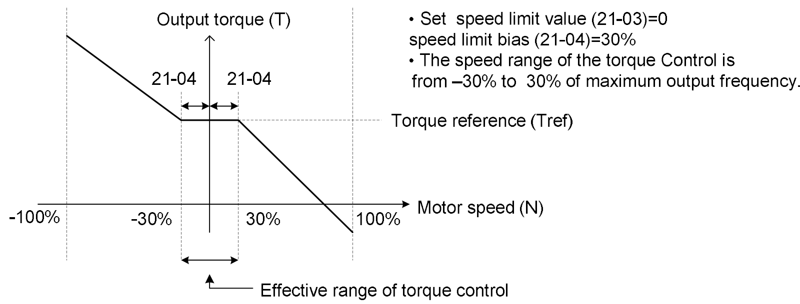


Figure 4.3.162 Speed Limit Setting

Example 2 – Settings:

1. Speed Limit Value (21-03) = 100% (Forward Speed Limit)
2. Speed Limit Bias (21-04) = 20%

·The torque control speed range is from -20% (21-04) to 120% (21-03 + 21-04)

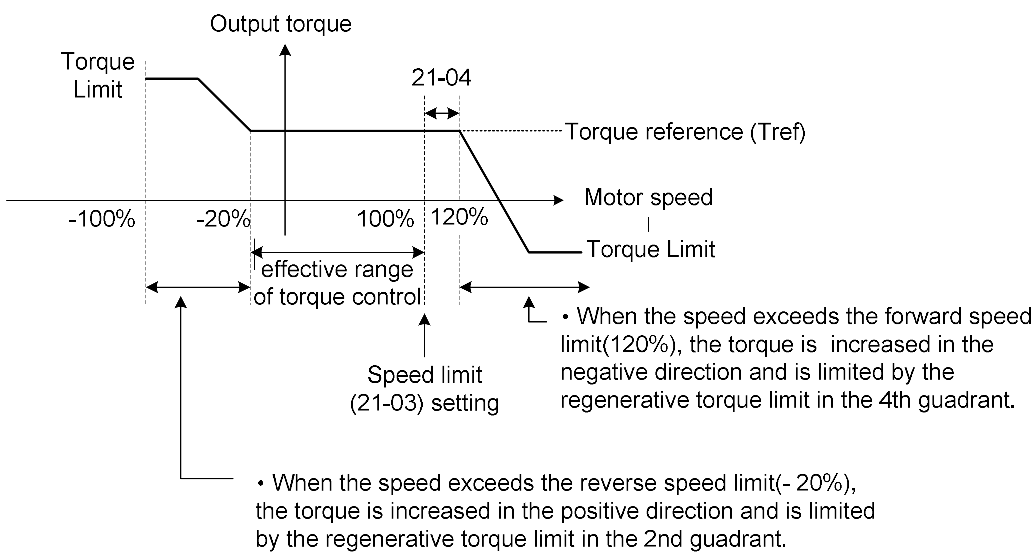


Figure 4.3.163 Speed Limit Setting (Example 2)

(6) Operation Examples of Torque Limit and Speed Limit

·Torque and speed limit examples are applied in winding and unwinding operations.

(a) Winding Operation

·The line speed (N) and motor torque (T) are generated in the same direction by the motor. Refer to the below Figure 4.3.165

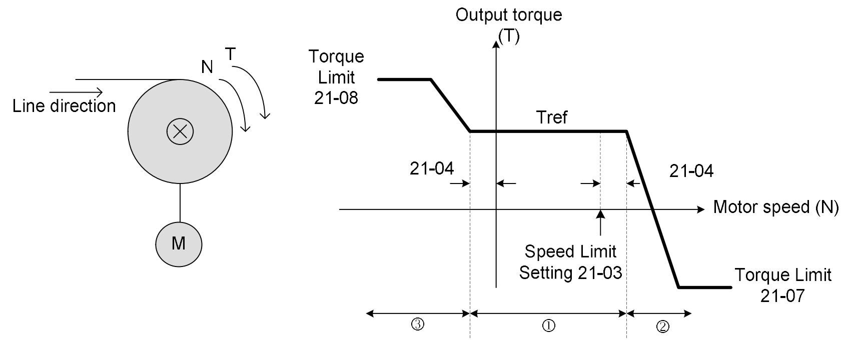


Figure 4.3.164 Winding Operation

①Speed Limit Bias (-21-04) < Motor Speed < Speed Limit (21-03 + 21-04) → Torque is controlled according to Tref.

②Motor Speed (N) > 21-03 + 21-04 → The speed limit will output negative torque to prevent speed increase.

③Motor Speed (N) < -21-04 → The speed limit will output positive torque to prevent further speed drop.

(b) Unwinding Operation

·The line speed (N) and motor torque (T) are in opposite directions.

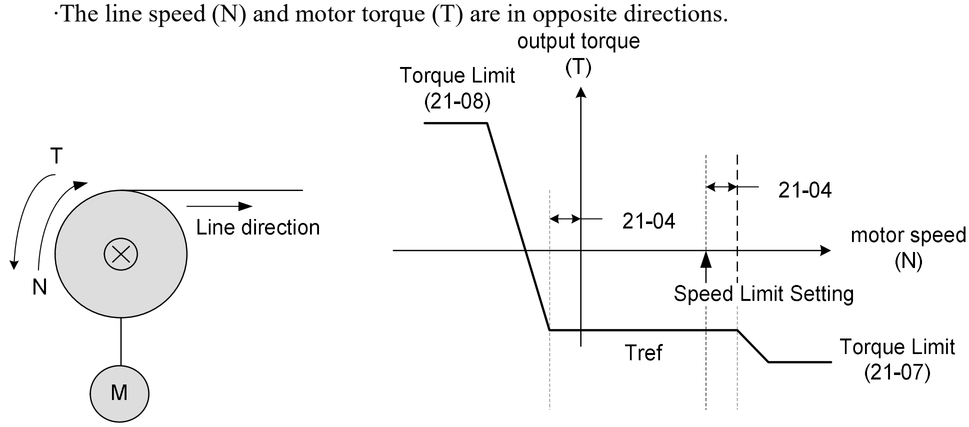


Figure 4.3.165 Unwinding Operation

The relationship between Tref (Torque Reference), NLmt (Speed Limit), and N (Motor Speed) in winding and unwinding operations is as follows:

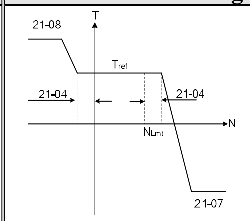
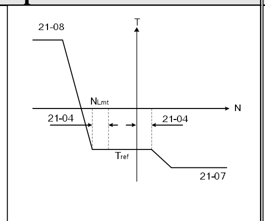
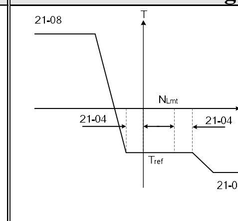
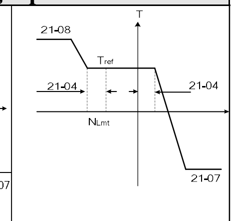
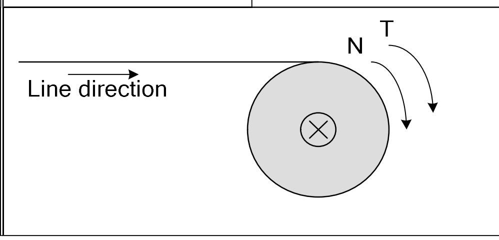
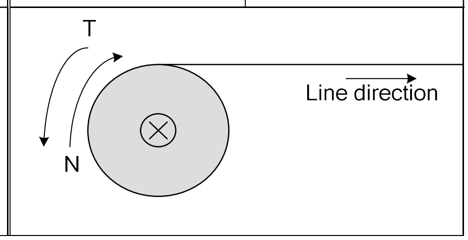
·Operation	Winding Operation		Unwinding Operation	
T-N Curve				
Rotation Direction	Forward	Reverse	Forward	Reverse
Tref (Torque Reference)	+	−	−	+
N_{Lmt} (Speed limit)	+	−	+	−
Structure				

Figure 4.3.166 Winding and Unwinding Operation

21- 05	Forward torque limit	**21- 07**	Forward regenerative torque limit
Scope	【0~300】%	**Scope**	【0~300】%
21- 06	Negative torque limit	**21- 08**	Reverse regenerative torque limit
Scope	【0~300】%	**Scope**	【0~300】%

·When the torque limit function is used, torque control takes priority over motor speed control and compensation. As a result, acceleration and deceleration times may increase, and motor speed may decrease. There are two sources of torque limit in Speed Mode: (In SV control mode, and in torque mode, torque limit sources are only configurable via the digital operator.)

1. Torque limit values set via digital operator (21-05 to 21-08)
2. Torque limit values set via multifunction analog input (AI2).

(1) Setting Torque Limits Using Parameters (21-05 to 21-08)

·There are four torque limit values that can be set individually:

(I) Forward-Side Positive Torque Limit (21-05)
(II) Reverse-Side Positive Torque Limit (21-08, Reverse Regenerative Torque Limit)
(III) Reverse-Side Negative Torque Limit (21-06)
(IV) Forward-Side Negative Torque Limit (21-07, Forward Regenerative Torque Limit)
Refer to Figure 4.3.168.

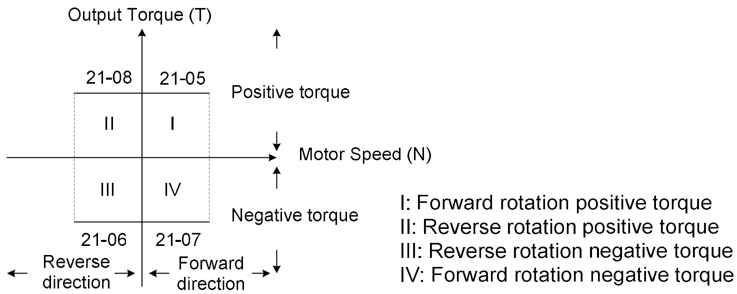


Figure 4.3.167 Torque Limit Setting for Four Quadrants

(2) Setting Torque Limits Using Multifunction Analog Input AI2

·The multifunction analog input (AI2) can be configured for torque limit settings via the AI2 function setting (04-05). Refer to the below Table 4.3.43 for analog input settings for torque limit.

Table 4.3.43 Torque Limit Analog Input Settings

AI2 function setting (04-05)	Function
11	Forward torque limit
12	Negative torque limit
13	Regenerative Torque Limit (for both forward and reverse)
14	Positive/Negative Torque Limit (detects both forward and reverse directions)

·The analog input for torque limit can only be provided via AI2. The analog input signal type (04-00) can be set to 0, 2 (0–10V) or 1, 3 (4–20mA). A 10V or 20mA input corresponds to 100% of the rated motor torque limit.

When the torque limit source is set to multifunction analog input AI2, the actual torque limit value is the smaller of the values between the multifunction analog input AI2 and the parameter settings (21-05 to 21-05) via the digital operator.

— When the analog input is at its maximum value (10V or 20mA), the torque limit is 100% of the rated motor torque. ·To set the torque limit above 100%, increase the AI2 Gain (04-07) to above 100%. For example, when the AI2 Gain is set to 200.0% and the multifunction analog input AI2 is at maximum value (10V/20mA), the torque limit can be raised to 200%.

Note: When the torque limit source is set to multifunction analog input, the maximum torque limit value is 200%.

Scope	【0.1~100】**Hz**
21- 09	Position control maximum frequency

Scope	[-9999~9999]		
21- 10	Segment 0 rotation count command	**21- 26**	Segment 8 rotation count command
21- 11	Segment 0 pulse count command	**21- 27**	Segment 8 pulse count command
21- 12	Segment 1 rotation count command	**21-28**	Segment 9 rotation count command
21- 13	Segment 1 pulse count command	**21- 29**	Segment 9 pulse count command
21- 14	Segment 2 rotation count command	**21- 30**	Segment 10 rotation count command
21- 15	Segment 2 pulse count command	**21- 31**	Segment 10 pulse count command

21- 16	Segment 3 rotation count command	**21- 32**	Segment 11 rotation count command
21- 17	Segment 3 pulse count command	**21- 33**	Segment 11 pulse count command
21- 18	Segment 4 rotation count command	**21- 34**	Segment 12 rotation count command
21- 19	Segment 4 pulse count command	**21- 35**	Segment 12 pulse count command
21- 20	Segment 5 rotation count command	**21- 36**	Segment 13 rotation count command
21- 21	Segment 5 pulse count command	**21- 37**	Segment 13 pulse count command
21- 22	Segment 6 rotation count command	**21- 38**	Segment 14 rotation count command
21- 23	Segment 6 pulse count command	**21-39**	Segment 14 pulse count command
21- 24	Segment 7 rotation count command	**21- 40**	Segment 15 rotation count command
21- 25	Segment 7 pulse count command	**21- 41**	Segment 15 pulse count command

Scope	[0] Enter position mode when speed falls below the minimum frequency [1] Z-Phase Lock Function
21- 42	Position mode selection

Scope	【0~9999】Pulse
21- 43	Offset angle

Function Description:

- ·Position Control Maximum Frequency (21-09): This is the speed frequency used for moving to the next position in multipoint positioning mode.
- ·During the search for the next positioning point while the run command is active, the motor accelerates based on Acceleration Time 1 (00-14).
- ·During the search for the next positioning point while a stop command is issued, the motor decelerates based on Deceleration Time 1 (00-15).
- ·In SV or PMSV control modes, digital input terminals 03-00 to 03-07 can be used to select functions as defined in Table 4.3.44.

Figure 4.3.168 Zero-Servo Positioning Schematic

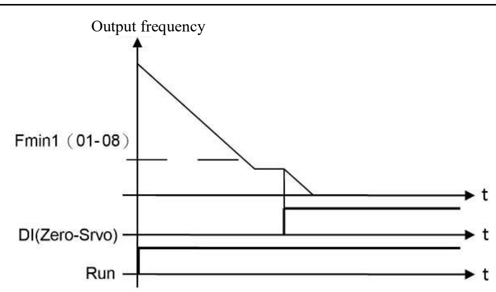


Table 4.3.44 Multipoint Positioning Function Settings

03-00~03-07 (DI fun) Settings	Function
02	Multi-Speed Command 1 / Multi-Point Position Command 1
03	Multi-Speed Command 2 / Multi-Point Position Command 2
04	Multi-Speed Command 3 / Multi-Point Position Command 3
05	Multi-Speed Command 4 / Multi-Point Position Command 4
46	Zero-Speed Servo (Zero-Srvo)
51	Multi-Speed & Multi-Point Position Switch (Multi Pos. Switch)
52	Position Command Enable (Multi Pos. Enable)

- Multi-Point Positioning Function (MultiPosRef) Description:
  When parameter (21-42) is set to Option 0, the system enters position mode when the speed falls below the minimum frequency. In Zero-Servo positioning mode, if the multi-speed and multi-point position switch command is input (DI set to 51), Multi-Speed Commands 1 to 4 are converted into Multi-Point Position Commands 1 to 4. Including the home position of the Zero-Servo positioning mode, a total of 17 position points are available. Refer to Figure 4.3.170.
- Spindle Positioning Function (Z-Phase Lock Function)

  When parameter (21-42) is set to Option 1, the motor enters position mode upon detecting a Z-phase signal while rotating below the minimum frequency. The home position is determined by Z-phase signal + the value set in parameter (21-43). This can also be used in combination with the Multi-Point Positioning Function.

Monitoring parameter 12-78 (Z-Phase Deviation) displays the deviation between the Z-phase signal and the current position.

To use this function, rotate the motor one full turn in the direction of future operation. Once the Z-point is captured, parameter 12-78 will show the deviation between the captured Z position and the actual one. After confirming, input this 12-78 value into parameter 21-43 as the offset angle. The home position will then be located at Z-phase signal + (21-43) setting.

Note: If the motor has not passed the Z-point upon startup, 12-78 will display 9999.

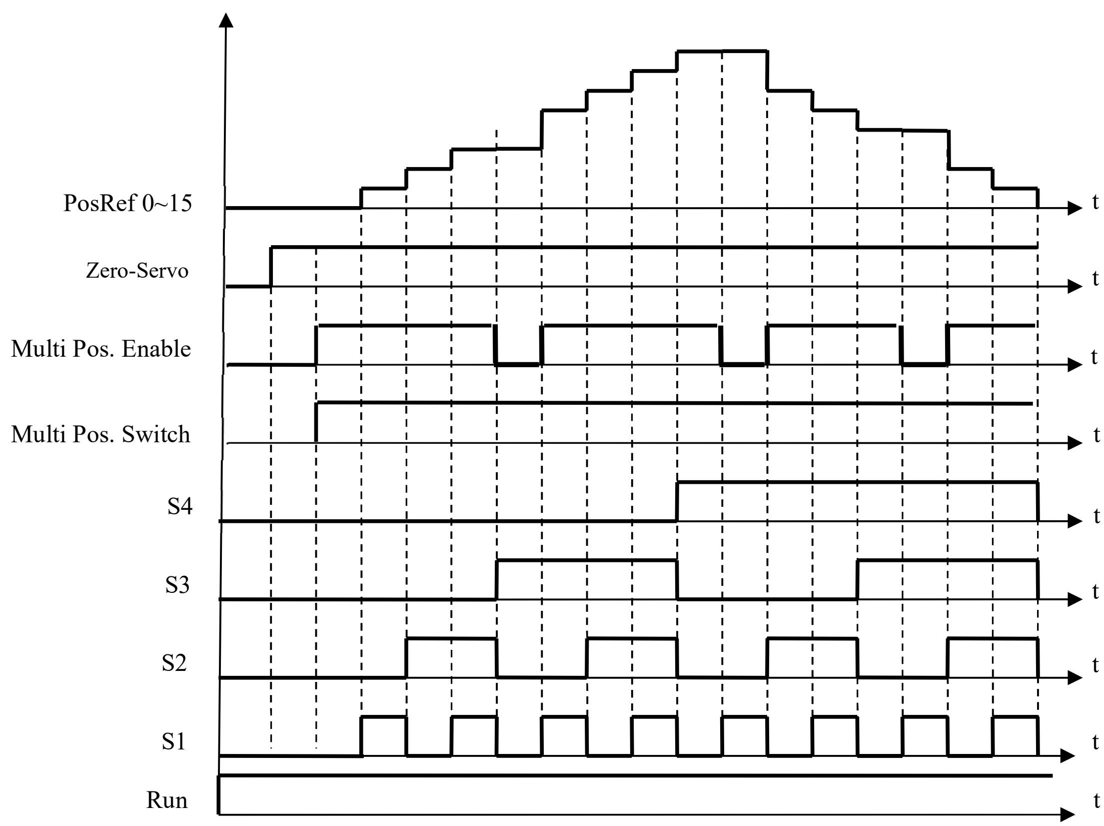


Figure 4.3.169 Multi-Point Positioning Function Schematic

When using the Multi-Point Positioning Function, the Position Command Enable (Multi Pos. Enable, DI set to 52) must be ON for the inverter to accept external position commands. Refer to Figure 4.3.171.

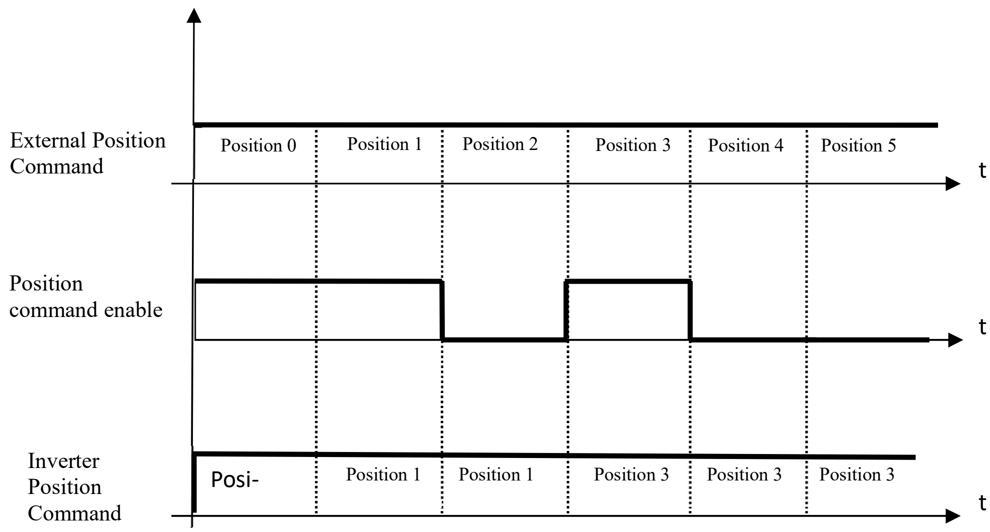


Figure 4.3.170 Position Command Enable Schematic

The Multi-Point Positioning Mode is absolute. For example, if Position 1 is set to 100 pulses and the goal is to move another 100 pulses, then Position 2 must be set to 200 pulses. Refer to Figure 4.3.172.

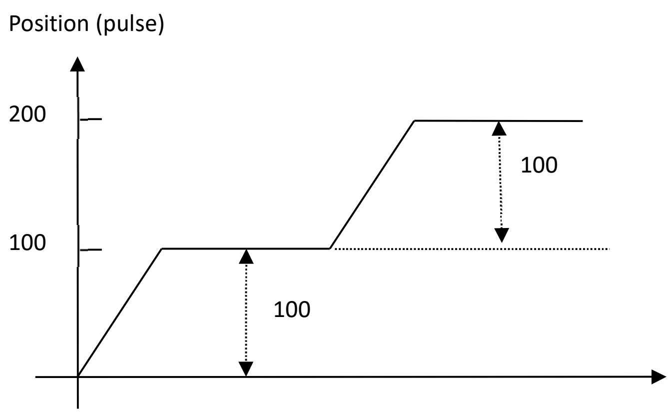


Figure 4.3.171 Absolute Mode Diagram

Position Setting Description (21-10 to 21-41):

Motor position for step N = Step N number of revolutions × PG pulse count (20-27) + Step N pulse count

Example: Motor encoder resolution: 2500 PPR
To rotate the motor forward by half a revolution, set the number of revolutions to 0, and the pulse count to 1250.

Pulse count command = ½ revolution × PG pulse count (20-27) = $\frac{1}{2} \times 2500 = 1250$

Motor position = Number of revolutions × PG pulse count (20-27) + Pulse count = $0 \times 2500 + 1250 = 1250$

To rotate the motor in reverse by 1 and ¾ revolutions, set the number of revolutions to -1 and the pulse count to -1875.

Pulse count command = ¾ revolution × PG pulse count (20-27) = $\frac{-3}{4} \times 2500 = -1875$

Motor positioning position = Number of revolutions command × PG pulse count (20-27) + pulse count command = $-1 \times 2500 - 1875 = -4375$

Note: Motor rotation direction is based on PG rotation direction selection (20-28)

22-PM Motor Parameter Group

22- 00	PM motor rated power	**22- 04**	PM motor rated rotation speed
Scope	**[**0.00~600.00**] kW**	**Scope**	【6~60000】**rpm**
22-01	PM motor rated voltage	**22- 05**	PM motor maximum rotation speed
Scope	**200V**[50 ~ 240]**V** **400V**[100 ~ 480]**V**	**Scope**	【6~60000】**rpm**
22- 02	PM motor rated current	**22- 06**	PM motor rated frequency
Scope	25%~200% of the inverter's rated current	**Scope**	【4.8~599.0】**Hz**
22- 03	PM motor number of poles	**22- 07**	PM Type
Scope	【2~96】**Poles**	**Scope**	【0】SPM 【1】IPM

The PM motor parameters are configured as follows. This parameter group can be reset to default values by setting parameter (13-08). Before initialization, please ensure that the motor model type is correctly set in parameter (13-00).

(01) PM Motor Rated Power (22-00), PM Motor Rated Voltage (22-01), and PM Motor Rated Current (22-02)
Set according to the motor nameplate.

(02) PM Motor Pole Count (22-03), PM Motor Rated Speed (22-04), and PM Motor Rated Frequency (22-06)
Set according to the motor nameplate. Either the rated speed (22-04) or rated frequency (22-06) needs to be set; the program will automatically calculate the other. When setting the rated speed (22-04), the PM Motor Maximum Speed (22-05) will be updated to the same value by default. If the field weakening function is used, the maximum speed (22-05) must be manually modified. The formula is as follows:

$$\text{(PM motor rated rotation speed) } N = \frac{120 \text{ x } f \ \text{ (PM motor rated frequency)}}{P \ \text{ (Number of poles of the PM motor)}}$$

(03) PM Motor Maximum Rotation Speed (22-05)
If the field weakening function is required, the PM Motor Maximum Speed (22-05) must be set to a value higher than the PM Motor Rated Speed (22-04).

(04) PM Type (22-07)
When using an SPM motor, it is recommended to set this parameter to 0. Related adjustable parameters include Speed Estimation Gain (22-30) and Speed Estimation Filter Value (22-31).
When using an IPM motor, it is recommended to set this parameter to 1. Related adjustable parameters include Speed Estimation Gain (22-34) and Speed Estimation Filter Value (22-35).

22- 08	PM Encoder Type	
Scope	[0]: Tamagawa – Non-reduced wiring [1]: Tamagawa – Reduced wiring [2]: SUMTAK – Reduced wiring	[3]: General differential incremental type [4]: Sinusoidal type
22- 10	PM SLV starting current	
Scope	【20 ~ 200】%	
22- 11	I/f Mode Starting Frequency Switch Point	
Scope	【10 ~ 100】%	
22- 14	PM Stator Resistance	
Scope	【0.001 ~ 30.000】**Ω**	

<table>
<tr><td>22- 15</td><td colspan="4">PM D-axis Inductance</td></tr>
<tr><td>Scope</td><td colspan="4">【0.01 ~ 300.00】mH</td></tr>
<tr><td>22- 16</td><td colspan="4">PM Q-axis Inductance</td></tr>
<tr><td>Scope</td><td colspan="4">【0.01 ~ 300.00】mH</td></tr>
<tr><td>22- 17</td><td colspan="4">PM No-Load Voltage</td></tr>
<tr><td>Scope</td><td colspan="4">200V: 【0 ~ 250】V
400V: 【0 ~ 500】V</td></tr>
<tr><td>22-18</td><td colspan="4">Field Weakening Current Limit</td></tr>
<tr><td>Scope</td><td colspan="4">[0 ~ 120]%</td></tr>
<tr><td>22- 20</td><td colspan="4">Pole shift angle</td></tr>
<tr><td>Scope</td><td colspan="4">0–360 degrees</td></tr>
<tr><td>22- 21</td><td colspan="4">PM Motor Tuning</td></tr>
<tr><td>Scope</td><td colspan="2">[0]: Do not perform PM motor tuning
[1]: Auto parameter tuning (for PMSLV)</td><td colspan="2">[2]: Pole alignment and loop tuning (for PMSV)
[3]: Rotational auto-tuning</td></tr>
<tr><td>22- 22</td><td colspan="4">PM motor tuning failure history</td></tr>
<tr><td>Scope</td><td colspan="2">[0]: No error
[1]:Stationary pole alignment failed
[2]: No PG option card
[3]:Rotational pole alignment forcibly stopped
[4]:Encoder feedback direction error
[5]:Loop tuning timeout</td><td colspan="2">[6]: Encoder error
[7]:Other motor tuning error
[8]:Current abnormal during rotational pole alignment
[9]:Current abnormal during loop adjustment
[11]: Stator resistance measurement timeout</td></tr>
<tr><td>22-25</td><td colspan="4">Initial pole detection method selection</td></tr>
<tr><td>Scope</td><td>[0]: Use the angle before stopping</td><td>【1】: Method 1</td><td>【2】: Method 2</td><td>【3】: Method 3</td></tr>
<tr><td>22-26</td><td colspan="4">High-Speed Control Ratio Enable (applicable to PMSLV)</td></tr>
<tr><td>Scope</td><td>[0]: Low-speed open-loop control</td><td>[1]: Low-speed high-frequency estimation control</td><td colspan="2">[2]: Full closed-loop control</td></tr>
<tr><td>22-27</td><td colspan="4">Method 2 voltage command</td></tr>
<tr><td>Scope</td><td colspan="4">[5 ~ 120]% (Valid when 22-25 = 2 or 22-26 = 1)</td></tr>
<tr><td>22-28</td><td colspan="4">Method 2 frequency division ratio</td></tr>
<tr><td>Scope</td><td colspan="4">[0 ~ 8] (Valid when 22-25 = 2 or 22-26 = 1)</td></tr>
<tr><td>22-29</td><td colspan="4">Weak magnetic voltage command limit</td></tr>
<tr><td>Scope</td><td colspan="4">[80 ~ 110]% (Related to 22-18)</td></tr>
<tr><td>22-30</td><td colspan="4">SPM Speed Estimation Gain</td></tr>
<tr><td>Scope</td><td colspan="4">【1 ~ 150】%</td></tr>
<tr><td>22-31</td><td colspan="4">SPM Speed Estimation Filter Value</td></tr>
<tr><td>Scope</td><td colspan="4">【1 ~ 2000】Hz</td></tr>
<tr><td>22-32</td><td colspan="4">MTPA selection</td></tr>
<tr><td>Scope</td><td>[0]: Disabled</td><td>[1]: Method 1</td><td>[2]: Method 2</td><td>[3]: Method 3</td></tr>
<tr><td>22-33</td><td colspan="4">MTPA gain</td></tr>
<tr><td>Scope</td><td colspan="4">【0 ~ 400】%</td></tr>
<tr><td>22-34</td><td colspan="4">IPM estimator gain</td></tr>
<tr><td>Scope</td><td colspan="4">【1 ~ 180】%</td></tr>
<tr><td>22-36</td><td colspan="4">PM motor type selection</td></tr>
<tr><td>Scope</td><td colspan="4">[0] General PM motor</td></tr>
</table>

	[1] DVEN motor

22-37	PM motor horse power	
Scope	【1】0.75KW 1800RPM 【4】1.5KW 1800RPM 【7】2.2KW 1800RPM 【10】3.7KW 1800RPM 【13】5.5KW 1800RPM	【16】7.5KW 1800RPM 【19】11KW 1800RPM 【22】15KW 1800RPM 【25】18.5KW 1800RPM 【28】22KW 1800RPM

(05) PM Encoder Type (22-08)

1. After changing the PM encoder type (22-08), the inverter must be powered off and on again for the system to update.
2. If using an incremental encoder type other than options 0–2, please select option 3 to avoid malfunction. When option 3 is selected, the motor will start with a strong magnetic field. The startup current will be approximately 100% of the rated current (22-02), and pole search will be performed according to parameter (22-25) or the motor will start from the last stop angle. If parameter (22-25) is set to 0, then on the first startup after power cycling, the inverter will start the motor from 0 degrees due to no stored previous stop angle, which may result in vibration.
3. The following encoders are compatible with the sinusoidal card: ERN1387, ECN1313, and ECN413.

Note: The sinusoidal card does not support position control mode.
Note: If the PG card is incompatible with the PM encoder type, SE07 fault will be displayed.
Note: After reconfiguring the PM encoder type (22-08), the inverter must be powered off and on again. Then, perform PM motor tuning (22-21) and re-detect the magnetic pole offset angle (22-20). If the above steps are not performed again, the SE08 fault message will be displayed.

(06) PMSLV Startup Current (22-10)
Sets the torque current at startup, expressed as a percentage of the rated motor current.

(07) I/f Mode Startup Frequency Switching Point (22-11)
Sets the transition frequency point at which the permanent magnet motor switches from open-loop to closed-loop in sensorless vector control mode.
Recommended setting values:
Above 5% for 400V models and above 10% for 200V models.

(08) PM Motor Armature Resistance (22-14)
Sets the per-phase motor resistance in 0.001 Ω units (note: do not confuse with line-to-line resistance). This parameter is automatically set during motor auto-tuning (22-21).

(09) PM Motor d-axis Inductance (22-15)
Sets the motor's d-axis inductance in 0.001 mH units. This parameter is automatically set during motor auto-tuning (22-21).

(10) PM Motor q-axis Inductance (22-16)
Sets the motor's q-axis inductance in 0.001 mH units. This parameter is automatically set during motor auto-tuning (22-21).

(11) Field Weakening Current Limit (22-18)

1. When MTPA Selection (22-32) is set to 0, and PM Motor Maximum Speed (22-05) is greater than PM Motor Rated Speed (22-04), field weakening control is automatically enabled. This parameter sets the limit for the maximum field weakening capability and is expressed as a percentage of the rated motor current.
2. When MTPA Selection (22-32) is set to 2 or 3, increase the field weakening current limit if the output voltage is too high.

(12) Magnetic Pole Offset Angle (22-20)
Stores the zero-point compensation angle after pole alignment is completed.

(13) PM Motor Tuning (22-21)
Warning! PM motor tuning is performed under powered conditions. Touching the motor may result in electric shock. Do not touch the motor before the tuning process is completed.

Warning! PM motor tuning may cause sudden motor startup and result in personal injury. Before performing Step 2 (Pole Alignment and Loop Tuning) or Step 3 (Rotational Auto-Tuning), ensure that the area around the motor and load is safe.

Warning! Do not perform Step 2 (Pole Alignment and Loop Tuning) or Step 3 (Rotational Auto-Tuning) when the motor is connected to a load or when the brake is engaged. Doing so may result in inverter malfunction. Performing pole alignment with a motor connected to a load may result in incorrect motor parameter calculations. Disconnect the motor from the load and ensure that the motor can rotate smoothly and freely.

1. Before selecting PM Motor Tuning, enter the motor nameplate values for parameters 22-00 to 22-06. If Motor Control Mode (00-00) is set to 4 (PMSV), select 2 (Pole Alignment and Loop Tuning). If 00-00 is set to 5 (PMSLV), select 1 (Auto Parameter Tuning) to perform appropriate motor tuning.
2. When Motor Control Mode (00-00) is set to 4 (PMSV) and the motor pole count (22-03) is unknown, select 2 (Pole Alignment and Loop Tuning). If Encoder Type (22-08) is set to option 4 (sinusoidal) — such as ECN1313, ECN413, or ERN1387 — or if Special Encoder Selection (20-32) is set to 1 (Resolver) and the motor pole count (22-03) is known, you may first perform 1 (Auto Parameter Tuning) and then proceed with 3 (Pole Alignment) to reduce motor dynamic tuning time.
   Note 1: If Encoder Type (22-08) is set to any of the incremental encoder options from 0 to 3, and Option 3 (Pole Alignment) is used during tuning, the system will display PM Tune Error03.
   Note 2: If Option 2 (Pole Alignment and Loop Tuning) or Option 3 (Pole Alignment) is used during PM motor tuning and a PM Tune Error04 occurs, the PG Rotation Direction Selection (20-28) will automatically reverse.
   Please repeat the PM motor tuning using the same option.
   If the same error occurs again, rewire the feedback phase or motor phase, and then perform the tuning again.
3. If any error occurs during the tuning process, follow the troubleshooting instructions to resolve the issue and then repeat tuning using the appropriate control mode.
4. When PM Motor Tuning (22-21) is set to 1 (Auto Parameter Tuning) or 2 (Pole Alignment and Loop Tuning) and ENTER is pressed, the system will enter the PM Motor Tuning screen. The operator display will show the message "IPrdy". Press RUN to start tuning. The operator display will then show "IPtun". If the tuning completes successfully, the message "IPEnd" will appear.
   If tuning is interrupted by pressing the stop button, the message "IPbrd" (PM Motor Tuning Interrupted) will appear.

Note: If the inverter has already completed motor tuning, it does not need to be repeated after powering on again.

(14) PM Motor Tuning Fault History (22-22)

If PM motor tuning fails, the display will show "IPErr" (PM Motor Tuning Failed). For possible causes and troubleshooting, please refer to Chapter 5.

Note: PM Motor Tuning Fault History (22-22) records the result of the most recent automatic motor tuning. If tuning was canceled or completed successfully, the display will indicate no error.

(15) Initial Magnetic Pole Detection Method Selection (22-25)

Specifies how the rotor position is detected during motor startup.

0: Do not detect rotor position; start using the angle from the last stop.

1: Method 1 – Detect rotor position using a pulse signal input.

2: Method 2 – Detect rotor position using a continuous variable-frequency signal input.

3. Method 3 – Detect rotor position using a voltage pulse signal.

(16) High-Speed Control Ratio Enable (22-26)

When using an SPM motor, it is recommended to set this parameter to 0. The inverter will use I/f mode for startup. Related adjustable parameters are 22-10 and 22-11.

When using an IPM motor, if you need to operate in speed control mode with a 1:50 speed ratio, set this parameter to 1. Under estimator mode 1, the inverter will input a continuous variable-frequency signal to the motor. The adjustable parameters are 22-27 and 22-28.

When set to 2, both IPM and SPM motors can be used. Related adjustable parameters are 22-42 to 22-45.

(17) Method 2 Voltage Command (22-27)

When Parameter 22-25 is set to Method 2 or Parameter 22-26 is enabled, this parameter sets the voltage amplitude of the continuous variable-frequency signal. If the rotor vibrates at startup, increase this voltage setting appropriately to improve detection accuracy.

Note: Setting the voltage too high may result in over-current errors.

(18) Method 2 Frequency Division Ratio (22-28)
When Parameter 22-25 is set to Method 2 or Parameter 22-26 is enabled, the frequency of the continuous signal is dependent on Carrier Frequency Setting (11-01). If a higher carrier frequency is set, it is recommended to increase the frequency division ratio to reduce the continuous signal frequency, ensuring accurate angle detection.

(19) Field Weakening Voltage Command Limit (22-29)
This parameter sets the output voltage limit (as a percentage of the inverter's input voltage) to prevent output voltage saturation during field weakening control. If Field Weakening Current Limit (22-18) is set too low, the inverter may still output voltage beyond the voltage command limit.

(20) Speed Estimation Gain (22-30) and Speed Estimation Filter Value (22-31)
When Estimator Mode (22-26) is set to 0, these parameters adjust the speed response. A higher gain improves response but may cause system vibration and instability. A lower gain increases speed error. Adjust according to the on-site equipment for optimal performance.

(21) MTPA Selection (22-32)
0: MTPA disabled
1: Distributes d-q axis current commands based on the torque command.
2: Distributes d-q axis current commands based on the torque command and limits the output voltage (12-19) to below the motor rated voltage (22-01).
3: Distributes d-q axis current commands based on the torque command and maintains the output voltage (12-19) approximately equal to the motor rated voltage (22-01).

(22) MTPA Gain (22-33)
The default value is 200%. When the PM motor's d-axis inductance (22-15) or q-axis inductance (22-16) is modified (e.g., after completing PM motor tuning or directly adjusting inductance values), the MTPA gain (22-33) is recalculated automatically.

(23) IPM Estimator Gain (22-34)
When Estimator Mode (22-26) is set to 1, this gain represents a multiplier of the bandwidth. A larger value results in faster motor response, but if set too high, may cause vibration and instability. If the value is too small, speed deviation may increase. Please adjust this parameter according to actual on-site equipment conditions.

(24) PM Motor Type Selection (22-36), PM Motor Horsepower and Speed (23-37)
(22-36) allows selection between General PM Motor and DVEN Motor. After selection, you may configure PM Motor Horsepower using parameter (23-37). Once the horsepower is selected, motor parameters can be loaded without auto-tuning. However, if you later switch to a general motor, auto-tuning will be required.

22- 38	Open-loop to closed-loop switching point frequency width (%)	**22- 42**	Full Closed-Loop Control Gain Ka
Scope	【1.0~40.0】**%**	**Scope**	【64~8192】
22- 39	Pre-DC injection time	**22- 43**	Full Closed-Loop Control Gain Kb
Scope	【0.00~20.0】**s**	**Scope**	【64~8192】
22- 40	High-frequency angle detection time	**22- 44**	Full Closed-Loop Control Gain – Speed Low-Pass Filter
Scope	【0.01~1.00】**s**	**Scope**	【1~256】
22- 41	PM stopping method	**22- 45**	PM magnetic flux
Scope	**[0]** Deceleration or stop below 22-11 triggers direct braking **[1]** Deceleration or stop below 22-11 switches back to open-loop mode	**Scope**	【0.01~10.00】**Wb**

(25) Open-Loop/Closed-Loop Switching Bandwidth (%) (22-38)

When parameter 22-26 = 0 (Open-Loop Control), and the speed exceeds the I/f Mode Startup Frequency Switching Point (22-11), the system transitions from open-loop to closed-loop control. This parameter defines the bandwidth weighting ratio used during switching. Proper adjustment can suppress current instability caused by varying load devices during the transition and improve control stability and protection.

(26) Pre-Injection DC Time (22-39)
When the PM motor starts in PMSLV mode, the system first estimates the rotor angle before operation begins. If this parameter is set, a DC injection will be applied after angle estimation to pull the motor into the estimated position before starting, effectively enhancing startup stability.

(27) High-Frequency Angle Search Time (22-40)
When parameter 22-25 is set to 2, high-frequency signals are used to estimate the PM motor angle during startup, which may generate high-frequency noise. To effectively suppress this noise, users can adjust the high-frequency angle search time using this parameter. By appropriately shortening the search duration while maintaining reliable angle detection, the generation of high-frequency sound can be reduced.

(28) PM Stop Mode (22-41)
In PMSLV mode, when the speed drops below the value set in parameter 22-11, the system will apply different deceleration modes based on the setting of parameter 22-41. When 22-41 = 0, the system performs DC braking below 22-11 during deceleration or stop. When 22-41 = 1, the system performs open-loop stopping below 22-11. Users can select between these modes based on their application needs to achieve better operational control.

(29) Full Closed-Loop Control Parameters (22-42 to 22-44, 22-52 to 22-53, 22-55 to 22-56)
Used in conjunction with 22-26 = 2 (Full Closed-Loop Control). Full closed-loop control is primarily applied in situations requiring control under low speed ratios, enabling full-domain PMSLV closed-loop operation. It is suitable for various applications that demand low-speed performance. By adjusting the estimator gain parameters 22-42 to 22-44, stable low-speed ratio control can be achieved in PMSLV mode. Among these, 22-42, 22-43, and 22-52 correspond to the low-speed gain constant Ka, high-speed gain constant Kb, and ultra-low-speed gain constant Kb, respectively, for full closed-loop control. 22-44 and 22-53 correspond to the full closed-loop high-speed and low-speed position filter constants, respectively. 22-55 and 22-56 correspond to the full closed-loop high-speed and low-speed filter constants, respectively.

(30) Magnetic Flux of the PM Motor (22-45)
This parameter sets the magnetic flux of the motor in units of 0.001 Wb. This parameter is automatically set during motor auto-tuning (22-21).

(31) 22-53: Position estimation filter value when 22-26 = 2.

(32) 22-54: This is the motor voltage calibration value used for position estimation. The factory default is typically sufficient and does not need adjustment.

(33) 22-55~22-56: When 22-26 is set to 2, these are the filter values for speed estimation. Parameter 22-55 is used when operating above 10% of the rated speed, while 22-56 is used when operating below 10% of the rated speed.

23- 00	Function selection
Scope	[0]: Disabled [1]: Pump selection [2]: HVAC selection (under development) [3]: Compressor selection *1 (under development)
23- 01	Single/multiple pump and primary/secondary unit setting
Scope	[0]: Single pump [1]: Main [2]: Auxiliary 1 [3]: Auxiliary 2 [4]: Auxiliary 3
23- 02	Work pressure setting
Scope	【0.10 ~ 650.00】PSI
23- 03	Maximum pressure of pressure transmitter
Scope	【0.10 ~ 650.00】PSI
23- 04	Pump pressure command source
Scope	[0]: Set via parameter 23-02 [1]: Set via AI
23-71	Pressure setting maximum value
Scope	【0.10 ~ 650.00】PSI

For wiring methods of single/multi-pump setups, please refer to section 3.3 “Wiring and Precautions of Inverter Peripherals.”

(01) When parameter 23-00 is set to use either the pump or HVAC function, the selected function will affect the PID target value and enable relevant functions in Group 23. When 23-00 is set to 1 (pump selection) or 2 (HVAC selection), and 10-03 = 1 (PID enabled), this function will also be activated.
When 23-00 = 1, the LCD operator will automatically switch (16-00) the main screen monitoring to Working Pressure Setting (12-74), (16-01) Subscreen Monitor 1 to Pressure Feedback Value (12-75), and (16-02) Subscreen Monitor 2 to Output Frequency (12-17).
When 23-00 = 2, the LCD operator will automatically switch (16-00) the main screen monitoring to Flowmeter Target (12-77), (16-01) Subscreen Monitor 1 to Flowmeter Feedback Value (12-71), and (16-02) Subscreen Monitor 2 to Output Frequency (12-17).
When 23-00 is set to 3 (compressor selection), PID mode is not supported. However, all other frequency command sources in 00-05 may be configured. Additionally, the V/F curve (01-00) will be limited to F, and the Mid-Output Voltage in 01-07 will be automatically set to half of the Maximum Output Voltage in 01-03. Parameter 01-00 will also be hidden.

Note 1: For LED operator display settings, please refer to parameter 23-05.
Note 2: When switching operation modes via parameter 00-00, if the pump or compressor selection is not in V/F mode, parameter 23-00 will be reset to “Disabled.”

(02) Parameter 23-01 allows this inverter to be set as either the main or one of the auxiliary units (Auxiliary 1 to Auxiliary 3). Once configuration is complete, refer to Figure 4.3.181 “Dual Pump Start Function Flow” to operate multiple pumps. After completing the settings, power off the system to save the parameters.
(03) Parameter 23-02 sets the pressure value according to the pressure transmitter used in the pump system. However, parameter 10-00 must first be set to 0 (setpoint given by operator) for the feedback value to follow this setting.
(04) Parameter 23-03 sets the maximum pressure value based on the pressure transmitter used in the pump system. The value in 23-02 will be limited by this maximum.
(05) The command source for working pressure can be set via parameter 23-04, either from parameter 23-02 (Working Pressure Setting) or from the AI input. (If using the AI input, please refer to parameter 10-00.)
(06) Parameter 23-71 (Maximum Pressure Setting Value) defines the upper limit for the input value of parameter 23-02 (Working Pressure Setting). The maximum value of 23-71 is determined by parameter 23-03 (Maximum Pressure of the Pressure Transmitter).

23- 20	Pressure percentage switching
Scope	[0]: Pressure [1]: Percentage

When parameter 23-20 (Pressure Percentage Switch) = 1, parameters 23-09, 23-24, 23-34, 23-38, and 23-39 are switched to percentage mode based on parameter 23-02, and parameters 23-12 and 23-15 are switched based on parameter 23-03.

When 23-20 = 0, parameters 23-09, 23-24, 23-34, 23-38, 23-39, 23-12, and 23-15 are displayed and set using pressure units.

Example: 23-02 = 4.00 PSI, 23-03 = 10.00 PSI, 23-09 = 0.5 PSI, 23-12 = 5.00 PSI

When 23-20 is changed from 0 to 1:

((23-09)/(23-02)) × 100 → 23-09 = 13% (rounded to the nearest whole number)

((23-15)/(23-03)) × 100 → 23-15 = 50% (rounded to the nearest whole number)

When 23-20 is changed from 1 to 0:

((23-09)/100)* 23-02 => 23-09 = 0.52PSI

((23-15)/100)* 23-03 => 23-15 = 5.00PSI

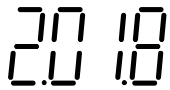
23- 36	PUMP Unit Display (LCD use only)
Scope	【0】: PSI 【1】: FPM 【2】: CFM 【3】: PSI 【4】: GPH 【5】: GPM 【6】: IN 【7】: FT 【8】: /s 【9】: /m 【10】: /h 【11】: °F 【12】: inW 【13】: HP 【14】: m/s 【15】: MPM 【16】: CMM 【17】: W 【18】: KW 【19】: m 【20】: °C 【21】: RPM 【22】: Bar 【23】: Pa 【24】: KPa

When 23-00 = 1 and 23-20 = 0, the unit display will follow the unit set in parameter 23-36 (PUMP Unit Display). At this time, the display units for parameters 12-74, 12-75, 23-02, 23-03, 23-09, 23-12, 23-15, 23-23, 23-24, 23-34, 23-38, and 23-39 are unified.

23- 05	Display method selection
Scope	[0]: Display target pressure and feedback pressure [1]: Display target pressure only [2]: Display feedback pressure only

The display mode set in parameter 23-05 determines whether both the target pressure and feedback pressure are shown, or if only one of them is displayed.

① When 23-05 = 0000: The LED panel displays both the pressure setting and the feedback pressure.



The left two digits of the 7-segment display show the pressure setting, and the right two digits show the feedback pressure.

When 23-00 = 2 (HVAC mode), values will be multiplied by 1000. For example, a display of 5.0 indicates 5000 GPM (available in version V1.4 and above).

②When 23-05 = 0001: The LED panel displays only the pressure setting.

③When 23-05 = 0002: The LED panel displays only the feedback pressure.

Note:

1. When used with the LED operator: In PUMP mode, parameter 23-03 must be ≤ 99.0 PSI. In PID mode, parameter 10-33 must be ≤ 999 and 10-34 must be set to 1.

23- 06	Proportional gain (P)
Scope	【0.00~10.00】
23- 07	Integral time (I)
Scope	【0.0~100.0】Sec
23- 08	Derivative time (D)
Scope	【0.00~10.00】Sec

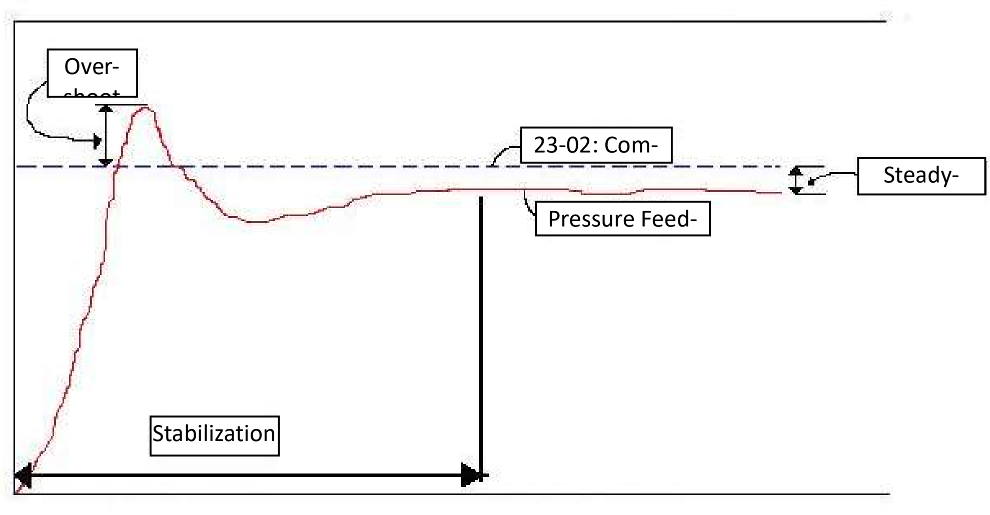
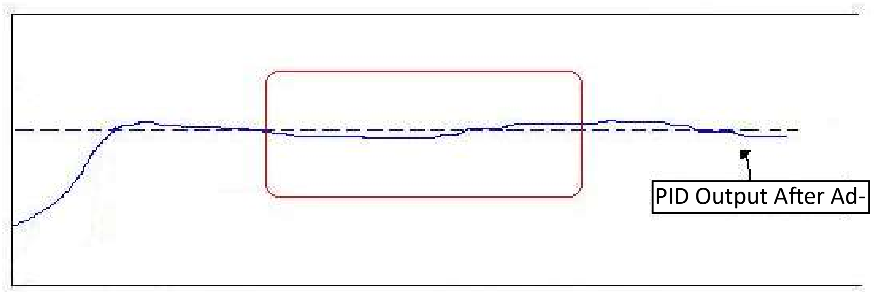


Figure 4.3.172 Illustration of Pressure Feedback Value

Table 4.3.45 Parameter Adjustment Reference

	Increase Effect	Decrease Effect	Note
Proportional gain (P)	(Advantage) Speeds up constant pressure control response (Disadvantage) Excessive value may cause water return vibration	(Advantage) Reduces vibration (Disadvantage) Slower response	Adjust stabilization time

Integral time (I)	(Advantage) Reduces error value (Disadvantage) Degrades constant pressure control response	(Advantage) Speeds up response (Disadvantage) Increases error	Adjust steady-state error
Derivative time (D)	(Advantage) Reduces speed overshoot (Disadvantage) Motor may be prone to vibration	(Advantage) Reduces vibration (Disadvantage) Increases risk of overshoot	Adjust overshoot amount



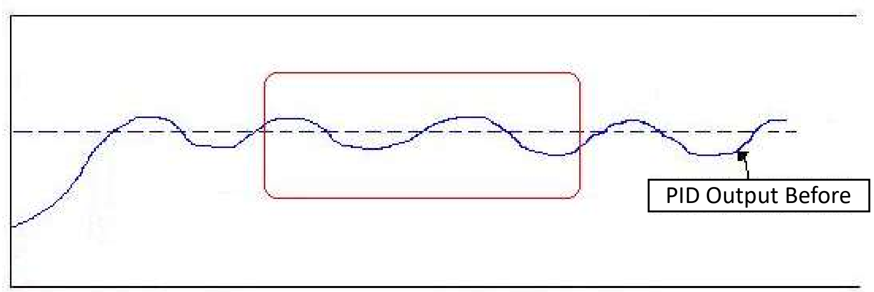


Figure 4.3.173 Illustration of PID Parameter Adjustment

*PID parameter adjustments can be made during operation.
*Parameter tuning should strike a balance between constant pressure control responsiveness and system stability.

23- 09	Constant pressure error range
Scope	【0.01 ~ 650.00】PSI *1 【1~100】% *2
23- 34	Constant pressure error range 2
Scope	【0.01 ~ 650.00】PSI *1 【1~100】% *2
23- 10	* Constant pressure sleep frequency
Scope	【0.00~599.00】Hz
23- 11	Constant pressure sleep time
Scope	【0.0~255.5】Sec

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)
*1: When 23-20 = 0, the displayed unit and range apply.
*2: When 23-20 = 1, the displayed unit and range apply.

23-09 and 23-34 Constant Pressure Error Range:

Within the constant pressure error range, the PID operation will gradually stop. When the pressure feedback value falls within the range of 23-02 (Operating Pressure Setting) ± 23-09 (Constant Pressure Error Range), the inverter frequency will slowly decrease, transitioning into sleep mode.

23-10 Constant Pressure Sleep Frequency:

When the inverter’s output frequency drops below 23-10 (Constant Pressure Sleep Frequency), it will begin counting based on 23-11 (Constant Pressure Sleep Time).

23-11 Constant Pressure Sleep Time:

After the 23-11 (Constant Pressure Sleep Time) countdown ends, the frequency will decrease based on 00-15 (Deceleration Time) and then enter sleep mode. 23-10 is the constant pressure sleep frequency used for PUMP mode and is not shared with the general PID setting 10-17 (Sleep Start Frequency).

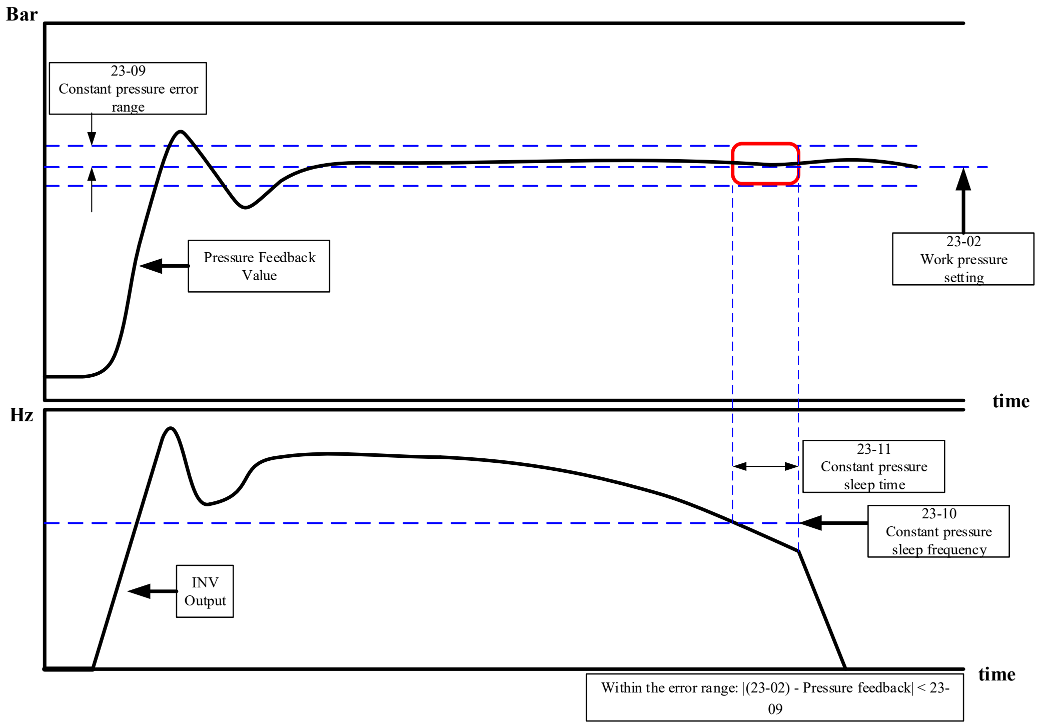


Figure 4.3.174 Constant Pressure Sleep Diagram

*The purpose of constant pressure sleep is to save energy.

23- 12	Maximum pressure limit
Scope	【0.00~ 650.00】PSI *1 【0~100】% *2
23- 15	Minimum pressure limit
Scope	【0.00~ 650.00】PSI *1 【0~100】% *2

*1: When 23-20 = 0, the displayed unit and range apply.

*2: When 23-20 = 1, the displayed unit and range apply.

23-12 Maximum Pressure Limit:

For user convenience, a maximum pressure limit can be set as needed. If the pressure feedback exceeds this maximum, a warning will be issued and the system will shut down.

23-15 Minimum Pressure Limit:

Similarly, a minimum pressure limit can be set. If the pressure feedback drops below this minimum, a warning will be issued and the system will shut down.

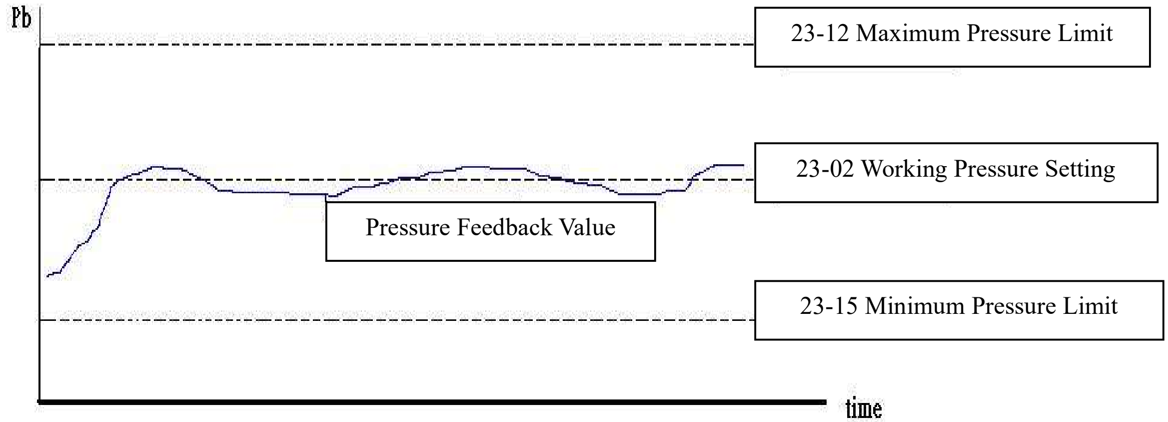


Figure 4.3.175 Pressure Feedback Limit Illustration

*Under PID control, the pressure will remain between the maximum pressure (23-12) and the minimum pressure (23-15).

23- 13	High pressure warning time
Scope	【0.0 ~600.0】Sec
23- 14	High-pressure shutdown time
Scope	【0.0 ~ 600.0】Sec

23-13 High Pressure Warning Time:

When the pressure feedback exceeds the maximum pressure limit, the high pressure warning time begins to count. If the feedback returns below the limit during this time, the counter resets. Once the countdown completes, warning HIPb will be triggered.

23-14 High Pressure Shutdown Time:

If a high pressure warning is already triggered and the pressure feedback remains above the maximum pressure limit, the shutdown timer begins. If the pressure drops below the limit during this countdown, the timer resets. If the countdown completes, shutdown error OPbFt will be triggered.

Note: If the user does not wish to apply the maximum pressure limit, set 23-74 = 0 (disabled) to deactivate the high pressure limit function.

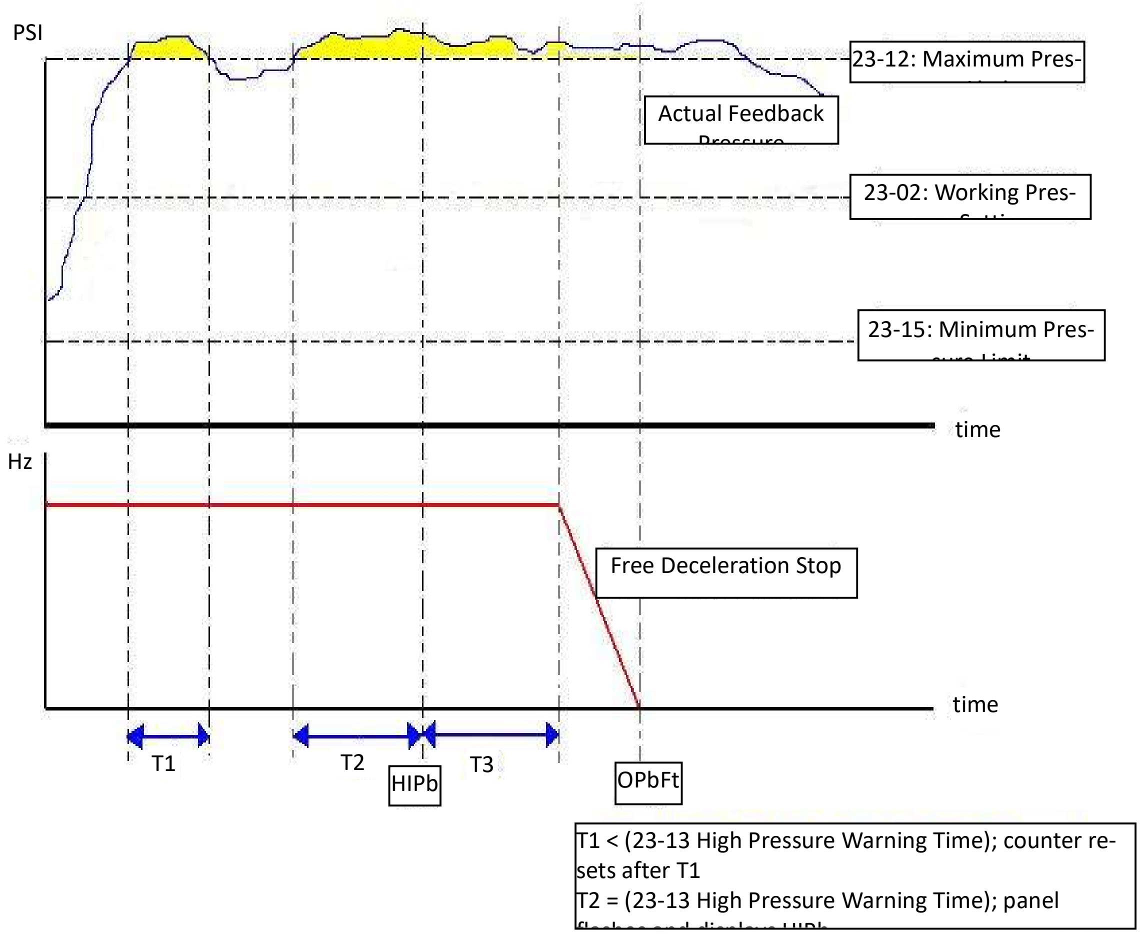


Figure 4.3.176 High Pressure Limit Warning and Shutdown Diagram

23- 74	High-pressure action setting
Scope	【0】 Invalid 【1】 High-pressure warning only 【2】 High-pressure warning error all effective

23-74 = 0: Both high pressure warning and fault are inactive.
23-74 = 1: Only high pressure warning is active; high pressure fault will not be triggered.
23-74 = 2: Both warning and fault are active, as illustrated in Figure 4.3.177.

23- 16	Low-pressure warning time
Scope	【0.0 ~ 600.0】 Sec
23- 17	Low-pressure failure shutdown time
Scope	【0.0 ~ 600.0】 Sec

23-16 Low Pressure Warning Time:

When the pressure feedback drops below the minimum pressure limit, the low pressure warning time begins to count. If the feedback rises above the limit during this period, the timer resets. If the countdown completes, warning LoPb will be triggered.

23-17 Low Pressure Shutdown Time:

If a low pressure warning is already triggered and the pressure feedback remains below the minimum pressure limit, the shutdown timer begins. If the feedback rises above the limit during this period, the timer resets. Once the countdown completes, shutdown error LPbFt will be triggered.

Note: If the user does not wish to apply the minimum pressure limit, set 23-75 = 0 (disabled) to deactivate the low pressure limit function.

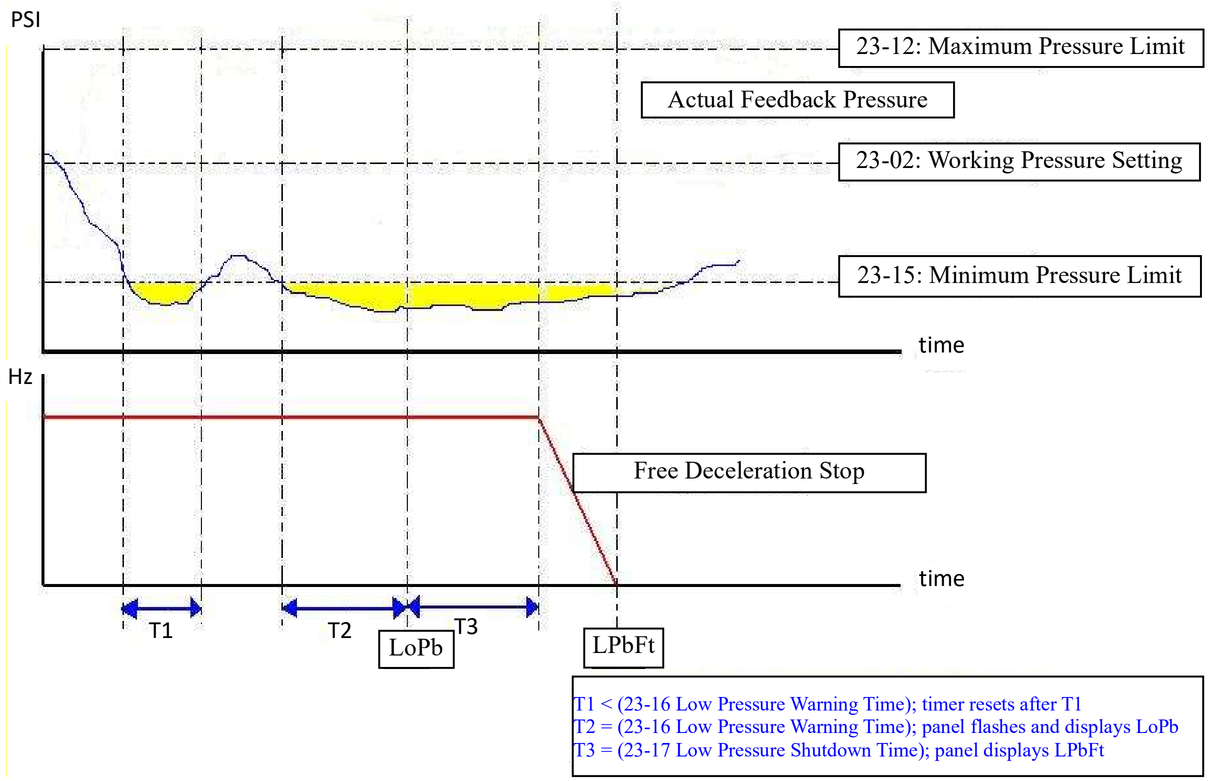


Figure 4.3.177 Low Pressure Limit Warning and Shutdown Diagram

23- 75	Low-pressure action setting
Scope	[0] Disabled [1] Warning Only [2] Both Warning and Fault Active

23-75 = 0: Low pressure warning and fault are both disabled.
23-75 = 1: Only low pressure warning is enabled; fault will not be triggered.
23-75 = 2: Both low pressure warning and fault are enabled. Operation follows Figure 4.3.118.

23- 18	Pressure loss detection time
Scope	【0.0 ~ 600.0】Sec
23- 19	Pressure loss detection ratio
Scope	【0 ~ 100.0】%
23- 78	Pressure loss detection action selection
Scope	[0] Disabled [1] Warning on Pressure Loss [2] Fault on Pressure Loss

(1) When 23-19 = 0 or 23-78 disables the pressure loss detection function.
(2) When 23-19 > 0, the inverter determines whether the feedback pressure is lower than the value calculated by (Transmitter Maximum Pressure (23-03) × Pressure Loss Ratio (23-19)). If this condition persists for a duration equal to the Pressure Loss Detection Time (23-18), a fault signal "FBLSS" will be triggered.
(3) 23-78 = 1: A pressure loss warning will be displayed when pressure loss is detected.
(4) 23-78 = 2: A fault message will be triggered when pressure loss is detected.

23-23	Water usage detection direction
Scope	[0]: Upward Detection [1]: Downward Detection
23- 24	Water use inspection pressure range
Scope	【0.00 ~ 65.00】PSI *1 【0~10】% *2
23- 25	Water usage detection cycle

Scope	【0.0 ~ 200.0】Sec
23- 26	Water usage detection acceleration time
Scope	【0.1 ~ 6000.0】Sec
23- 27	Water usage detection deceleration time
Scope	【0.1 ~ 6000.0】Sec

*1: When 23-20 = 0, the displayed unit and range apply.
*2: When 23-20 = 1, the displayed unit and range apply.
*Parameters 23-26 (Water Usage Detection Acceleration Time) and 23-27 (Water Usage Detection Deceleration Time) correspond to 00-16 (Acceleration Time 2) and 00-17 (Deceleration Time 2) respectively. These are shared parameters, so modifying 23-26 will also modify 00-16. Therefore, when using the PUMP function, it is recommended to avoid functions such as multi-speed operation.

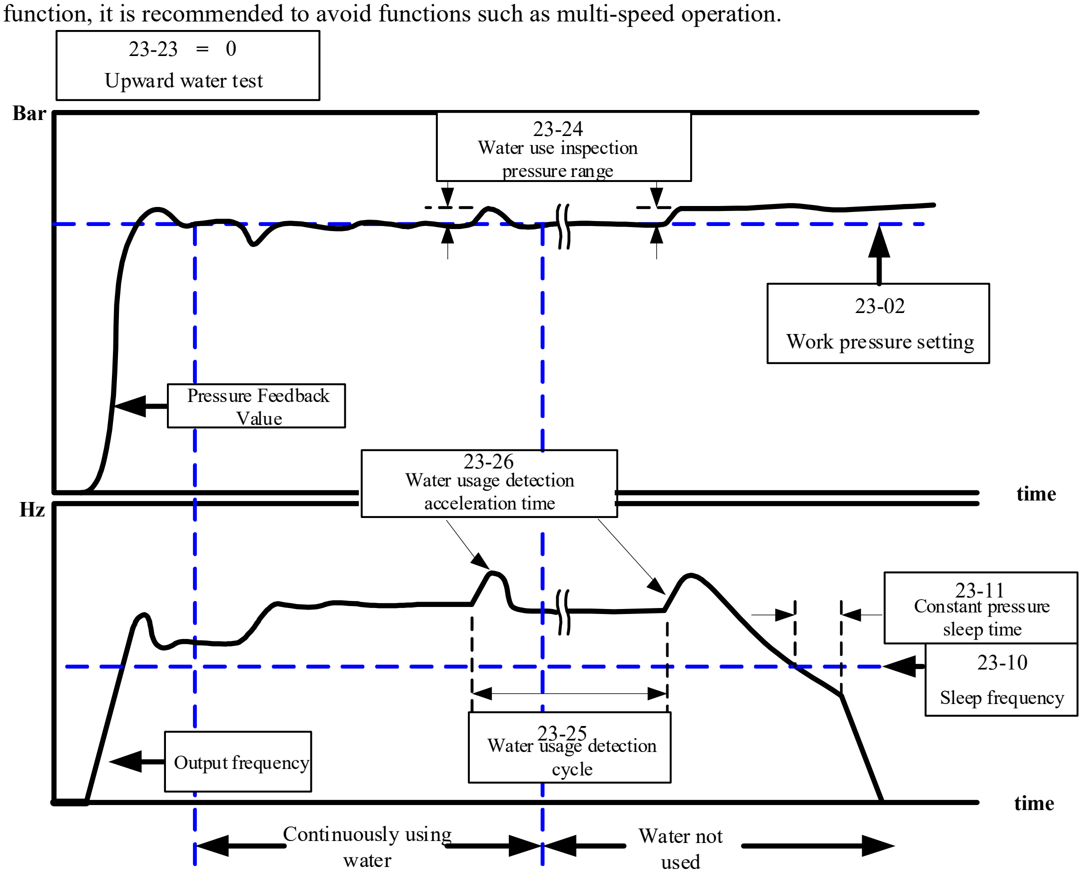


Figure 4.3.178 Illustration of Upward Water Usage Detection Function

★When 23-25 = 0.0 (sec), the water usage detection function is disabled.

★Using the water usage detection function can effectively shorten the time for the inverter to enter sleep mode when there is no or minimal water usage.

★If water usage is frequent, it is recommended to increase the setting of 23-25 (Water Usage Detection Cycle) to reduce the number of detections. This helps avoid pressure fluctuations or instability during constant pressure operation caused by the detection process.

★Since upward water usage detection raises pressure slightly when active, if water continues to be used during this time, it may cause temporary pressure fluctuations or instability. It is recommended to reduce the value of 23-24 (Water Usage Detection Pressure Range) to mitigate this issue. However, doing so may also extend the time required for the inverter to enter sleep mode during low or no water usage.

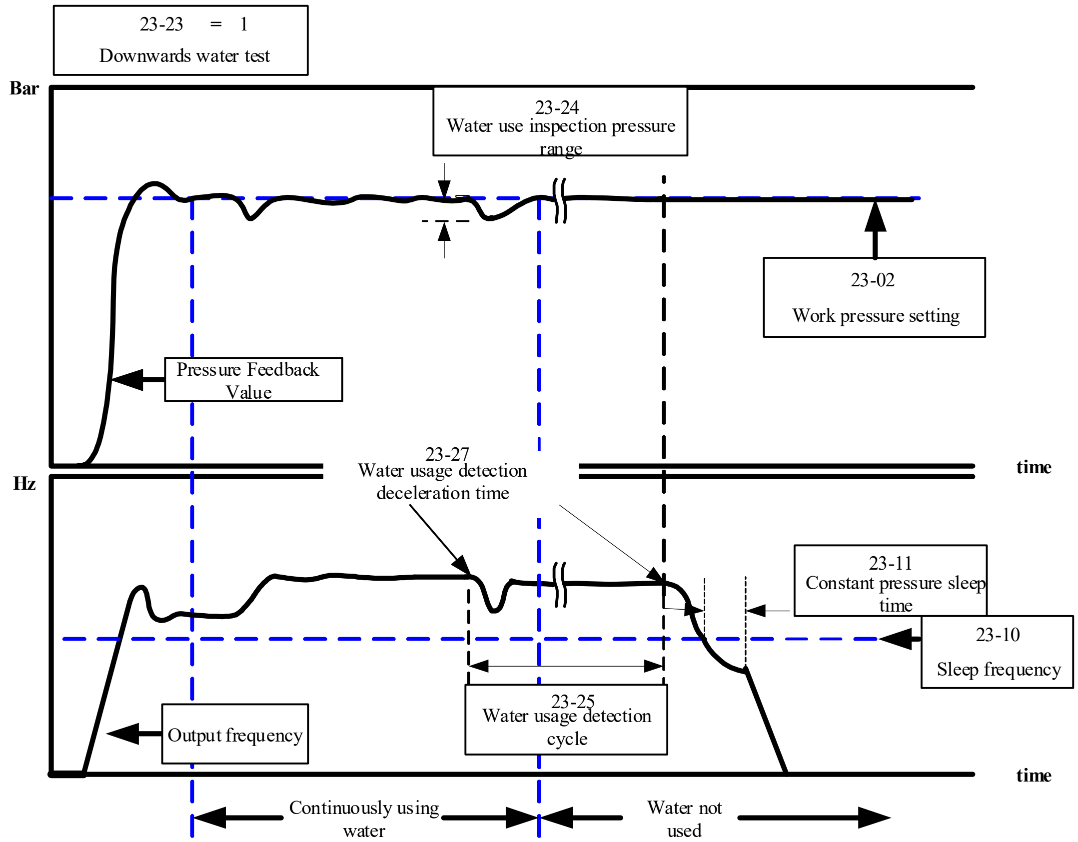


Figure 4.3.179 Illustration of Downward Water Usage Detection Function

★When 23-25 = 0.0 (sec), the water usage detection function is disabled.

★Using the water usage detection function can effectively shorten the time for the inverter to enter sleep mode when there is no or minimal water usage.

★If water usage is frequent, it is recommended to increase the setting of 23-25 (Water Usage Detection Cycle) to reduce the number of detections. This helps avoid pressure fluctuations or instability during constant pressure operation caused by the detection process.

★When the downward water usage detection function is activated, the output frequency will decrease based on parameter 23-27 [Water Usage Detection Deceleration Time]. If water usage continues during this process, the pressure will drop due to the reduced speed, and then the speed will immediately increase to recover the pressure—this determination is based on whether the feedback pressure falls below [Working Pressure Setting (23-02) – Water Usage Detection Pressure Range (23-24)]. During this process, temporary pressure fluctuations or instability may occur. It is recommended to properly adjust parameter 23-24 [Water Usage Detection Pressure Range] to avoid excessive pressure fluctuations. If there is minor water leakage during deceleration, causing pressure to drop, the system will determine whether to enter sleep mode based on whichever occurs first: reaching the sleep frequency or the feedback pressure falling below [23-02 – 23-24]; if not, the system will accelerate again.

Table 4.3.46Reference of Pros and Cons for Water Usage Detection

	Advantages	Disadvantages
Water Usage Detection Direction: Upward	1. During the water usage detection process, pressure can always remain above the target pressure, making it suitable for more stringent and precise applications.	1. If the head is too high, the operating frequency may remain high under conditions of minimal or no water usage, making it harder for the upward water detection to enter sleep mode. 2. When multiple pumps are used in parallel, the energy-saving effect is insignificant, and auxiliary pumps are less likely to enter sleep mode.
Water Usage Detection Direction: Downward	1. Quickly enters sleep mode during minimal or no water usage. 2. When multiple pumps are used in parallel, the system effectively regulates the optimal online pump operation during downward water detection to achieve energy-saving goals. 3. Start-up sequence: Main → Auxiliary 1 → Auxiliary 2 → Auxiliary 3; water detection sleep sequence: Auxiliary 3 → Auxiliary 2 → Auxiliary 1 → Main. After the rotation interval, rotation among auxiliary pumps is performed to balance lifespan.	If Water Usage Detection Pressure Range (23-24) and Water Usage Detection Deceleration Time (23-27) are not properly adjusted, pressure fluctuations may occur during downward detection.

23- 28	* Forced Operation Frequency
Scope	【0.00 ~ 599.00】Hz

*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

The PID mode parameter 10-03 must be enabled for this function to be activated. When any of the DI terminals S1 to S6 is set to 16 (PID Function Disabled) and activated, the pump will no longer perform any PID output adjustment based on feedback and will operate according to the frequency source specified in parameter 00-05.

If another DI is set to 57 (Forced Frequency Operation) and activated, the inverter will operate at the frequency defined in parameter 23-28 (Forced Frequency Operation). Once the PID Function Disabled command is removed, control will return to PID operation. The Forced Frequency Operation function can be used when the pressure sensor is disconnected, allowing the inverter to be controlled by an external pressure sensor (e.g., a differential pressure switch).

23-29	Multi-pump parallel alternating time
Scope	【0 ~ 240】hour/min
23-72	Parallel alternating time switching
Scope	[0]: Hours [1]: Minutes
23-35	Multi-unit parallel connection switching selection
Scope	[0]: Do not perform function [1]: Timer alternation selection [2]: Sleep stop alternation selection [3]: Timer and sleep stop alternation selection [4]: Multi-unit parallel testing mode
23- 30	Multi-pump parallel auxiliary water pumping detection time
Scope	[0.0 ~ 30.0] Sec
23- 31	Multi-pump parallel synchronization selection
Scope	[0]: Disabled [1]: Pressure setting and Run/Stop synchronization [2]: Pressure setting synchronization [3]: Run/Stop synchronization

23-29 Multi-pump parallel alternating time

When multiple pumps are operated in parallel, alternation occurs in the sequence: Main → Auxiliary 1 → Auxiliary 2 → Auxiliary 3. This parameter is used to set the alternation interval

23-72 Parallel alternating time switching:

23-72 = 0: Parameters 23-29 and 24-08 use hours as the unit.
23-72 = 1: Parameters 23-29 and 24-08 use minutes as the unit.

23-35 Multi-unit parallel connection alternation selection:

1. Timer-Based Alternation: Alternation occurs based on the interval set in parameter 23-29. After the timer elapses, the roles of main and auxiliary pumps are switched.
2. Alternation on Sleep Stop: When both the main and auxiliary pumps enter sleep mode in a multi-pump configuration, and the pump activation detection time (parameter [23-30]) is exceeded, an alternation will occur once. Each time multi-pump operation starts and this condition is met, alternation will take place. Please refer to the alternation-on-sleep-stop flowchart for detailed operation steps.
3. Combined Timer and Sleep Stop Alternation: Alternation occurs by both timer and sleep stop conditions concurrently.
4. Multi-Pump Parallel Test Mode: This setting is used when the main pump is stopped and the auxiliary pump must operate. It enables operation without alternation, intended for testing purposes.

23- 30 Multi-pump parallel auxiliary water pumping detection time:

When 23-31 (Multi-Pump Synchronization Selection) is set to 1 or 3, this parameter becomes active. If the water pressure does not reach the target constant pressure deviation range and the detection time set in 23-30 is exceeded, the main pump will signal the auxiliary pump to start auxiliary pumping, initiating its operation.

23-31 Multi-pump parallel synchronization selection:

1. When 23-31 = 0: Disabled
2. When 23-31 = 1: The pump designated as the main pump via 23-01 can modify the pressure setting and Run/Stop command. The auxiliary pump only follows the main pump's commands; however, its own Run/Stop input can serve as an emergency stop with the highest priority.
3. When 23-31 = 2: The main pump (set via 23-01) can modify the pressure setting, and the auxiliary pump will synchronize its setting accordingly.
4. When 23-31 = 3: The main pump (set via 23-01) issues Run/Stop commands. The auxiliary pump follows these commands, but its own Run/Stop input can still serve as an emergency stop with the highest priority.

Note: When the main pump modifies the pressure setting, the ENTER key must be pressed for the change to apply to the auxiliary pump.

Note: If the alternating time setting in 23-29 is changed or power is restored, the timer will reset.

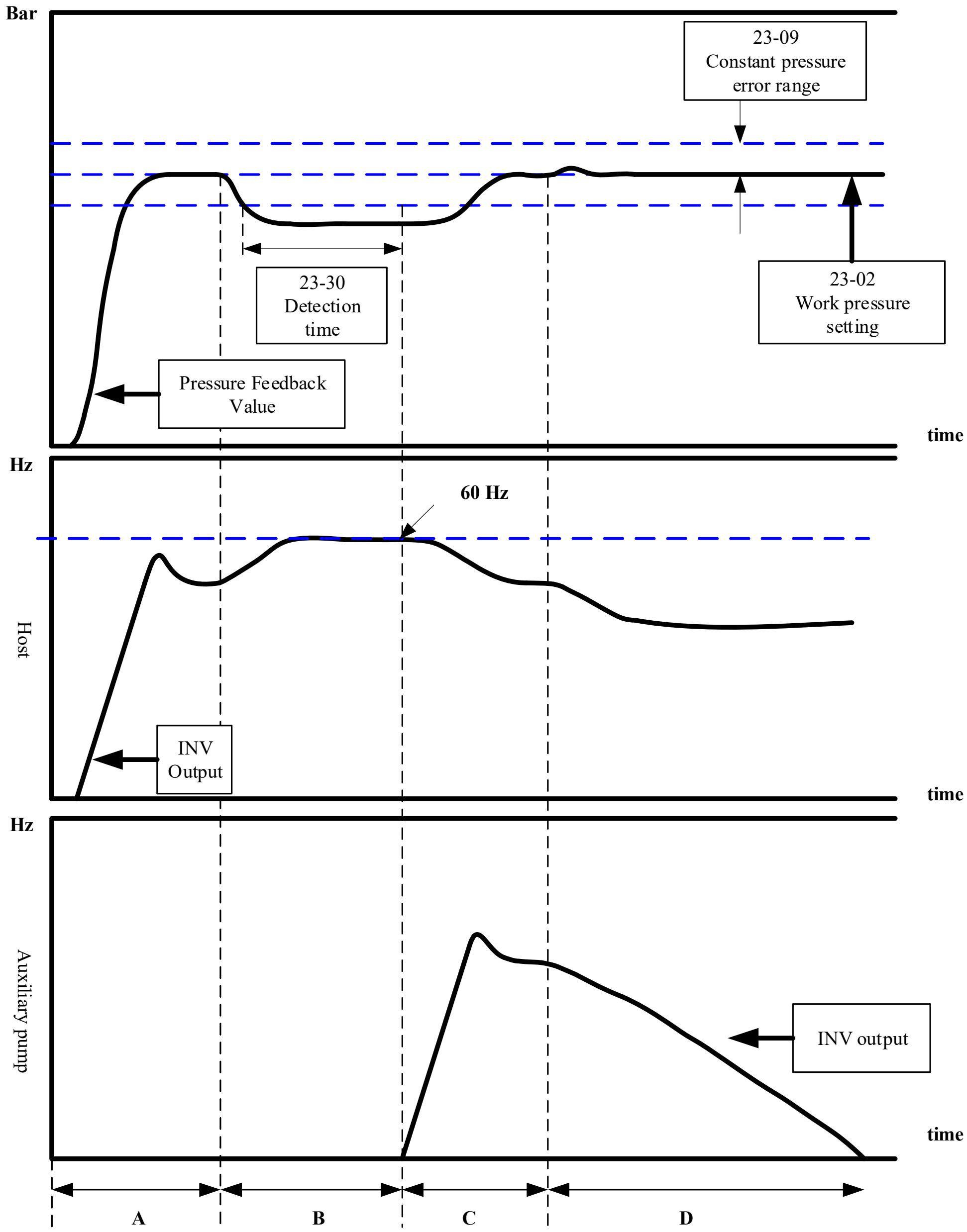


Figure 4.3. 180 Dual-Pump Start Function Process

Description:

A: Upon dual-pump startup, the main pump starts delivering water, while the auxiliary pump remains on standby, entering constant pressure operation.

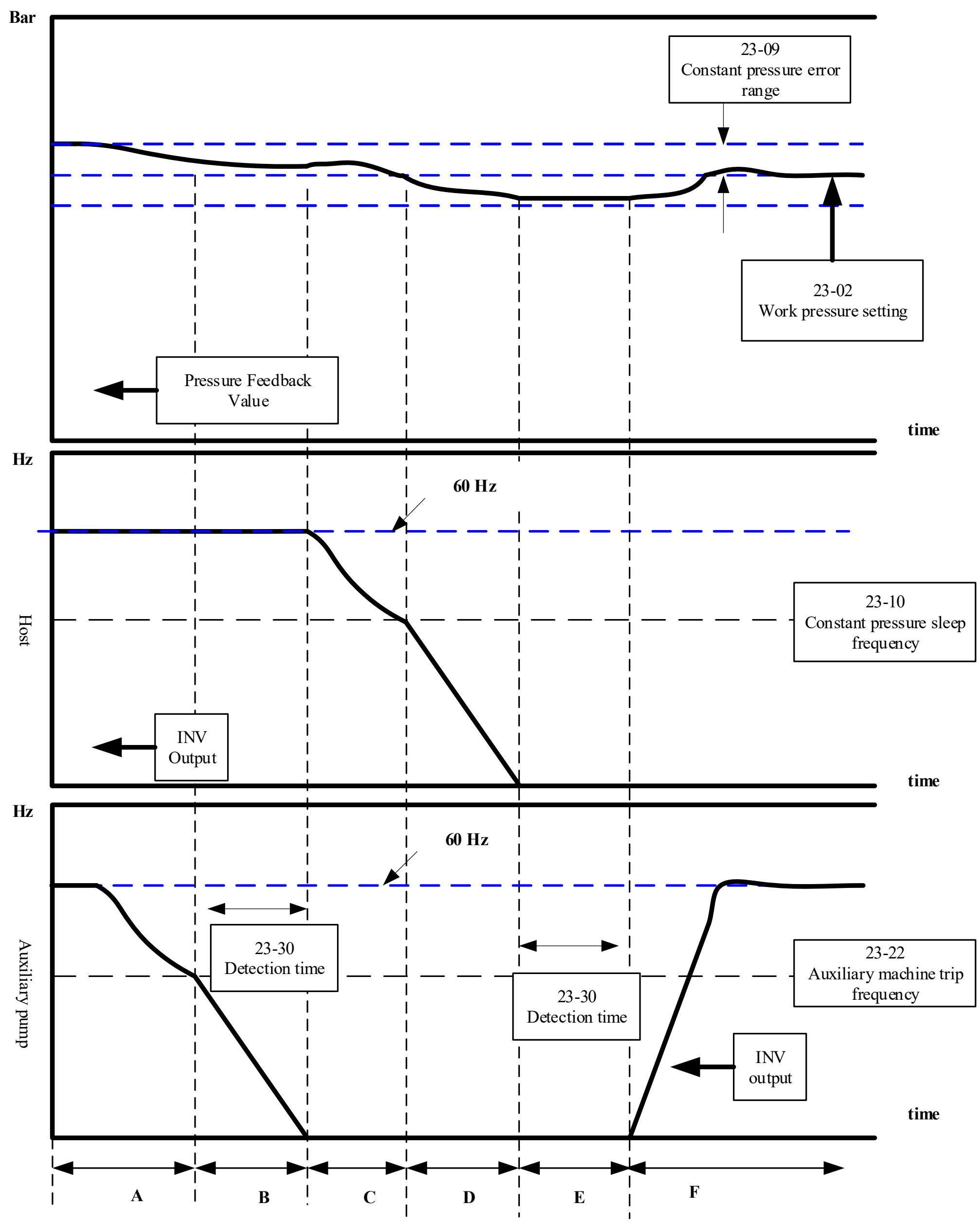
B: As water consumption increases, the main pump's frequency rises. If the pressure has not yet reached the constant pressure tolerance and the elapsed time is still within the 23-30 detection period, the auxiliary pump remains in standby.

C: If the 23-30 detection time is exceeded and the main pump reaches 60Hz, the main pump will command the auxiliary pump to assist. Once the auxiliary pump starts and the water usage stabilizes, both pumps reduce their frequency to maintain constant pressure.

D: When water consumption decreases, both pumps reduce their frequency. Since demand is lower than when both pumps were operating, the auxiliary pump stops and enters sleep mode (refer to 23-22 for auxiliary pump sleep conditions). The main pump alone maintains constant pressure operation.

Note 1: When 23-35 (Multi-unit Parallel Alternation Selection) is set to 3, and dual-pump operation exceeds the alternating time set in 23-29 or enters sleep-stop mode, the roles of main and auxiliary pumps will switch.

Note 2: When using dual-pump configuration (23-01 ≠ 0), both inverters must not simultaneously have 23-01 set to 1 or both set to 2.



Sleep-Stop Alternation Function Process

Description:

A: Dual-pump startup. If pressure becomes excessively high, the main pump continues water delivery while the auxiliary pump reduces its frequency output.

B: The main pump operates at full frequency. If pressure does not drop to the constant pressure target, the auxiliary pump continues to reduce speed until it reaches the dropout frequency specified in 23-22. At this point, the 23-30 detection timer starts, and the auxiliary pump decelerates to a full stop.

C: If water consumption decreases and pressure remains high, and the auxiliary pump is in sleep mode, the 23-30 timer ends and the main pump reduces output frequency to stabilize pressure within the target range.

D: When the main pump frequency falls to the constant pressure sleep frequency (23-10), it slows down and stops. With minimal water consumption, pressure gradually decreases.

E: Once water usage stops, the main pump enters sleep-stop mode, maintaining pressure. At this point, the 23-30 detection timer starts for the auxiliary pump.

F: When the 23-30 detection time completes, a stop-based alternation is triggered. The virtual main pump becomes the auxiliary pump. If pressure falls below the setpoint, constant pressure operation resumes.

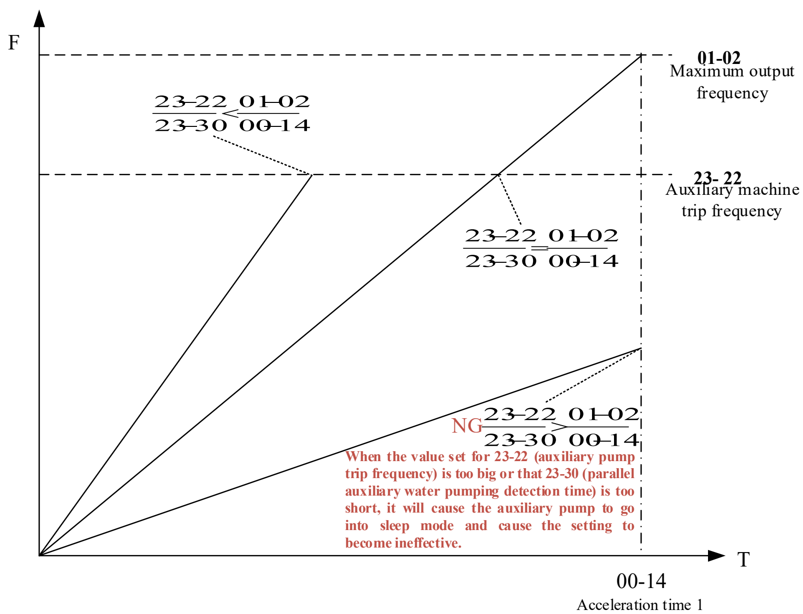
23-73	Secondary unit wakeup selection
Scope	【0】 Invalid 【1】 Valid

When operating in multi-pump parallel mode, if the feedback pressure remains within the tolerance range and the conditions for waking up the auxiliary pump are not met, set 23-73 = 1 to enable the following logic:

①When the main pump runs at full speed (reaches the maximum output frequency set in 01-02), but the feedback pressure still fails to reach the target value,

②after 30 seconds + the duration defined in 23-30, the system will forcibly start the auxiliary pump (even if the wake-up conditions and the feedback pressure being outside the tolerance range are not yet met), and both pumps will operate together until the pressure target is reached.

③However, to wake up the auxiliary pump, the conditions must still comply with the equation defined by Method 1, and the auxiliary pump start condition diagram must be referenced to properly configure the startup conditions.



Auxiliary Pump Start Condition Diagram

$$\frac{23-22}{23-30} \leq \frac{01-02}{00-14}$$ -----------------------Method Configuration 1

23- 22	Auxiliary machine trip frequency
Scope	[0.00~599.00] Hz

When both the main and auxiliary pumps are operating, the conditions under which the auxiliary pump will stop assisting are as follows:

1. When 23-22 = 0 Hz: The cut-out frequency condition is disabled.

If the auxiliary pump's output frequency drops below the sleep frequency (23-10) and remains so beyond the constant pressure sleep time (23-11), the auxiliary pump will stop automatically.

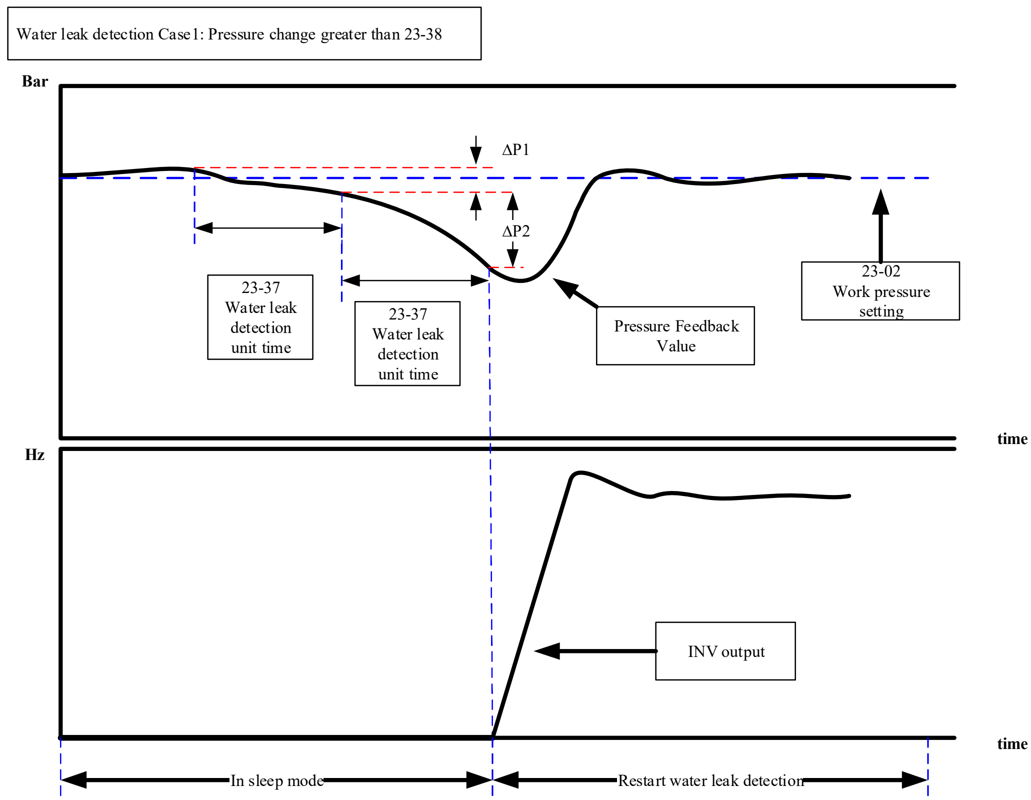
2. When 23-22 = 1 to 400 Hz (with the maximum frequency determined by 01-02): The cut-out frequency condition is enabled.

If the auxiliary pump's output frequency falls below the frequency set in 23-22, the main pump will command the auxiliary pump to stop and enter sleep mode. Alternatively, if the auxiliary pump's output frequency drops below the sleep frequency (23-10) and remains so beyond the constant pressure sleep time (23-11), the auxiliary pump will also stop automatically.

23-37	Water leakage detection time
Scope	[0.0~100.0] Sec
23-38	Leak Detection Restart Pressure Variation *3
Scope	【0.01~65.00】PSI *1

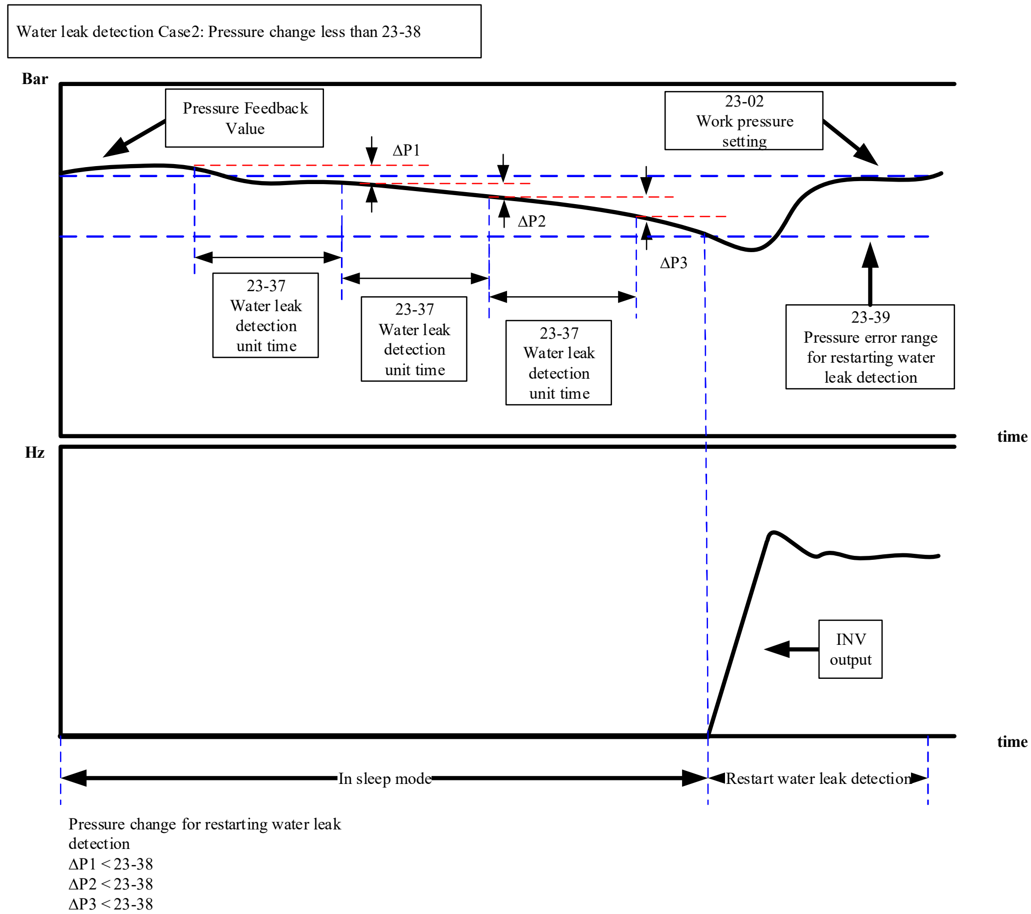
	【1~10】% *2
23-39	Water leakage detection restart error range
Scope	【0.01~650.00】PSI *1 【1~100】% *2

*1: When 23-20 = 0, the displayed unit and range apply.
*2: When 23-20 = 1, the displayed unit and range apply.



Pressure change for restarting water leak detection
ΔP1 <23-38
ΔP2 >23-38

✱This function is restricted for use in single-pump systems only.
✱When 23-37 = 0.0 (sec), this function is disabled.
✱If the pump is in sleep mode and pipeline leakage causes a gradual pressure drop, the inverter checks at each interval of 23-37. If the pressure drop exceeds the value set in 23-38 (Leak Detection Restart Pressure Variation), the pump will restart to supply water.



✱When 23-37 = 0.0 (sec), this function is disabled.

✱If the pump is in sleep mode and pipeline leakage causes a gradual pressure drop, but during each 23-37 detection interval the pressure variation is less than 23-38, the inverter will remain in sleep mode. The pump will only restart if, within a given time, the pressure variation exceeds 23-38 or the pressure deviation exceeds the range set in 23-39 (Leak Detection Restart Error Range).

✱Appropriate adjustment of the leak detection parameters 23-37 / 23-38 / 23-39 can mitigate frequent pump start-stop cycles caused by pressure drops due to water leakage in the system.

✱The leak detection function is only effective in single-pump configurations.

4.4 Built-in PLC Function Description

The E710 supports built-in basic PLC functionality by using TECO's Drive Link software to create ladder programs and upload them to the inverter.

4.4.1 Basic Commands

		⮝	⮟	P			NO / NC
Input Commands					I	i	I1~I8 / i1~i8
Output Commands	Q	Q	Q	Q	Q	q	Q1~Q2 / q1~q2
Auxiliary Commands	M	M	M	M	M	m	M1~MF / m1~mF
Special Registers							V1~V7
Counter Commands	C				C	c	C1~C8 / c1~c8
Timer Commands	T				T	t	T1~T8 / t1~t8
Analog Comparison Commands	G				G	g	G1~G8 / g1~g8
Operation Control Commands	F				F	f	F1~F8 / f1~f8
Addition and Subtraction Commands	AS						AS1~4
Multiplication and Division Commands	MD						MD1~4

Special Register Descriptions

V1: Set Frequency	Range: 0.1~599.0 Hz
V2: Operating Frequency	Range: 0.1~599.0 Hz
V3: AI1 Input Value	Range: 0~1000
V4: AI2 Input Value	Range: 0~1000
V5: Keypad Input Value	Range: 0~1000
V6: Output Current	Range: 0.1~999.9 A
V7: Torque Value	Range: 0.1~200.0%
V8: PID Target Value	Range: 0.1~599.0 Hz

	Differential Up	Differential Down	Other Command Symbols
Differential Commands	D	d	
SET Command			⮝
RESET Command			⮟
P Command			P

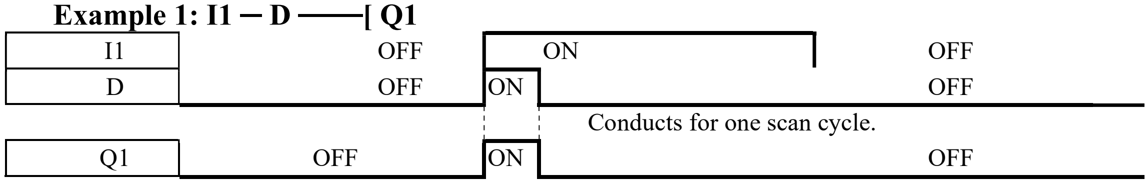
Open Circuit	“ “	
Short Circuit	“--”	

Connection Symbols	Definition
─	Connect components on the left and right sides
┴	Connect components on the left, right, and upper sides
┼	Connect components on the left, right, upper, and lower sides
┬	Connect components on the left, right, and lower sides

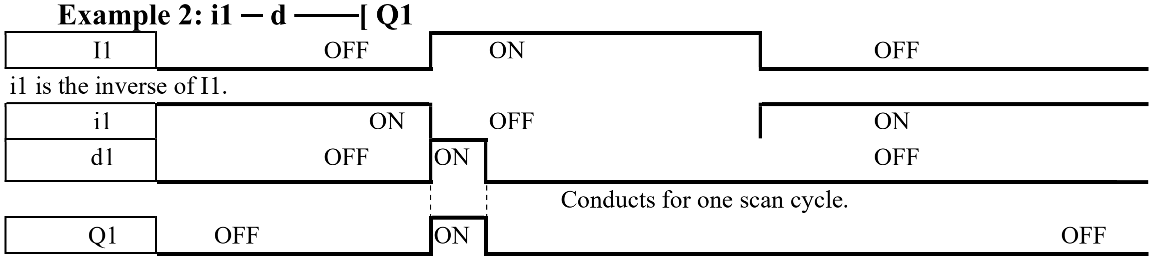
4.4.2 Basic Command Functions

◎ D (d) Command Function

Example 1: I1 ─ D ──[Q1

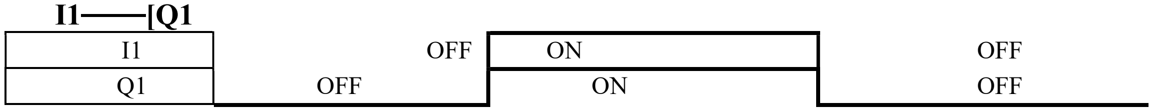


Example 2: i1 ─ d ──[Q1



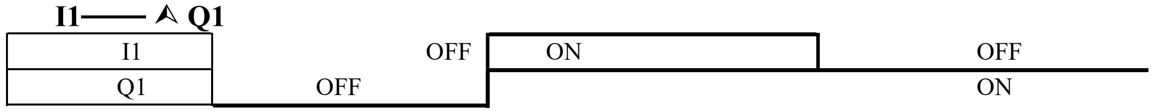
◎ NORMAL (-[ ) Output Mode

I1──[Q1



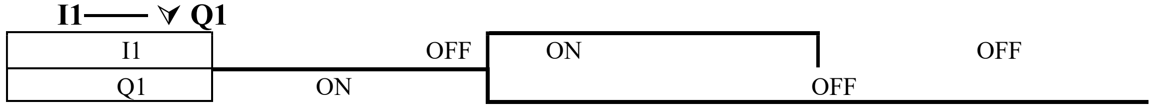
◎ SET (⮝) Output Mode

I1── ⮝ Q1



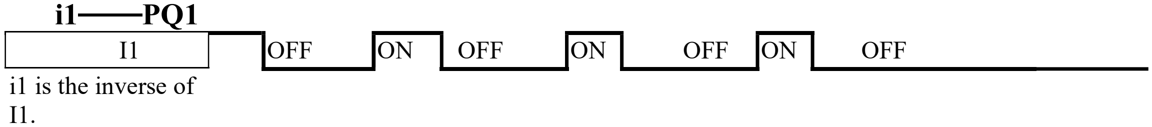
◎ RESET (⮟) Output Mode

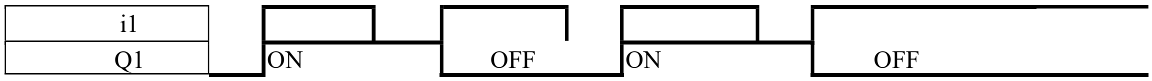
I1── ⮟ Q1



◎ P Output Mode

i1──PQ1




i1
Q1
ON
OFF
ON
OFF

4.4.3 Application Commands

1. Counter

①	Counting Modes (1–4)
②	The up/down counting mode can be configured using (I1 ~ f8).
	OFF: Up count (0, 1, 2, 3…)
	ON: Down count (…3, 2, 1, 0)
③	Counter Reset Configuration using (I1 and f8)
	ON: Resets the count and turns OFF ⑥
	OFF: Continues counting
④	Current Counter Value
⑤	Counter Setpoint (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V7, constants)
⑥	Counter Number (C1~C8, total of 8 sets)

Counter Mode Descriptions:

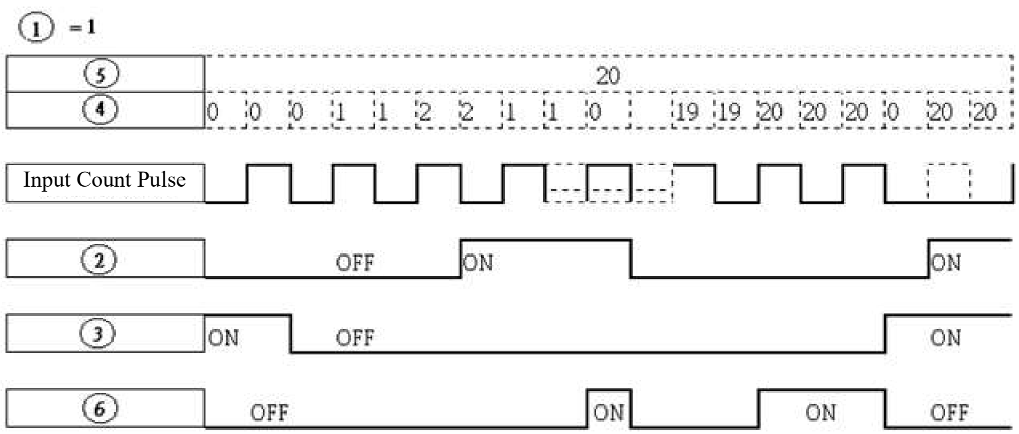
Mode 1:
Counter value locks at setpoint. Value is not retained when powered off.

Mode 2:
Counter value does not lock. Value is not retained when powered off.

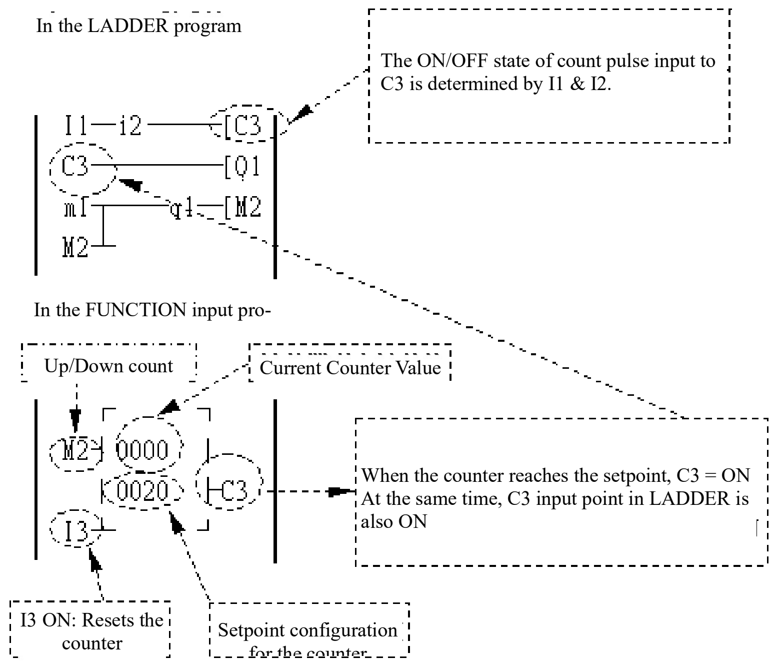
Mode 3:
Counter value locks and is retained when powered off.

Mode 4:
Counter value does not lock but is retained when powered off.

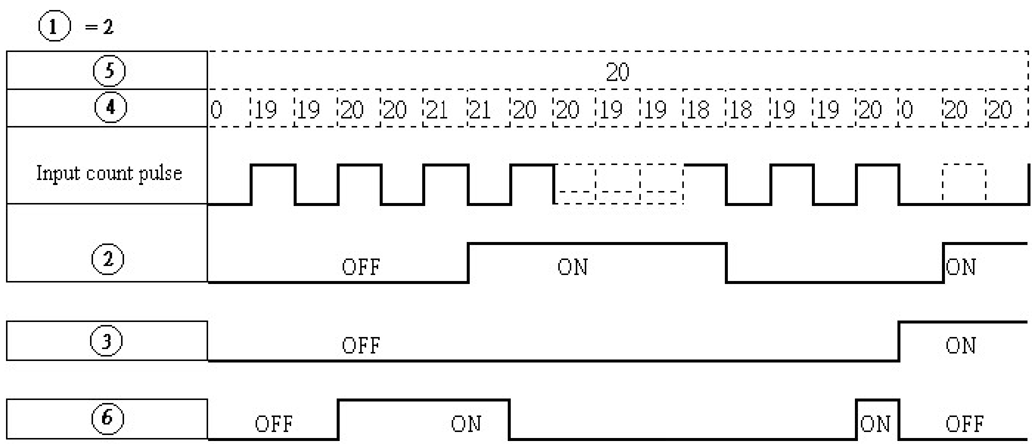
(1) Counter Mode 1



Example:

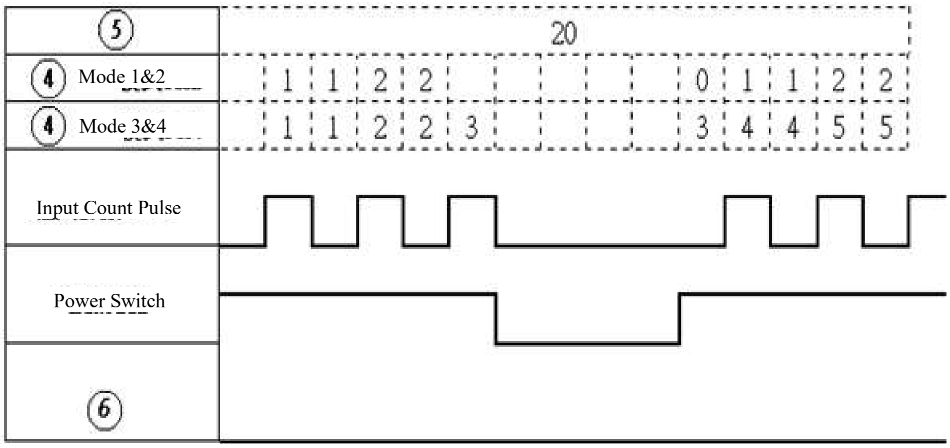


(2) Counter Mode 2

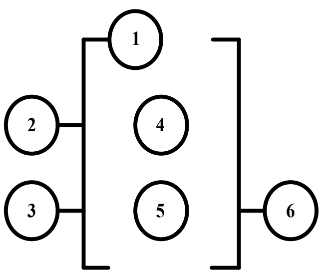


※Note: In this mode, the current count value can exceed 20 and will not lock at 20 like in Mode 1.

(1) Counter Mode 3 is the same as Mode 1, but retains the current count value after power off. The value will be available the next time the power is turned on.
(2) Counter Mode 4 is the same as Mode 2, but retains the current count value after power off. The value will be available the next time the power is turned on.



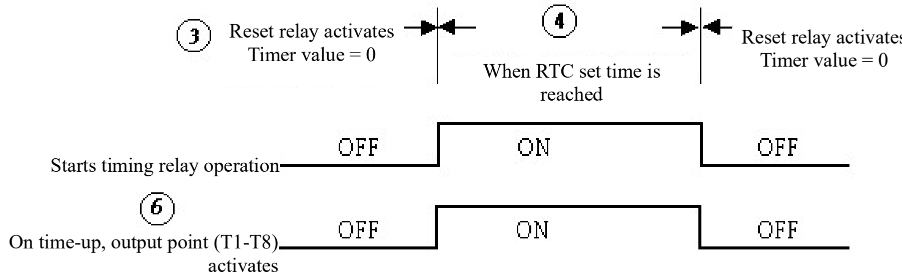
2. Timer



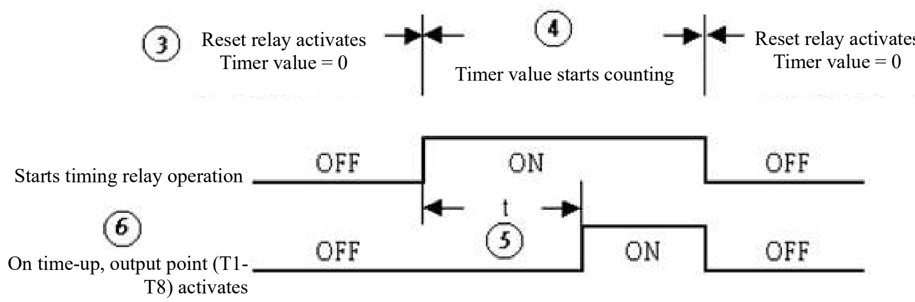
Symbol	Description
①	Timer Modes (0–7)
②	Time Units: 1: 0.0–999.9 seconds
	2: 0–9999 seconds
	3: 0–9999 minutes
③	Timer Reset Configuration using (I1 and f8)
	ON: Resets the timer and turns⑥ OFF
	OFF: Continues timing
④	Current Timer Value
⑤	Timer Setpoint (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
⑥	Timer Number (T1-T8, total of 8 sets)

Timer Mode Descriptions:

(1) Timer Mode 0 (ON-RTC Mode)

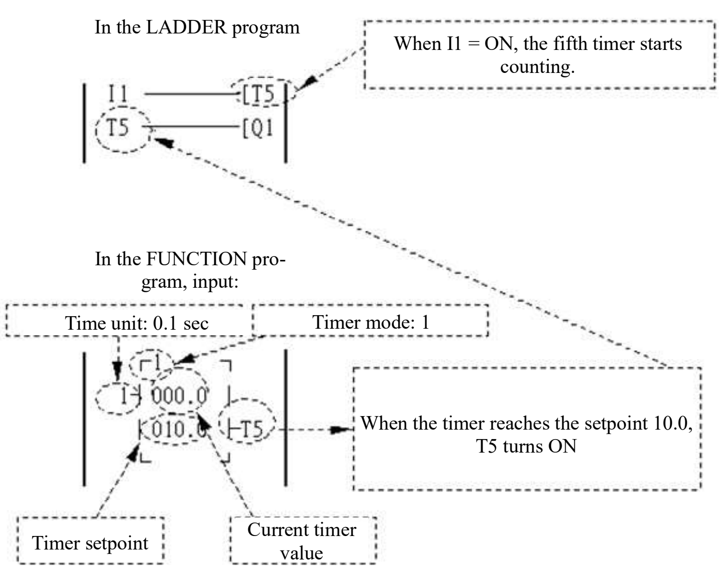


(2) Timer Mode 1 (ON-Delay Timer Mode 1)

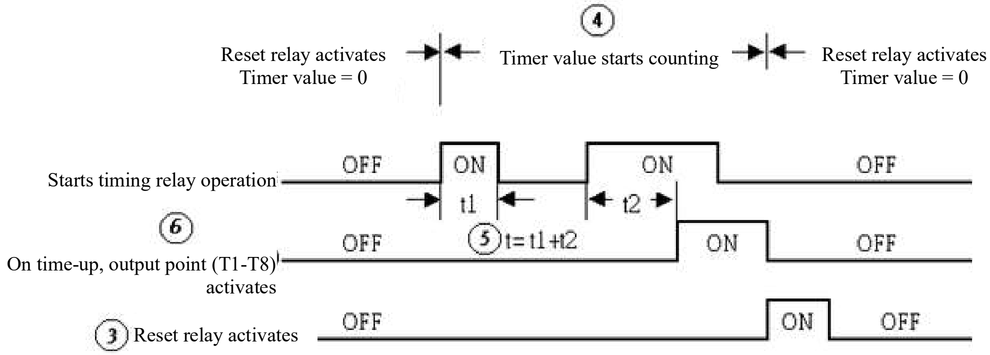


t = Timer setpoint

Example:

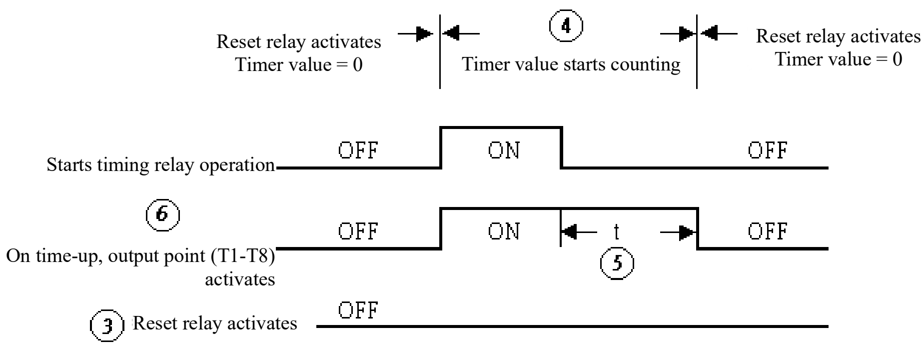


(3) Timer Mode 2 (ON-Delay Timer Mode 2)

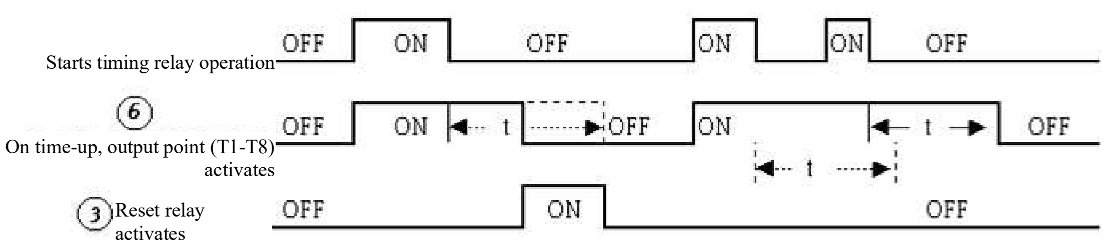


t = Timer Action Value

(4) Timer Mode 3 (OFF-Delay Timer Mode 1)

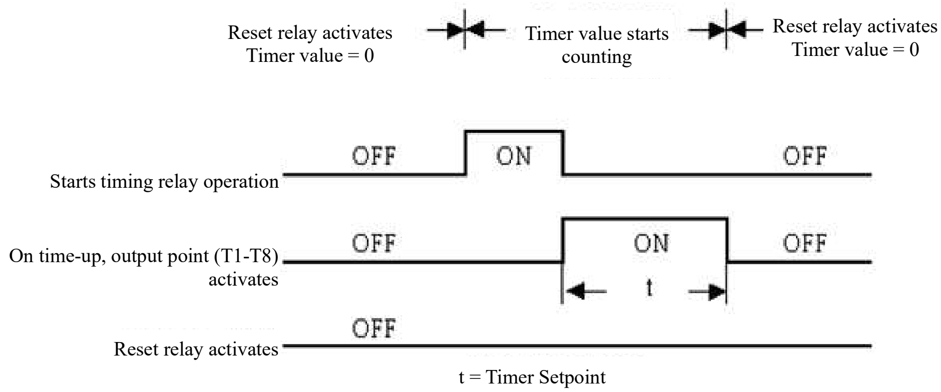


t = Timer setpoint

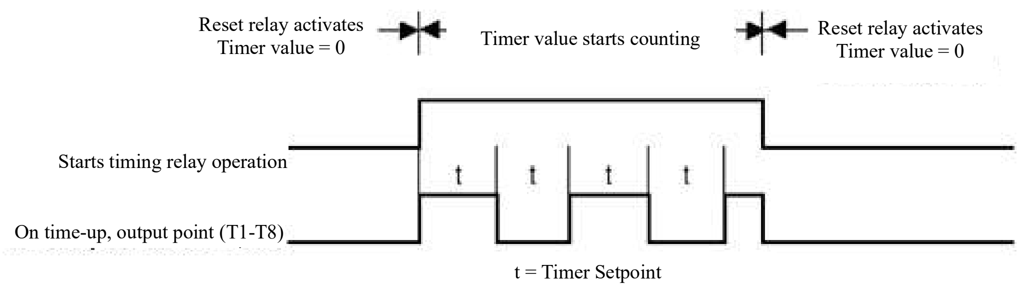


t = Timer setpoint

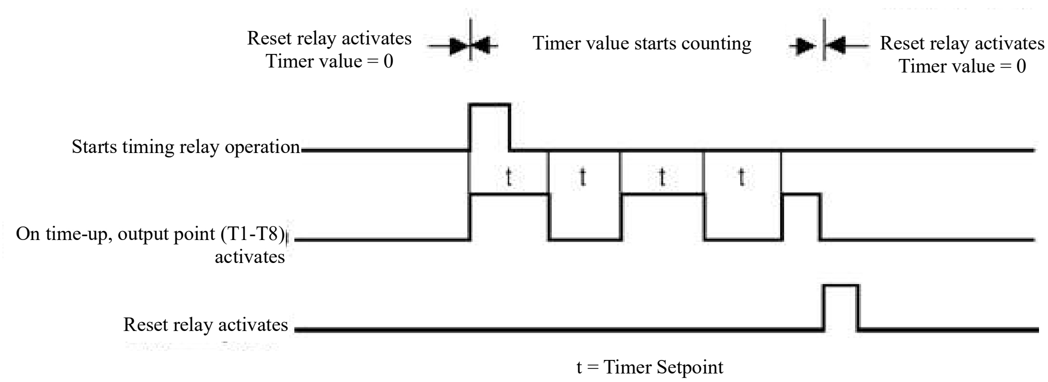
(5) Timer Mode 4 (OFF-Delay Timer Mode 2)



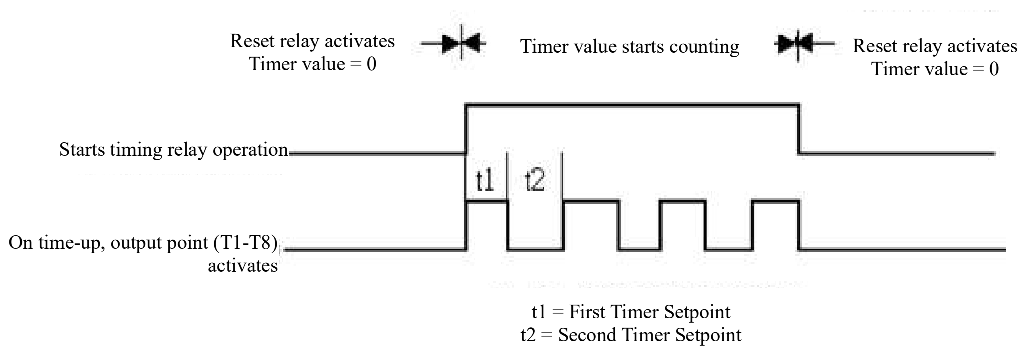
(6) Timer Mode 5 (FLASH Timer Mode 1)



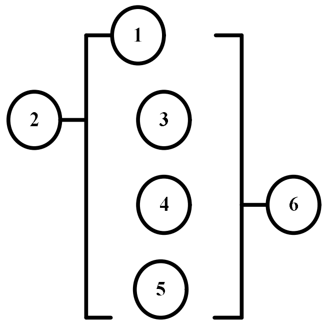
(7) Timer Mode 6 (FLASH Timer Mode 2)



(8) Timer Mode 7 (FLASH Timer Mode 3)



3. Analog Comparator



Symbol	Description
①	Analog Comparison Modes (1–3)
②	Comparison Input Source Selection (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8)
③	Current Analog Input Value
④	Reference Comparison Value (Upper Limit) (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
⑤	Reference Comparison Value (Lower Limit) (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
⑥	Analog Comparator Output Point (G1~G8)

Analog Comparison Mode Descriptions:

(1) Analog Comparison Mode 1: (③ ≤ ⑤, ⑥ ON)
(2) Analog Comparison Mode 2: (③ ≥ ④, ⑥ ON)
(3) Analog Comparison Mode 3: (⑤ ≤ ③ ≤ ④, ⑥ ON)

Comparison Input Source Selection (V1~V7):

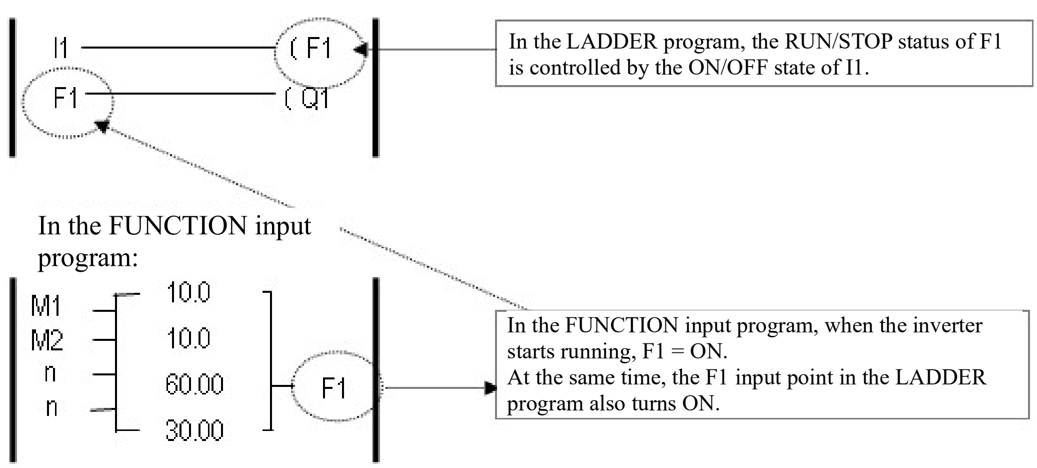
(1) Comparison Input Source Selection = V1: Set Frequency
(2) Comparison Input Source Selection = V2: Operating Frequency
(3) Comparison Input Source Selection = V3: AI1 Input Value
(4) Comparison Input Source Selection = V4: AI2 Input Value
(5) Comparison Input Source Selection = V5: Operation Panel Input Value
(6) Comparison Input Source Selection = V6: Operating Current
(7) Comparison Input Source Selection = V7: Torque Value
(8) Comparison Input Source Selection = V8: PID Target Value

4. Operation Control Commands

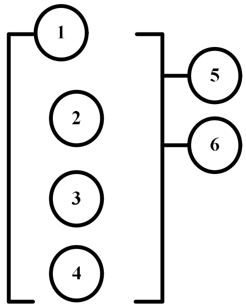
Symbol	Description
①	Timer Reset Configuration using (I1~f8) OFF: Forward (FWD) ON: Reverse (REV)
②	Multi-Speed Terminal Control can be set using (I1-f8)
	OFF: Operates at the Set Frequency ③
	ON: Operates at the Multi-Speed Frequency ④
③	Set Frequency (can be a constant or V3, V4, V5, V8)
④	Multi-Speed Frequency (can be a constant or V3, V4, V5, V8)
⑤	Acceleration Time (ACC Time)
⑥	Deceleration Time (DEC Time)
⑦	Operation Control Command Number (F1~F8, total of 8 groups)

Example:

:In the LADDER program



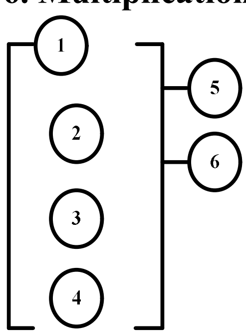
5. Addition and Subtraction Mode



RESULT (Calculation Result) = V1 + V2 – V3

Symbol	Description
①	Calculation Result
②	Addend V1 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
③	Addend V2 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
④	Subtrahend V3 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
⑤	Error signal coil output (M1~MF)
⑥	Addition/Subtraction Mode Number (AS1~AS4)

6. Multiplication and Division Mode



RESULT (Calculation Result) = V1 × V2 ÷ V3

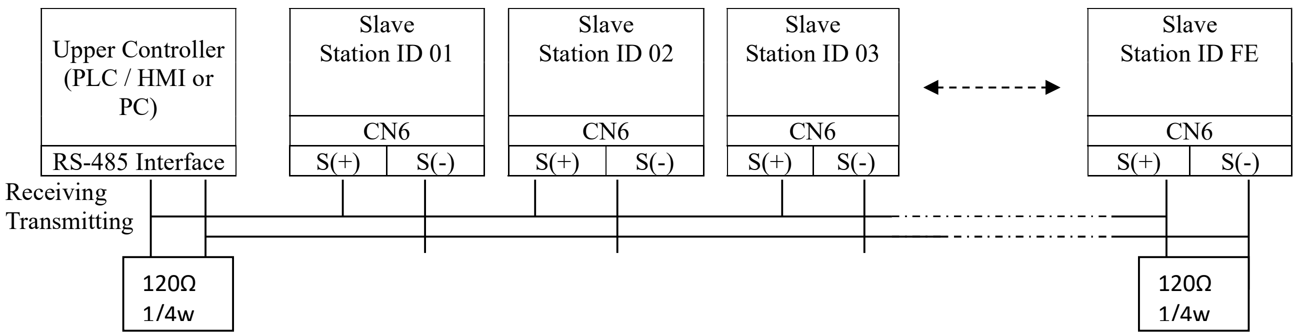
Symbol	Description
①	Calculation Result
②	Multiplier V1 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
③	Multiplier V2 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
④	Divisor V3 (AS1~AS4, MD1~MD4, T1~T8, C1~C8, V1~V8, constants)
⑤	Error signal coil output (M1~MF)
⑥	Multiplication/Division Mode Number (MD1~MD4)

4.5 Modbus Communication Protocol Description

4.5.1 Communication Hardware and Data Structure

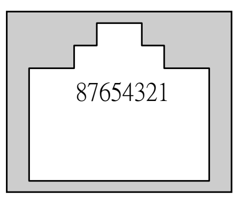
The E710 series models accept commands from a computer or other upper-level controller via RS485 or RS232 communication interfaces. It supports Modbus RTU Mode and Modbus ASCII Mode protocols. The maximum receive size is 84 bytes, and the maximum send size is 80 bytes.

- **Hardware Installation Method**



A 120Ω, 1/4W termination resistor must be installed at both the starting and ending points of the communication line.

CN6 Pin definitions as indicated below:



Pin	Signal Name	Pin	Signal Name
1	RS-485 Data+ Signal	5	Reserved
2	RS-485 Data– Signal	6	RS-485 Data– Signal
3	RS-485 Data+ Signal	7	5V Power
4	Reserved	8	GND

When using RS-485 communication, S(+) corresponds to Pin 1 or Pin 3; S(–) corresponds to Pin 2 or Pin 6

- **Data Frame Structure**

FOR ASCII MODE

STX(3AH)	Start Character: 3AH
Address Hi	Communication Address (Station ID): 2 ASCII characters
Address Lo	
Function Hi	Function Code (Command): 2 ASCII characters
Function Lo	
Command Start Address	Command Start Bit: 4 ASCII characters
Command Start Address	
Command Start Address	
Command Start Address	
Data length	Length from Command Start to End: 4 ASCII characters
Data length	
Data length	
Data length	
LRC Check Hi	LRC Checksum: 2 ASCII characters
LRC Check Lo	
END Hi	End Character: END Hi = CR(0DH) · END Li = LF(0AH)
END Lo	

FOR RTU MODE

In RTU Mode, the master device (e.g., PLC) sends a command to the slave, and the slave replies. Communication Sequence Structure
As shown on the right, the length of the DATA section varies depending on the content of the command (function).

**A minimum interval of 10 ms must be maintained between command and response signals.

Slave Address
Function Code
DATA
CRC CHECK
Signal Interval

- **Communication Address**

  00H: Broadcast to all drives
  01H: Address 01 drive
  0FH: Address 15 drive
  10H: Address 16 drive
  ..and so on, up to a maximum of 31 (1FH)

- **Function Code**

  03H: Read holding register
  06H: Write a single WORD to the register (single register write)
  08H: Loopback test
  10H: Write multiple registers (multiple register write)

- **Checksum Calculation**

LRC

```
  ex.   ADDRESS         01H
        FUNCTION        03H
        COMMAND         01H
                             00H
+       DATA LENGTH     0AH
------------------------------------------
                             0FH – Two's complement
     Checksum   =       F1H
       CS(H)    =       46H (ASCII)
       CS(L)    =       31H (ASCII)
```

CRC

CRC CHECK: The CRC checksum is calculated from the slave address to the end of the DATA section as follows:

(1) Set a 16-bit register to FFFFH (all bits set to 1) as the CRC register.
(2) Perform an exclusive OR (XOR) operation between the first byte of the command signal and the lower byte of the 16-bit CRC register, and store the result back into the CRC register.
(3) Shift the CRC register one bit to the right, filling the most significant bit (leftmost bit) with 0. Check the current value of the CRC register.
(4) If the result is 0, store the new value from step (3) into the CRC register. If not, perform an XOR operation between the CRC register and A001H (binary: 1010 0000 0000 0001), then store the result into the CRC register.
(5) Repeat steps (3) and (4) until all 8 bits are processed.
(6) Repeat steps (2) to (5) for the next 8-bit command byte, and continue until all command bytes have been processed. The final value in the CRC register is the CRC checksum. When transmitting, send the low-order byte first, followed by the high-order byte. For example, if the CRC checksum value is 1241hex, the CRC-16 high byte must be set to 41hex, and the low byte must be set to 12hex.

- **CRC Calculation Application**

```
UWORD ch_sum ( UBYTE long , UBYTE *rxdbuff ) {
        BYTE i = 0;
        UWORD wkg = 0xFFFF;
        while ( long-- ) {
        wkg ^= rxdbuff++;
        for ( i = 0 ; i < 8; i++ ) {
              if ( wkg & 0x0001 ) {
                 wkg = ( wkg >> 1 ) ^ 0xa001;
              }
              else {
                 wkg = wkg >> 1;
              }
          }
    }
   return( wkg );
}
```

- **Error code**

ASCII Mode

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Exception code	'5'
	'1'
LRC Check	'2'
	'8'
END	'CR'
	'LF'

RTU Mode

Slave Address		02H
Function		83H
Exception code		52H
CRC-16	High	C0H
	Low	CDH

When communication is established and an error occurs, the drive will respond with an error code and return the function code plus 80H to the master system, indicating that an error has occurred.

Error code	Description
01	Invalid function code
02	Invalid register address
03	Invalid data setting
04	Number of registers exceeds 32

4.5.2 Register and Data Format

- **Command DATA (allows reading and writing)**

Register Address		Bit	Content
2500H			Reserved
2501H	Operation signal	0	Operation Command 1: Run 0: Stop
		1	Reverse Command 1: Reverse 0: Forward
		2	External Error 1: Error
		3	Error reset 1: Reset
		4	Reserved
		5	Reserved
		6	Multi-function terminal S1 1: "ON"
		7	Multi-function terminal S2 1: "ON"
		8	Multi-function terminal S3 1: "ON"
		9	Multi-function terminal S4 1: "ON"
		A	Multi-function terminal S5 1: "ON"
		B	Multi-function terminal S6 1: "ON"
		C	Multi-function terminal S7 1: "ON" (Frame1 does not support S7)
		D	Reserved
		E	Controller mode 1: "ON"
		F	Communication setting torque command 1: "ON"
2502H			*Frequency command (Unit: 0.01Hz)
2503H			Torque Command (+/-8192 corresponds to rated torque +/-100%)
2504H			Speed Limit (+/-120 corresponds to +/-120%)
2505H			AO1 (0.00V~10.00V)
2506H			AO2 (0 ~ 1000) Voltage (corresponds to 0.00~10.00V) Current (corresponds to 4mA~20mA)
2507H			DO
2508H			Reserved
2509H			Reserved
250AH			Reserved
250BH			Reserved
250CH			Reserved
250DH			Reserved
250EH			Reserved
250FH			Reserved
2510H			G12-00 H-WORD
2511H			G12-00 L-WORD

* (When the motor's maximum output frequency exceeds 300Hz, the frequency resolution is 0.1Hz)

- **Monitor DATA (read only)**

Register No.		Bit	Content		
2520H	Status signal	0	Operation status 1: Operate 0: Stop		
		1	Direction status 1: Reverse 0: Forward		
		2	Frequency converter operation preparation status 1: Preparation complete 0: Preparation not yet complete		
		3	Error 1: Abnormal		
		4	Warning 1: “ON”		
		5	Zero speed 1: “ON”		
		6	Model 440 1: “ON”		
		7	Frequency reached 1: “ON”		
		8	Any frequency reached 1: “ON”		
		9	Frequency detection one 1: “ON”		
		A	Frequency detection two 1: “ON”		
		B	Low voltage 1: “ON”		
		C	Frequency converter no output 1: “ON”		
		D	Frequency not according to communication 1: “ON”		
		E	Seq. not from Comm 1 :“ON”		
		F	Over-torque 1: “ON”		
2521H	Error description	0		30	
		1	UV	31	
		2	OC	32	
		3	OV	33	
		4	OH1	34	
		5	OL1	35	
		6	OL2	36	LSCFT
		7	OT	37	LSCFT(Rtry)
		8	UT	38	CF07
		9	SC	39	LOPBT
		10	Ground OC	40	HIPBT
		11	Fuse broken	41	Reserved
		12	Input Phase Loss	42	LPBFT
		13	Output Phase Loss	43	OPBFT
		14	PG Overspeed	44	FBLSS
		15	PG Open	45	
		16	PG Speed Deviation	46	OH4
		17	External Fault 01	47	SS1
		18	External Fault 02	48	保留
		19	External Fault 03	49	RUN
		20	External Fault 04	50	OCA
		21	External Fault 05	51	OCD
		22	External Fault 06	52	OCC
		23	External Fault 07	53	CF08
		24	External Fault 08	54	
		25	FB	55	PF (Protection fault)
		26	OPR	56	TOL (External overload)
		27		57	STO2
		28	CE	58	
		29	STO	59	
2522H	DI status	0	Multi-function terminal S1		
		1	Multi-function terminal S2		
		2	Multi-function terminal S3		
		3	Multi-function terminal S4		
		4	Multi-function terminal S5		
		5	Multi-function terminal S6		
		6	Multi-function terminal S7 (Frame1 does not support S7)		
		7	Reserved		
		8	Reserved		

Register No.	Bit	Content
	9	Reserved
	A	Reserved
	B	Reserved
	C	Reserved
	D	Reserved
	E	Reserved
	F	Reserved
2523H		* Frequency command (0.01Hz)
2524H		* Output frequency (0.01Hz)
2525H		Reserved
2526H		DC voltage command (0.1V)
2527H		Output current (0.1A)

Register No.									
2528H	Warning description	0	No alarm	22	EF6	44	Reserved	66	FIRE
		1	OV	23	EF7	45	OL1	67	ES
		2	UV	24	Reserved	46	HP_ER	68	STP1
		3	OL2	25	CLA	47	SE10	69	Reserved
		4	OH2	26	CLB	48	COPUP	70	EPERR
		5	OH3	27	Reserved	49	BB1	71	ADCER
		6	OT	28	Reserved	50	BB2	72	Reserved
		7	Reserved	29	USP	51	BB3	73	STP0
		8	Reserved	30	RDE	52	BB4	74	ENC
		9	UT	31	WRE	53	BB5	75	STP2
		10	OS	32	FB	54	BB6	76	RUNER
		11	PGO	33	VRYE	55	BB7	77	LOC
		12	DEV	34	SE01	56	Reserved	78	Reserved
		13	CE	35	SE02	57	LOPB	79	Reserved
		14	Reserved	36	SE03	58	HIPB	80	FBLSS
		15	Reserved	37	Reserved	59	LSCFT	81	CYEAR
		16	EF0	38	SE05	60	LFPB	82	SE11
		17	EF1	39	HPERR	61	RETRY	83	CBER1
		18	EF2	40	EF	62	SE07	84	FLIFE
		19	EF3	41	Reserved	63	SE08	85	ILIFE
		20	EF4	42	Reserved	64	HFPB	86	CBER2
		21	EF5	43	RDP	65	OH1	87	CBER3

Register No.	Content
2529H	DO status
252AH	AO1 (0.00V ~ 10.00V)
252BH	AO2 (0 ~ 1000) Voltage (corresponds to 0.00~10.00V) Current (corresponds to 4mA~20mA)
252CH	AI 1 input (0.1%)
252DH	AI 2 input (0.1%)
252EH	Reserved
252FH	L510(s)/ E510(s)/ A510(s)/ F510 Check

Note : Do not write in data for the reserved register.
*: (When the maximum output frequency of the motor exceeds 300Hz, the frequency resolution is 0.1Hz)

- **Read Holding Register Contents [03H]**

  Reads a specified number of consecutive holding register contents starting from a designated address.
  (Example) Reading the frequency command from inverter A510 of SLAVE 1.

ASCII Mode

Command Signal

3AH	STX
30H	Slave Address
31H	
30H	Function Code
33H	
30H	Starting Address
43H	
31H	
30H	
30H	Quantity
30H	
30H	
31H	
44H	LRC CHECK
46H	
0DH	END
0AH	

Response Signal (Normal)

3AH	STX
30H	Slave Address
31H	
30H	Function Code
33H	
30H	Data Items
32H	
31H	First Holding Register
37H	
37H	
30H	
37H	LRC CHECK
33H	
0DH	END
0AH	

Response Signal (Error – Data Length Mismatch)

3AH	STX
30H	Slave Address
31H	
38H	Function Code
33H	
30H	Error Code
34H	
34H	LRC CHECK
30H	
0DH	END
0AH	

RTU Mode

Command Signal

Slave Address		01 H
Function Code		03H
Starting Address	High	0CH
	Low	10H
Quantity	High	00H
	Low	01H
CRC-16	High	86H
	Low	9FH

Response Signal (Normal)

Slave Address		01H
Function Code		03H
Data Items		02H
First Holding Register	High	17H
	Low	70H
CRC-16	High	B6H
	Low	50H

Response Signal (Error – Data Length Mismatch)

Slave Address		01H
Function Code		83H
Error Code		04H
CRC-16	High	40H
	Low	F3H

- **LOOP BACK Test [08H]**

The command message is returned as the response message. This test function is used between the MASTER and SLAVE to verify signal transmission. The data field can be set to any arbitrary value for testing purposes.

ASCII Mode

Command Signal

3AH	STX
30H	Slave Address
31H	
30H	Function Code
38H	
30H	Testing Code
30H	
30H	
30H	
41H	DATA
35H	
33H	
37H	
31H	LRC CHECK
42H	
0DH	END
0AH	

Response Signal (Normal)

3AH	STX
30H	Slave Address
31H	
30H	Function Code
38H	
30H	Testing Code
30H	
30H	
30H	
41H	DATA
35H	
33H	
37H	
31H	LRC CHECK
42H	
0DH	END
0AH	

Response Signal (Error – Data Length Mismatch)

3AH	STX
30H	Slave Address
31H	
38H	Function Code
38H	
30H	Error Code
33H	
30H	LRC CHECK
36H	
0DH	END
0AH	

RTU Mode

Command Signal

Slave Address		01 H
Function Code		08H
Testing Code	High	00H
	Low	00H
DATA	High	A5H
	Low	37H
CRC-16	High	DAH
	Low	8DH

Response Signal (Normal)

Slave Address		01H
Function Code		08H
Testing Code	High	00H
	Low	00H
DATA	High	A5H
	Low	37H
CRC-16	High	DAH
	Low	8DH

Response Signal (Error – Data Length Mismatch)

Slave Address		01H
Function Code		88H
Error Code		03H
CRC-16	High	06H
	Low	01H

- **Write to Holding Register [06H]**

  Writes a specified value to a single holding register at the designated address.
  (Example) Set the frequency command to 60.00 Hz on the inverter of SLAVE 1 via PLC.

ASCII Mode

Command Signal

3AH	STX
30H	Slave Address
31H	
30H	Function Code
36H	
32H	Starting Address
35H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
34H	LRC CHECK
42H	
0DH	END
0AH	

Response Signal (Normal)

3AH	STX
30H	Slave Address
31H	
30H	Function Code
36H	
32H	Starting Address
35H	
30H	
32H	
31H	DATA
37H	
37H	
30H	
34H	LRC CHECK
42H	
0DH	END
0AH	

Response Signal (Error – Data Length Mismatch)

3AH	STX
30H	Slave Address
31H	
38H	Function Code
36H	
30H	Error Code
33H	
30H	LRC CHECK
32H	
0DH	END
0AH	

RTU Mode

Command Signal

Slave Address		01 H
Function Code		06H
Starting Address	High	25H
	Low	02H
Quantity	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response Signal (Normal)

Slave Address		01H
Function Code		06H
Starting Address	High	25H
	Low	02H
Quantity	High	17H
	Low	70H
CRC-16	High	2DH
	Low	12H

Response Signal (Error – Data Length Mismatch)

Slave Address		01H
Function Code		86H
Error Code		03H
CRC-16	High	02H
	Low	61H

- **Write to Multiple Holding Registers [10H]**

Writes specified data to a designated number of consecutive holding registers, starting from the specified address.

(Example) Use a PLC to set the A510 inverter of SLAVE 1 to a frequency command of 60.00 Hz and run in the forward direction.

ASCII Mode

Command Signal

3AH	STX
30H	Slave Address
31H	
31H	Function Code
30H	
32H	Starting Address
35H	
30H	
31H	
30H	Quantity
30H	
30H	
32H	
30H	DATA Count*
34H	
30H	First DATA
30H	
30H	
31H	
31H	Subsequent DATA
37H	
37H	
30H	
33H	LRC CHECK
42H	
0DH	END
0AH	

* DATA count must be the number of registers × 2

Response Signal (Normal)

3AH	STX
30H	Slave Address
31H	
31H	Function Code
30H	
32H	Starting Address
35H	
30H	
31H	
30H	Quantity
30H	
30H	
32H	
43H	LRC CHECK
37H	
0DH	END
0AH	

Response Signal (Error – Data Length Mismatch)

3AH	STX
30H	Slave Address
31H	
39H	Function Code
30H	
30H	Error Code
33H	
30H	LRC CHECK
43H	
0DH	END
0AH	

RTU Mode

Command Signal

Slave Address		01 H
Function Code		10H
Starting Address	High	25H
	Low	01H
Quantity	High	00H
	Low	02H
DATA Count*		04H
First DATA	High	00H
	Low	01H
Subsequent DATA	High	17H
	Low	70H
CRC-16	High	60H
	Low	27H

Response Signal (Normal)

Slave Address		01H
Function Code		10H
Starting Address	High	25H
	Low	01H
Count	High	00H
	Low	02H
CRC-16	High	1BH
	Low	04H

Response Signal (Error – Data Length Mismatch)

Slave Address		01H
Function Code		90H
Error Code		03H
CRC-16	High	0CH
	Low	01H

* DATA count must be the number of registers × 2

- **Parameters and Corresponding Register Numbers**

Function	Register No	Function	Register No	Function	Register No
Group 0		Group 0		Group 1	
0 – 00	0000H	0 – 45	002DH	1 – 00	0100H
0 – 01	0001H	0 – 46	002EH	1 – 01	0101H
0 – 02	0002H	0 – 47	002FH	1 – 02	0102H
0 – 03	0003H	0 – 48	0030H	1 – 03	0103H
0 – 04	0004H	0 – 49	0031H	1 – 04	0104H
0 – 05	0005H	0 – 50	0032H	1 – 05	0105H
0 – 06	0006H	0 – 51	0033H	1 – 06	0106H
0 – 07	0007H	0 – 52	0034H	1 – 07	0107H
0 – 08	0008H	0 – 53	0035H	1 – 08	0108H
0 – 09	0009H	0 – 54	0036H	1 – 09	0109H
0 – 10	000AH	0 – 55	0037H	1 – 10	010AH
0 – 11	000BH	0 – 56	0038H	1 – 11	010BH
0 – 12	000CH	0 – 57	0039H	1 – 12	010CH
0 – 13	000DH	0– 58	003AH	1 – 13	010DH
0 – 14	000EH	0– 59	003BH	1 – 14	010EH
0 – 15	000FH	0– 60	003CH	1 – 15	010FH
0 – 16	0010H	0– 61	003DH	1 – 16	0110H
0 – 17	0011H	0– 62	003EH	1 – 17	0111H
0 – 18	0012H	0– 63	003FH	1 – 18	0112H
0 – 19	0013H			1 – 19	0113H
0 – 20	0014H			1 – 20	0114H
0 – 21	0015H			1 – 21	0115H
0 – 22	0016H			1 – 22	0116H
0 – 23	0017H			1 – 23	0117H
0 – 24	0018H			1 – 24	0118H
0 – 25	0019H			1 – 25	0119H
0 – 26	001AH			1 – 26	011AH
0 – 27	001BH				
0 – 28	001CH				
0 – 29	001DH				
0 – 30	001EH				
0 – 31	001FH				
0 – 32	0020H				
0 – 33	0021H				
0 – 34	0022H				
0 – 35	0023H				
0 – 36	0024H				

0 – 37	0025H				
0 – 38	0026H				
0 – 39	0027H				
0 – 40	0028H				
0 – 41	0029H				
0 – 42	002AH				
0 – 43	002BH				
0 – 44	002CH				

Function	Register No	Function	Register No	Function	Register No
Group 2		Group 3		Group 3	
2 – 00	0200H	3 – 00	0300H	3 – 47	032FH
2 – 01	0201H	3 – 01	0301H	3 – 48	0330H
2 – 02	0202H	3 – 02	0302H	3 – 49	0331H
2 – 03	0203H	3 – 03	0303H	3 – 50	0332H
2 – 04	0204H	3 – 04	0304H	3 – 51	0333H
2 – 05	0205H	3 – 05	0305H	3 – 52	0334H
2 – 06	0206H	3 – 06	0306H	3 – 53	0335H
2 – 07	0207H	3 – 07	0307H	3 – 54	0336H
2 – 08	0208H	3 – 08	0308H	3 – 55	0337H
2 – 09	0209H	3 – 09	0309H	3– 56	0338H
2 – 10	020AH	3 – 10	030AH	3– 57	0339H
2 – 11	020BH	3 – 11	030BH	3– 58	033AH
2 – 12	020CH	3 – 12	030CH	3– 59	033BH
2 – 13	020DH	3 – 13	030DH		
2 – 14	020EH	3 – 14	030EH		
2 – 15	020FH	3 – 15	030FH		
2 – 16	0210H	3 – 16	0310H		
2 – 17	0211H	3 – 17	0311H		
2 – 18	0212H	3 – 18	0312H		
2 – 19	0213H	3 – 19	0313H		
2 – 20	0214H	3 – 20	0314H		
2 – 21	0215H	3 – 21	0315H		
2 – 22	0216H	3 – 22	0316H		
2 – 23	0217H	3 – 23	0317H		
2 – 24	0218H	3 – 24	0318H		
2 – 25	0219H	3 – 25	0319H		
2 – 26	021AH	3 – 26	031AH		
2 – 27	021BH	3 – 27	031BH		
2 – 28	021CH	3 – 28	031CH		
2 – 29	021DH	3 – 29	031DH		
2 – 30	021EH	3 – 30	031EH		
2 – 31	021FH	3 – 31	031FH		
2 – 32	0220H	3 – 32	0320H		
2 – 33	0221H	3 – 33	0321H		
2 – 34	0222H	3 – 34	0322H		
2 – 35	0223H	3 – 35	0323H		
2 – 36	0224H	3 – 36	0324H		
2 – 37	0225H	3 – 37	0325H		
		3 – 38	0326H		
		3 – 39	0327H		
		3 – 40	0328H		
		3 – 41	0329H		
		3 – 42	032AH		
		3 – 43	032BH		
		3 – 44	032CH		
		3 – 45	032DH		
		3 – 46	032EH		

Function	Register No	Function	Register No	Function	Register No
Group 4		Group 5		Group 5	
4 – 00	0400H	5 – 00	0500H	5 – 33	0521H
4 – 01	0401H	5 – 01	0501H	5 – 34	0522H
4 – 02	0402H	5 – 02	0502H	5 – 35	0523H
4 – 03	0403H	5 – 03	0503H	5 – 36	0524H
4 – 04	0404H	5 – 04	0504H	5 – 37	0525H
4 – 05	0405H	5 – 05	0505H	5 – 38	0526H
4 – 06	0406H	5 – 06	0506H	5 – 39	0527H
4 – 07	0407H	5 – 07	0507H	5 – 40	0528H
4 – 08	0408H	5 – 08	0508H	5 – 41	0529H
4 – 09	0409H	5 – 09	0509H	5 – 42	052AH
4 – 10	040AH	5 – 10	050AH	5 – 43	052BH
4 – 11	040BH	5 – 11	050BH	5 – 44	052CH
4 – 12	040CH	5 – 12	050CH	5 – 45	052DH
4 – 13	040DH	5 – 13	050DH	5 – 46	052EH
4 – 14	040EH	5 – 14	050EH	5 – 47	052FH
4 – 15	040FH	5 – 15	050FH	5 – 48	0530H
4 – 16	0410H	5 – 16	0510H		
4 – 17	0411H	5 – 17	0511H		
4 – 18	0412H	5 – 18	0512H		
4 – 19	0413H	5 – 19	0513H		
4 – 20	0414H	5 – 20	0514H		
4 – 21	0415H	5 – 21	0515H		
4 – 22	0416H	5 – 22	0516H		
4 – 23	0417H	5 – 23	0517H		
4 – 24	0418H	5 – 24	0518H		
4 – 25	0419H	5 – 25	0519H		
4 – 26	041AH	5 – 26	051AH		
4 – 27	041BH	5 – 27	051BH		
		5 – 28	051CH		
		5 – 29	051DH		
		5 – 30	051EH		
		5 – 31	051FH		
		5 – 32	0520H		

Function	Register No	Function	Register No	Function	Register No
Group 6		Group 6		Group 7	
6 – 00	0600H	6 – 41	0629H	7 – 00	0700H
6 – 01	0601H	6 – 42	062AH	7 – 01	0701H
6 – 02	0602H	6 – 43	062BH	7 – 02	0702H
6 – 03	0603H	6 – 44	062CH	7 – 03	0703H
6 – 04	0604H	6 – 45	062DH	7 – 04	0704H
6 – 05	0605H	6 – 46	062EH	7 – 05	0705H
6 – 06	0606H	6 – 47	062FH	7 – 06	0706H
6 – 07	0607H			7 – 07	0707H
6 – 08	0608H			7 – 08	0708H
6 – 09	0609H			7 – 09	0709H
6 – 10	060AH			7 – 10	070AH
6 – 11	060BH			7 – 11	070BH
6 – 12	060CH			7 – 12	070CH
6 – 13	060DH			7 – 13	070DH
6 – 14	060EH			7 – 14	070EH
6 – 15	060FH			7 – 15	070FH
6 – 16	0610H			7 – 16	0710H
6 – 17	0611H			7 – 17	0711H
6 – 18	0612H			7 – 18	0712H
6 – 19	0613H			7 – 19	0713H
6 – 20	0614H			7 – 20	0714H
6 – 21	0615H			7 – 21	0715H
6 – 22	0616H			7 – 22	0716H
6 – 23	0617H			7 – 23	0717H
6 – 24	0618H			7 – 24	0718H
6 – 25	0619H			7 – 25	0719H
6 – 26	061AH			7 – 26	071AH
6 – 27	061BH			7 – 27	071BH
6 – 28	061CH			7 – 28	071CH
6 – 29	061DH			7 – 29	071DH
6 – 30	061EH			7 – 30	071EH
6 – 31	061FH			7 – 31	071FH
6 – 32	0620H			7 – 32	0720H
6 – 33	0621H			7 – 33	0721H
6 – 34	0622H			7 – 34	0722H
6 – 35	0623H			7 – 35	0723H
6 – 36	0624H			7 – 36	0724H
6 – 37	0625H			7 – 42	072AH
6 – 38	0626H			7 – 43	072BH
6 – 39	0627H			7 – 44	072CH
6 – 40	0628H			7 – 45	072DH
				7 – 46	072EH
				7 – 47	072FH

Function	Register No	Function	Register No	Function	Register No
Group 8		Group 8		Group 9	
8 – 00	0800H	8 – 46	082EH	9 – 00	0900H
8 – 01	0801H	8 – 47	082FH	9 – 01	0901H
8 – 02	0802H	8 – 48	0830H	9 – 02	0902H
8 – 03	0803H	8 – 49	0831H	9 – 03	0903H
8 – 04	0804H	8 – 50	0832H	9 – 04	0904H
8 – 05	0805H	8 – 51	0833H	9 – 05	0905H
8 – 06	0806H	8 – 52	0834H	9 – 06	0906H
8 – 07	0807H	8 – 53	0835H	9 – 07	0907H
8 – 08	0808H	8 – 54	0836H	9 – 08	0908H
8 – 09	0809H	8 – 55	0837H	9 – 09	0909H
8 – 10	080AH	8 – 56	0838H	9 – 10	090AH
8 – 11	080BH	8 – 57	0839H	9 – 11	090BH
8 – 12	080CH	8 – 58	083AH	9 – 12	090CH
8 – 13	080DH	8 – 59	083BH	9 – 13	090DH
8 – 14	080EH	8 – 60	083CH	9 – 14	090EH
8 – 15	080FH	8 – 61	083DH	9 – 15	090FH
8 – 16	0810H	8 – 62	083EH		
8 – 17	0811H	8 – 63	083FH		
8 – 18	0812H	8 – 64	0840H		
8 – 19	0813H	8 – 65	0841H		
8 – 20	0814H	8 – 66	0842H		
8 – 21	0815H				
8 – 22	0816H				
8 – 23	0817H				
8 – 24	0818H				
8 – 25	0819H				
8 – 26	081AH				
8 – 27	081BH				
8 – 28	081CH				
8 – 29	081DH				
8 – 30	081EH				
8 – 31	081FH				
8 – 32	0820H				
8 – 33	0821H				
8 – 34	0822H				
8 – 35	0823H				
8 – 36	0824H				
8 – 37	0825H				
8 – 38	0826H				
8 – 39	0827H				
8 – 40	0828H				
8 – 41	0829H				
8 – 42	082AH				
8 – 43	082BH				
8 – 44	082CH				
8 – 45	082DH				

Function	Register No	Function	Register No	Function	Register No
Group 10		Group 10			
10 – 00	0A00H	10 – 46	0A2EH		
10 – 01	0A01H	10 – 47	0A2FH		
10 – 02	0A02H	10 – 48	0A30H		
10 – 03	0A03H	10 – 49	0A31H		
10 – 04	0A04H				
10 – 05	0A05H				
10 – 06	0A06H				
10 – 07	0A07H				
10 – 08	0A08H				
10 – 09	0A09H				
10 – 10	0A0AH				
10 – 11	0A0BH				
10 – 12	0A0CH				
10 – 13	0A0DH				
10 – 14	0A0EH				
10 – 15	0A0FH				
10 – 16	0A10H				
10 – 17	0A11H				
10 – 18	0A12H				
10 – 19	0A13H				
10 – 20	0A14H				
10 – 21	0A15H				
10 – 22	0A16H				
10 – 23	0A17H				
10 – 24	0A18H				
10 – 25	0A19H				
10 – 26	0A1AH				
10 – 27	0A1BH				
10 – 28	0A1CH				
10 – 29	0A1DH				
10 – 30	0A1EH				
10 – 31	0A1FH				
10 – 32	0A20H				
10 – 33	0A21H				
10 – 34	0A22H				
10 – 35	0A23H				
10 – 36	0A24H				
10 – 37	0A25H				
10 – 38	0A26H				
10 – 39	0A27H				
10 – 40	0A28H				
10 – 41	0A29H				
10 – 42	0A2AH				
10 – 43	0A2BH				
10 – 44	0A2CH				
10 – 45	0A2DH				

Function	Register No	Function	Register No	Function	Register No
Group 11		Group 11		Group 12	
11 – 00	0B00H	11 – 46	0B2EH	12 – 00	High WORD: 2510H Low WORD: 2511H
11 – 01	0B01H	11 – 47	0B2FH	12 – 01	0C01H
11 – 02	0B02H	11 – 48	0B30H	12 – 02	0C02H
11 – 03	0B03H	11 – 49	0B31H	12 – 03	0C03H
11 – 04	0B04H	11 - 50	0B32H	12 – 04	0C04H
11 – 05	0B05H	11 - 51	0B33H	12 – 05	0C05H
11 – 06	0B06H	11 – 52	0B34H	12 – 06	0C06H
11 – 07	0B07H	11 – 53	0B35H	12 – 07	0C07H
11 – 08	0B08H	11 – 54	0B36H	12 – 08	0C08H
11 – 09	0B09H	11 – 55	0B37H	12 – 09	0C09H
11 – 10	0B0AH	11 – 56	0B38H	12 – 10	0C0AH
11 – 11	0B0BH	11 – 57	0B39H	12 – 11	0C0BH
11 – 12	0B0CH	11 – 58	0B3AH	12 – 12	0C0CH
11 – 13	0B0DH	11 – 59	0B3BH	12 – 13	0C0DH
11 – 14	0B0EH	11 – 60	0B3CH	12 – 14	0C0EH
11 – 15	0B0FH	11 – 61	0B3DH	12 – 15	0C0FH
11 – 16	0B10H	11 – 62	0B3EH	12 – 16	0C10H
11 – 17	0B11H	11 – 63	0B3FH	12 – 17	0C11H
11 – 18	0B12H	11 – 64	0B40H	12 – 18	0C12H
11 – 19	0B13H	11 – 65	0B41H	12 – 19	0C13H
11 – 20	0B14H	11 – 66	0B42H	12 – 20	0C14H
11 – 21	0B15H	11 – 67	0B43H	12 – 21	0C15H
11 – 22	0B16H	11 – 68	0B44H	12 – 22	0C16H
11 – 23	0B17H	11 – 69	0B45H	12 – 23	0C17H
11 – 24	0B18H	11 – 70	0B46H	12 – 24	0C18H
11 – 25	0B19H	11 – 71	0B47H	12 – 25	0C19H
11 – 26	0B1AH	11 – 72	0B48H	12 – 26	0C1AH
11 – 27	0B1BH	11 – 73	0B49H	12 – 27	0C1BH
11 – 28	0B1CH	11 – 74	0B4AH	12 – 28	0C1CH
11 – 29	0B1DH	11 – 75	0B4BH	12 – 29	0C1DH
11 – 30	0B1EH	11 – 76	0B4CH	12 – 30	0C1EH
11 – 31	0B1FH	11 – 77	0B4DH	12 – 31	0C1FH
11 – 32	0B20H	11 – 78	0B4EH	12 – 32	0C20H
11 – 33	0B21H	11 – 79	0B4FH	12 – 33	0C21H
11 – 34	0B22H	11 – 80	0B50H	12 – 34	0C22H
11 – 35	0B23H	11 – 81	0B51H	12 – 35	0C23H
11 – 36	0B24H	11 – 82	0B52H	12 – 36	0C24H
11 – 37	0B25H			12 – 37	0C25H
11 – 38	0B26H			12 – 38	0C26H
11 – 39	0B27H			12 – 39	0C27H
11 – 40	0B28H			12 – 40	0C28H
11 – 41	0B29H			12 – 41	0C29H
11 – 42	0B2AH			12 – 42	0C2AH
11 – 43	0B2BH			12 – 43	0C2BH
11 – 44	0B2CH			12 – 44	0C2CH
11 – 45	0B2DH			12 – 45	0C2DH

Function	Register No	Function	Register No	Function	Register No
Group 12		Group 13		Group 13	
12 – 46	0C2EH	13 – 00	0D00H	13 – 46	0D2EH
12 – 47	0C2FH	13 – 01	0D01H	13 – 47	0D2FH
12 – 48	0C30H	13 – 02	0D02H	13 – 48	0D30H
12 – 49	0C31H	13 – 03	0D03H	13 – 49	0D31H
12 – 50	0C32H	13 – 04	0D04H	13 – 50	0D32H
12 – 51	0C33H	13 – 05	0D05H	13 – 46	0D2EH
12 – 52	0C34H	13 – 06	0D06H	13 – 47	0D2FH
12 – 53	0C35H	13 – 07	0D07H	13 – 48	0D30H
12 – 54	0C36H	13 – 08	0D08H	13 – 49	0D31H
12 – 55	0C37H	13 – 09	0D09H	13 – 50	0D32H
12 – 56	0C38H	13 – 10	0D0AH	13 – 51	0D33H
12 – 57	0C39H	13 – 11	0D0BH	13 – 52	0D34H
12 – 58	0C3AH	13 – 12	0D0CH	13 – 53	0D35H
12 – 59	0C3BH	13 – 13	0D0DH		
12 – 60	0C3CH	13 – 14	0D0EH		
12 – 61	0C3DH	13 – 15	0D0FH		
12 – 62	0C3EH	13 – 16	0D10H		
12 – 63	0C3FH	13 – 17	0D11H		
12 – 64	0C40H	13 – 18	0D12H		
12 – 65	0C41H	13 – 19	0D13H		
12 – 66	0C42H	13 – 20	0D14H		
12 – 67	0C43H	13 – 21	0D15H		
12 – 68	0C44H	13 – 22	0D16H		
12 – 69	0C45H	13 – 23	0D17H		
12 – 70	0C46H	13 – 24	0D18H		
12 – 71	0C47H	13 – 25	0D19H		
12 – 72	0C48H	13 – 26	0D1AH		
12 – 73	0C49H	13 – 27	0D1BH		
12 – 74	0C4AH	13 – 28	0D1CH		
12 – 75	0C4BH	13 – 29	0D1DH		
12 – 76	0C4CH	13 – 30	0D1EH		
12 – 77	0C4DH	13 – 31	0D1FH		
12 – 78	0C4EH	13 – 32	0D20H		
12 – 79	0C4FH	13 – 33	0D21H		
12 – 80	0C50H	13 – 34	0D22H		
12 – 81	0C51H	13 – 35	0D23H		
12 – 82	0C52H	13 – 36	0D24H		
12 – 83	0C53H	13 – 37	0D25H		
12 – 84	0C54H	13 – 38	0D26H		
12 – 85	0C55H	13 – 39	0D27H		
12 – 86	0C56H	13 – 40	0D28H		
12 – 87	0C57H	13 – 41	0D29H		
		13 – 42	0D2AH		
		13 – 43	0D2BH		
		13 – 44	0D2CH		
		13 – 45	0D2DH		

Function	Register No	Function	Register No	Function	Register No
Group 14		Group 14		Group 15	
14 – 00	0E00H	14 – 35	0E23H	15 – 00	0F00H
14 – 01	0E01H	14 – 36	0E24H	15 – 01	0F01H
14 – 02	0E02H	14 – 37	0E25H	15 – 02	0F02H
14 – 03	0E03H	14 – 38	0E26H	15 – 03	0F03H
14 – 04	0E04H	14 – 39	0E27H	15 – 04	0F04H
14 – 05	0E05H	14 – 40	0E28H	15 – 05	0F05H
14 – 06	0E06H	14 – 41	0E29H	15 – 06	0F06H
14 – 07	0E07H	14 – 42	0E2AH	15 – 07	0F07H
14 – 08	0E08H	14 – 43	0E2BH	15 – 08	0F08H
14 – 09	0E09H	14 – 44	0E2CH	15 – 09	0F09H
14 – 10	0E0AH	14 – 45	0E2DH	15 – 10	0F0AH
14 – 11	0E0BH	14 – 46	0E2EH	15 – 11	0F0BH
14 – 12	0E0CH	14 – 47	0E2FH	15 – 12	0F0CH
14 – 13	0E0DH			15 – 13	0F0DH
14 – 14	0E0EH			15 – 14	0F0EH
14 – 15	0E0FH			15 – 15	0F0FH
14 – 16	0E10H			15 – 16	0F10H
14 – 17	0E11H			15 – 17	0F11H
14 – 18	0E12H			15 – 18	0F12H
14 – 19	0E13H			15 – 19	0F13H
14 – 20	0E14H			15 – 20	0F14H
14 – 21	0E15H			15 – 21	0F15H
14 – 22	0E16H			15 – 22	0F16H
14 – 23	0E17H			15 – 23	0F17H
14 – 24	0E18H			15 – 24	0F18H
14 – 25	0E19H			15 – 25	0F19H
14 – 26	0E1AH			15 – 26	0F1AH
14 – 27	0E1BH			15 – 27	0F1BH
14 – 28	0E1CH			15 – 28	0F1CH
14 – 29	0E1DH			15 – 29	0F1DH
14 – 30	0E1EH			15 – 30	0F1EH
14 – 31	0E1FH			15 – 31	0F1FH
14 – 32	0E20H			15 – 32	0F20H
14 – 33	0E21H				
14 – 34	0E22H				

Function	Register No	Function	Register No	Function	Register No
Group 16		Group 16		Group 17	
16 – 00	1000H	16 – 35	1023H	17 – 00	1100H
16 – 01	1001H	16 – 36	1024H	17 – 01	1101H
16 – 02	1002H	16 – 37	1025H	17 – 02	1102H
16 – 03	1003H			17 – 03	1103H
16 – 04	1004H			17 – 04	1104H
16 – 05	1005H			17 – 05	1105H
16 – 06	1006H			17 – 06	1106H
16– 07	1007H			17 – 07	1107H
16 – 08	1008H			17 – 08	1108H
16 – 09	1009H			17– 09	1109H
16 – 10	100AH			17 – 10	110AH
16 – 11	100BH			17 – 11	110BH
16 – 12	100CH			17 – 12	110CH
16 – 13	100DH			17 – 13	110DH
16 – 14	100EH			17 – 14	110EH
16 – 15	100FH				
16 – 16	1010H				
16 – 17	1011H				
16 – 18	1012H				
16 – 19	1013H				
16 – 20	1014H				
16 – 21	1015H				
16 – 22	1016H				
16 – 23	1017H				
16 – 24	1018H				
16 – 25	1019H				
16 – 26	101AH				
16 – 27	101BH				
16 – 28	101CH				
16 – 29	101DH				
16 – 30	101EH				
16 – 31	101FH				
16 – 32	1020H				
16 – 33	1021H				
16 – 34	1022H				

Function	Register No	Function	Register No	Function	Register No
Group 18		Group 19		Group 20	
18 – 00	1200H	19 – 00	1300H	20 – 00	1400H
18 – 01	1201H	19 – 01	1301H	20 – 01	1401H
18 – 02	1202H	19 – 02	1302H	20 – 02	1402H
18 – 03	1203H	19 – 03	1303H	20 – 03	1403H
18 – 04	1204H	19 – 04	1304H	20 – 04	1404H
18 – 05	1205H	19 – 05	1305H	20 – 05	1405H
18 – 06	1206H	19 – 06	1306H	20 – 06	1406H
		19 – 07	1307H	20 – 07	1407H
				20 – 08	1408H
				20 – 09	1409H
				20 – 10	140AH
				20 – 11	140BH
				20 – 12	140CH
				20 – 13	140DH
				20 – 14	140EH
				20 – 15	140FH
				20 – 16	1410H
				20 – 17	1411H
				20 – 18	1412H
				20 – 19	1413H
				20 – 20	1414H
				20 – 21	1415H
				20 – 22	1416H
				20 – 23	1417H
				20 – 24	1418H
				20 – 25	1419H
				20 – 26	141AH
				20 – 27	141BH
				20 – 28	141CH
				20 – 29	141DH
				20 – 30	141EH
				20 – 31	141FH
				20 – 32	1420H
				20 – 33	1421H
				20 – 34	1422H
				20 – 35	1423H
				20 – 36	1424H
				20 – 37	1425H
				20 – 38	1426H
				20 – 39	1427H
				20 – 40	1428H
				20 – 41	1429H
				20 – 42	142AH
				20 – 43	142BH
				20 – 44	142CH

Function	Register No	Function	Register No	Function	Register No
Group 21		Group 22		Group 22	
21 – 00	1500H	22 – 00	1600H	22 – 45	162DH
21 – 01	1501H	22 – 01	1601H	22 – 46	162EH
21 – 02	1502H	22 – 02	1602H	22 – 47	162FH
21 – 03	1503H	22 – 03	1603H	22 – 48	1630H
21 – 04	1504H	22 – 04	1604H	22 – 49	1631H
21 – 05	1505H	22 – 05	1605H	22 – 50	1632H
21 – 06	1506H	22 – 06	1606H	22 – 51	1633H
21 – 07	1507H	22 – 07	1607H	22 – 52	1634H
21 – 08	1508H	22 – 08	1608H	22 – 53	1635H
21 – 09	1509H	22 – 09	1609H	22 – 54	1636H
21 – 10	150AH	22 – 10	160AH	22 – 55	1637H
21 – 11	150BH	22 – 11	160BH	22 – 56	1638H
21 – 12	150CH	22 – 12	160CH		
21 – 13	150DH	22 – 13	160DH		
21 – 14	150EH	22 – 14	160EH		
21 – 15	150FH	22 – 15	160FH		
21 – 16	1510H	22 – 16	1610H		
21 – 17	1511H	22 – 17	1611H		
21 – 18	1512H	22 – 18	1612H		
21 – 19	1513H	22 – 19	1613H		
21 – 20	1514H	22 – 20	1614H		
21 – 21	1515H	22 – 21	1615H		
21 – 22	1516H	22 – 22	1616H		
21 – 23	1517H	22 – 23	1617H		
21 – 24	1518H	22 – 24	1618H		
21 – 25	1519H	22 – 25	1619H		
21 – 26	151AH	22 – 26	161AH		
21 – 27	151BH	22 – 27	161BH		
21 – 28	151CH	22 – 28	161CH		
21 – 29	151DH	22 – 29	161DH		
21 – 30	151EH	22 – 30	161EH		
21 – 31	151FH	22 – 31	161FH		
21 – 32	1520H	22 – 32	1620H		
21 – 33	1521H	22 – 33	1621H		
21 – 34	1522H	22 – 34	1622H		
21 – 35	1523H	22 – 35	1623H		
21 – 36	1524H	22 – 36	1624H		
21 – 37	1525H	22 – 37	1625H		
21 – 38	1526H	22 – 38	1626H		
21 – 39	1527H	22 – 39	1627H		
21 – 40	1528H	22 – 40	1628H		
21 – 41	1529H	22 – 41	1629H		
21 – 42	152AH	22 – 42	162AH		
21 – 43	152BH	22 – 43	162BH		
		22 – 44	162CH		

Function	Register No	Function	Register No	Function	Register No
Group 23		Group 23		Group 23	
23 – 00	1700H	23 – 39	1727H	23– 78	174EH
23 – 01	1701H	23 – 40	1728H	23– 79	174FH
23 – 02	1702H	23 – 41	1729H		
23 – 03	1703H	23 – 42	172AH		
23 – 04	1704H	23 – 43	172BH		
23 – 05	1705H	23 – 44	172CH		
23 – 06	1706H	23 – 45	172DH		
23 – 07	1707H	23 – 46	172EH		
23 – 08	1708H	23 – 47	172FH		
23 – 09	1709H	23 – 48	1730H		
23 – 10	170AH	23 – 49	1731H		
23 – 11	170BH	23 – 50	1732H		
23 – 12	170CH	23 – 51	1733H		
23 – 13	170DH	23 – 52	1734H		
23 – 14	170EH	23 – 53	1735H		
23 – 15	170FH	23 – 54	1736H		
23 – 16	1710H	23 – 55	1737H		
23 – 17	1711H	23 – 56	1738H		
23 – 18	1712H	23 – 57	1739H		
23 – 19	1713H	23 – 58	173AH		
23 – 20	1714H	23 – 59	173BH		
23 – 21	1715H	23 – 60	173CH		
23 – 22	1716H	23 – 61	173DH		
23 – 23	1717H	23 – 62	173EH		
23 – 24	1718H	23 – 63	173FH		
23 – 25	1719H	23 – 64	1740H		
23 – 26	171AH	23 – 65	1741H		
23 – 27	171BH	23 – 66	1742H		
23 – 28	171CH	23 – 67	1743H		
23 – 29	171DH	23 – 68	1744H		
23 – 30	171EH	23 – 69	1745H		
23 – 31	171FH	23 – 70	1746H		
23– 32	1720H	23 – 71	1747H		
23– 33	1721H	23 – 72	1748H		
23– 34	1722H	23 – 73	1749H		
23 – 35	1723H	23– 74	174AH		
23 – 36	1724H	23– 75	174BH		
23 – 37	1725H	23– 76	174CH		
23 – 38	1726H	23– 77	174DH		

Chapter 5 Fault Diagnosis and Troubleshooting

5.1 General Overview

The inverter is equipped with fault detection, warning, and self-diagnostic functions. When a fault is detected, the corresponding fault code is displayed on the digital operator, and the fault output relay is activated. The inverter output is cut off, and the motor coasts to a stop (in some cases, the stop method is configurable).
When a warning or self-diagnostic alert is detected, a warning/self-diagnostic code appears on the digital operator, but the fault output relay does not activate. Once the warning condition is cleared, the system will automatically return to its normal state.

5.2 Fault Detection Function

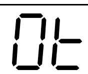
If a fault occurs, refer to Table 5.1 to identify possible causes and take the appropriate corrective actions.
To restart the system, use one of the following methods:
1. Assign one of the multi-function digital input terminals (03-00 to 03-07) to code 17 (Fault Reset), and set the reset signal to ON.
2. Press the [Reset] key on the digital operator.
3. Power off the main circuit supply and then power it back on.

When a fault occurs, relevant fault data is stored in the Monitoring Function Group (Group 12) and the Maintenance Function Group (Group 13).

Table 5.1 Fault Messages and Corrective Actions

LED display	Description	Possible Cause	Corrective Action
OC (Over-current)	Over-current: The inverter output current exceeds the over-current detection level (approximately 200% of the rated current).	· Acceleration/deceleration time is too short. · Operation of magnetic switch on inverter output side. · Use of special motor or a motor rated above the inverter capacity. · Short circuit or grounding fault occurred.	· Extend acceleration/ eceleration time · Check load wiring · Remove motor and test inverter operation
OCA (Over-current)	Over-current during acceleration	**1.** Acceleration time setting is too short **2.** Motor capacity exceeds inverter capacity **3.** Motor winding shorted to casing **4.** Motor wiring shorted to ground **5.IGBT** Module failure	**1.** Set a longer acceleration time **2.** Replace with inverter of appropriate capacity **3.** Repair motor **4.** Inspect wiring **5.** Replace **IGBT** module
OCC (Over-current)	Over-current during constant speed	**1.** Sudden change in load **2.** Sudden change in power supply	**1.** Increase inverter capacity **2.** Add reactor to power input side
OCD (Over-current)	Over-current during deceleration	Deceleration time is too short	Set a longer deceleration time
SC (Short circuit)	Short circuit: Short circuit on inverter output or load	· Short circuit or ground fault occurred (08-23 = 1) Caused by motor failure, insulation degradation, damaged cables, resulting in contact or ground short.	· Confirm load wiring

LED display	Description	Possible Cause	Corrective Action
GF (Ground Fault)	Ground fault: Ground fault current on output side exceeds 50% of inverter rated output current and 08-23 = 1 (GF function enabled).	· Motor grounding or DCCT current sensor failure. · This protects equipment but not personnel.	· Check motor wiring and wiring impedance.
OV (Over-voltage)	Main circuit over-voltage: DC voltage exceeds over-voltage detection level –- 200V class: 410Vdc 400V class: 820Vdc	· Deceleration time too short, resulting in excessive regenerative energy. · Input voltage too high · Use of power factor correction capacitors.	· Extend deceleration time · Check input circuit and reduce input voltage to meet specifications · Remove power factor correction capacitors.
UV (Undervoltage)	Main circuit undervoltage: DC bus voltage falls below undervoltage detection level, or DC bus magnetic contactor not engaged while inverter is operating. Approx. 200V class: 190Vdc 400V class: 380Vdc (This detection value is adjustable via 07-13).	· Input voltage too low. · Input power phase loss. · Acceleration time set too short. · Excessive fluctuation in input voltage. · DC bus magnetic contactor not engaged or feedback signal abnormal.	· Check input circuit and power voltage. · Extend acceleration time.
IPL Input Phase Loss	Input phase loss: Phase loss or large voltage imbalance on inverter input side When 08-09=1 (enabled), this fault is detected.	· Input phase loss occurred · Loose screws on R/L1, S/L2, or T/L3 terminals · Excessive fluctuation in input voltage. · Voltage imbalance between phases · Aging of inverter's internal main circuit capacitors.	· Verify main circuit power wiring is correct. · Check if terminal screws are loose. · Ensure stable power voltage or disable input phase loss detection. · Replace circuit board or inverter
OPL (Output Phase Loss)	Output phase loss: Inverter output phase loss Fault detection enabled when 08-10=1.	· Damaged output cable or internal motor fault. · Loose or missing screws on R/L1, S/L2, or T/L3 terminals. · Motor capacity is below 10% of inverter rated output.	· Inspect motor wiring. · Check motor and inverter capacity.
OH1 Heatsink overheat	Heatsink overheat: Heatsink temperature is too high. If the heatsink overheat fault occurs three times within five minutes, the fault cannot be reset until 10 minutes have passed.	· Ambient temperature is too high. · Cooling fan has stopped. · Carrier frequency setting is too high.	· Check ambient temperature around inverter. · Check for dust or dirt in fan or heatsink. · Check carrier frequency setting.
OL1 Motor overload	Motor overload: Motor overload protection activates according to the internal motor overload curve when 08-05 = xxx1 (motor overload protection enabled).	· Voltage setting in V/F mode is too high, causing motor overexcitation. · Incorrect motor rated current setting (02-01). · Motor is overloaded.	· Check V/F mode. · Check motor rated current. · Check load level and duty cycle time.
OL2 Frequency converter overload	Frequency converter overload: Inverter overload protection activates according to the internal inverter overload curve. After the frequency converter overload fault is cleared, an frequency converter overload warning will appear. If the fault occurs four times within five minutes, a 4-minute wait is required before fault reset.	· Voltage setting in V/F mode is too high. · Inverter capacity is too small. · Motor is overloaded.	· Check V/F mode. · Replace with a higher-capacity inverter. · Check load level and duty cycle time.

LED display	Description	Possible Cause	Corrective Action
OT Over-torque detection 	Over-torque detection: If the inverter output torque exceeds 08-15 (over-torque detection level) and the duration exceeds 08-16, the inverter triggers base block (08-14=0).	Mechanical load is too large	· Check application or operating status · Check whether 08-15 and 08-16 are properly set
UT Under-torque detection 	Under-torque detection: If the inverter output torque drops below 08-19 (under-torque detection level) and the duration exceeds 08-20, the inverter triggers base block (08-18=0).	Mechanical load has suddenly reduced (e.g., broken belt)	· Check application or operating status · Check whether 08-19 and 08-20 are properly set
run Motor 1/motor 2 switching 	Motor 1 and Motor 2 were switched during operation	**1.** Motor 2 switch command was input during operation. **2.** Motor switching occurred during operation.	· Modify the sequence control so that motor switching only occurs when stopped.

LED display	Description	Possible Cause	Corrective Action
OS Overspeed 	Motor overspeed: · Motor speed exceeds 20-20 (PG overspeed level) and lasts longer than 20-21 (PG overspeed time). · Per 20-19 (=0 or 1), inverter stops. · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4). · Motor speed can be monitored via 12-22.	· Speed reference is too high. · Excessive overshoot or insufficient response.	· Check whether speed reference gain and settings for 20-20 and 20-21 are appropriate. · Adjust ASR parameters in Group 21.
PGO PG open circuit 	PG open circuit detection: · When inverter is operating, PG pulse not detected within PG open detection time (20-26). · Per 20-25 (=0 or 1), inverter stops. · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4).	· Incorrect PG wiring · No power to PG · PG cable is broken · Brake mechanism activated	· Check PG wiring. · Check PG power supply. · Check PG wiring · Check motor actuation mechanism.
DEV Speed deviation 	Speed deviation: · Motor speed deviation exceeds 20-23 (PG speed deviation level) for a time longer than 20-24 (PG deviation time). · Per 20-22 (=0 or 1), inverter stops · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4).	· Load is too high. · Load is locked. (e.g., brake mechanism activated). · PG wiring error. · PG parameters (Group 20) are incorrectly set. · Acceleration/deceleration time is too short.	· Check mechanical load. · Check if brake mechanism is activated or reduce the load. · Check PG wiring. · Verify 20-23 and 20-24 parameter settings. · Extend acceleration/deceleration time.
CE Communication error 	Modbus communication error: · No communication received beyond 09-06 (communication timeout setting). · Per 09-07 (= 0 to 2), this fault protection is triggered.	· Connection lost or host has stopped communicating.	· Check all connections and verify all client software settings.
FB PID feedback disconnected 	PID feedback disconnected: When PID feedback disconnection detection is enabled (10-11 = 2, motor coast-to-stop), and PID feedback input < PID disconnection detection level	· PID feedback sensor is malfunctioning or not installed properly.	· Check whether PID feedback configuration is correct. · Ensure proper installation and PID feedback signal is functioning normally.

LED display	Description	Possible Cause	Corrective Action
	(10-12) for longer than the detection time (10-13).		
STO Safety switch  STO2 Safety switch 	Inverter safety switch	· Check whether F1 and F2 on the inverter control board are shorted with SG. (Applicable to standard version S) · 08-30 is set to 1 for free-run stop, and digital terminal switch (58) is open.	· Check whether F1 and F2 are shorted with SG. (Applicable to standard version S) · Check whether digital terminal (58) is open.
SS1 Safety switch 	Inverter safety switch	· 08-30 is set to 0 for deceleration stop, and digital terminal switch (58) is open.	· Check whether digital terminal (58) is open.
EF0 External fault 0 	External fault (Modbus)	· Bit 2 of Modbus register 0x2501 is set to "1"	· Check external fault cause · Reset bit 2 of Modbus register 0x2501

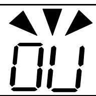
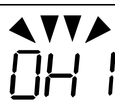
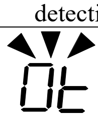
LED display	Description	Possible Cause	Corrective Action
EF1 External Fault (S1)	External fault (Terminal S1)	Received external fault input via multifunction digital input terminal. When 03-00 to 03-07 = 25 or 68 and external fault selection 08-24 = 0 or 1.	· Check external cause of fault. · Reset external fault via multifunction digital input.
EF2 External Fault (S2)	External Fault (Terminal S2)		
EF3 External Fault (S3)	External Fault (Terminal S3)		
EF4 External Fault (S4)	External Fault (Terminal S4)		
EF5 External Fault (S5)	External Fault (Terminal S5)		
EF6 External Fault (S6)	External fault (Terminal S6)		
EF7 External Fault (S7)	External Fault (Terminal S7)		
CF07 Motor control fault	Motor control fault	Startup fault in SLV mode.	· Perform rotational motor auto-tuning. · If rotational motor auto-tuning cannot be performed, execute stationary motor auto-tuning or increase the value of parameter 01-08.
CF08 Motor control fault	Motor control fault	Startup or operation fault in PM SLV mode.	· Adjust and increase the value of parameter 22-10 appropriately. · Re-execute 22-21 for auto-tuning. · Check if the load is too large and whether the output torque limit needs to be increased.
CF00 Operator communication error	Digital operator data transmission error	· No data is transmitted between the LCM digital operator and inverter 5 seconds after power-on.	· Reconnect the digital operator connector · Replace the control board
CF01 Operator communication error 2	Digital operator data transmission error	· Data transmission between the digital operator and inverter fails for more than 3.5 seconds after power-on.	· Reconnect the digital operator connector · Replace the control board

LED display	Description	Possible Cause	Corrective Action
CF01			
PF Protection fault PF	Occurs when OH1 fault appears three times within 5 minutes and no run command release is received via multifunction digital input terminal/communication.	Run command via digital input/communication not removed.	· Remove run command from digital input/communication
TOL External overload tOL	External overload (Only active when fire mode is enabled)	External overload input (e.g., fan overheat) received via multifunction digital input terminal.	· Check the cause of external overload. · Reset external overload from multifunction digital input.
LOPBT Low flow fault LOPbt	Low flow fault.	Feedback signal not connected · Caused by HVAC flow feedback value falling below the set minimum flow limit.	· Check whether the feedback signal is properly connected. · Verify if the flow feedback value is lower than the minimum limit (parameter 23·51).
HIPBT High flow fault HIPbt	High flow fault.	Caused by HVAC flow feedback value exceeding the set maximum flow limit.	· Check whether the feedback signal is correct. · Verify if the flow feedback value exceeds the maximum limit (parameter 23·48).
LPBFT Low pressure fault LPbFt	Low pressure fault.	· Feedback signal not connected. · Caused by PUMP pressure feedback value falling below the set minimum pressure limit.	· Check whether the feedback signal is properly connected. · Verify whether the feedback pressure is below the minimum pressure limit (parameter 23·15).
OPBFT High pressure fault OPbFt	High pressure fault.	Caused by the PUMP pressure feedback value exceeding the set maximum pressure limit.	· Check whether the feedback signal is correct. · Verify whether the feedback pressure exceeds the maximum pressure limit (parameter 23·12).
LSCFT Low suction fault LSCFt	Low suction fault.	· Caused by insufficient water in the outlet tank, resulting in low suction. · PID error exceeds the PID error threshold or output current is below the suction current threshold.	· Check whether there is sufficient water in the outlet tank and whether water supply is normal. · Verify whether PID error exceeds the PID error threshold or the output current is below the suction current threshold.
FBLSS PID feedback signal loss FbLSS	When 23-19 > 0, the inverter determines whether the feedback pressure is lower than (Operating Pressure Setting (23-02) × Pressure Loss Ratio (23-19)); if this condition persists beyond the Pressure Loss Detection Time (23-18), a fault signal will be triggered.	Excessively high pressure loss ratio setting in 23·19 or improperly functioning/missing pressure sensor can cause fault.	· Check whether the pressure loss ratio set in 23·19 is correct. · Ensure the sensor is installed properly and the PID feedback signal is functioning normally.

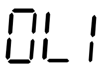
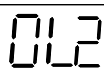
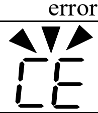
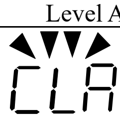
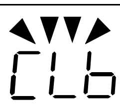
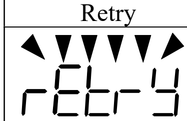
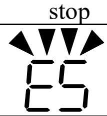
5.3 Warning / Self-Diagnosis Detection Function

When a warning is detected by the inverter, the digital operator will flash a warning code. Fault output contact does not activate. Once the warning clears, the system automatically returns to its original state.
When a self-diagnostic error is detected (such as an invalid or conflicting parameter setting),the digital operator will display a self-diagnostic code. Fault output contact will not activate. The inverter cannot execute run commands until the parameters are correctly set.
When a warning or self-diagnostic error occurs, refer to Table 5.2 to identify and correct the issue.

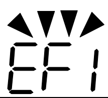
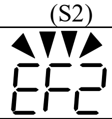
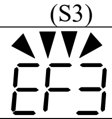
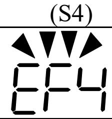
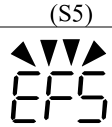
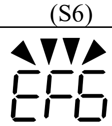
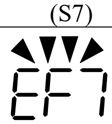
Table 5.2 Warnings / Self-Diagnostic Codes and Corrective Actions

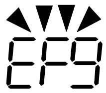
LED display	Description	Possible Cause	Corrective Action
HPErr Incorrect model selection 	Inverter capacity setting error: Inverter capacity setting (13·00) does not match the rated voltage.	This inverter capacity setting (13·00) does not match the hardware voltage class.	Check that the inverter capacity setting (13·00) matches the hardware voltage class.
OV (flashing) Over voltage 	Main circuit voltage: DC bus voltage exceeds the over-voltage detection level, and the inverter has shut down. 200V class: 410Vdc 400V class: 820Vdc	Input power supply voltage is too high.	· Check the input power supply voltage.
UV (flashing) Low voltage 	Main circuit voltage: DC bus voltage falls below the undervoltage detection level, and the inverter has shut down. 200V class: 190Vdc 400V class: 380Vdc (The detection level can be set via 07·13)	· Power supply voltage too low. .Momentary power loss occurred.	· Check the input power supply voltage. · Check the input circuitry. · Check the main circuit magnetic contactor (MC).
OH1 Heatsink overheat 	Heatsink overheat: Heatsink temperature is too high. If the overheat fault occurs three times within five minutes, a 10-minute wait is required before the fault can be reset.	· Ambient temperature is too high. · Cooling fan has stopped. · Carrier frequency setting is too high.	· Check ambient temperature around inverter. · Check for dust or dirt in fan or heatsink. · Check carrier frequency setting.
LED display	Description	Possible Cause	Corrective Action
OH2 (flashing) Inverter overheat warning 	Inverter overheat warning: Inverter overheat warning signal is received via multifunction digital input terminals. (03-00 to 03-07 = 31)	Multifunction digital input terminal receives an external overheat warning.	· Check external conditions.
OT (flashing) Over-torque detection 	Over-torque detection: Inverter output current exceeds 08-15 (overtorque detection level) for longer than the time set in 08-16. If 08-14 = 1, the inverter continues to operate.	Mechanical load is too large	· Check application or machine operating condition. · Check parameter settings for 08-15 and 08-16.

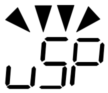
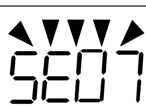
LED display	Description	Possible Cause	Corrective Action
UT (flashing) Under-torque detection	Under-torque detection: Inverter output current is lower than 08-19 (undertorque detection level) for longer than the time set in 08-20. If 08-18 = 1, the inverter continues to operate.	Mechanical load has been momentarily removed. (e.g., broken belt)	· Check application or machine operating condition. · Check parameter settings for 08-19 and 08-20.
bb1 (flashing) External trip	External trip (Terminal S1)	· External trip signal received via multifunction digital input terminal.	· Remove the cause of the external trip.
bb2 (flashing) External trip	External trip (Terminal S2)		
bb3 (flashing) External trip	External trip (Terminal S3)		
bb4 (flashing) External trip	External trip (Terminal S4)		
bb5 (flashing) External trip	External trip (Terminal S5)		
bb6 (flashing) External trip	External trip (Terminal S6)		
bb7 (flashing) External trip	External trip (Terminal S7)		

LED display	Description	Possible Cause	Corrective Action
DEV (flashing) Speed deviation 	Motor speed deviation: · Motor speed deviation exceeds the level set in 20-23 (PG Speed Deviation Level) and persists longer than the time set in 20-24 (PG Deviation Time). · Per 20-22 (=0 or 1), inverter stops · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4).	· Load is too high. · Load is locked. (e.g., brake mechanism activated). · PG wiring error. · PG parameters (Group 20) are incorrectly set. · Acceleration/deceleration time is too short.	· Check mechanical load. · Check if brake mechanism is activated or reduce the load. · Check PG wiring. · Verify whether parameters 20-23, 20-24, and 20-28 are correctly set. · Extend acceleration/deceleration time.
OL1 Motor overload 	Motor overload: Motor overload protection is activated according to the motor internal overload curve when 0805 = xxx1 (Motor Overload Protection Enabled).	· Voltage setting in V/F mode is too high, causing motor overexcitation. · Incorrect motor rated current setting (02-01). · Motor is overloaded.	• Check V/F mode. • Check motor rated current. • Check load level and duty cycle time.
OL2 Frequency converter overload 	Frequency converter overload: Frequency converter overload fault previously occurred, and less than 4 minutes have passed since then (if 4 minutes have passed, this warning will automatically clear).	· Voltage setting in V/F mode is too high. · Inverter capacity is too small. · Motor is overloaded.	• Check V/F mode. • Replace with a higher-capacity inverter. • Check load level and duty cycle time.
CE (flashing) Communication error 	Modbus communication error: · When 09-07 = 3, communication data is not received for more than two seconds.	· Communication cable is disconnected. · Host has stopped data transmission.	Check all connections and verify all client software settings.
CLA Current Protection Level A 	Inverter Over-current Warning: Inverter current has reached Current Protection Level A.	Inverter current is too high · Motor is overloaded.	Check the load size and operating duty cycle.
CLB Current Protection Level B 	Inverter Over-current Warning: Inverter current has reached Current Protection Level B.	Inverter current is too high · Motor is overloaded.	Check the load size and operating duty cycle.
Retry (flashing) Retry 	Auto-restart has been activated and is displayed until the time set in 07-01 has elapsed.	07-01 Auto Restart Time ≠ 0 07-02 Auto Restart Attempts ≠ 0	Display will disappear after the auto restart time has elapsed.
ES (flashing) External emergency stop 	External emergency stop: The external emergency stop function is activated	Any parameter between 03-00 to 03-08 is set to 14, and the corresponding digital input is triggered.	· Remove the cause of the external emergency stop. · Turn off the run command and reset the multifunction digital input for external emergency stop.
OS (flashing) Motor overspeed	Motor overspeed: · Motor speed exceeds 20-20	· Speed reference value is too high. · Speed response overshoot or	· Check speed reference gain and verify settings of 20-20

	(PG overspeed level) and lasts longer than 20-21 (PG overspeed time). · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4).	insufficient response occurred.	and 20-21. · Adjust ASR settings (Group 20 parameters).
PGO (flashing) PG open circuit 	PG open circuit detection: · When inverter is operating, PG pulse not detected within PG open detection time (20-26). · Per 20-25 (=0 or 1), inverter stops. · This fault is valid only in V/F+PG and SV control modes (00-00 = 1, 3, or 4).	· PG wiring error. · PG power supply disconnected. · PG signal line disconnected. · Brake mechanism activated.	· Check PG wiring. · Check PG power supply.

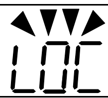
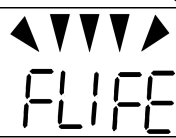
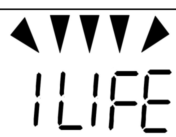
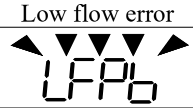
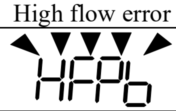
LED display	Description	Possible Cause	Corrective Action
EF1 (flashing) External Fault (S1) 	External fault (Terminal S1)	· External fault input received via multifunction digital input terminal. · When 03-00 to 03-05 is set to 25 or 68, and inverter external fault selection 08-24 = 2.	· Remove the cause of the external fault. · Reset the external fault on the multifunction digital input.
EF2 (flashing) External Fault (S2) 	External fault (Terminal S2)		
EF3 (flashing) External Fault (S3) 	External fault (Terminal S3)		
EF4 (flashing) External Fault (S4) 	External fault (Terminal S4)		
EF5 (flashing) External Fault (S5) 	External fault (Terminal S5)		
EF6 (flashing) External Fault (S6) 	External fault (Terminal S6)		
EF7 (flashing) External Fault (S7) 	External fault (Terminal S7)		

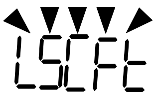
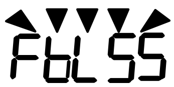
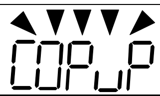
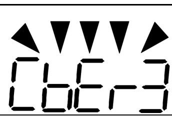
EF9 (flashing) Forward/reverse command error 	· Both forward and reverse commands (in 2-wire mode) are input simultaneously for 0.5 seconds or more. · Inverter will respond according to motor stop method set in 07-09. · After the error is cleared, the inverter returns to normal operation.	Forward and reverse commands were input at the same time. (Refer to 2-wire mode operation)	Check external control logic
FB (flashing) PID feedback disconnected 	PID feedback disconnected: PID feedback disconnection detection is activated (when 10-11 = 1); inverter continues to operate. Detection is based on the PID feedback disconnection level (10-12) and detection time (10-13).	PID feedback signal (e.g., transducer) not functioning or incorrectly installed.	· Check whether the selected PID feedback method is correct. · Ensure proper installation and correct operation of the PID feedback signal.

LED display	Description	Possible Cause	Corrective Action
USP (flashing) Unattended protection 	Unattended Protection (USP) activated at power-on	· When the unattended protection function (set via multifunction digital input) is enabled at power-on, the inverter will not accept any run command. · The inverter will not enter operation mode until the warning message is cleared. (Refer to the full manual for detailed explanation when 03-00 to 03-08 = 50).	· Turn off the run command, perform a reset via terminal input (03-00 to 03-07 = 3), or press the RESET key on the digital operator. · Turn off the USP signal and cycle the power.
SE01 Setting range error 	Parameter setting exceeds allowable range: When parameter value exceeds permitted range	· When parameter value exceeds permitted range. · In some cases, the parameter setting depends on the values of other parameters (e.g., 1. 02-00 > 02-01, or 02-20 > 02-21; 2. 00-12 > 00-13; 3.00-07 = 1, 00-05 and 00-06 are the same). 4. 02-03, 02-05, 02-06, or 02-22, 02-25, 02-26 do not conform to motor speed formula; 5.20-16 < 20-15	Check parameter settings.
SE02 Digital input terminal error 	Multifunciton digital input terminal error	Errors in multifunction digital input terminal settings (03-00 to 03-07), such as: 1. Up/Down commands not configured as a pair (must be used together). **2.** Up/Down commands (08 and 09) and ACC/DEC command (11) all set at the same time. **3.** Speed Search 1 (19, Maximum Frequency) and Speed Search 2 (34, from Set Frequency) both enabled. **4.** Both 2-wire and 3-wire modes set simultaneously in 03-00 to 03-07.	Check parameter settings
SE03 V/f curve error 	V/f curve setting error	· V/f curve settings not configured in accordance with required structure: ① 01-02 > 01-12 >01-06 > (Fmax) (Fbase) (Fmid1) 01-08; (Fmin) ②01-16 > 01-24 > 01-20 > 01-22; (Fmax(2)) (Fbase(2)) (Fmid(1)) (Fmin(2))	Check V/f parameters.
SE05 PID Selection Error 	PID Selection Error	①Both 10-00 and 10-01 are set to 1 (AI1) or both are set to 2 (AI2) ②If 10-29 = 1 or 2 and 10-25 = 1 (reverse operation allowed) ③If 10-29 = 1 or 2 and 10-03 = 1xxxb (PID output + target value)	①Check the values of parameters 10-00 and 10-01. ②Check the values of parameters 10-29 and 10-25. ③Check the values of parameters 10-29 and 10-03.
SE07 PG Card Error 	PG Card configuration error in the inverter	Possible Cause 1: PG card is not installed in the inverter Possible Cause 2: Incorrect setting of PM encoder type (22-08)	Cause 1: Check the PG card installation and control mode Cause 2: After setting the PM encoder type (22-08), power must be cycled.

SE08 PM motor mode error SE08	Pole alignment not performed in PMSV mode	In PM motor mode, if pole alignment has not been performed, the inverter will flash for 3 seconds after issuing the Run command and then automatically clear the warning.	Perform magnetic pole alignment.

LED display	Description	Possible Cause	Corrective Action
SE09 Invalid PI setting SE09	Inverter PI configuration error	Conflict between inverter PI selection (03-30) and PID source (10-00 and 10-01)	Check PI selection (03-30) and PID source settings (10-00 and 10-01)
Parameter setting error PArEr	Parameter setting error	The inverter parameters are incorrectly configured.	Please refer to the manual for proper settings, or this option may be invalid.
Direct start warning StP1	When parameter 07-04 is set to 1, the inverter cannot perform a direct start and a warning will be issued.	This occurs when the external run terminal is connected and set as the run source, while 07-04 is set to 1.	Disconnect and reconnect the external run terminal. After power-on, wait for the time defined by parameter 07-05 before issuing the run command.
FIRE Forced operation mode FirE	Forced operation mode.	· When entering Fire mode, check whether a fire has occurred near the equipment.	· Confirm if the area around the equipment is affected by fire. If this is a false trigger, power off and reset the system.
ADC Voltage Error AdCEr	Abnormal voltage level on the control board	This may be caused by abnormal input voltage, excessive electrical noise, or a faulty control board.	Check the input voltage signal and the voltage level on the control board.
EEPROM Storage error EPErr	EEPROM data storage is faulty	**1.** Peripheral circuits of the EEPROM are faulty. **2.** An error occurred during parameter check at power-on. **3.** Both the DI error signal and the reset signal were activated at the same time.	· After initialization, power cycle the inverter. If the warning reappears, replace the circuit board or check whether there is a conflict on the DI input terminals.
Control Board Error bdErr	Mismatch between control board and program	Mismatch between control board and program.	Mismatch between the control board and the program, please replace the control board.
Zero Speed Stop Warning StP0	There is a run signal, but the frequency command is lower than the minimum output frequency (01-08), and DC braking is not active.	The frequency command is lower than the minimum motor output frequency.	Adjust the frequency command. Note: If the frequency source (00-05) is set to digital operator, adjust the 0-speed frequency setting at 05-01.
External Stop Warning StP2	When 00-02 (main run command source) is set to external control, and the inverter is stopped using the digital operator while the run signal is active.	Using the digital operator to stop while external run command is active.	Remove the external run command.
Encoder Error Warning	An encoder signal error was detected during motor auto-	Encoder signal abnormal.	1. Check encoder wiring. 2. Ensure 17-07 (PG pulse

	rotation tuning while a PG card was connected.		count) matches the encoder. 3. Replace the encoder. Note: Encoder errors do not affect the results of motor auto-tuning. Users may adjust 20-27 (PG pulse count) and 20-28 (PG rotation direction) manually without re-running motor auto-tuning.
Run Direction Error Warning 	The locked motor direction (11-00) differs from the current external run direction.	Check whether 11-00 (motor direction lock command) is opposite to the direction issued by external DI control, JOG, or three-wire mode.	Correct the 11-00 motor direction lock command to match the current direction command issued via external control DI, JOG, or three-wire operation.
Parameter lock 	Parameter password is locked	The parameter password function (13-07) is enabled	Enter the correct password in parameter 13-07
Password setting error 	When using the password lock function, the second entered password does not match the first.	When using the password lock function, the second entered password does not match the first.	When using the password lock function, the second entered password matches the first.
Capacitor Life Warning 	Capacitor service life has expired	The operating hours have exceeded 90% of the expected service life. Once this threshold is surpassed, a CyErr warning will appear.	Replace the capacitor and contact the manufacturer to update the inverter’s operation time counter.
Fan Life Warning 	Fan service life has expired	The operating hours have exceeded 90% of the expected service life. Once this threshold is surpassed, a FLIFE warning will appear.	Replace the fan and contact the manufacturer to update the inverter’s operation time counter.
IGBT Life Warning 	IGBT service life has expired	The operating hours have exceeded 90% of the expected service life. Once this threshold is surpassed, a ILIFE warning will appear.	Replace the IGBT and contact the manufacturer to update the inverter’s operation time counter.
LFPB Low flow error 	Low flow error.	· Feedback signal not connected. · Caused by HVAC flow feedback value falling below the set minimum flow limit.	· Check whether the feedback signal is properly connected. ·Check whether the feedback flow is below the minimum flow limit value.
HFPB High flow error 	High flow error.	Caused by the HVAC feedback flow value falling below the configured maximum flow limit.	· Check whether the feedback signal is correct. · Verify that the feedback flow is below the maximum flow limit value.
L0PB Low pressure error 	Low pressure error.	· Feedback signal not connected. · Caused by PUMP pressure feedback value falling below the set minimum pressure limit.	· Check whether the feedback signal is properly connected. ·Verify that the feedback pressure is below the minimum pressure limit value.
HIPB High pressure error	High pressure error.	Caused by the pump feedback pressure value falling below the	· Check whether the feedback signal is correct.

		configured maximum pressure limit.	·Verify that the feedback pressure is below the maximum pressure limit value.
LSCFT Low suction error 	Low suction pressure error.	· Caused by insufficient water in the outlet tank, resulting in poor suction. · PID error exceeds the PID error threshold or output current is below the suction current threshold.	· Check whether there is sufficient water in the outlet tank and whether water supply is normal. · Verify whether PID error exceeds the PID error threshold or the output current is below the suction current threshold.
PID feedback signal loss 	When 23-19 > 0, the inverter determines whether the feedback pressure is lower than (Operating Pressure Setting (23-02) × Pressure Loss Ratio (23-19)); if this condition persists beyond the Pressure Loss Detection Time (23-18), a fault signal will be triggered.	If the pressure loss ratio (23-19) is enabled and set too high, it may trigger a fault. The feedback sensor may not be functioning correctly or is improperly installed.	· Check whether the pressure loss ratio (23-19) is set correctly. · Ensure the sensor is installed properly and the PID feedback signal is functioning normally.
COPUP Pump communication Disconnection error 	Multi-pump communication error.	Communication is disconnected or not connected properly among multiple connected pumps.	Check whether the communication is functioning or if any connections are loose or faulty.
SE10 PUMP/HVAC Setting error 	Incorrect inverter PUMP/HVAC settings.	① Inverter pump option (23-02) > (23-03). ② Inverter HVAC option (23-46) < (23-47).	· Check the inverter pump setting (23-02) and verify against the maximum pressure setting (23-03). · Check the inverter HVAC setting (23-46) and verify against the maximum pressure setting (23-47).
CbEr1 Internal communication error 1 	Internal communication error 1.	Internal communication error.	Power cycle the inverter. If the warning reappears, please contact the manufacturer for support.
CbEr2 Internal communication error 2 	Internal communication error 2.	Internal communication error.	Power cycle the inverter. If the warning reappears, please contact the manufacturer for support.
CbEr3 Internal communication error 3 	Internal communication error 3	Internal communication error.	Power cycle the inverter. If the warning reappears, please contact the manufacturer for support.

5.4 Auto tuning error

When an auto tuning error occurs, "AtErr" will be displayed on the digital operator and the motor will stop. The error code will be shown in parameter 17-11. The digital output fault contact will not activate. Refer to Table 5.3 to identify and correct the cause of the error.

Table 5.3 Auto Tuning Errors and Corrective Actions

Error	Description	Cause	Corrective Action
01	Motor Data Input Error	· Incorrect data entered for auto tuning · Mismatch between motor output current and rated motor current	· Check the input data for auto tuning (17-00 to 17-09). · Check the inverter capacity.
02	Motor Line-to-Line Resistance R1 Tuning Error	· Auto tuning did not complete within the designated time. · Tuning result exceeded parameter limits. · Motor current exceeded rated value. · One phase of the inverter's three-phase output is disconnected.	· Check the input data for auto tuning (17-00 to 17-09). · Check motor wiring. · Disconnect the load connected to the motor. · Inspect the inverter's current detection circuit, including the current sensor. · Check motor wiring. · Check motor installation.
03	Motor leakage inductance tuning error.		
04	Motor rotor resistance R2 tuning error.		
05	Motor Mutual Inductance Lm Tuning Error		
07	Deadtime Compensation Detection Error		
06	Motor Encoder Error	Motor Encoder Noise Too High	Confirm the motor rated current (02-01, 02-21).
08	Motor acceleration error (applicable only to rotating auto tuning).	The motor failed to accelerate within the specified time (00-14 = 20 sec).	· Increase the acceleration time (00-14). · Disconnect the load connected to the motor.
09	Other Auto Tuning Errors	Other auto tuning errors not included in ATE-01 to ATE-08 (e.g., no-load current exceeds 70%, rated current or torque exceeds 100% of reference).	· Check motor wiring. · Check auto tuning input data.

5.5 PM Motor Auto Tuning Error

When a PM motor auto tuning error occurs, the fault message "IPErr" (PM motor tuning failed) will appear on the digital operator and the motor will stop. The error information will be displayed in 22-18. The digital output fault contact will not activate. Refer to Table 5.4 to identify and correct the cause of the error.

Table 5.4 PM Motor Auto Tuning Errors and Corrective Actions

Error	Description	Cause	Corrective Action
01	Stationary pole alignment failed	· Mismatch between motor output current and rated current	· Check the auto tuning input data (22-02). · Check the inverter capacity. · Check motor wiring.
02	No PG option card	· Pole alignment cannot be performed without a PG option card	· Check whether the PM PG card is properly installed.
03	Rotating pole alignment forcibly stopped	· System abnormality	· Check if other protection functions are active.
04	Rotating pole alignment timeout	· Motor cannot rotate normally	· Check motor wiring.

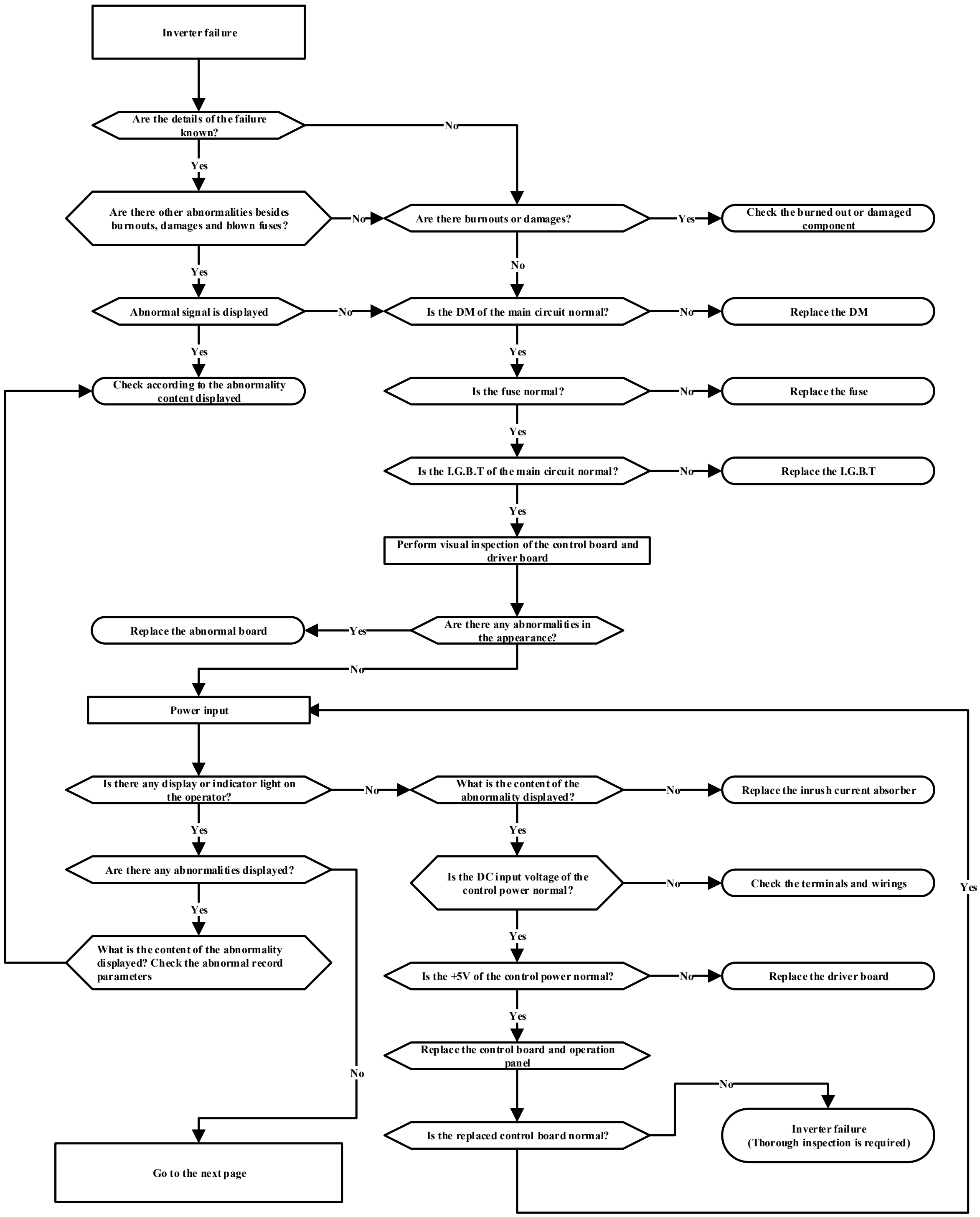
05	Loop tuning timeout	· System abnormality during loop tuning	· Check if other protection functions are active.
06	Encoder error	· Excessive motor encoder noise	· Check if the PG card ground is connected.
07	Warning	· Other motor tuning errors	· Check motor wiring. · Check auto tuning input data
08	Abnormal current during rotating pole alignment	· Motor cannot rotate normally at low speed	· PG card A and B phases may be reversed. You may redo the process, and the system will automatically adjust the wiring definitions. · Check motor wiring.
09	Current abnormal during loop adjustment	· Mismatch between motor output current and rated current	· Check the auto tuning input data (22-02). · Check the inverter capacity.
10	Retry pole alignment and loop tuning	· Auto tuning not completed	Retry pole alignment and loop tuning

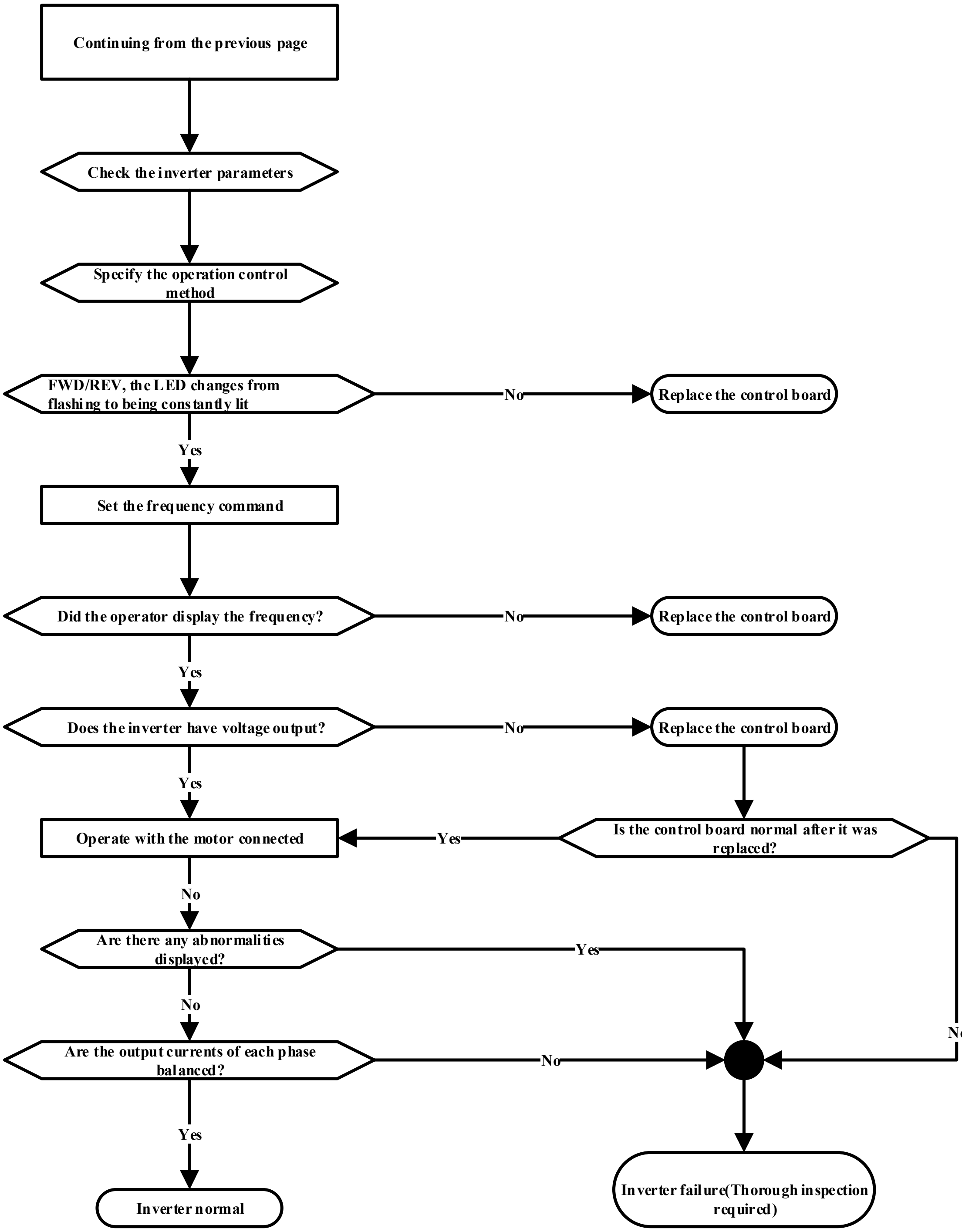
5.6 General troubleshooting methods

Abnormal condition	**Checkpoints**	**Handling procedures**
Motor rotation direction is reversed	Are the output terminal wirings correct?	They must match the motor's **U, V, and W**
	Are the forward/reverse signal wirings correct?	Check and correct the wiring
Motor cannot vary its speed	Is the analog frequency input wiring correct?	Check and correct the wiring
	Is the operation mode setting correct?	Check the operation mode and frequency settings 00-05 / 00-06
	Is the load too heavy?	Reduce the load
Motor speed is too high or too low	Are the motor specifications (number of poles, voltage) correct?	Check the motor specifications
	Is the gear ratio correct?	Check the gear ratio
	Is the maximum output frequency setting correct?	Check the maximum output frequency
Motor speed fluctuates abnormally during operation	Is the load too heavy?	Reduce the load
	Is the load variation significant?	To reduce load variation, increase inverter and motor capacity
	Is there a phase loss in the input power supply?	**1.** For single-phase models, add an AC reactor on the input side
		2. For three-phase input models, check the wiring
Motor does not operate	Is the power supply voltage correctly connected to the inverter input terminals (is the charge indicator light on?)	**1.** Is the power turned on? **2.** Turn off the power and then turn it on again **3.** Check the power supply voltage level **4.** Are the terminal screws properly tightened?
	Does the inverter have voltage output?	Turn off the power and then turn it on again
	Is the load too heavy, causing the motor to stall?	Reduce the load so the motor can operate
	Is there an inverter fault?	Refer to the fault indicator for troubleshooting and correct any abnormal wiring
	Has the forward/reverse run command been sent to the inverter?	
	Has the analog frequency setting been input?	**1.** Is the frequency input voltage setting correct? **2.** Is the analog frequency input signal wiring correct?
	Is the run mode setting correct?	Set the run mode from the operator panel

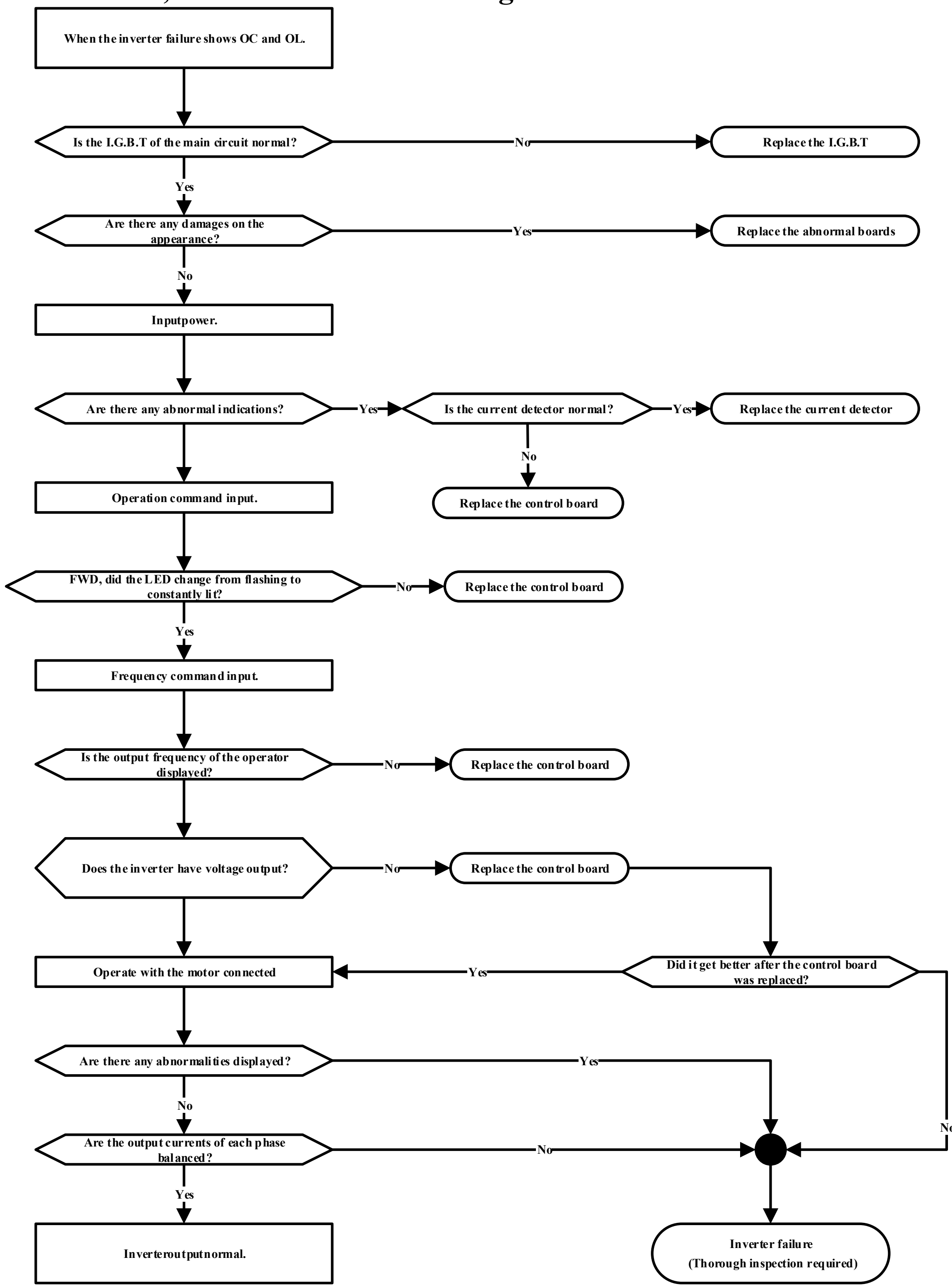
5.7 Troubleshooting steps

5.7.1 Basic inverter fault troubleshooting

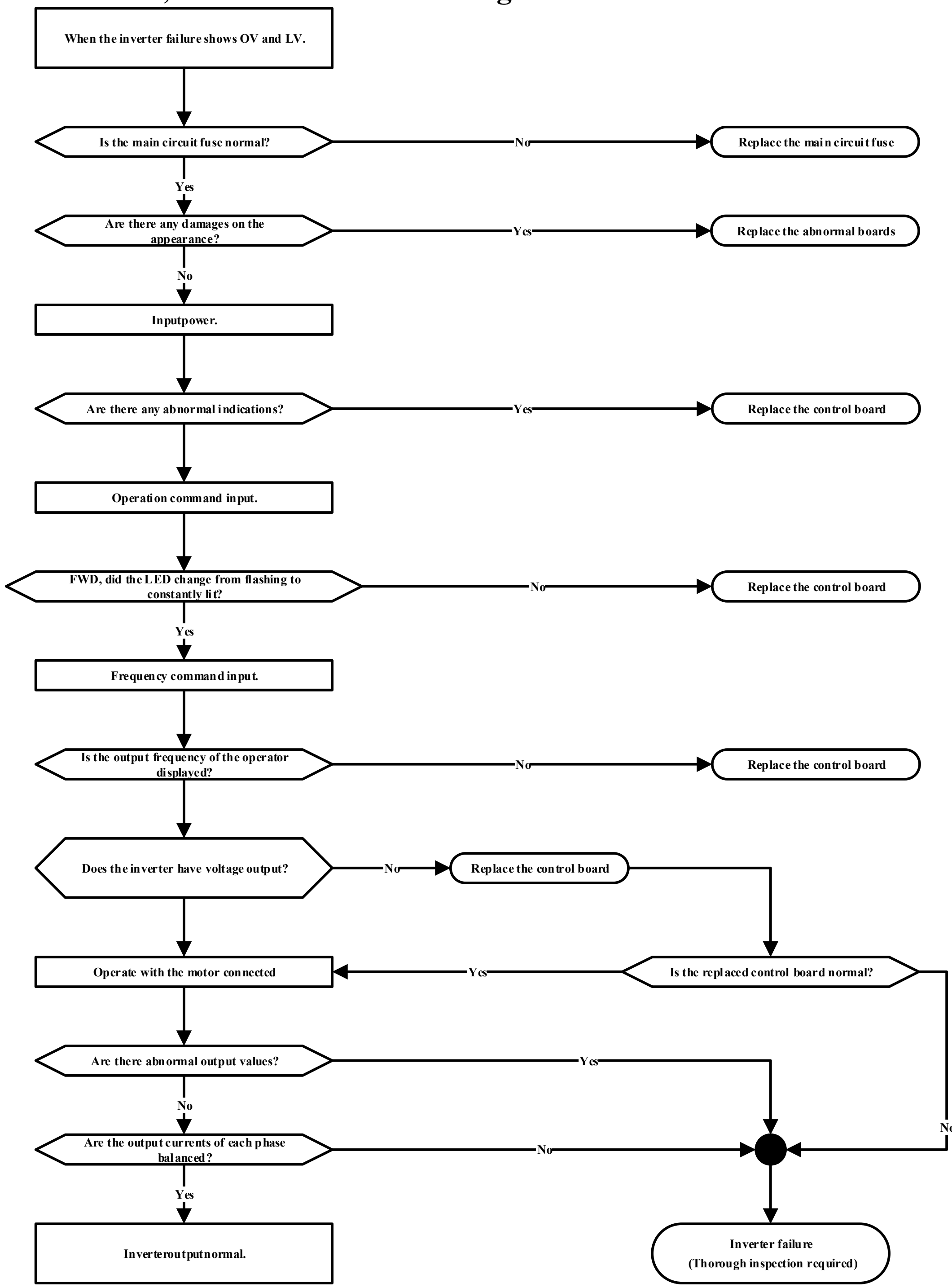



Continuing from the previous page
Check the inverter parameters
Specify the operation control method
FWD/REV, the LED changes from flashing to being constantly lit
No
Replace the control board
Yes
Set the frequency command
Did the operator display the frequency?
No
Replace the control board
Yes
Does the inverter have voltage output?
No
Replace the control board
Yes
Operate with the motor connected
Yes
Is the control board normal after it was replaced?
No
Are there any abnormalities displayed?
Yes
No
No
Are the output currents of each phase balanced?
No
Yes
Inverter normal
Inverter failure(Thorough inspection required)

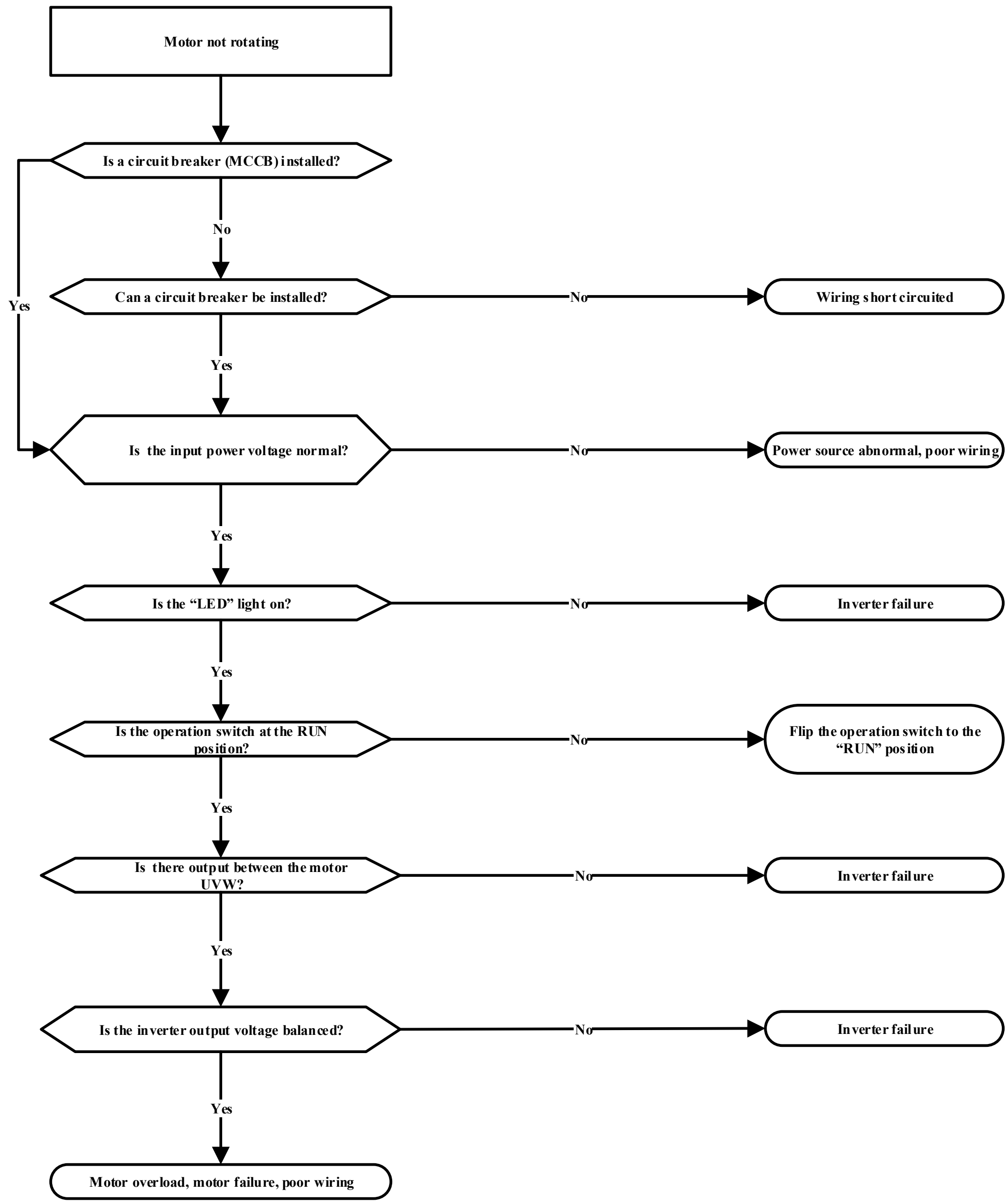
5.7.2 OC, OL fault troubleshooting



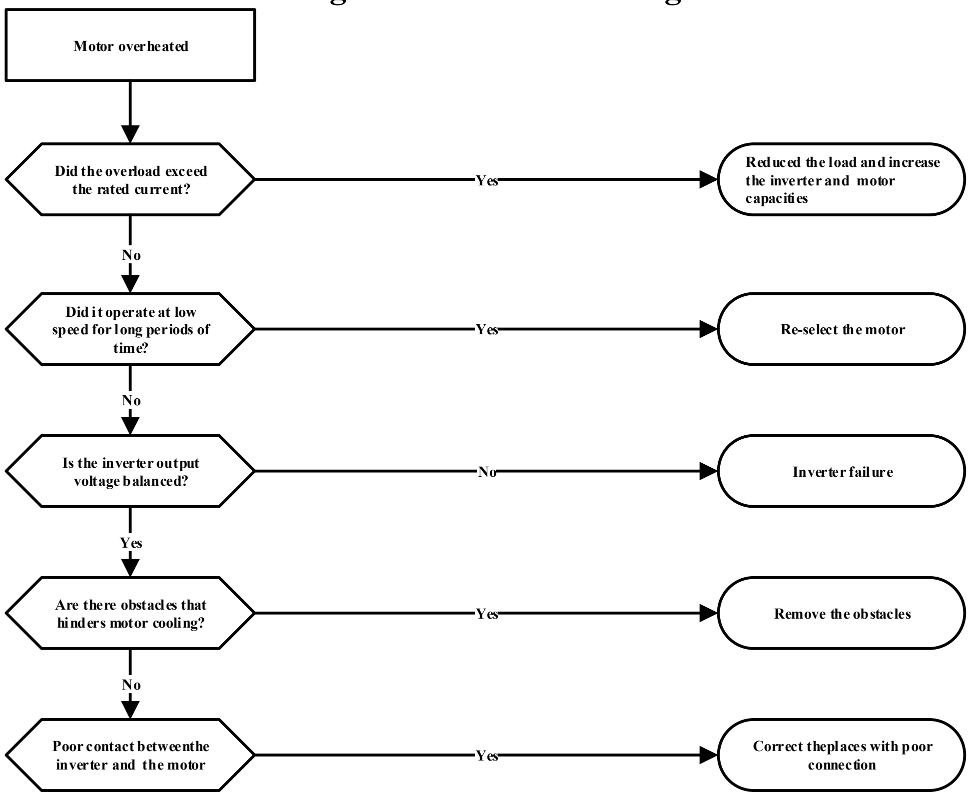
5.7.3 OV, LV fault troubleshooting



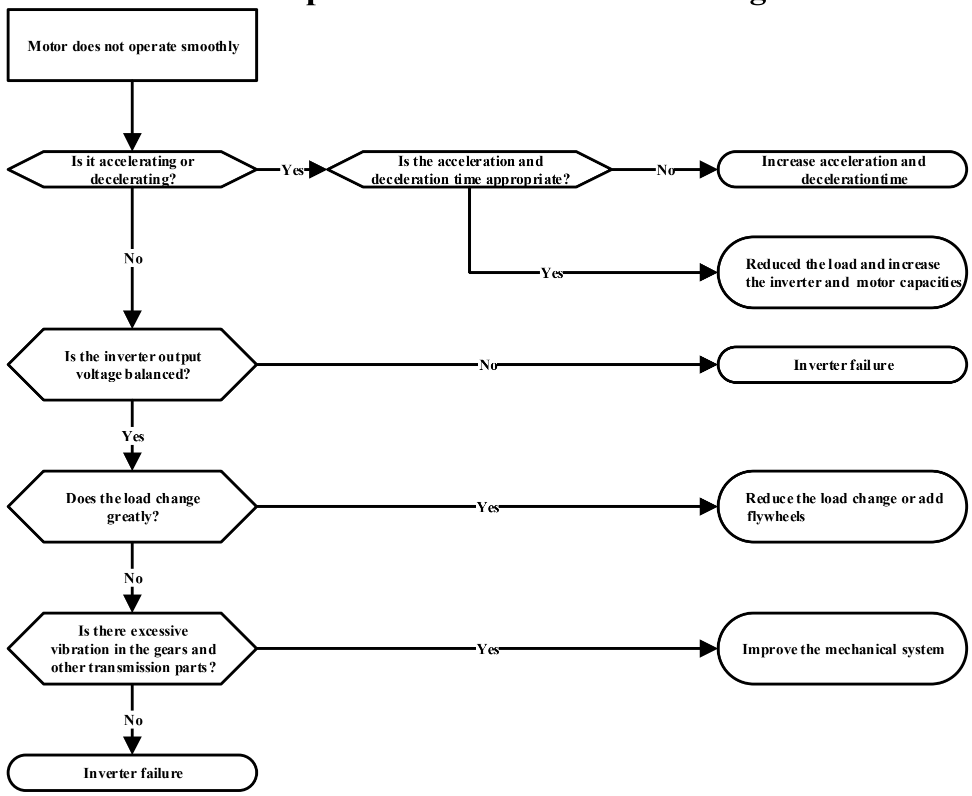
5.7.4 Motor abnormality troubleshooting



5.7.5 Motor overheating cause troubleshooting



5.7.6 Motor uneven operation cause troubleshooting



5.8 Daily and periodic inspection checklist

The inverter requires daily and periodic maintenance inspections to ensure stable and safe operation.

The following are essential inspection items to ensure the stable and safe operation of the inverter. Wait at least 5 minutes after the keypad panel on the inverter turns off before conducting inspections to avoid injury from residual charge in the inverter's capacitors.

Inspection Item	Inspection Content	Inspection Frequency		Inspection Method	Acceptance Criteria	Countermeasures
		Daily	Yearly			
Environment						
Operating environment around the equipment	Is the ambient temperature and humidity within specified limits?	○		Measure with thermometer and hygrometer	Temperature: -10 to 40°C / 50°C Humidity: Below 95% RH	Improve the working environment
	Is there any accumulation of flammable materials nearby?	○		Visual inspection	No foreign objects	
Inverter Installation and Grounding	Is there abnormal shaking or vibration of the equipment?	○		Visual and auditory inspection	No foreign objects	Tighten mounting screws
	Is the grounding resistance value within specification?		○	Measure resistance with multimeter	Below 100Ω for 220V units	Improve grounding
Terminal Blocks and Wiring						
Terminal block	Are the tightened parts loose or shaking?		○	Visual inspection; check screws with screwdriver	No abnormalities	Tighten or send for repair
	Is there any damage to terminal blocks, etc.?		○			
	Any signs of obvious rust?		○			
Check inverter internal wiring	Any deformation or misalignment?		○	Visual inspection	No abnormalities	Replace or send for repair
	Is the wire insulation damaged?		○			
Voltage						
Input power voltage	Is the main circuit voltage normal?	○		Measure voltage with multimeter	Voltage within specification	Improve power input
Circuit Boards and Components						
PCBs	Any conductive metal scattered on the PCB?		○	Visual inspection	No abnormalities	Remove debris or replace the circuit board
	Are there signs of rust, discoloration, or scorching from overheating?		○			
Capacitors	Any unusual odors or electrolyte leakage?	○		Visual inspection	No abnormalities	Replace the capacitor or inverter
	Are there signs of swelling or bulging?	○				
Power Components	Is there an accumulation of dust or debris?		○	Visual inspection	No abnormalities	Clean
	Check the resistance between each terminal		○	Measure with a multimeter	No short or open circuits on the three-phase output	Replace power components or inverter
Peripheral Devices						
Variable Resistors	Any unusual odor or damage to insulation?		○	Olfactory and visual inspection	No abnormalities	Replace variable resistor
	Are the resistor wires or connection terminals damaged?		○	Visual inspection	No abnormalities	

Electromagnetic contactor	Are the contact points operating normally?	○			No abnormalities	Replace contactor
	Are there unusual noises?	○		Auditory inspection	No abnormalities	
Reactor	Any unusual odor or noise?	○		Olfactory and auditory inspection	No abnormalities	Replace reactor
Cooling System						
Cooling Fan	Any unusual noise or vibration?		○	Auditory inspection	No abnormalities	Replace cooling fan
	Any deformation or burnt smell?	○		Visual and olfactory inspection	No abnormalities	Replace fan
	Are the fan mounting screws loose?			Visual inspection; check with screwdriver	No abnormalities	Tighten or send for repair
	Are any fan blades missing or damaged?			Visual inspection	No abnormalities	Replace fan
Heat Sink	Is there an accumulation of dust or debris?	○		Visual inspection	No abnormalities	Remove dust and debris
Ventilation Ducts	Are the air intake and exhaust openings blocked?	○		Visual inspection	No abnormalities	Clean

5.9 Maintenance

To ensure long-term reliability, conduct regular inspections as outlined below. Always turn off the power and wait until the keypad display is off before starting maintenance (due to residual voltage in large internal capacitors).

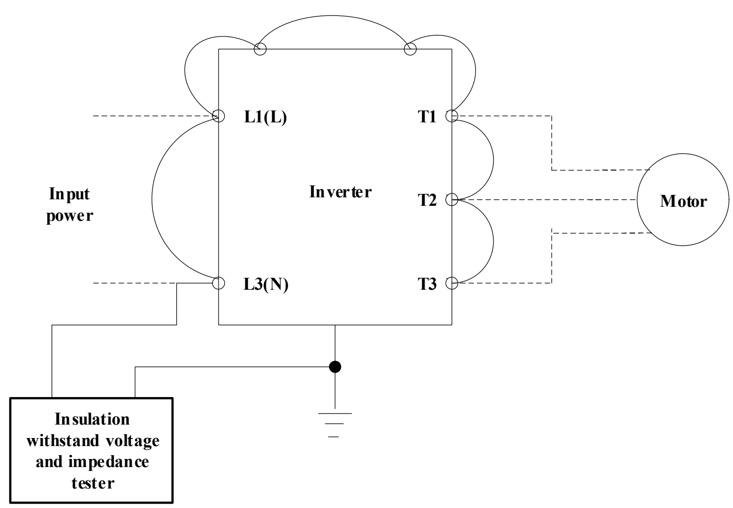
1. Maintenance items indicated below:

- ➢ Ensure the ambient temperature and humidity around the inverter are suitable, with proper ventilation and away from heat sources.
- ➢ Inspect the internal components of the inverter and replace any deteriorated or damaged parts.
- ➢ Remove any internal dust or foreign matter.
- ➢ Check the grounding to ensure proper connection.
- ➢ Tighten all terminal screws, especially on the inverter’s power input and output sides.

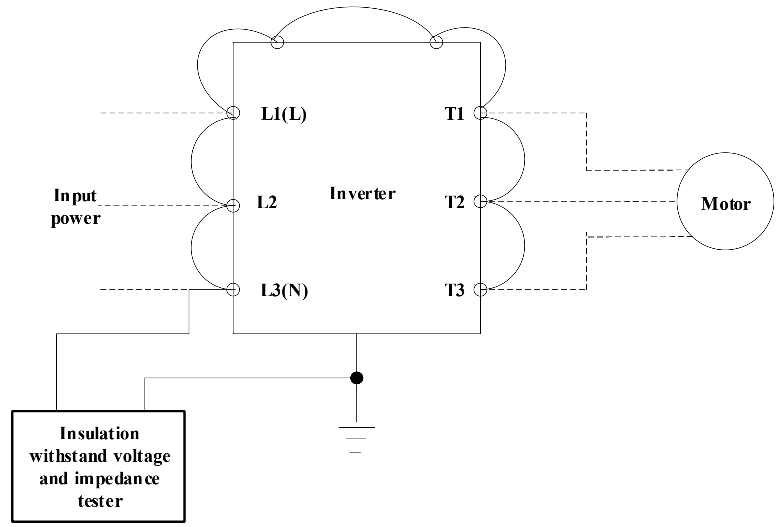
(! Never perform insulation withstand voltage tests on the control circuit.)

2. Insulation Withstand Voltage Testing Method

Single-phase:



Three-phase:



L1(L)
T1
Input
power
L2
Inverter
T2
Motor
L3(N)
T3
Insulation
withstand voltage
and impedance
tester

Chapter 6 Peripheral Devices and Optional Items

6.1 Brake Resistor List

For models E710 200V 0.5~7.5HP / 400V 1-10HP, brake transistors are built-in as standard.

Table 6.1 Brake Resistor List

Inverter			Brake Resistor					Approximate braking torque 10%ED	Minimum Allowable Brake Resistance *1	
V	HP	KW	Part Number	Resistance Specification	Number of Units Used	Single Resistor Specification (W/Ω) Dimensions (L×W×H) mm	Number of Units Used		(Ω)	(W)
200V 1 Ø /3 Ø	0.5	0.4	JNBR-150W400	150W/400Ω	1	150W/400Ω (251x28x60)	1	119	50	350
	1	0.75	JNBR-150W200	150W/200Ω	1	150W/200Ω (251x28x60)	1	119	50	350
	2	1.5	JNBR-150W100	150W/100Ω	1	150W/100Ω (251x28x60)	1	119	50	350
	3	2.2	JNBR-260W70	260W/70Ω	1	260W/70Ω (274x40x78)	1	115	50	350
200V 3 Ø	5	3.7	JNBR-390W40	390W/40Ω	1	390W/40Ω (395x40x78)	1	119	19	1000
	7.5	5.5	JNBR-520W30	520W/30Ω	1	520W/30Ω (400x50x100)	1	108	10	1600
400V 3 Ø	1	0.75	JNBR-150W750	150W/750Ω	1	150W/750Ω (251x28x60)	1	126	125	600
	2	1.5	JNBR-150W400	150W/400Ω	1	150W/400Ω (251x28x60)	1	119	125	600
	3	2.2	JNBR-260W250	260W/250Ω	1	260W/250Ω (274x40x78)	1	126	84	800
	5	3.7	JNBR-400W150	400W/1500Ω	1	400W/150Ω (395x40x78)	1	126	56	1200
	7.5	5.5	JNBR-600W130	600W/130Ω	1	600W/130Ω (395x40x78)	1	102	67	1000
	10	7.5	JNBR-800W100	800W/100Ω	1	800W/100Ω (535x60x110)	1	99	67	1000

*1: The minimum allowable brake resistance is the lowest resistance value that can be connected.

Note 1: When installing brake resistors, ensure all resistors are mounted outside the inverter in a location with proper ventilation for heat dissipation.

Note 2: The surface temperature of the resistor becomes very high, and the air flowing from the resistor is extremely hot. Therefore, materials near the brake resistors must be non-combustible, and appropriate protection should be implemented to prevent accidental contact with the resistor.

6.2 AC Reactor

- If the power system capacity is significantly larger than the inverter capacity, or if the inverter is connected close to the power source (within 10 meters), or to improve the power factor on the power supply side, an external AC reactor may be added.
- Please select an AC reactor according to the table below.

Table 6.2 AC Reactor List

Model			AC Reactor	
V	**HP**	**Rated current (A)**	**3% Impedance Inductance Value (mH)**	**Rated current (A)**
200V 1 Ø /3 Ø	0.5	2.8	2.1	8.5
	1	4.8	2.1	12
	2	7.5	1.1	19.0
	3	11	0.71	25.0
200V 3 Ø	5	17	0.53	20
	7.5	25	0.35	33.0
400V 3 Ø	1	2.7	8.4	4.5
	2	4.2	4.2	6
	3	5.5	3.6	7.5
	5	9	2.2	12
	7.5	13	1.42	17.0
	10	17	1.06	23.0

The AC reactors listed in the table above are for inverter input side use only. Do not connect them to the output side.

6.2.1 Dimensions of 200V-Class AC Reactors

1. **Basis Standard: JEC-2210 (1990 edition)**
2. **Insulation Class: Class H**
3. **Phases: 3-phase**
4. **System Voltage: 200–240V**
5. **Insulation Resistance: Below 0.2–1.1kV, withstand voltage AC4000V/1 minute**
6. **Model: MR-DL (For Input Side)**
7. **External Dimensions**

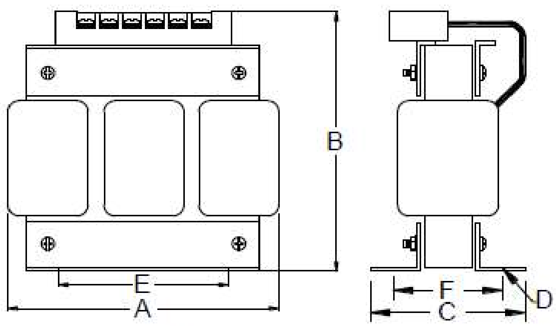


Figure 1

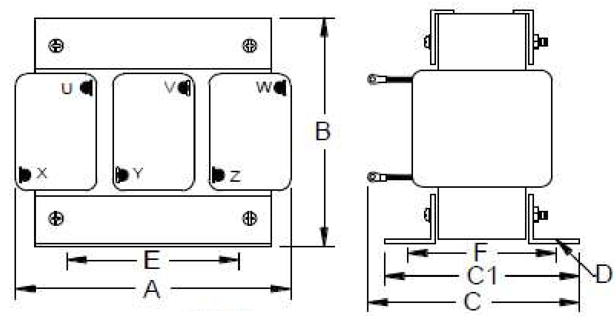


Figure 2

Voltage (V)	Inductance value (mH)	Rated current (A)	Dimensions (mm)							Approx. Weight (Kg)	Figure No.
			A	B	C	C1	D	E	F		
	1.70	15	155	150	100	75	7	60	60	4	1
	1.10	20	155	150	100	75	7	60	60	4	1
3	0.85	25	180	140	120	90	7	90	60	6	2
220V	0.46	25	155	150	100	75	7	60	60	3.5	1
	0.34	40	180	140	120	90	7	90	60	6	2
	0.24	50	180	140	120	90	7	90	60	6	2

6.2.2 Dimensions of 400V-Class AC Reactors

1. **Basis Standard: JEC-2210 (1990 edition)**
2. **Insulation Class: Class H**
3. **Phases: 3-phase**
4. **System Voltage: 380–600V**
5. **Insulation Resistance: Below 0.2–1.1kV, withstand voltage AC4000V/1 minute**
6. **Model: MR-DL (For Input Side)**
7. **External Dimensions**

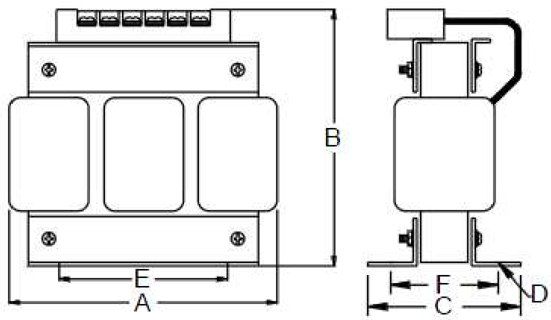


Figure 1

Voltage (V)	Inductance value (mH)	Rated current (A)	Dimensions (mm)							Approx. Weight (Kg)	Figure No.
			A	B	C	C1	D	E	F		
3 440V	4.90	5	155	150	95	70	7	60	55	3	1
	3.70	6.5	155	150	95	70	7	60	55	3	1
	2.90	8.5	155	150	95	70	7	60	55	3	1
	1.70	15	155	150	100	75	7	60	60	3.5	1
	1.20	25	155	150	100	75	7	60	60	4	1

6.3 Noise filter

A. Input-side Noise Filter

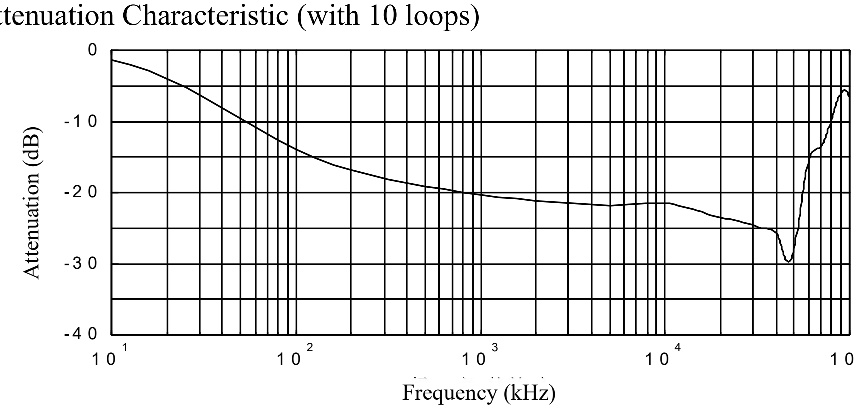
- E710 200V models require an external dedicated noise filter. 400V models also require an external dedicated noise filter to comply with the EN61800-3 standard. Alternatively, 400V models with built-in filters are available, which also comply with EN61800-3.

Table 6.3. Input-side Noise Filters

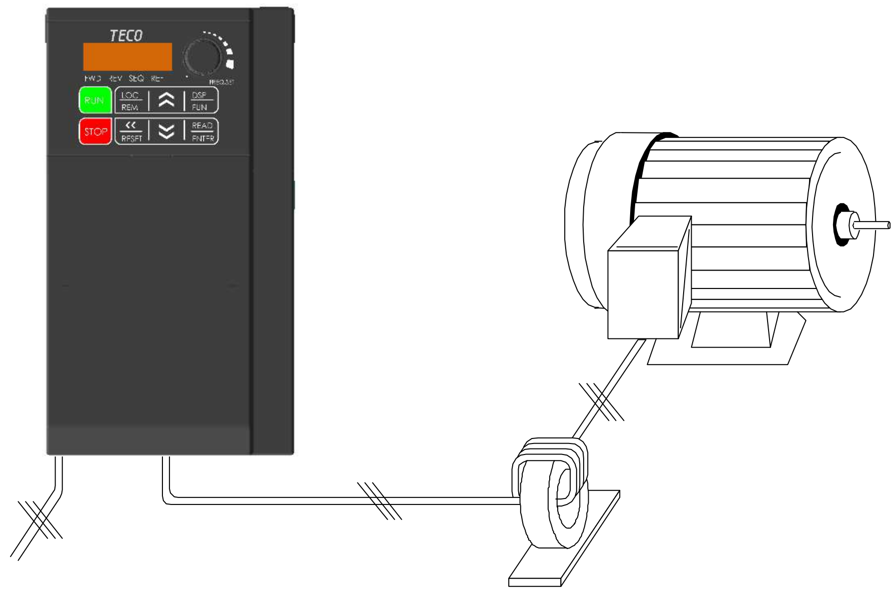
Inverter Model		Noise filter	
Input Voltage	**Horsepower**	**Model No.**	**Dimensions**
200V 1Ø/3Ø	0.5HP/1HP	FN258HV-7-29	254*49*125
	2HP/3HP	FN3258-16-45	264*45*70
200V 3Ø	5HP	FN431-0036	275*100*90
	7.5HP	FN431-0036	275*100*90
400V 3Ø	1HP/2HP	FN3258-16-45	264*45*70
	3HP/5HP	FN3258-16-45	264*45*70
	7.5HP/10HP	FN431-0036	275*100*90

B. Zero-Phase Noise Filter (EMI Suppression Zero Core)

- Product Part Number: 4H000D0250001
- Choose the appropriate zero-phase noise filter based on the horsepower and cable diameter.
- Utilizing the high attenuation characteristics of the zero-phase noise filter (effective from the AM frequency range of 100 kHz to approximately 50 MHz, as shown in the attenuation characteristic curve below), this filter effectively suppresses radiated noise emitted by the inverter.
- The zero-phase noise filter can be installed on either the input or output side of the inverter. For installation, loop each phase wire through the core in the same direction for several turns—the more turns, the better the attenuation effect. If the wires are too thick to loop, pass the U, V, and W phase wires straight through the core in the same direction and use multiple zero-phase noise filters in series.
- Attenuation Characteristic (with 10 loops)



· Use Cases



Note: The U, V, and W wires must pass through the same ZERO CORE and be wound in the same direction to be effective.

6.4 Input Power Side Fuse Ratings

200V Class

Model No.	Horse power	KVA	100% Rated Output Current (A)	3-Phase Rated Input Current (A)	3-Phase Fuse Rating (A)	Single-Phase Rated Input Current (A)
E710-2P5-H□E□	0.5	1.9	2.8	2.9	16	5.0
E710-201-H□E□	1	1.9	4.8	5.0	20	8.7
E710-202-H□S	2	3	7.5	7.9	32	13.7
E710-203-H□S	3	4.2	11	11.6	50	20.1
E710-205-H3S	5	6.7	17	17.9	50	X
E710-208-H3S	7.5	9.5	25	26.3	63	X

400V Class

Model No.	Horse power	KVA	100% Rated Output Current (A)	Rated Input Current (A)	Fuse Rating (A)
E710-401- H3E(F)	1	2.6	2.7	2.8	10
E710-402- H3E(F)	2	3.2	4.2	4.4	16
E710-403- H3S(F)	3	4.2	5.5	5.8	16
E710-405- H3S (F)	5	7	9	9.5	25
E710-408- H3S (F)	7.5	11.3	13	13.7	40
E710-410- H3S (F)	10	13.7	17	17.9	50

Fuse Type: Please select UL-compliant semiconductor fuses.
Voltage Range: For 220V-class inverters, use 300V-class fuses.
For 440V-class inverters, use 500V-class fuses.

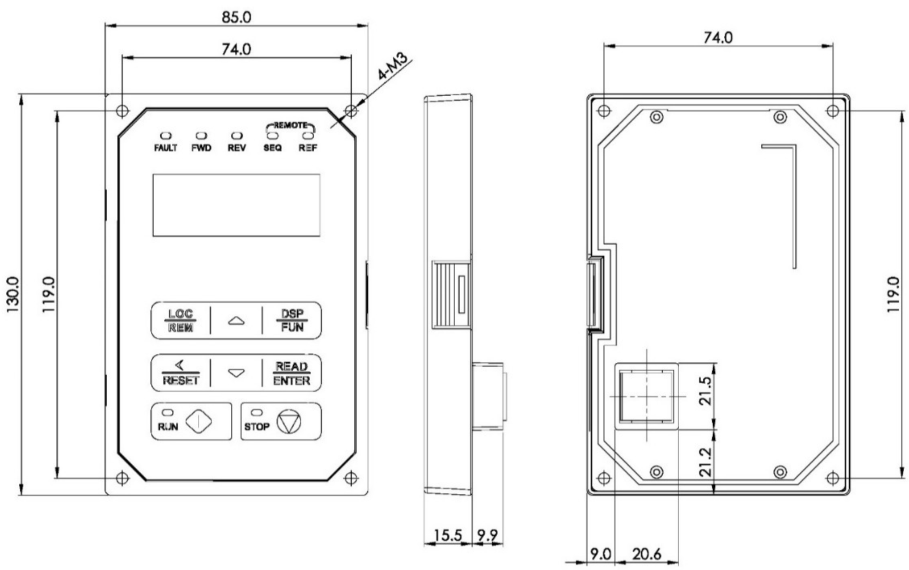
6.5 Others

A. Digital Operator Extension Cable

· The digital operator can be detached from the inverter unit and operated remotely using a digital operator extension cable. Available in four lengths: 1m, 2m, 3m, and 5m.

Name	Model No.	Configuration
Digital Operator Extension Cable	JN5-CB-01M	Length: 1m
	JN5-CB-02M	Length: 2m
	JN5-CB-03M	Length: 3m
	JN5-CB-05M	Length: 5m

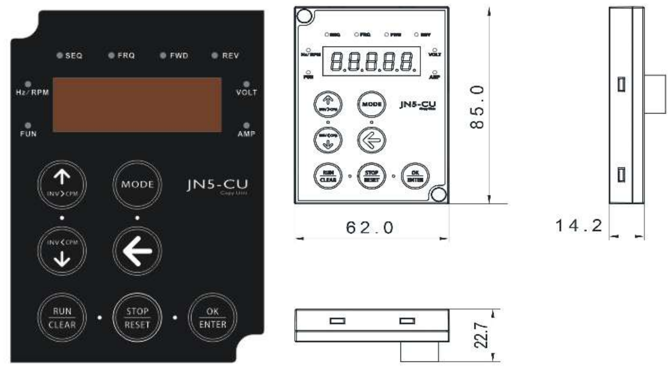
The installation dimensions of the externally mounted LCD digital operator (JN5-OP-F02) are shown below.



B. Copy Module (JN5-CU)

· Copy Function: When multiple E710 inverters of the same model require identical parameter settings, you can configure one inverter, store the parameters using the copy module, and then copy the saved parameters to other inverters, thus reducing repetitive manual setup.

Copy Module(JN5-CU)Dimensions and Appearance



6.6 NEMA1 Wiring Box

· To upgrade protection to NEMA1 level, it is recommended to purchase a NEMA1 wiring box and install it above or below the inverter.

Enclosure	Model No.
1	JN7-NK-E01
2	JN7-NK-E02
3	JN7-NK-E03

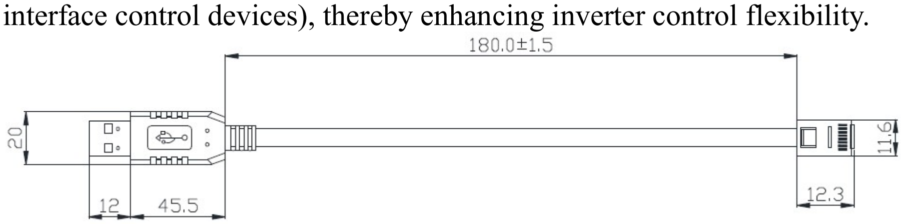
6.7 DIN RAIL Accessories

· For DIN RAIL mounting (Frame 1 & 2 models only), it is recommended to purchase the DIN RAIL accessory and install it beneath the inverter.

Enclosure	Model No.
1&2	JN7-DIN-L01

6.8 RJ45 to USB Cable

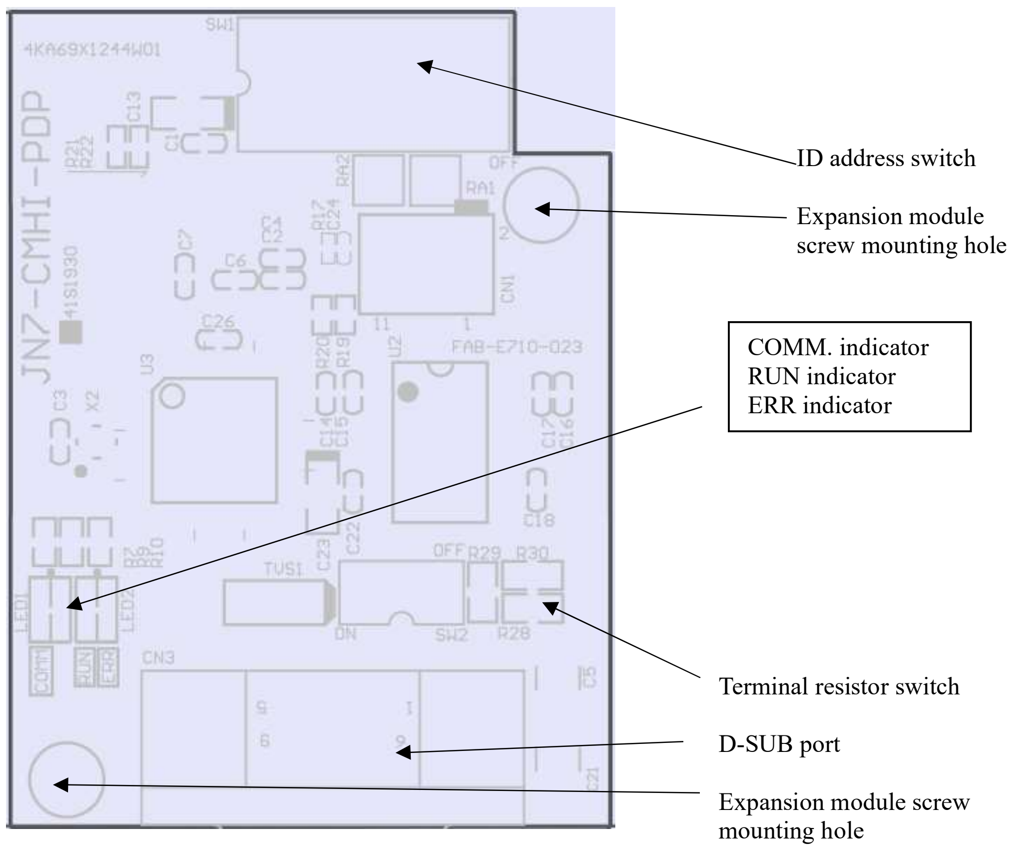
· RJ45 to USB cable (JN5-CM-USB), length: 1.8 meters. Converts USB communication format to RS485 format, enabling communication between the inverter and PC (or other USB interface control devices), thereby enhancing inverter control flexibility.



6.9 PROFIBUS High-Speed Communication Expansion Module

6.9.1 Communication Hardware and Data Structure

This product is the PROFIBUS high-speed communication expansion module; it can perform remote setting and communication functions through the PROFIBUS bus. Used on the TECO E710 AC motor drive (hereinafter referred to as the "drive"), enabling the drive to operate on the PROFIBUSnetwork.



6.9.2 Product Specifications

PROFIBUS ports

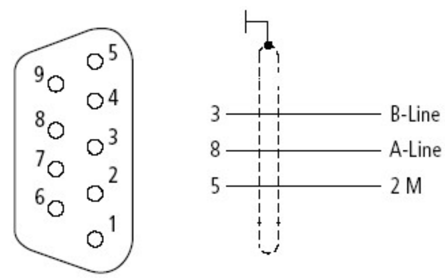
Item	Specifications
Connector	DB-9
Transmission rate	9.6Kbit/**s** to 12Mbit/s (automatic detection of transmission rate)
Network protocols	PROFIBUS communication protocol

AC motor driver port

Item	Specifications
Connector	Connection between Control Board CN5 and Communication Card CN2
Transmission method	SPI high speed communication
Terminal functions	1. The communication module communicates with the AC motor driver through this interface. 2. The AC motor driver provides power to the communication module through this interface.
Communication protocols	TECO communication protocol

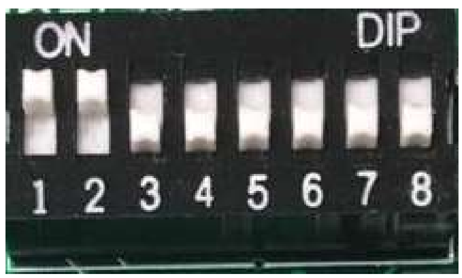
6.9.3 Installation Instructions

PROFIBUS network connection
Definitions of PROFIBUS DP communication port pins are as shown in the figure below.



Pin	Definition	Description
1～2	Not assigned	-
3	RXD/TXD-P (B-Line)	Receive/Send data -P
4	Not assigned	-
5	DGND (2M)	Data reference potential
6～7	Not assigned	-
8	RXD/TXD-N (A-Line)	Receive/Send data -N
9	Not assigned	-

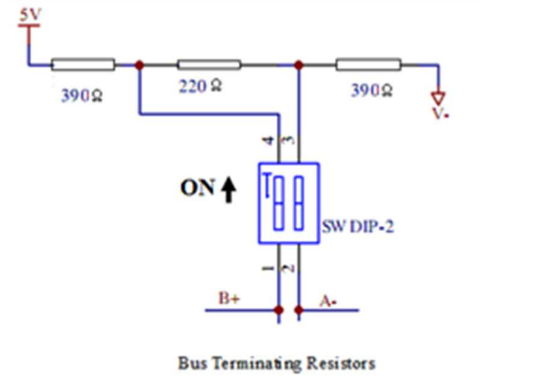
PROFIBUS network connection
As shown in the figure below, the ID address range (1–125) corresponds to SW1 b1–b7.

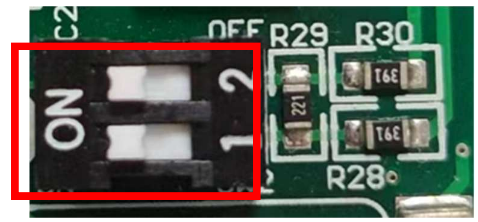


Function	DIP switch position	DIP switch status	Description
Network address setting	b1~b7	1000000	Network address is 1
		0100000	Network address is 2
		1100000	Network address is 3
		....	…….
		1011111	Network address is 125
No function	b8	-	-

Network address switch setting range: 1~125 (0, 128~255 cannot be used).

PROFIBUS bus terminal resistor





The first and last station of the PROFIBUS bus must be connected to the bus, and the bus terminal resistor must be turned on.

Serial Transmission Rate (kbps)	Maximum Bus Length (m)
9.6	1200
19.2	1200
45.45	1200
93.75	1200
187.5	1000
500	400
1500	200
3000	100
6000	100
12000	100

6.9.4 LED Indicator Description

The module has two dual-color LED indicators built-in used to quickly diagnose and monitor the communication statuses between the module itself and the bus.

Module status LEDs (RUN LED & ERR LED)
Used to monitor whether the equipment is operating normally.

Indicator statuses	**Description**
Does not light up	Power not supplied
Orange light lights up	Communication with the frequency converter not established
Red light flashes (1 Hz)	Communication error with the frequency converter
Red light flashes (4 Hz)	Flip-switch ID address error
Green light flashes (4 Hz)	Power supply normal but DP communication not established
Green light lights up	DP communication normal

Network status LED (COMM LED)
Used to monitor the operability of the communication module PROFIBUS network.

Indicator statuses	Description
Does not light up	DP communication not established
Green light lights up	DP communication established and normal

6.9.5 Driver parameter setting description

Used to monitor the operability of the communication module PROFIBUS network.
Users must first confirm related parameter settings on the driver in order to ensure that the communication module can connect normally.

Parameters	Parameter name	Settings	Settings descriptions
00-02	Operation command source	2	Communication control
00-05	Frequency command source	3	Communication control

6.9.6 Connection operations

PPO communication

<table>
<tr><td colspan="4">PKW</td><td colspan="10">PZD</td></tr>
<tr><td>PKE</td><td>IND</td><td colspan="2">PWE</td><td>PZD1
STW
ZSW</td><td>PZD2
HSW
HIW</td><td>PZD3</td><td>PZD4</td><td>PZD5</td><td>PZD6</td><td>PZD7</td><td>PZD8</td><td>PZD9</td><td>PZD10</td></tr>
<tr><td>1st word</td><td>2nd word</td><td>3rd word</td><td>4th word</td><td>1st word</td><td>2nd word</td><td>3rd word</td><td>4th word</td><td>5th word</td><td>6th word</td><td>7th word</td><td>8th word</td><td>9th word</td><td>10th word</td></tr>
<tr><td colspan="6">PPO1</td><td colspan="8"></td></tr>
<tr><td colspan="10">PPO2</td><td colspan="4"></td></tr>
<tr><td colspan="4"></td><td colspan="2">PPO3</td><td colspan="8"></td></tr>
<tr><td colspan="4"></td><td colspan="6">PPO4</td><td colspan="4"></td></tr>
<tr><td colspan="14">PPO5</td></tr>
</table>

PKW: Parameter address/value	**STW**: Control character
PZD: Process data	**ZSW**: Status character
PKE: Parameter address	**HSW**: Main settings
IND: Subindex	**HIW**: Main actual value
PWE: Parameter value	

PZD Structure default
User parameters of the communication module configured through the GSD file. Default values of the PZD structure are as follows:
STW1 Control character; mapped to the MODBUS address 0x2501 of the driver.
HSW Main setting value; mapped to the MODBUS address 0x2502 of the driver.
ZSW1 Status character; mapped to the MODBUS address 0x2520 of the driver.
HIW Main actual value; mapped to the MODBUS address 0x2524 of the driver.

PLC Master station→ driver slave station
PZD3/ PZD4: Not used.

Driver slave station→ PLC master station
Driver output status; mapped to the MODBUS addresses 0x2520~0x252F of the driver. The default values of PZD3/PZD4/PZD5/PZD6 are set as follows:
PZD3: Default multi-function terminal block on/off status; mapped to the MODBUS address 0x2522 of the driver.
PZD4: Default output current; mapped to the MODBUS address 0x2527 of the driver.
PZD5: Default output current; mapped to the MODBUS address 0x2521 of the driver.
PZD6: Default output current; mapped to the MODBUS address 0x2528 of the driver.

6.9.7 Meanings of each character

Control Character (STW)

Bit	Description	1	0
0	Operation command	Operate	Stop
1	Reverse command	Reverse	Forward
2	External error	Error	-
3	Error reset	Reset	-
4～5	Reserved	-	-
6	Multi-function terminal S1	ON	OFF
7	Multi-function terminal S2	ON	OFF
8	Multi-function terminal S3	ON	OFF
9	Multi-function terminal S4	ON	OFF
A	Multi-function terminal S5	ON	OFF
B	Multi-function terminal S6	ON	OFF
C	Multi-function terminal S7	ON	OFF
D			
E	Controller mode	ON	OFF
F	Communication setting torque command	ON	

Status Character (ZSW)

Bit	Meaning	1	0
0	Operation status	Operate	Stop
1	Direction status	Reverse	Forward
2	Frequency converter operation preparation status	Preparation complete	Not yet prepared
3	Error	Abnormal	Normal
4	Warning	ON	OFF
5	Zero speed	ON	OFF
6	Model 440	ON	OFF
7	Frequency reached	ON	OFF
8	Any frequency reached	ON	OFF
9	Frequency detection one	ON	OFF
A	Frequency detection two	ON	OFF
B	Low voltage	ON	OFF
C	Frequency converter no output	ON	OFF
D	Frequency not according to communication	ON	OFF
E	SeqNotFromComm	ON	OFF
F	Over-torque	ON	OFF

6.9.8 PKW area access parameters

The driver can provide request and response information. Due to the request and response mechanism, the master station must send requests until a communication response is received. The 4 characters of the PKW region are as follows:

Word 1	Parameter ID(PKE)	
bit	15 12 AK	11 0 Parameter number(PNU)
Word 2	IND Reserved	
Word 3	PWE1	
bit	15 8 Reserved	7 0 Fault number
Word 4	PWE2 Read/Write parameters	

Parameter Address (PKE)

Bits 0–11 (PNU): Contains the parameter address / MODBUS address of the related parameter.

Parameter address/MODBUS address: Please refer to the MODBUS communication protocol description chapter in the driver manual for the register numbers, registers and data format that corresponds to the operation parameters.

Bits 12–15 (AK): Contains the identifier characters for the request or response.

Request character AK

PLC master station→ driver slave station

Request Identifier	Description
0	No request
1	Read parameter value
2	Modify parameter value

Response character AK

Driver slave station→ PLC master station

Request Identifier	Description
0	No response
1	Request parameter value processed
7	Request parameter value cannot process

Error character

If the request parameter value was not processed, then the error codes that will be kept in the low-bit PWE1 set are as follows:

Error code	Description
0	Parameter does not exist
1	The current status parameter cannot be read/written
2	Parameter value not within range
101	Other SP communication error occurred, such as: response timeout

Parameter Value (PWE)

Driver parameters are sent through PWE2 (4th word). In the following example, PWEI (3rd word) must be set as 0 in the PROFIBUS master station.

Example of the PKW mechanism:

For example: Read parameters 00-05 (frequency command source).

Read the values of 00-05; first set the request identification character as 1, and then refer to the MODBUS communication protocol description chapter in the driver manual to find out that the address of 00-05 is 0x0005, then the data sequences are as follows:

PLC master station →driver slave station: 1000 0005 0000 0000

Driver slave station→ PLC master station: 1000 0005 0000 0004

Request	
1st word (PKE)	1000
2nd word (IND)	0005
3rd word (PWE1)	0000
4th word (PWE2)	0000

Response	
1st word (PKE)	1000
2nd word (IND)	0005
3rd word (PWE1)	0000
4th word (PWE2)	0004

6.9.9 Troubleshooting

There are two indicators on top of the PROFIBUS communication module; when malfunction occurs, the cause of the malfunction can be confirmed based on the indicator statuses, and troubleshoot the error by following the descriptions below.

Indicator troubleshooting

Module status LED

Indicator statuses	Status name	Troubleshooting method
Does not light up	Power not supplied to the communication module	1. Confirm whether the driver power is normal. 2. Confirm whether the power terminal of the communication module is connected to the driver.
Red and green light flashes alternately	Self-check	1. The host is under self-check; if it flashes continuously, disconnect the power and then reconnect it. 2. Confirm whether the driver communication connection parameters are properly set (19200, 8, N, 1)
Green light flashes	Communication module is in standby mode.	1. Not yet connected with the driver.

Network status LED

Indicator statuses	Status name	Description
Does not light up	Power not supplied	1. Confirm whether the driver power is normal. 2. Confirm whether the power terminal of the communication module is connected to the driver.
	Standby	1. Not yet connected with the PROFIBUS host terminal.

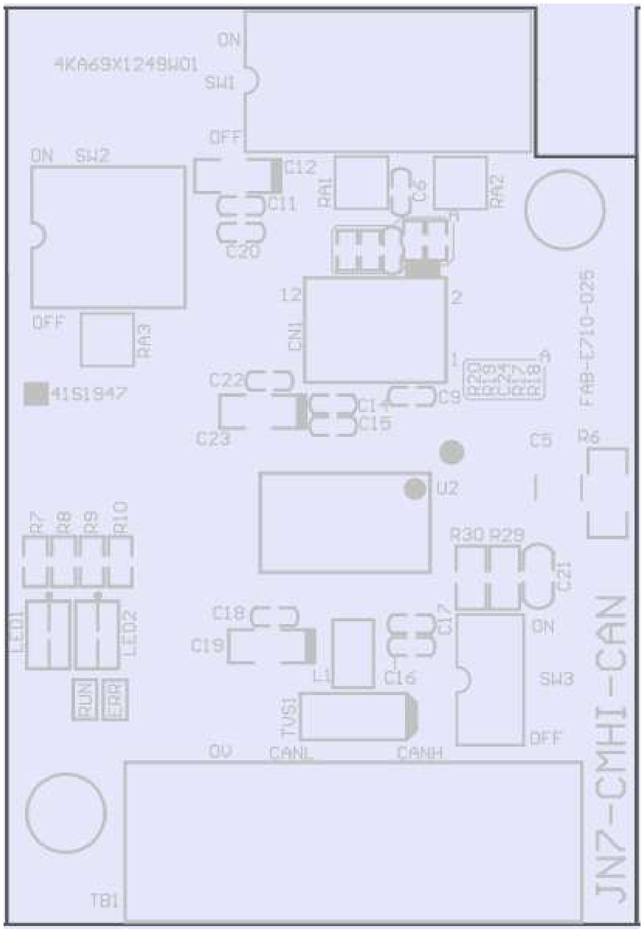
6.9.10 GSD File

When using the Profibus communication module, if the GSD description file (JN7-CMHI-PDP_V (latest version).GSD) is needed, please download it from the TECO official website or request for it from your purchasing sales channel.

6.10 CANopen High-Speed Communication Expansion Card

6.10.1 Communication Hardware and Data Structure

This product is the CANopen high-speed communication expansion module; it can perform remote setting and communication functions through the CANopen bus. This product is exclusively for use with the TECO E710 AC Motor Drive (hereinafter referred to as the “drive”), enabling the drive to operate on a CANopen network.



6.10.2 Product Specifications

CANopen Port

Item	Specifications
Connector	5-pin open pluggable connector; pin spacing 5.08mm
Transmission rate	10kbps、20kbps、50kbps、125kbps、250kbps、500kbps、800kbps、1Mbps
Network protocols	CANopen communication protocol

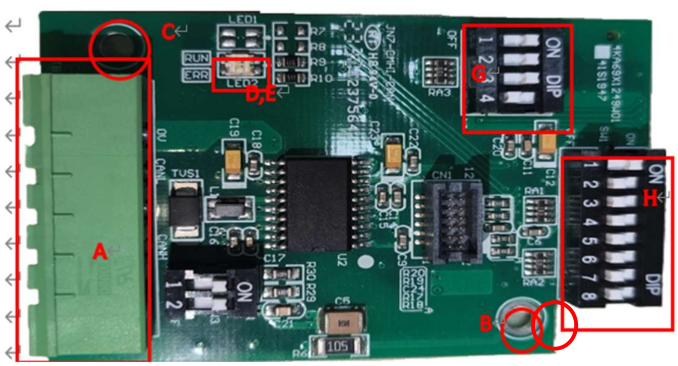
AC motor driver port

Item	Specifications
Connector	Connection between Control Board CN5 and Communication Card CN2
Transmission method	SPI high speed communication
Terminal functions	1. The communication module communicates with the AC motor driver through this interface. 2. The AC motor driver provides power to the communication module through this interface.
Communication protocols	TECO communication protocol

6.10.3 Installation Instructions

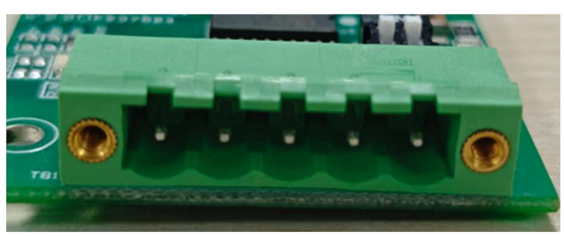
Communication module contact description

As shown in the figure below, A – Terminal block (TB1)
B, C – Mounting holes
D - RUN LED
E - ERR LED
G – Baud Rate Configuration
H – Node ID Configuration



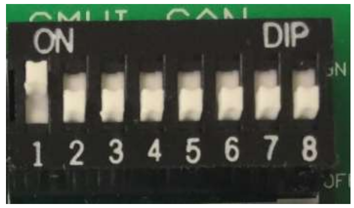
Terminal block definition

As shown in the figure below, the contact definitions in the order from left to right are GND, CAN_L, NC, CAN_H and NC.

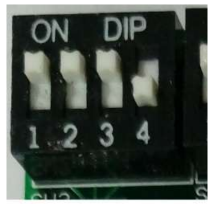


ID address setting description

As shown in the diagram below, the ID address (1–127) corresponds to SW1 b1–b7.



Transmission rate corresponds to SW2 b1~b3.



Function	DIP switch position	DIP switch status 7654321	Description
Network address setting	SW1 b7—b1	0000000	Cannot be used
		0000001	Network address is 1
		0000010	Network address is 2
		0000011	Network address is 3
		....	....
		1111110	Network address is 126
		1111111	Network address is 127
CANopen Transmission Rate Settings	SW2 b3—b1	000	10K
		001	20K
		010	50K
		011	125K
		100	250K
		101	500K
		110	800K
		111	1M

Network address switch setting range: 1~127 (0, 128~255 cannot be used).
Transmission rate switch setting range: 0–7 (8–15 are not usable).

6.10.4 Transmission Rate, Maximum Distance, and Cable Type

The maximum allowable bus length primarily depends on the type of cable used. The permissible cable types include:

- Thin cable
- Thick cable
- Flat cable

According to ODVA specifications, the requirements for data transmission cables (thick cable) are as follows:

Serial Transmission Rate (kbps)	**Maximum Bus Length (m)**	**Serial Transmission Rate (kbps)**	**Maximum Bus Length (m)**
1000	25	125	500
800	50	50	1000
500	100	20	2500
250	250	10	5000

6.10.5 LED Indicator Description

The module has RUN (green) and ERR (red) indicators built-in used to quickly diagnose and monitor the communication statuses between the module itself and the bus.

Module status LED (RUN LED)

Used to monitor whether the equipment is operating normally.

Indicator statuses	Status name	Description
Does not light up	Initial status	Power not supplied
Continuous flashing	Pre-operation	Preparation status
Single flash	Stop	Stopping
Green light lights up	Operation	Operating

Error LED (ERR LED)

Used to monitor the operability of the communication module CANopen network.

Indicator statuses	Status name	Description
Does not light up	No error	Operating
Single flash	Warning	Packet error
Double flash	Error	Guard/Heartbeat error
Red light lights up	Disconnected	Bus closed

6.10.6 Driver parameter setting description

Used to monitor the operability of the communication module CANopen network.

Users must first confirm related parameter settings on the driver in order to ensure that the communication module can connect normally.

Parameters	Parameter name	Settings	Settings descriptions
00-02	Operation command source	2	Communication control
00-05	Frequency command source	3	Communication control

6.10.7 Connection operations

Service Data Object (SDO)

This module supports 1 SDO server, which means it can provide SDO service, and the SDO uses the sending and receiving COB-ID of the predefined connection, 0x580 + NodeID (sending) and 0x600 + NodeID (receiving).

Each SDO message includes a set of COB-ID (request SDO and response SDO); it allows performing of access actions within two nodes. SDO can transmit any size of data, but segment transmission must be used once it exceeds 4 bytes.

The COB IDs of SDO communication are as follows:

Read: Master to slave (request code 0x40) / Master to slave: 600H + Node ID

<table>
<tr><td>COB-ID</td><td>Byte0</td><td>Byte1</td><td>Byte2</td><td>Byte3</td><td>Byte4</td><td>Byte5</td><td>Byte6</td><td>Byte7</td></tr>
<tr><td rowspan="2">(600H) + Node ID</td><td rowspan="2">Request code</td><td colspan="2">Object index</td><td rowspan="2">Object subindex</td><td colspan="4">Request data</td></tr>
<tr><td>LSB</td><td>MSB</td><td colspan="4">Reserved</td></tr>
</table>

Read: Slave response / slave to master: 580H + Node ID

<table>
<tr><td>COB-ID</td><td>Byte0</td><td>Byte1</td><td>Byte2</td><td>Byte3</td><td>Byte4</td><td>Byte5</td><td>Byte6</td><td>Byte7</td></tr>
<tr><td rowspan="2">(580H) + Node ID</td><td rowspan="2">Request code</td><td colspan="2">Object index</td><td rowspan="2">Object subindex</td><td colspan="4">Request data</td></tr>
<tr><td>LSB</td><td>MSB</td><td>bit0~ bit7</td><td>Bit8~ bit15</td><td>Bit16~ bit23</td><td>Bit24~ bit31</td></tr>
</table>

Response code:

43H: Read 4-byte data / 4BH: read 2-byte data / 4FH: read 1-byte data

Write: Master to slave (4-byte data maximum)

<table>
<tr><td>COB-ID</td><td>Byte0</td><td>Byte1</td><td>Byte2</td><td>Byte3</td><td>Byte4</td><td>Byte5</td><td>Byte6</td><td>Byte7</td></tr>
<tr><td rowspan="2">(600H) + Node ID</td><td rowspan="2">Request code</td><td colspan="2">Object index</td><td rowspan="2">Object subindex</td><td colspan="4">Request data</td></tr>
<tr><td>LSB</td><td>MSB</td><td>bit0~ bit7</td><td>Bit8~ bit15</td><td>Bit16~ bit23</td><td>Bit24~ bit31</td></tr>
</table>

Request code:
23H: Write a 4-byte data entry
2BH: Write a 2-byte data entry
2FH: Write a 1-byte data entry

Write: Slave to master (response code 0x60H)

<table>
<tr><td>COB-ID</td><td>Byte0</td><td>Byte1</td><td>Byte2</td><td>Byte3</td><td>Byte4</td><td>Byte5</td><td>Byte6</td><td>Byte7</td></tr>
<tr><td rowspan="2">(580H) + Node ID</td><td rowspan="2">Request code</td><td colspan="2">Object index</td><td rowspan="2">Object subindex</td><td colspan="4">Request data</td></tr>
<tr><td>LSB</td><td>MSB</td><td colspan="4">Reserved</td></tr>
</table>

When we use SDO to perform control to the group 25H of the driver control group, corresponding rules are as follows:

Index
25xxH (register address)

For example, when we want to perform write/read to 2501H of the control group, the corresponding SDO object index is the control group register address 2501H.
Operate directly using Index 2501H, and the module will automatically convert it to access the control group register address 2501H of the E710.

6.10.8 Object Index Table

Basic index

Index	Sub	Name	Default value	R/W	Size	Remarks
1000H	0	Device type	00010192H	R	U32	
1001H	0	Error register	0	R	U8	
1005H	0	COB-ID SYNC message	80H	R	U32	
1006H	0	Communication cycle period	0	RW	U32	
1008H	0	Manufacturer device name	E710	R	U32	
1009H	0	Manufacturer hardware version	1.0	R	U32	
100AH	0	Manufacturer software version	1.00	R	U32	
1014H	0	COB-ID emergency	00000080H+Node-ID	R	U32	
1015H	0	Inhibit time EMCY	0	RW	U16	
1016H	0	number of entries	1	R	U8	
	1	Consumer heartbeat time	0	RW	U32	Not supported
1017H	0	Producer heartbeat time	0	RW	U16	
1018H	0	number of entries	3	R	U8	
	1	Vender ID	00000373H	R	U32	
	2	Product code	00000100H	R	U32	
	3	Revision	00010000H	R	U32	
1200H	0	Server SDO Parameter	2	R	U8	
	1	COB-ID Client Server	0000600H+Node-ID	R	U32	
	2	COB-ID Client Server	0000580H+Node-ID	R	U32	
1400H	0	Number of entries	2	R	U8	
	1	COB-ID used by PDO	00000200H+Node-ID	RW	U32	
	2	Transmission Type	0xFF	RW	U8	
1401H	0	Number of entries	2	R	U8	
	1	COB-ID used by PDO	00000300H+Node-ID	RW	U32	
	2	Transmission Type	0xFF	RW	U8	
1600H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	60400010H	RW	U32	
	2	2.Mapped Object	60420010H	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1601H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	604F0010H	RW	U32	
	2	2.Mapped Object	60500010H	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1800H	0	Number of entries	5	R	U8	Number of entries
	1	COB-ID used by PDO	180H+Node-ID	RW	U32	
	2	Transmission Type	0xFF	RW	U8	Transmission type
	3	Inhibit time	0x64	RW	U16	Inhibit time
	4	CMS-Priority Group	0	RW	U8	

Index	Sub	Name	Default value	R/W	Size	Remarks
	5	Event timer	0x64	RW	U16	Event timer
1801H	0	Number of entries	5	R	U8	Number of entries
	1	COB-ID used by PDO	00000280H+Node-ID	RW	U32	
	2	Transmission Type	0xFF	RW	U8	
	3	Inhibit time	0x64	RW	U16	Inhibit time
	4	CMS-Priority Group	0	RW	U8	
	5	Event timer	0x64	RW	U16	Event time
	4	CMS-Priority Group	0	RW	U8	
	5	Event timer	0x64	RW	U16	Event time
	2	Transmission Type	0xFF	RW	U8	
	3	Inhibit time	0x64	RW	U16	Inhibit time
	4	CMS-Priority Group	0	RW	U8	
	5	Event timer	0x64	RW	U16	Event time
1A00H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	60400010	RW	U32	
	2	2.Mapped Object	60420010	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1A01H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	604F0010	RW	U32	
	2	2.Mapped Object	60500010	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	

DS402 part

Index	Sub-Index	Name	Default value	R/W	Size	Unit	PDO MAP
603F	0	Error code	0	RO	U16		Yes
6040	0	Control word	0	RW	U16		Yes
6041	0	Status word	0	RO	U16		Yes
6042	0	vl target velocity	0	RW	S16	Hz	Yes
6043	0	vl velocity demand	0	RO	S16	Hz	Yes
604F	0	vl ramp function time Acceleration time	100	RW	U16	0.1S	Yes
6050	0	vl slow down time Deceleration time	100	RW	U16	0.1S	Yes

Driver control group command index

Command DATA (allows reading and writing)

Register address		Bit	Content
2500H	Reserved		
2501H	Operation signal	0	Operation command 1: Operate 0: Stop
		1	Reverse command 1: Reverse 0: Forward
		2	External error 1: Error
		3	Error reset 1: Reset
		4	Reserved
		5	Reserved
		6	Multi-function terminal S1 1: "ON"
		7	Multi-function terminal S2 1: "ON"
		8	Multi-function terminal S3 1: "ON"
		9	Multi-function terminal S4 1: "ON"
		A	Multi-function terminal S5 1: "ON"
		B	Multi-function terminal S6 1: "ON"
		C	Multi-function terminal S7 1: "ON"
		D	
		E	Controller mode 1: "ON"
		F	Communication setting torque command 1: "ON"
2502H		*Frequency command (Unit: 0.01Hz)	
2505H		AO1 (0.00V ~ 10.00V)	
2510H		G12-00 H-WORD	
2511H		G12-00 L-WORD	

Monitor DATA (read only)

Register address		Bit	Content
2520H	Status signal	0	Operation status 1: Operate 0: Stop
		1	Direction status 1: Reverse 0: Forward
		2	Frequency converter operation preparation status 1: Preparation complete 0: Preparation not yet complete
		3	Error 1: Abnormal
		4	Warning 1: "ON"
		5	Zero speed 1: "ON"
		6	Model 440 1: "ON"
		7	Frequency reached 1: "ON"
		8	Any frequency reached 1: "ON"
		9	Frequency detection one 1: "ON"
		A	Frequency detection two 1: "ON"
		B	Low voltage 1: "ON"
		C	Frequency converter no output 1: "ON"

Register address		Bit	Content				
		D	Frequency not according to communication 1: “ON”				
		E	Operation not according to communication 1: “ON”				
		F	Over-torque 1: “ON”				
2521H	Error description	0	Reserved	31	Reserved		
		1	UV (Under-voltage)	32	Reserved		
		2	OC (Over-current)	33	Reserved		
		3	OV (Over-voltage)	34	Reserved		
		4	OH1 (Heat sink overheat)	35	Reserved		
		5	OL1 (Motor overload)	36	Reserved		
		6	OL2 (Frequency converter overload)	37	Reserved		
		7	OT (Over-torque)	38	CF07 (Motor control fault)		
		8	UT (Under-torque)	39	Reserved		
		9	SC (Short circuit)	40	Reserved		
		10	GF (Ground fault)	41	Reserved		
		11	FO	42	Reserved		
		12	IPL (Input phase loss)	43	Reserved		
		13	OPL (Output phase loss)	44	Reserved		
		14	OS	45	Reserved		
		15	PGO	46	OH4 (Motor overheat)		
		16	DEV	47	Reserved		
		17	EF1	48	Reserved		
		18	EF2	49	MtrSw (DI Motor Switch Fault)		
		19	EF3	50	OCA (Acceleration over-current)		
		20	EF4	51	OCD (Deceleration over-current)		
		21	EF5	52	OCC (Operation over-current)		
		22	EF6	53	CF08		
		23	EF7	54	PTCLS		
		24		55	PF (Protection fault)		
		25	FB (PID feedback signal error)	56	TOL		
		26	OPR(Keypad Removed)	57	STO2 (Safety switch 2)		
		27	Reserved	58	Reserved		
		28	CE	59	Reserved		
		29	STO (Safety switch 1)	60	Reserved		
		30	Reserved	61	Reserved		
2522H	DI status	0	Multi-function terminal S1	4	Multi-function terminal S5	8~F	Reserved
		1	Multi-function terminal S2	5	Multi-function terminal S6		
		2	Multi-function terminal S3	6	Multi-function terminal S7		

Register address		Bit	Content				
		3	Multi-function terminal S4	7			
2523H		Frequency command (0.01Hz)					
2524H		Output frequency (0.01Hz)					
2526H		DC voltage command (0.1V)					
2527H		Output current (0.1A)					
2528H	Warning description	0	No alarm	30	RDE	60	Reserved
		1	OV	31	WRE	61	RETRY
		2	UV	32	FB	62	SE07
		3	OL2	33	VRYE	63	Reserved
		4	OH2	34	SE01	64	Reserved
		5	Reserved	35	SE02	65	OH1
		6	OT	36	SE03	66	FIRE
		7	Reserved	37	Reserved	67	ES
		8	Reserved	38	SE05	68	STP1
		9	UT	39	HPERR	69	BDERR
		10	OS	40	EF	70	EPERR
		11	PGO	41	Reserved	71	Reserved
		12	DEV	42	Reserved	72	Reserved
		13	CE	43	RDP	73	STP0
		14	CALL	44	Reserved	74	Reserved
		15	Reserved	45	OL1	75	STP2
		16	EF0	46	Reserved	76	RUNER
		17	EF1	47	Reserved	77	LOC
		18	EF2	48	Reserved	78	PTCLS
		19	EF3	49	BB1	79	Sys Init
		20	EF4	50	BB2	80	FBLSS
		21	EF5	51	BB3		
		22	EF6	52	BB4		
		23	EF7	53	BB5		
		24		54	BB6		
		25	Reserved	55	BB7		
		26	Reserved	56	BB8		
		27	Reserved	57	Reserved		
		28	Reserved	58	Reserved		
		29	Reserved	59	Reserved		
2529H		DO 狀態					
252AH		AO1					
252BH		AO2					
252CH		AI 1 input (0.1%)					
252DH		AI 2 input (0.1%)					
252FH		E710 Check					

6.10.9 Troubleshooting

There are two indicators on top of the CANopen communication module; when malfunction occurs, the cause of the malfunction can be confirmed based on the indicator statuses, and troubleshoot the error by following the descriptions below.

Indicator troubleshooting

Module status LED (RUN LED)

Indicator statuses	Status name	Troubleshooting method
Does not light up	Power not supplied to the communication module	1. Confirm whether the driver power is normal. 2. Confirm whether the power terminal of the communication module is connected to the driver.

Error LED (ERR LED)

Indicator statuses	Status name	Description
Single flash	CANopen packet error	Poor connection quality with the CANopen host terminal or host not connected when powered on. Continue transmission or power off inspection can be selected. Two results can be expected with continue transmission 1) Packet transmission returns to normal and the red light no longer flashes 2) Packet continues to have errors causing disconnection. When the power is off, check whether the TB1 terminal and cable are firmly connected, and whether the transmission rate, maximum transmission distance and cable length comply with ODVA specifications.
Double flash	Guard/Heartbeat error	User sends periodic heartbeat messages. If a message is not received after a specific time, please disconnect the power and check the connection status of that node.
Red light lights up	Disconnected	Unable to connect to the CANopen master. Please power off and check whether the TB1 terminal and wiring are securely connected, and whether the transmission rate, maximum transmission distance, and cable length comply with ODVA specifications.

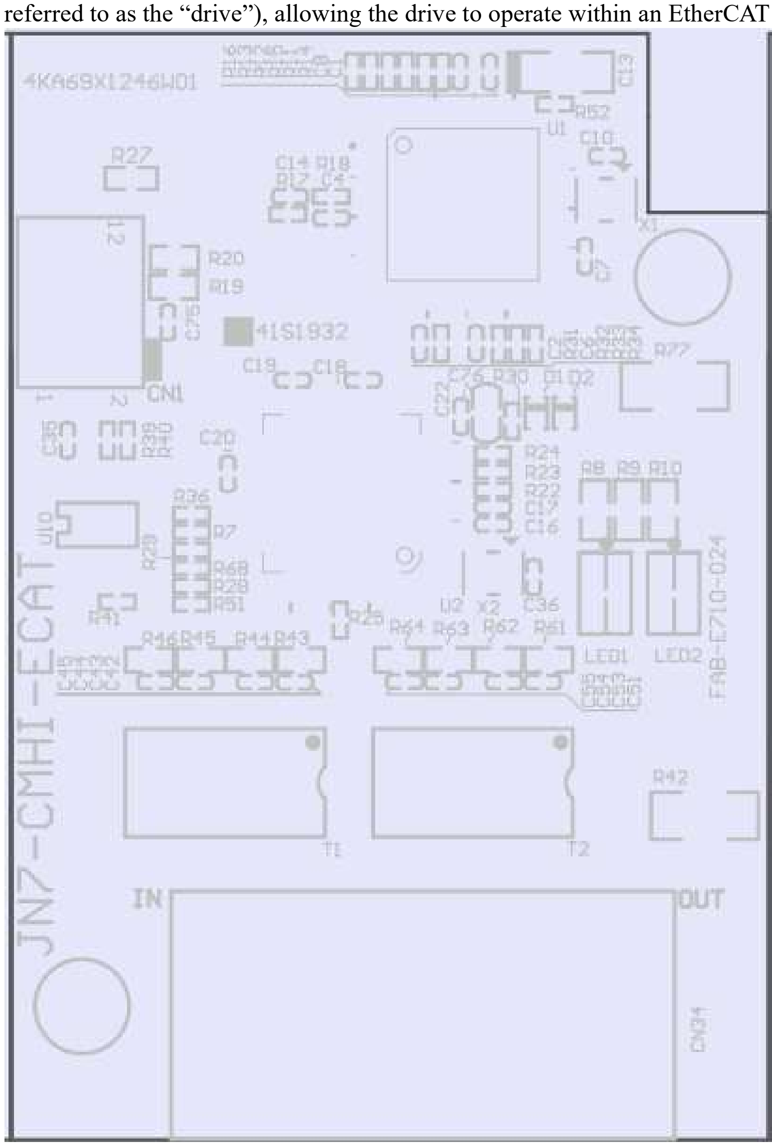
6.10.10 EDS File

When using the CANopen communication module, if the EDS description file (JN7-CMHI-CAN_V(latest version).eds) is needed, please download it from the TECO official website or request for it from your purchasing sales channel.

6.11 Introduction to the EtherCAT High Speed Communication Expansion Module

6.11.1 Communication Hardware and Data Structure

This product is an EtherCAT high-speed communication expansion module (hereinafter referred to as the communication module), which enables remote configuration and communication functions over an EtherCAT network. This product is exclusively for use with the TECO E710 AC Motor Drive (hereinafter referred to as the "drive"), allowing the drive to operate within an EtherCAT network.



6.11.2 Product Specifications

EtherCAT ports

Item	Specifications
Connector	Dual-port network socket
Network protocols	EtherCAT communication protocol

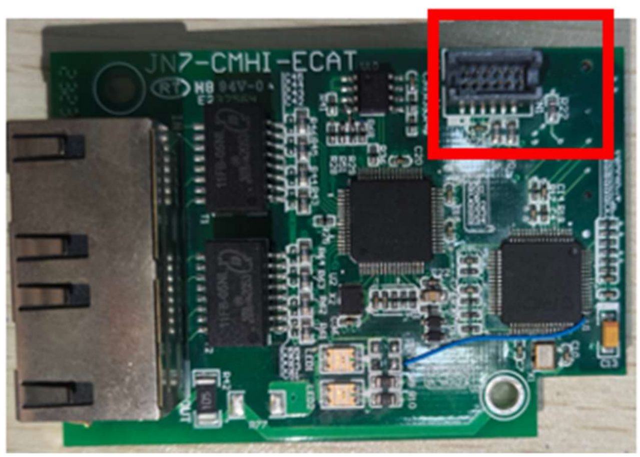
AC motor driver port

Item	Specifications
Connector	Connection between Control Board CN5 and Communication Card CN2
Terminal functions	1. The communication module communicates with the AC motor driver through this interface. 2. The AC motor driver provides power to the communication module through this interface.

6.11.3 Installation Instructions

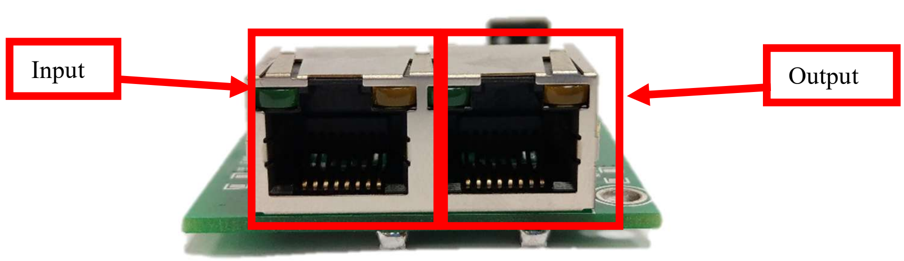
Communication module contact description

As shown in the figure below, the framed part is the CN2 connector that connects to the driver.



Communication module network socket

As shown in the figure below, the left socket is input and the right socket is output.



Driver parameter setting description

Users must first confirm related parameter settings on the driver in order to ensure that the communication module can connect normally.

Parameters	Parameter name	Settings	Settings descriptions
00-02	Operation command source	2	Communication control
00-05	Frequency command source	3	Communication control

6.11.4 LED Indicator Description

The module has two dual-color LED indicators built-in used to quickly diagnose and monitor the communication statuses between the module itself and the EtherCAT network.

Module status LED2

Used to monitor whether the communication module is operating normally.

Indicator statuses	Status name	Description
Does not light up	Power not supplied	Power not supplied
Red light flashes	Data transmitting	Driver and communication expansion module data transmitting
Red/green light lights up	Driver data transmission error	Data transmission error between the driver and communication expansion module

Network status LED1

Used to monitor the operability of the communication module EtherCAT network.

Indicator statuses	Status name	Description
Does not light up	Not connected / INIT	EtherCAT network not connected (INIT)
Green light flashes	Standby	Pre-operational (Pre-OP)
Green light lights up	Operation status	Operational (OP)
Red light lights up	Driver data transmission error	Data transmission error between the driver and communication expansion module

6.11.5 Object Index Table

Basic index

Index	Sub-Index	Name	Default value	R/W	Size	Remarks
1000H	0	Device type	00000192H	R	U32	
1001H	0	Error register	0	R	U8	
1008H	0	Manufacturer device name	JN5-CM-CAN	R	U32	
1009H	0	Manufacturer hardware version	Version	R	U32	
100AH	0	Manufacturer software version	Version	R	U32	
1018H	0	number of entries	4	R	U8	
	1	Vender ID	0000081BH	R	U32	
	2	Product code	00000001H	R	U32	
	3	Revision	00000001H	R	U32	
1600H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	60400010H	RW	U32	
	2	2.Mapped Object	60420010H	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1601H	0	Number of entries	2	RW	U8	
	1	1.Mapped Object	604F0010H	RW	U32	
	2	2.Mapped Object	60500010H	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1A00H	0	Number of entries	3	RW	U8	
	1	1.Mapped Object	60400010	RW	U32	
	2	2.Mapped Object	60420010	RW	U32	
	3	3.Mapped Object	604F0020	RW	U32	
	4	4.Mapped Object	0	RW	U32	
1A01H	0	Number of entries	3	RW	U8	
	1	1.Mapped Object	604F0020	RW	U32	
	2	2.Mapped Object	60500020	RW	U32	
	3	3.Mapped Object	0	RW	U32	
	4	4.Mapped Object	0	RW	U32	

Object part

Index	Sub-Index	Name	Default value	R/W	Size	Unit	PDO MAP
603F	0	Error code	0	RO	U16		Yes
6040	0	Control word	0	RW	U16		Yes
6041	0	Status word	0	RO	U16		Yes
6042	0	vl target velocity	0	RW	S16	Hz	Yes
6043	0	vl velocity demand	0	RO	S16	Hz	Yes
604F	0	vl ramp function time (acceleration time)	Driver default value	RW	U32	0.1S	Yes
6050	0	vl slow down time Deceleration time	Driver default value	RW	U32	0.1S	Yes

6.11.6 Troubleshooting

There are two indicators on top of the EtherCAT communication module. When a malfunction occurs, the cause of the malfunction can be confirmed based on the indicator statuses, and troubleshoot the error by following the descriptions below.

Indicator troubleshooting

Module status LED2

Indicator statuses	Status name	Troubleshooting method
Does not light up	Power not supplied	1. Confirm whether the driver power is normal. 2. Confirm whether the power terminal of the communication module is connected to the driver.
Red/green light lights up	Driver data transmission error	1. Confirm whether the communication module has proper contact. 2. Reconnect the power of the driver and confirm whether the error has been eliminated.

Network status LED1

Indicator statuses	Status name	Description
Does not light up	Not connected / INIT	1. Confirm whether the driver power is normal. 2. If connected to EtherCAT, confirm whether it is in INIT mode.
Red light lights up	Driver data transmission error	1. Confirm whether the communication module has proper contact. 2. Reconnect the power of the driver and confirm whether the error has been eliminated.

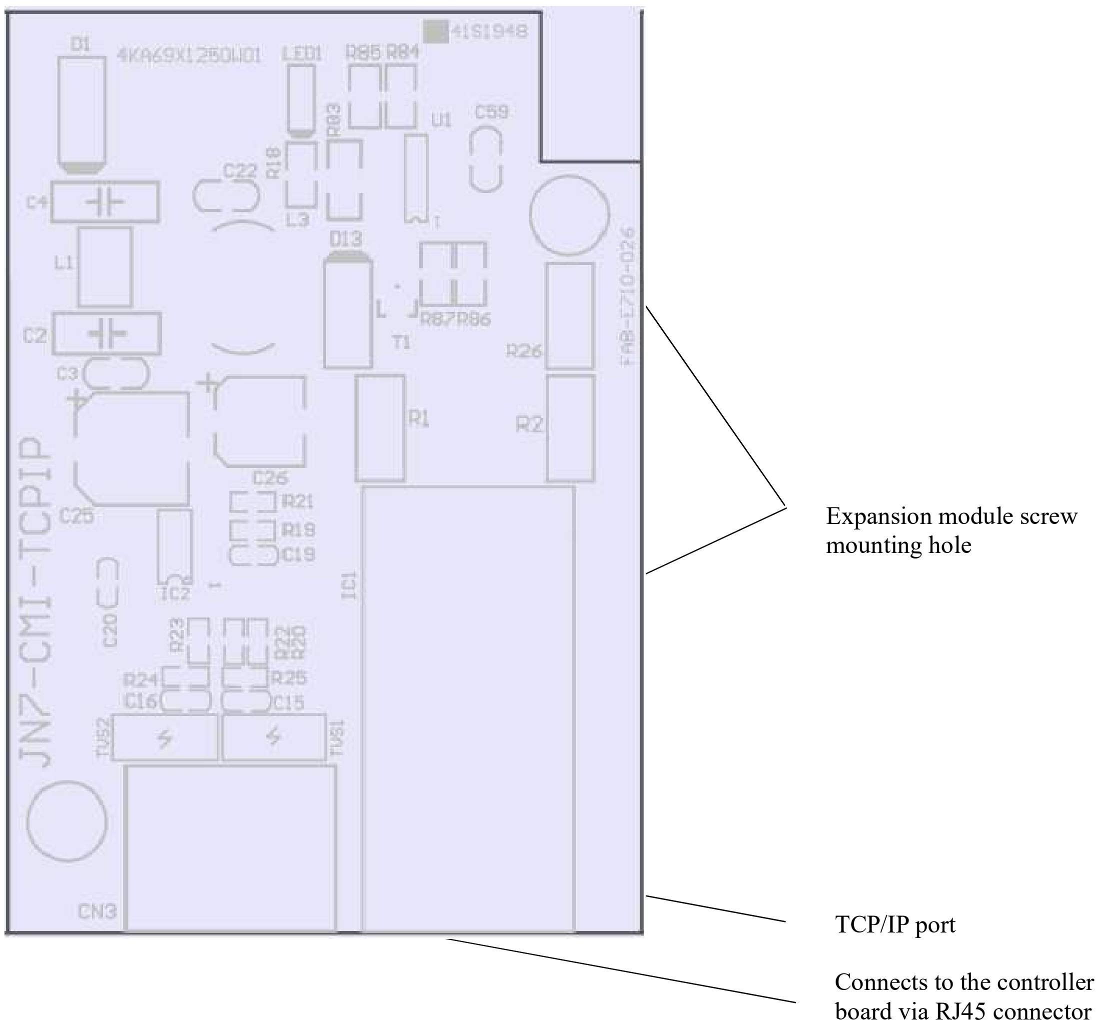
6.11.7 xml file

When using the EtherCAT communication module, if the xml description file (JN7-CMHI-ECAT_V (latest version).xml) is needed, please download it from the TECO official website or request for it from your purchasing sales channel.

6.12 Introduction to the TCP/IP Communication Expansion Module

6.12.1 Communication Hardware and Data Structure

This product is a TCP/IP communication expansion module (hereinafter referred to as the “communication module”), which enables remote configuration and communication via a TCP/IP network environment. This product is exclusively for use with the TECO E710 AC Motor Drive (hereinafter referred to as the “drive”), enabling the drive to operate on a TCP/IP network.



6.13 Communication Interface Modules

(a) PROFIBUS Communication Interface Module (JN5-CM-PDP)
· For wiring examples and communication program configuration, please refer to the "JN5-CM-PDP Communication Function Application Manual."

(b) DeviceNet Communication Interface Module (JN5-CM-DNET)
· For wiring examples and communication program configuration, please refer to the "JN5-CM-DNET Communication Function Application Manual."

(c) CANopen Communication Interface Module (JN5-CM-CAN)
· For wiring examples and communication program configuration, please refer to the "JN5-CM-CAN Communication Function Application Manual."

(d) TCP/IP Communication Interface Module (JN5-CM-TCPIP)
· For wiring examples and communication program configuration, please refer to the "JN5-CM-TCPIP Communication Function Application Manual."

Chapter 7 Appendix A: UL Instructions

- **Maximum surrounding air temperature rating of 40(Enclosed Type) / 50 (Open Type)°C**
- **This equipment is to be installed in an enclosure that provides a Pollution Degree 2 environment.**
- **Main Circuit Terminal Wiring**

UL approval requires crimp terminals when wiring the inverter's main circuit terminals. Use crimping tools as specified by the crimp terminal manufacturer. Teco recommends crimp terminals made by NICHIFU for the insulation cap.

The table below matches inverter models with crimp terminals and insulation caps.

Closed-Loop Crimp Terminal Size

Drive Product / Model E710	Wire Gauge (AWG / mm2) R/L1 S/L2 T/L3 U/T1 V/T2 W/T3	Terminal Screws	Crimp Terminal Model No.	Tool Machine No.	Insulation Cap Model No.
2P5 (11-701-2□-2P8-□□□)	14 (2)	M4	R2-4	Nichifu NH 1 / 9	TIC 2
201 (11-701-2□-4P8-□□□)	14 (2)	M4	R2-4	Nichifu NH 1 / 9	TIC 2
202 (11-701-2□-7P5-□□□)	12 (3.5)	M4	R3.5-4	Nichifu NH 1 / 9	TIC 3.5
203 (11-701-2□-011-□□□)	10 (5.5)	M4	R5.5-4	Nichifu NH 1 / 9	TIC 5.5
205 (11-701-23-017-□□□)	8 (8)	M4	R8-4	Nichifu NOP 60 ; NH 1 / 9	TIC 8
208 (11-701-23-025-□□□)	8 (8)	M4	R8-4	Nichifu NOP 60 ; NH 1 / 9	TIC 8
401 (11-701-43-2P7-□□□)	14 (2)	M4	R2-4	Nichifu NH 1 / 9	TIC 2
402 (11-701-43-4P2-□□□)	14 (2)	M4	R2-4	Nichifu NH 1 / 9	TIC 2
403 (11-701-43-5P5-□□□)	14 (2)	M4	R2-4	Nichifu NH 1 / 9	TIC 2
405 (11-701-43-009-□□□)	12 (3.5)	M4	R3.5-4	Nichifu NH 1 / 9	TIC 3.5
408 (11-701-43-013-□□□)	10 (5.5)	M4	R5.5-4	Nichifu NH 1 / 9	TIC 5.5
410 (11-701-43-017-□□□)	8 (8)	M4	R84	Nichifu NH 1 / 9	TIC 8

Terminal Block Wire Range and Torque Recommended

Driver Product / Model E710	Terminal rating, Wire Range (AWG) and Torque (lb.in) Input Terminal Block	Output Terminal Block
2P5 (11-701-2□-2P8-□□□) 201 (11-701-2□-4P8-□□□)	14AWG(Sol/Str), 8.5 lb.in(9.79 kgf.cm)	14AWG(Sol/Str), 8.5 lb.in(9.79 kgf.cm)
202 (11-701-2□-7P5-□□□)	12AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	12AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
203 (11-701-2□-011-□□□)	10AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	10AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
205 (11-701-23-017-□□□)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
208 (11-701-23-025-□□□)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
401 (11-701-43-2P7-□□□) 402 (11-701-43-4P2-□□□)	14AWG(Sol/Str), 8.5 lb.in(9.79 kgf.cm)	14AWG(Sol/Str), 8.5 lb.in(9.79 kgf.cm)
403 (11-701-43-5P5-□□□)	14AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	14AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
405 (11-701-43-009-□□□)	12AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	12AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
408 (11-701-43-013-□□□)	10AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	10AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)
410 (11-701-43-017-□□□)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)	8AWG(Sol/Str), 12 lb.in(13.82 kgf.cm)

■ Type 1

During installation, all conduit hole plugs shall be removed, and all conduit holes shall be used.

Recommended Input Fuse Selection

Drive Product / Model E710	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
200 V Class Single/Three-Phase Drives		
2P5 (11-701-2□-2P8-□□□)	Bussmann FWC-16A10F	600V 16A
201 (11-701-2□-4P8-□□□)	Bussmann FWC-20A10F	600V 20A
202 (11-701-2□-7P5-□□□)	Bussmann FWC-32A10F	600V 32A
203 (11-701-2□-011-□□□)	Bussmann 50FE	700V 50A
205 (11-701-23-017-□□□)	Bussmann 50FE	700V 50A
208 (11-701-23-025-□□□)	Bussmann 63FE	700V 63A

Drive Product/ Model E710	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
400 V Class Three-Phase Drives		
401 (11-701-43-2P7-□□□)	BussmannFWC-10A10F	600V 10A
402 (11-701-43-4P2-□□□)	BussmannFWC-16A10F	600V 16A
403 (11-701-43-5P5-□□□)	BussmannFWC-16A10F	600V 16A
405 (11-701-43-009-□□□)	BussmannFWC-25A10F	600V 25A
408 (11-701-43-013-□□□)	Bussmann 40FE	700V 40A
410 (11-701-43-017-□□□)	Bussmann 50FE	700V 50A

■ Motor Over-temperature Protection

Motor over temperature protection is not provided.
Motor over-temperature protection shall be provided in the end use application.

■ Solid State Motor Overload Protection

Solid State Motor Overload Protection: 116% of motor FLA.

■ Field Wiring Terminals

All input and output field wiring terminals not located within the motor circuit shall be marked to indicate the proper connections that are to be made to each terminal and indicate that copper conductors, rated 75°C are to be used.

■ Branch circuit protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

■ Inverter Short-Circuit Rating

This inverter has undergone the UL short-circuit test, which certifies that during a short circuit in the power supply the current flow will not rise above value. Please see electrical ratings for maximum voltage and table below for current.

• The MCCB and breaker protection and fuse ratings (refer to the preceding table) shall be equal to or greater than the short-circuit tolerance of the power supply being used.
• Suitable for use on a circuit capable of delivering not more than (A) RMS symmetrical amperes for right side table in 240 / 480 V class drives motor overload protection.

Horse Power (Hp)	Current (A)	Voltage (V)
1/4-50	5,000	240 / 480

Préface

- Le produit est un lecteur conçu pour commander un moteur à induction triphasé. lire attentivement ce manuel pour garantir le bon fonctionnement, la sécurité et pour se familiariser avec les fonctions d'entraînement.
- Le lecteur est un appareil électrique / électronique et doit être installé et géré par un personnel qualifié
- Une mauvaise manipulation peut entraîner un fonctionnement incorrect, cycle de vie plus court, ou l'échec de ce produit ainsi que le moteur.
- Tous les documents sont sujets à changement sans préavis. Soyez sûr d'obtenir les dernières éditions de l'utilisation ou visitez notre site Web
- Lire le manuel d'instructions avant de procéder à l'installation, les connexions (câblage), le fonctionnement ou l'entretien et l'inspection.
- Vérifiez que vous avez une bonne connaissance de l'entraînement et de vous familiariser avec les consignes de sécurité et les précautions avant de procéder à fonctionner le lecteur.
- prêter attention aux consignes de sécurité indiquées par l'avertissement et symbole Attention .

Avertissement

ignorer les informations indiquées par le symbole d'avertissement peut entraîner la mort ou des blessures graves.

Attention

ignorer les informations indiquées par le symbole de mise en garde peut entraîner des blessures mineures ou modérées et / ou des dommages matériels importants.

Chapitre 8 Consignes de sécurité

8.1 avant d'alimenter le disque dur

Avertissement

- Le circuit principal doit être correctement câblée. Pour les terminaux monophasés d'approvisionnement de l'utilisation des intrants (R/L1, T/L3) et de trois bornes d'entrée de l'utilisation de l'offre de phase (R/L1, S/L2, T/L3). U/T1, V/T2, W/T3 ne doivent être utilisés pour connecter le moteur. Raccordement de l'alimentation d'entrée à l'un des U/T1, V/T2 W/T3 ou bornes risque d'endommager le lecteur.

Attention

- Pour éviter que le couvercle ne se désengage ou de tout autre dommage physique, ne portez pas le lecteur par son couverture. Soutenir le groupe par son dissipateur de chaleur lors du transport. Une mauvaise manipulation peut endommager le lecteur ou blesser le personnel, et doit être évitée.
- Pour éviter que les risques d'incendie, ne pas installer le lecteur sur ou à proximité d'objets inflammables. Installer sur des objets ininflammables comme les surfaces métalliques.
- Si plusieurs disques sont placés dans le même panneau de contrôle, fournir une ventilation adéquate pour maintenir la température en dessous de 40 ° C/104 ° F (50 ° C/122 ° F sans housse de protection) pour éviter la surchauffe ou incendie.

Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses.

Avertissement

- Lors d'un retrait ou d'installation de l'opérateur numérique, éteignez-le d'abord, puis de suivre les instructions de ce manuel pour éviter les erreurs de l'opérateur ou de la perte de l'affichage causé par des connexions défectueuses....

8.2 Câblage

Avertissement

- Coupez toujours l'alimentation électrique avant de procéder à l'installation d'entraînement et le câblage des terminaux utilisateurs.
- Le câblage doit être effectué par un personnel qualifié / électricien certifié.
- Assurez-vous que le lecteur est correctement mis à la terre. (220V Classe: impédance de mise à la terre doit être inférieure à 100Ω Classe 440V:. Impédance de mise à la terre doit être inférieure à 10Ω.)
- vérifier et tester mes circuits d'arrêt d'urgence après le câblage. (L'Installateur est responsable du câblage.)
- Ne touchez jamais de l'entrée ou de lignes électriques de sortie permettant directement ou toute entrée ou de lignes de puissance de sortie à venir en contact avec le boîtier d'entraînement.
- Ne pas effectuer un test de tenue en tension diélectrique (mégohmmètre) sur le disque dur ou cela va entraîner des dommages de lecture pour les composants semi-conducteurs.

Attention

- La tension d'alimentation appliquée doit se conformer à la tension d'entrée spécifiée par le lecteur. (Voir la section signalétique du produit)
- Raccorder la résistance de freinage et de l'unité de freinage sur les bornes assignées.
- Ne pas brancher une résistance de freinage directement sur les bornes CC P (+) et N (-), sinon risque d'incendie.
- Utilisez des recommandations de la jauge de fil et les spécifications de couple. (Voir Wire Gauge et la section de spécification de couple)。
- Ne jamais brancher l'alimentation d'entrée aux bornes onduleur de sortie U/T1, V/T2, W/T3.
- Ne pas brancher un contacteur ou interrupteur en série avec le variateur et le moteur.
- Ne branchez pas un facteur condensateur de correction de puissance ou suppresseur de tension à la sortie du variateur 。
- S'assurer que l'interférence générée par l'entraînement et le moteur n'a pas d'incidence sur les périphériques.

8.3 Avant l'opération

Avertissement

- Assurez-vous que la capacité du disque correspond aux paramètres de notation avant d'alimenter.
- Réduire le paramètre de la fréquence porteuse si le câble du variateur au moteur est supérieure à 80 pi (25 m). Un courant de haute fréquence peut être générée par la capacité parasite entre les câbles et entraîner un déclenchement de surintensité du variateur, une augmentation du courant ou d'une lecture actuelle inexactes.
- Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement.
- Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir autrement.
- Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté, même si le lecteur est arrêté, un choc électrique pourrait survenir autrement.

8.4 Configuration Paramètre

Attention

- Ne branchez pas une charge pour le moteur tout en effectuant un auto-tune.
- Assurez-vous que le moteur peut fonctionner librement et il y a suffisamment d'espace autour du moteur lors de l'exécution d'un auto-tune rotation.

8.5 Opération

Avertissement

- Veillez à installer tous les couvercles avant de l'allumer. Ne retirez pas les capots pendant que l'alimentation du lecteur est allumé, un choc électrique peut se produire autrement.
- Ne pas brancher ou débrancher le moteur pendant le fonctionnement. Le variateur pourrai se déclencher et ainsi endommager le lecteur.
- Les opérations peuvent commencer soudainement si une alarme ou un défaut est réarmé avec un ordre de marche active. Assurez-vous qu'un ordre de marche est actif lors de la réinitialisation de l'alarme ou de défaut, autrement des accidents peuvent se produire.
- Ne pas actionner d'interrupteurs avec les mains mouillées, un choc électrique pourrait survenir .
- Un interrupteur d'urgence externe indépendant est fourni, qui s'arrête en urgence vers le bas la sortie de l'onduleur en cas de danger.
- Si le redémarrage automatique après une récupération d'énergie est activée, le variateur démarrera automatiquement après le rétablissement du courant.
- Assurez-vous qu'il est sûr de faire fonctionner le variateur et le moteur avant d'effectuer un auto-tune rotation.
- Ne touchez pas les bornes d'entraînement lorsqu'il est alimenté même si l'onduleur s'est arrêté, un choc électrique pourrait survenir .
- Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.
- Après la mise hors tension, le ventilateur de refroidissement peut continuer à fonctionner pendant un certain temps.

Attention

- Ne touchez pas les composants générant de la chaleur tels que radiateurs et des résistances de freinage.
- Vérifiez soigneusement la performance du moteur ou de la machine avant d'utiliser à grande vitesse, sous peine de blessure.
- Notez les réglages des paramètres liés à l'unité de freinage lorsque applicable.
- Ne pas utiliser la fonction de freinage d'entraînement pour un maintien mécanique, sous peine de blessure.
- Ne pas contrôler les signaux sur les circuits pendant que le lecteur est en marche.

8.6 Entretien, Inspection et remplacement

Avertissement

- Attendre un minimum de 5 minutes après que l'alimentation a été débranchée avant de commencer une inspection. Vérifiez également que le voyant de charge est éteint et que la tension du bus cc a chuté au-dessous de 25Vdc.
- Ne jamais toucher les bornes à haute tension dans le lecteur.
- Assurez-vous que l'alimentation du lecteur est débranché avant de démonter le lecteur.
- Seul le personnel autorisé peuvent faire l'entretien, l'inspection et les opérations de remplacement. (Enlevez les bijoux en métal tels que les montres et les bagues et utiliser des outils isolés.)

Attention

- Le variateur peut être utilisé dans un environnement avec une gamme de température allant de 14 ° -104 ° F (10-40 ° C) et l'humidité relative de 95% sans condensation.
- Le variateur doit être utilisé dans un environnement sans poussière, gaz, vapeur et humidité.

8.7 Mise au rebut du variateur

Attention

- jeter cet appareil avec soin comme un déchet industriel et selon les réglementations locales nécessaires.
- Les condensateurs du circuit principal d'entraînement et circuits imprimés sont considérés comme des déchets dangereux et ne doivent pas être brûlés.
- The Plastic enclosure and parts of the drive such as the top cover board will release harmful gases if burned.

Les équipements contenant des composants électriques ne doivent pas être éliminés avec les ordures ménagères. Il doit être collecté séparément avec les déchets électriques et électroniques conformément à la législation locale en vigueur.

Product Documentation Appendix

Name and Content of Hazardous Substances in the Product

Component Name		Hazardous Substances or Elements					
		Lead and Its Compounds (Pb)	Mercury and Its Compounds (Hg)	Cadmium and Its Compounds (Cd)	Hexavalent Chromium Compounds (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Electronic Components	Electronic Parts	X	O	O	O	O	O
	Electromagnetic contactor	O	O	X	O	O	O
Display		O	O	O	O	O	O
Wires and Cables	Terminals	X	O	O	O	O	O
	Conductors	O	O	O	O	O	O
	Insulation Components	O	O	O	O	O	O
Mechanical Parts	Conductive Copper Columns, Fans, Thermostats	X	O	O	O	O	O
	Others	O	O	O	O	O	O

This table is compiled in accordance with the provisions of SJ/T 11364.
O: Indicates that the content of the toxic or hazardous substance in all homogeneous materials of the component is below the limit requirements set forth in GB/T 26572.
X: Indicates that the content of the toxic or hazardous substance in at least one of the homogeneous materials of the component exceeds the limit requirements set forth in GB/T 26572.
Definition of Component Categories in Major Components:
Electronic Components – Includes electronic elements, soldered printed circuit boards, etc.
Display – Includes display units, electronic components, or touchscreens.
Wires and Cables – Includes terminals, connectors, shielding wires, sheaths, and electronic parts.
Mechanical Parts – Refers to all parts excluding those already defined as electronic components, displays, and wires/cables.

Explanation of Environmental Protection Use Period (EPUP):
Within the environmental protection use period, this product will not release or leak hazardous substances under normal usage, nor will it pose health risks to consumers. It can be used with confidence.
TECO guarantees an EPUP of 10 years for this product. The "environmental protection use period" is valid only when the product is used under the conditions specified in this manual.
Disclaimer: **The information provided by TECO** regarding the content of substances in its products represents **TECO's** knowledge and understanding of the product at the time such information is provided. **TECO's** knowledge and understanding are based on information provided by third-party suppliers, and **TECO** makes no representations or warranties as to the accuracy of such third-party information. **TECO** may not have conducted destructive testing or chemical analysis on the materials or chemicals used. The use of the above products and **TECO's** related responsibilities shall be governed by **the Company's** standard contractual terms and conditions.

CDM losses and efficiency table

				❾	❽		❻		❸		❼		❺		❷		❹		❶		❿	
Modul name	Nominal voltage(V)	Nominal Current(A)	Nominal apparent KVA	CDM STANDBY LOSS	CDM (24,25)		CDM (24,50)		CDM (24,100)		CDM (50,25)		CDM (50,50)		CDM (50,100)		CDM (90,50)		CDM (90,100)		CDM (100,100)	
					p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)	p Loss(W)	η(%)
E710-401-H3	380	2.8	1.7	9.0	24.7	79.2	27.0	87.1	32.3	91.2	25.0	88.7	27.6	93.2	33.6	95.4	28.6	96.0	35.8	**97.2**	36.4	97.5
E710-402-H3	380	4.8	2.9	9.0	30.1	82.9	34.1	89.2	43.6	92.3	30.6	90.9	35.1	94.4	45.8	96.0	37.1	96.6	50.0	**97.5**	51.1	97.7
E710-403-H3	380	7.5	4.0	9.0	33.5	85.1	38.6	90.6	50.6	93.1	34.2	92.1	39.9	95.1	53.2	96.4	42.2	97.0	58.3	**97.8**	59.8	98.0
E710-405-H3	380	11	7.0	9.0	45.1	87.4	53.0	92.0	71.5	94.0	46.1	93.4	55.0	95.8	75.6	96.9	58.7	97.5	83.7	**98.1**	86.0	98.2
E710-408-H3	380	17	9.9	9.0	48.4	90.3	61.1	93.5	98.4	94.7	50.5	94.9	65.6	96.5	110.8	97.0	75.7	97.7	140.0	**97.9**	149.2	98.0
E710-410-H3	380	25	13.3	9.0	63.3	90.3	81.1	93.4	132.0	94.5	66.1	94.9	87.3	96.5	148.7	97.0	101.2	97.7	188.4	**97.8**	201.0	97.9
E710-2P5-H3	220	2.7	1.0	6.0	21.9	75.9	22.3	82.6	25.0	88.2	22.3	86.5	23.0	90.6	26.3	93.7	24.4	94.2	29.0	**96.0**	29.8	96.3
E710-201-H3	220	4.2	1.7	6.0	24.6	79.7	27.8	87.0	35.5	90.7	25.2	88.9	29.2	93.0	38.3	95.0	31.9	95.7	44.4	**96.7**	46.3	96.9
E710-202-H3	220	5.5	2.9	6.0	30.3	83.3	35.3	89.2	47.2	92.0	31.3	91.0	37.5	94.2	52.2	95.6	42.4	96.3	63.7	**97.0**	67.3	97.1
E710-203-H3	220	9	4.0	9.0	40.3	84.6	47.4	90.0	64.4	92.5	41.9	91.7	50.8	94.6	72.2	95.8	58.5	96.5	90.5	**97.1**	96.3	97.2
E710-205-H3	220	13	6.7	9.0	50.8	87.1	61.1	91.6	84.9	93.5	53.0	93.1	65.4	95.5	94.0	96.5	73.7	97.1	112.1	**97.6**	117.4	97.8
E710-208-H3	220	17	9.9	9.0	58.1	89.7	75.4	92.8	127.8	93.8	61.1	94.5	82.1	96.1	146.4	96.5	97.5	97.4	192.2	**97.4**	206.9	97.5
E710-2P5-H1	220	2.8	1.0	6.0	22.0	75.8	22.4	82.5	25.3	88.1	22.7	86.3	23.6	90.3	27.6	93.4	26.3	93.8	33.4	**95.5**	35.2	95.7
E710-201-H1	220	4.8	1.7	6.0	24.7	79.7	28.0	87.0	36.0	90.6	25.6	88.7	30.1	92.8	40.8	94.7	34.9	95.3	52.6	**96.1**	56.4	96.2
E710-202-H1	220	7.5	2.9	9.0	33.6	81.8	38.8	88.3	51.4	91.3	35.1	90.0	42.3	93.5	59.5	95.0	50.5	95.6	79.6	**96.2**	86.1	96.3
E710-203-H1	220	11	4.0	9.0	40.7	84.5	48.3	89.9	66.6	92.3	43.3	91.4	54.1	94.3	80.5	95.4	68.5	95.9	115.9	**96.3**	127.4	96.3

TECO Electric & Machinery Co., Ltd.
東元電機股份有限公司
10F., No.3-1, Park St., Nangang District,
Taipei City 115, Taiwan
115台北市南港區園區街3-1號10樓
Tel :+886-2-6615-9111
Fax :+886-2-6615-0933

Distributor

https://www.teco.com.tw

4KA72X823T01 Ver:01 2025.06

Please link to our website, to download the instruction manual of this product for proper use.
請連結至本公司官網，下載使用說明書，以能正確的使用本產品。