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Installation and maintenance Instruction

HPVFV
Vector Inverter

HP VER 31.31

Contents

1.SAFETY

ONLY A COMPETENT ELECTRICIAN SHOULD CARRY OUT THE ELECTRICAL INSTALLATION.

1.1 Warnings

1 Internal Components and circuit boards (excepting the isolated I/O terminals) apply an electric current when HPVFV inverter is connected to the main voltage. This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.

2 When HPVFV is connected to the main power, the current is flowing in the motor connections (U, V, W), DC-Link (P, N) and Dynamic Brake Resistor Connections (R+,R-) even if the motor is not running.

3 If there is control power (220Vac) in HPVFV inverter, the current is flowing in the motor connections (U, V, W), DC-Link (P, N) and Dynamic Brake Resistor Connections (R+,R-).

This voltage is extremely dangerous and may cause death or severe injury if you come in contact with it.

4 The control I/O terminals are isolated from the main voltage but the relay outputs and other I/Os may have dangerous voltage connected even if the power is disconnected from the HPVFV.

5 HPVFV inverter has a large capacitive leakage current.

6 If a HPVFV inverter is used as a part of the machine, the machine manufacturer is obliged to take care that the inverter has a main switch and power fuse in the machine.

7 Spare parts can be delivered only by SOLCOM&HAPN Electric Co.,Ltd.

1.2 Safety instructions

1 Do NOT make any connections when the HPVFV is connected to the main voltage.

2 Do NOT make any measurements when the HPVFV is connected to the main voltage.

3 After disconnecting the main power, wait until the cooling fan stops and the indicator of keypad goes out. Wait a further 5 minutes before doing any work on HPVFV connections. Do NOT open even the cover within this time.

4 Do NOT make any voltage withstand tests on any parts of the HPVFV inverter.

5 Disconnect motor cables from HPVFV before making any measurements on the motor cables or motors.

6 Do NOT touch the IC-circuits on the circuit boards. Static voltage discharge may destroy the components.

7 Make sure that the cover of HPVFV inverter is closed before connecting the main voltage.

Ground

The ground terminal of HPVFV inverter has to contact with ground wire.

Ground of HPVFV inverter prevents high voltage accidents that are caused by switching.

Warning Sign

Please be more cautious for the following warning signs for user's safety.

= Dangerous Voltage

= General Warning

1.3 Running the motor

1 Before running the motor, be cautious not to have any safety accident. Make sure that the motor is mounted properly. Check the parameters are set properly.

2 Maximum motor speed (frequency) should always be set according to the motor and machine connected to the motor.

3 Before reversing the rotation of the motor shaft, make sure that this can be done safely.

2.Checking

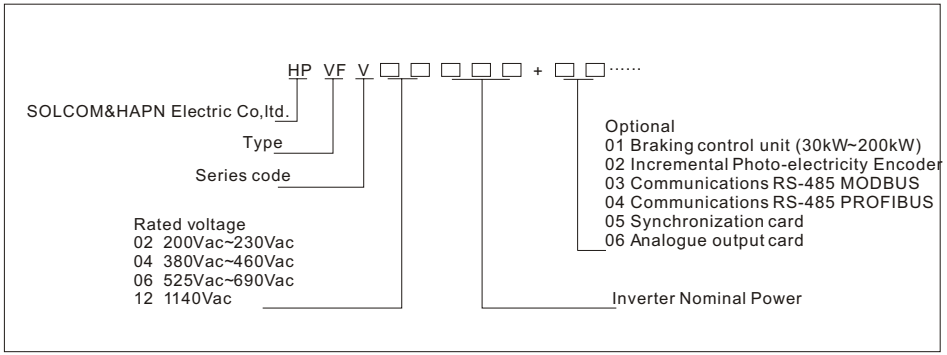
2.1 Checking

This HPVFV inverter has been subjected to demanding factory tests before shipment. After unpacking, check if the device does not show any sign of damage and any missing parts. (Refer to the type designation code in table 2.1-1). In the event of damage, please contact the insurance company involved or the supplier. If the delivery is not in compliance with the order, please contact the supplier immediately.

TYPE	HPVFV 04160	Inverter Model
Power Rating	160[kW]	Inverter Nominal Power
Rated Current	325[A]	Inverter Rated Current
Max. Current	473[A]	Max Current
Voltage	380[V]~460[V]	Inverter Input Voltage Range

Table 2.1-1 Inverter Label (This is attached the side of inverter.)

2.2 Inverter Type



2.3 Storing and Warranty

Check the ambient conditions in the storage room before the first commissioning. (Temperature: -40℃ ~ +50℃, relative humidity < 95%, no condensation allowed). SOLCOM&HAPN Electric Co.,Ltd. will not be responsible for the damage caused by ambient conditions. The period of manufacturer's warranty is 12 months from the date of delivery. The local distributor may have a different warranty period, which is specified in heir terms and conditions and warranty terms. If any queries concerning the warranty arise, please contact your distributor.

2.4 Power rating

ICT = rated input and output current (constant torque load)

Main Voltage 380V - 460V, 50/60Hz

Inverter Type	Rated OutputPower P(kW)	Rated Current I_{CT}(A)	Size	Dimension WxHxD (mm)	Weight (kg)
HPVFV0405.5	5.5	12	A1	195×370×188	8
HPVFV0407.5	7.5	16			
HPVFV04011	11	23.5			
HPVFV04015	15	31	B11	195×363×285	11
HPVFV0418.5	18.5	38	B1	195×460×301	18.5
HPVFV04022	22	45			
HPVFV04030	30	61	C1	283×490×319	34
HPVFV04037	37	72			
HPVFV04045	45	88			
HPVFV04055	55	107	D1	252×787×353	61
HPVFV04075	75	146			
HPVFV04090	90	174			
HPVFV04110	110	212			
HPVFV04132	132	252	E1	496×860×436	111
HPVFV04160	160	305			
HPVFV04200	200	382			
HPVFV04250	250	478	F1	555×1050×454	188
HPVFV04315	315	598			
HPVFV04400	400	759			

Main Voltage 660V - 690V, 50/60Hz

Inverter Type	Rated OutputPower P(kW)	Rated Current I_{CT}(A)	Size	Dimension WxHxD (mm)	Weight (kg)
HPVFV06030	30	35	A21	284×490×306	24
HPVFV06037	37	42	A2	250×650×336	*
HPVFV06045	45	50			
HPVFV06055	55	61			
HPVFV06075	75	84	B2	250×850×341	*
HPVFV06090	90	100			
HPVFV06110	110	122			
HPVFV06132	132	145	C2	527×1000×446	*
HPVFV06160	160	175			
HPVFV06200	200	220			
HPVFV06250	250	275			
HPVFV06315	315	343	D2	730×1400×470	*
HPVFV06400	400	435			
HPVFV06500	500	544			

Main Voltage 1140V, 50/60Hz

Inverter Type	Rated OutputPower P(kW)	Rated Current I_{CT}(A)	Size	Dimension WxHxD (mm)	Weight (kg)
HPVFV12110	110	73	A3	366×906×442	*
HPVFV12132	132	82			
HPVFV12160	160	103	B3	575×1000×418	*
HPVFV12200	200	128			
HPVFV12250	250	160			
HPVFV12315	315	202	C3	650×1500×469	*
HPVFV12400	400	255			
HPVFV12560	560	320			
HPVFV12630	630	375	*	*	*

The frame B1 is suitable for 15kW HPVFV inverter.
The frame B11 is suitable for 15kW HPVFV scheme only,
Please consult with supplier if requires 220V main voltage.

Note:

Isolation testing is quite necessary if the motor has been standing idle for a long time, and make sure the resistance is not less than 5M

If the working voltage is out of nominal value, please connect with a matched transformer device.

If the attitude is higher than 1000m, the working output frequency will be reduced because of the physical cooling. The effect as figure 2.4-1:

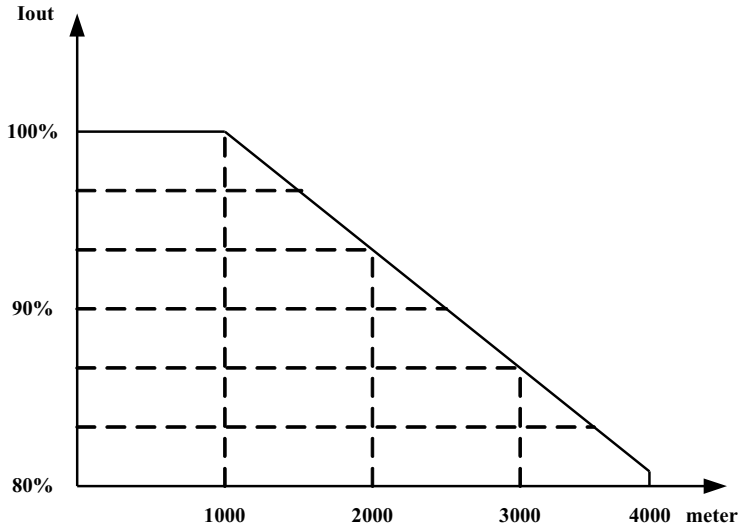


Figure 2.4-1 Derating curve drauing of Frequency converter

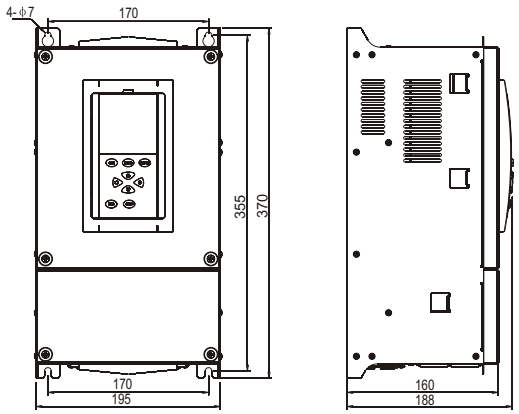
2.5 External Dimension

HPVFV inverter should be mounted in a vertical position on the wall or on the back plane of a cubicle. Follow the requirement for cooling. See chapter 3.2 for dimensions.

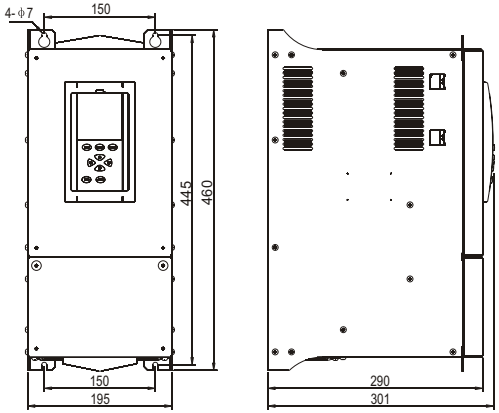
To ensure a safe installation, make sure that the mounting surface is relatively flat.

Fixing is done with four or more screws or bolts depending on the size of the unit. See Figure 2.5-1.

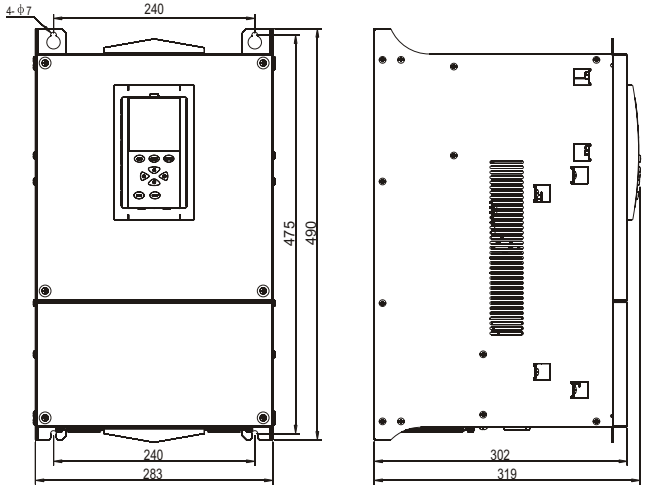
A1



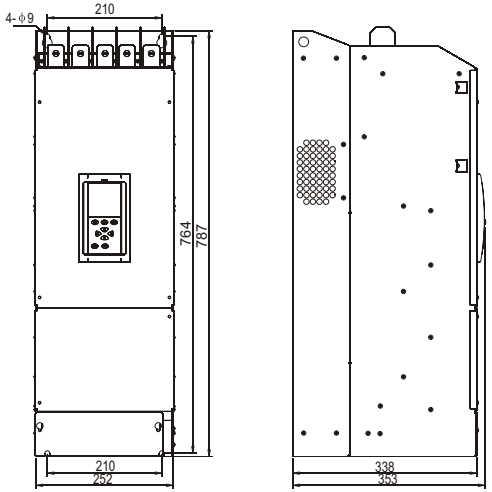
B1



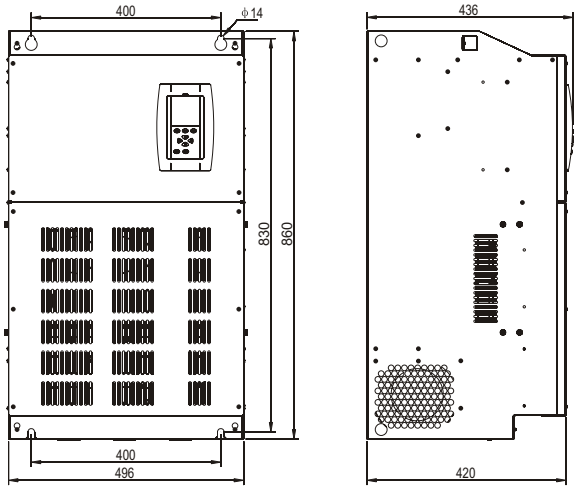
C1



D1



E1



F1

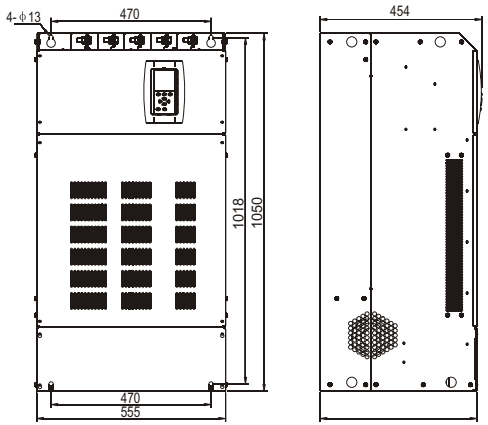
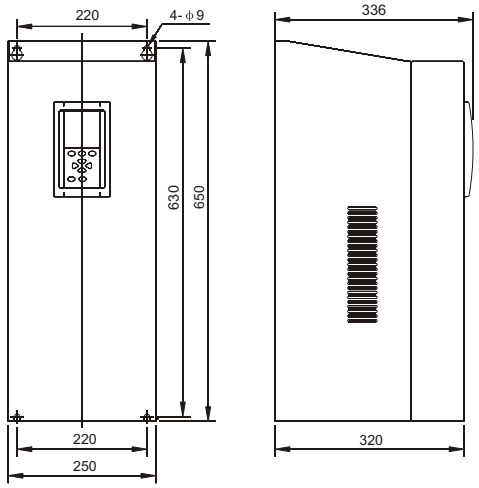


Figure 2.5-1(a) Mounting dimensions

A2



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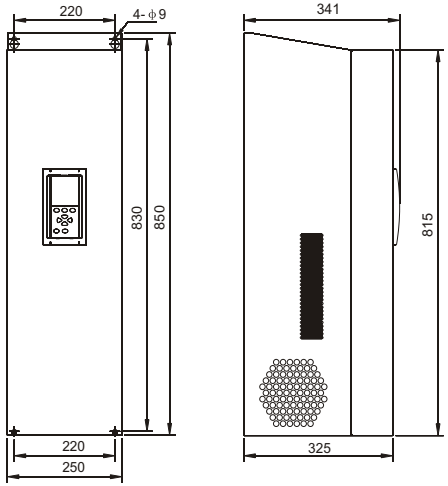

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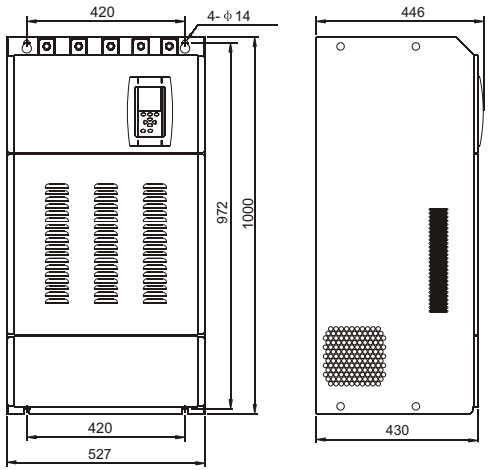

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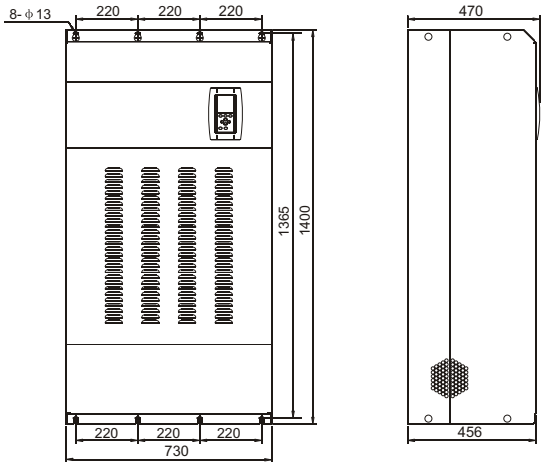
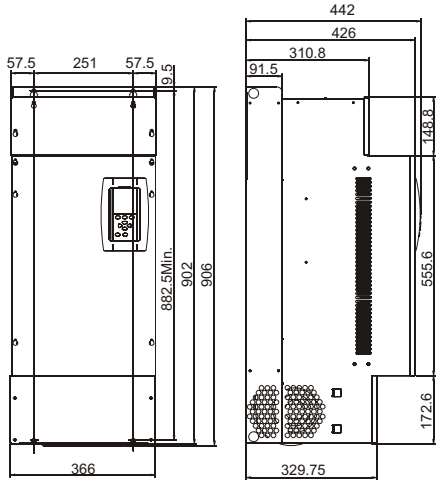
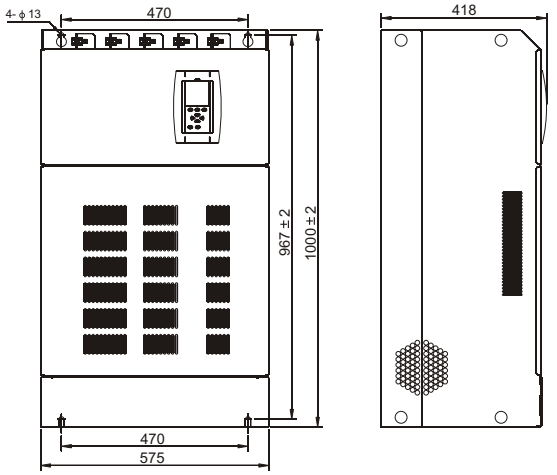


Figure 2.5-1(b) Mounting dimensions

A3



B3



C3

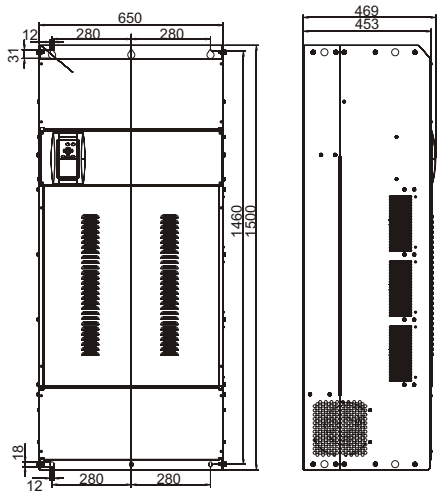
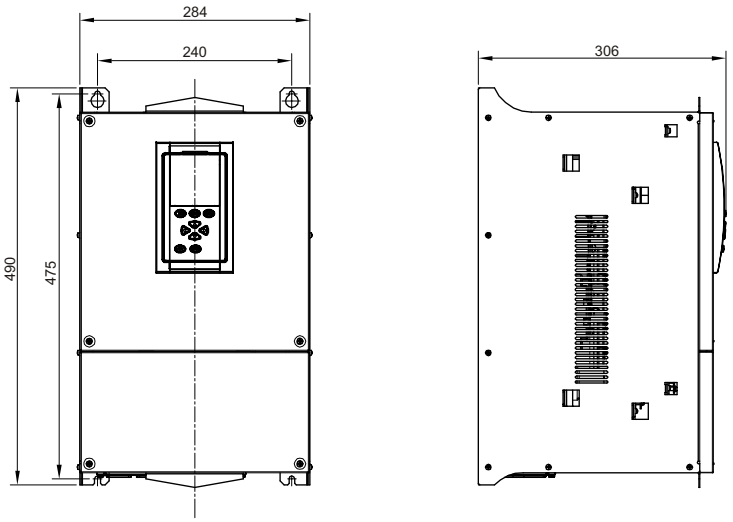
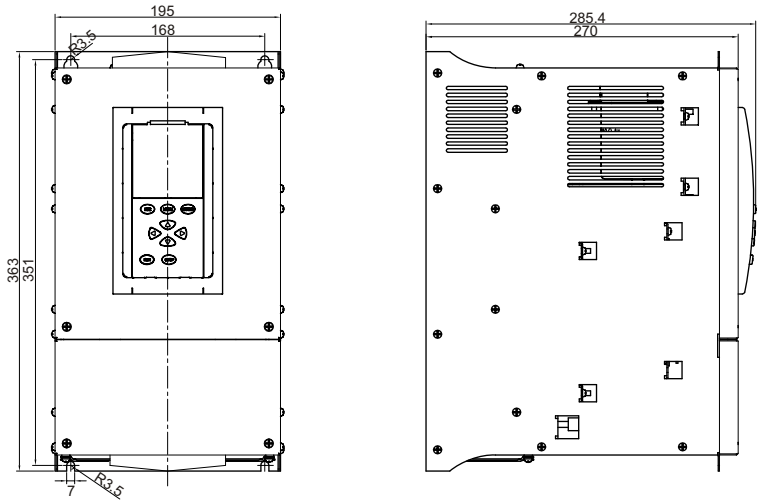


Figure 2.5-1(c) Mounting dimensions

A21

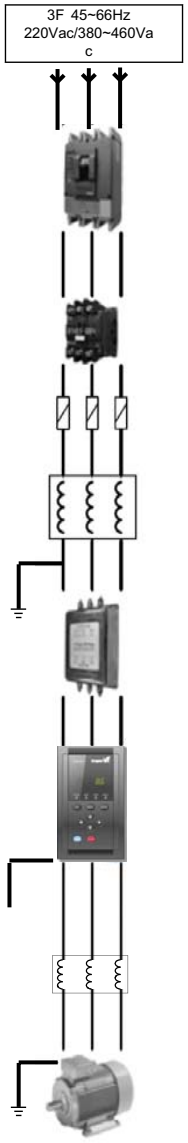


B11



2.6 Usage of auxiliary equipment

When using a HPVFV Inverter, it is recommended to use right auxiliary equipments. If the auxiliary equipments are not right for HPVFV inverter, it can cause damage to the inverter. Therefore, follow the recommended specifications for configuration.



Input source
Should be used within rated source indicated on the manual.

Earth leakage circuit breaker (ELCB)
When the Main Power in On, Very big inrush current can be occurred, So, You should be care when you choose the spec. about this.

Magnetic contactor
You should not run or stop the Driver using this contactor.

Fuse
Use the fuse to protect the Driver

AC reactor
It improves the power factor and reduces the ripple current of inverter Capacitors.

RFI (radio frequency interference) filter
RFI reduce the noise copied at Input source Line, and can protect the malfunction of equipment.

Line connection of inverter
Inverter can be damaged because wrong connection. Signal Line should separate from Power Line and should be used the shield cables.

Output of inverter
Do not Connect the magnetic Contactor, Phase advance Capacitor, Surge Absorber at output of Inverter.

Place to install
Life time of Inverter is influenced by ambient temperature. Inverter should be installed at the place is well ventilated. You should not install at a airtight room.

2.7 Specifications

Main Connection	Input Voltage Vin		3 Phase 200Vac~230Vac, 380Vac~460Vac, 660Vac~690Vac±10% 3 Phase 1200Vac	
	Input Frequency		50Hz~60Hz (±10%)	
	Connection to the Main		Don't turn on or off the inverter more than 1 times within 1 min.	
Rated Output	Output Voltage		0 ~95% of Vin	
	Continuous Output current		Ict : ambient max. +40℃ Over load 1.5xIct (1min./10min.) Ivt : ambient max. +40℃, not Over load	
	Starting Torque		150%~200% (0.5Hz) in Sensorless V/F Control 150% ~200% (0Hz) in Sensorless Vector Control	
	Output Frequency/speed		Sensorless : 0.0~300.0[Hz] / 0.0~3000.0[Hz] Sensored : 0~8000 [rpm]	
	Frequency/speed resolution		Sensorless V/F : 0.01Hz / 0.1Hz Sensorless & Sensored Vector : 1[rpm]	
Control Characteristics	Control Method		Sensorless V/F Frequency Control Sensorless V/F Speed Control Sensorless Vector Speed Control Sensorless Torque Control Sensored Vector Speed Control Sensored Torque Control	
	Switching Frequency	1.0~5.0[kHz]	400V 200V 690V	5.5kW~90kW 5.5kW~45kW 30kW~55kW
		1.0~2.0[kHz]	400V 200V 690V	110kW~200kW 55kW~90kW 55kW~250kW
		1.2[kHz]below	400V 690V 1140V	*250kW~* 315kW~ 110kW~
	Frequency reference	Analog Input	Resolution 10bit, accuracy ±0.1%	
		Keypad	Resolution 0.01Hz / 0.1Hz	
	Field weakening point		Auto Tuning	
	Acceleration Time		V/F Control 0.5~3000.0[sec] Sensorless & Sensored Vector Control -0.00~3000.00[sec]	
	Deceleration Time		V/F Control 0.5~3000.0[sec] Sensorless & Sensored Vector Control -0.00~3000.00[sec]	
Environmental Limits	Surrounding Temperature		-10℃~ +40℃	
	Relative Humidity		90%, no condensation allowed	

Continued

Protection Function	Over Voltage, Over Current, Over Load, Zero Phase Current, Low Current, Low Voltage. Motor Over Speed, Out of Control, over Temperature, IGBT_short, motor_short, Initial Recharge Fault, External Fault Signal Detection, Signal Detection of Gate Drive Main Power and Wiring, Keypad Fault Detection, Auto Tuning Fault Detection, Software Default Detection.		
Control Connections	Analog Input voltage		0V(-10V) ~+10VDC, resolution 10bit
	Analog Input current		0(4) ~20mA, resolution 10bit
	Digital Input		Negative Logic
	Aux. supply Voltage		+24V ±20%, Max. 100mA
	Analog Output		0 (or 4) ~20mA, RL<500Ω, resolution 10bit
	Digital Output(DO3)		Multi-Function Output : 24Vdc, 50mA
	Relay Output	DO1	Max. Switch Voltage: 250 Vac or 30Vdc Max. Switch Current: 1Aac or 1Adc
		DO2	Max. Switch Voltage: 250 Vac or 30Vdc Max. Switch Current: 1Aac or 1Adc

2.8 System Configuration

Figure 2-8.1 shows a block diagram of the HPVFV inverter. Diode Bridge produces the DC voltage for the IGBT inverter Bridge block. The IGBT bridge produces a symmetrical three-phase PWM modulated AC voltage to the motor. The power drawn from the supply is almost entirely active power.

The Motor Control block is based on microprocessor software. The microprocessor controls the motor according to the saved software (V/F, vector) in Flash memory, measured signals, parameter value settings and commands from the Control I/O block and the Keypad. And it calculates the IGBT switching positions. Gate Drivers amplify these signals to drive the IGBT inverter bridge. If the over-current occurs at the IGBT, the gate driver breaks the IGBT gate signal and sends the fault signal to the microprocessor.

The Keypad is a link between the user and the inverter. With the Keypad or personal Computer, the user can set parameter values, read status data and give control commands. The Keypad is detachable and can be mounted externally and connected via a cable to the inverter.

The optional DBR information can be referenced from this manual.

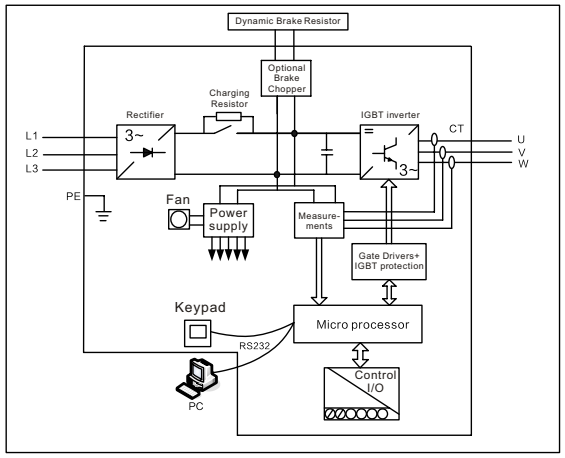


Figure 2.8-1 HPVFV Inverter Block Diagram

3. Installation Condition

3.1 Installation Condition

Please install the HPVFV inverter on the places satisfying the following conditions.

1 Avoid rain, hot temperature and high humidity place.

2 Avoid the direct sunlight.

3 The place should be protected from dirt, metal dust, and welding flame.

4 Install so as to be bearable to the vibration.

5 Defective main power may cause the inverter damages.
- Using the same power source with welding machine
- Using a generator as the power source
- Sudden changes in the main voltage.

6 Keep away from flammables.

7 Install on the nonflammable materials as metal.

8 Required ventilation quantity of frequency inverter(Refer to the table 3.1-1.)

Power（kW）	Ventilation quantity m^3/h	Power（kW）	Ventilation quantity m^3/h
5.5	26.5	90	433.4
7.5	36	110	529.8
11	53	132	635.7
15	72.2	160	770.6
18.5	89	200	963.2
22	105.9	250	1204
30	144.5	315	1517.1
37	178.2	400	1926.4
45	216.7	500	2408
55	264.9	560	2697
75	361.2	630	3034

Table 3.1-1 Required ventilation quantity of frequency inverter

3.2 Cooling

The specified space around the HPVFV inverter unit ensures proper cooling air circulation. See table 4-1 for dimensions. If multiple units are to be installed above each other, the distance between the units must be b + c and air from the outlet of the lower unit must be directed away from the inlet of the upper unit.

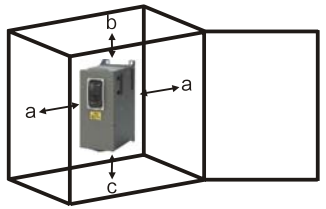


Figure 3.2-1 Installation space

SIZE	Dimension(mm)			
	a	a2	b	C
A1	20	10	150	50
B1	20	10	150	60
A2	30	10	160	80
B2	75	75	300	100
E2	250	75	300	----
F1/C2/D2/C3	250	75	300	----

Table 3.2-1 Installation space dimension
a2 = distance from the inverter unit to other inverter unit

3.3 Installation of keypad on the external panel

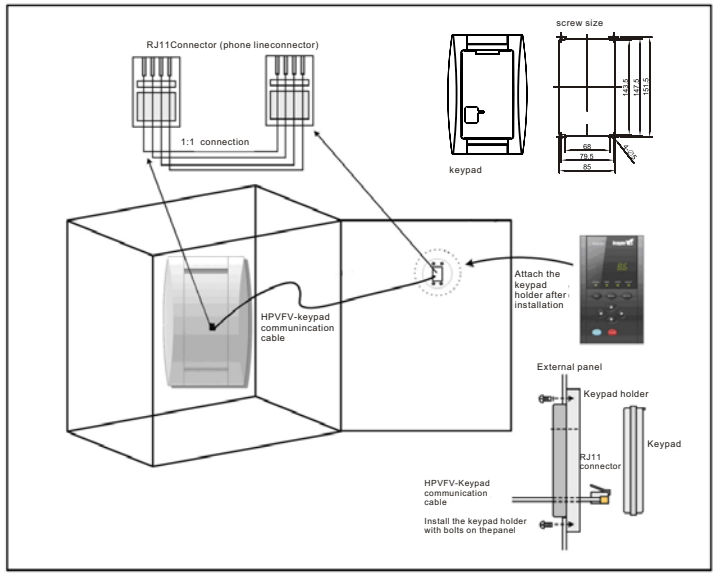


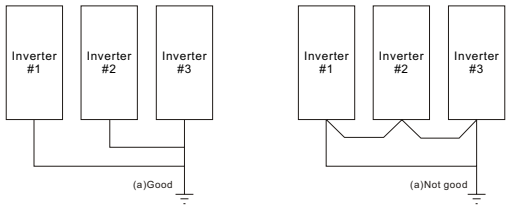
Figure 3.3-1 Installation of keypad on the external panel

When installing the HPVFV Keypad on the external panel, refer to the figure 3.3-1. First, make holes on the spot of the panel as shown in the figure 3.3-1. Then, install the keypad plate with bolts. The keypad that is installed on the external panel is connected by RJ11 serial cable, which is 1:1 connection. Refer to the figure 3.3-1.

4.WIRING

4.1Cautions in Wiring

1 Connect the ground cable surely.
If multiple units are to be installed, Do not loop the ground cables.



2 Only a competent electrician should carry out the wiring

3 Make sure that the input main voltage is switched off.

4 Do NOT connect AC power source to the output terminals (U, V, W).

5 In the case of installing an earth leakage breaker at the input (L1, L2,L3), Make inquiries to a competent electrician for the set-up of leakage current.

6 Power cables, the earth leakage breaker and a Magnetic contactor should be used with the rated capacity.

7 Attach surge filters to the Magnetic contactors that are installed around inverter.

8 Installing Static Condenser or Surge Suppressor on the output of Inverter is prohibited. In case of installed already, please remove.

9 Do NOT run or stop the inverter and/or the electric motor connected to it using Magnetic contactors [located at the main power input(L1,L2,L3) and/or output(U,V,W)]

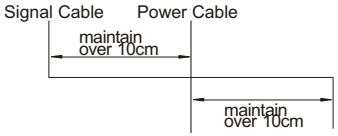
10 Fasten the terminal screws to the relevant torque value and make sure that there are not loose terminals.

11 The length of wire connected output lines to motor should be within 50m. In case of multi connection with several motors by only one Inverter, the length of wire between Inverter and motors should be within 50m. If the length of all wires connected to each device is inevitably over 50m, install AC Reactor between output lines of Inverter and motors.

12 When several motors are running by one inverter, install a thermal relay for each.

13 Use twisted and shielded cable for signal cables. For encoder signal cables, use the shielded cable containing 6 wires in the cable. The wires in the cable should be twisted and shielded by twos. Although the encoder signal cables have a good quality, they could be affected by surrounding noises during wiring. It needs a special attention.

14 The signal cables must be isolated from the power cables. For an unavoidable case, install perpendicular to each other as shown below.



4.2 materials of optional spare parts

4.2.1 input/output reactor

〈60Hz -200V，400V〉

voltage grade	power	frequency	input reactor (VD=2%)		output reactor		remark
			current	inductance	current	inductance	
400V	5.5kW	60Hz	14A	1.529mH	12A	673uH	1 permissiblee rror of inductance ± 5% 2. permissible inductance over current-over 80% of inductance at 150% current 3. permissibl temperature(100% load)-inductor temperature is under 100 centigrade at the ambient 40 centigrade 4. Switching frequency only for output reactor-5kHz Notes: Herein data of input reactor only apply to VFD with positive torque operation such as crane. As to input reactors applying to light torque running such as fans, pumps and compressors, the inductance should be subject to both capacitor group volume of VFD and whether DC reactor is built-in installed.
	7.5kW	60Hz	18A	1.147mH	16A	505uH	
	11kW	60Hz	26A	0.781mH	24A	344uH	
	15kW	60Hz	35A	0.592mH	31A	261uH	
	18.5kW	60Hz	42A	0.483mH	38A	213uH	
	22kW	60Hz	50A	0.408mH	45A	180uH	
	30kW	60Hz	68A	0.301mH	61A	67uH	
	37kW	60Hz	80A	0.255mH	72A	57uH	
	45kW	60Hz	97A	0.209mH	88A	46uH	
	55kW	60Hz	118A	0.172mH	107A	38uH	
	75kW	60Hz	161A	0.126mH	146A	28uH	
	90kW	60Hz	192A	0.106mH	174A	24uH	
	110kW	60Hz	234A	0.087mH	212A	20uH	
	132kW	60Hz	278A	0.073mH	252A	17uH	
	160kW	60Hz	336A	0.061mH	305A	14uH	
	200kW	60Hz	421A	0.049mH	382A	11uH	
	250kW	60Hz	526A	0.039mH	478A	9uH	
	315kW	60Hz	656A	0.031mH	596A	7uH	
	400kW	60Hz	832A	0.025mH	756A	6uH	
	500kW	60Hz	983A	0.021mH	894A	5uH	
200V	5.5kW	60Hz	25A	0.483mH	22A	213uH	
	7.5kW	60Hz	33A	0.354mH	30A	156uH	
	11kW	60Hz	48A	0.247mH	43A	109uH	
	15kW	60Hz	63A	0.187mH	57A	41uH	
	18.5kW	60Hz	77A	0.152mH	70A	34uH	
	22kW	60Hz	92A	0.128mH	83A	29uH	
	30kW	60Hz	125A	0.094mH	113A	21uH	
	37kW	60Hz	153A	0.077mH	139A	17uH	
	45kW	60Hz	182A	0.065mH	165A	15uH	
	55kW	60Hz	220A	0.054mH	200A	12uH	
	75kW	60Hz	297A	0.04mH	270A	9uH	
	90kW	60Hz	358A	0.033mH	325A	8uH	

〈60Hz -690V，1140V〉

voltage grade	power	frequency	input reactor (VD=2%)		output reactor		remark
			current	inductance	current	inductance	
690V	30kW	60Hz	39A	0.96mH	35A	419uH	1.permissible error of inductance ± 5% 2. permissible inductance over current-over 80% of inductance at 150% current 3.permissibletemperature(100 % load)-inductor temperature is under 100 centigrade at the ambient 40 centigrade 4. Switching frequency only for output reactor-5kHz Notes: Herein data of input reactor only apply to VFD with positive torque operation such as crane. As to input reactors applying to light torque running such as fans, pumps and compressors, the inductance should be subject to both capacitor group volume of VFD and whether DC reactor is built-in installed.
	37kW	60Hz	47A	0.8mH	42A	349uH	
	45kW	60Hz	55A	0.67mH	50A	147uH	
	55kW	60Hz	68A	0.55mH	61A	121uH	
	75kW	60Hz	93A	0.4mH	84A	88uH	
	90kW	60Hz	110A	0.34mH	100A	74uH	
	110kW	60Hz	135A	0.28mH	122A	61uH	
	132kW	60Hz	160A	0.23mH	145A	51uH	
	160kW	60Hz	193A	0.2mH	175A	42uH	
	200kW	60Hz	242A	0.16mH	220A	34uH	
	250kW	60Hz	303A	0.13mH	275A	27uH	
	315kW	60Hz	378A	0.1mH	343A	22uH	
	400kW	60Hz	479A	0.08mH	435A	17uH	
	500kW	60Hz	599A	0.07mH	544A	14uH	
	630kW	60Hz	737A	0.05mH	670A	11uH	
1140V	110kW	60Hz	81A	0.8mH	73A	175uH	
	132kW	60Hz	91A	0.71mH	82A	156uH	
	160kW	60Hz	114A	0.57mH	103A	124uH	
	200kW	60Hz	141A	0.46mH	128A	100uH	
	250kW	60Hz	171A	0.38mH	155A	83uH	
	315kW	60Hz	223A	0.29mH	202A	64uH	
	400kW	60Hz	281A	0.23mH	255A	50uH	
	500kW	60Hz	308A	0.21mH	280A	46uH	
	560kW	60Hz	385A	0.17mH	350A	37uH	
	630kW	60Hz	444A	0.15mH	403A	32uH	

〈50Hz－200V，400V〉

voltage grade	power	frequency	input reactor (VD=2%)		output reactor		remark
			current	inductance	current	inductance	
400V	5.5kW	50Hz	14A	1.834mH	12A	807uH	1.permissible error ofinductance±5%
	7.5kW	50Hz	18A	0.376mH	16A	606uH	
	11kW	50Hz	26A	0.937mH	24A	412uH	
	15kW	50Hz	35A	0.71mH	31A	313uH	2. permissible inductance over current-over 80% of inductance at 150% current
	18.5kW	50Hz	42A	0.58mH	38A	255uH	
	22kW	50Hz	50A	0.489mH	45A	216uH	
	30kW	50Hz	68A	0.361mH	61A	80H	3. Permissible temperature(100% load)-inductor temperature is under 100 centigrade at the ambient 40 centigrade
	37kW	50Hz	80A	0.306mH	72A	68uH	
	45kW	50Hz	97A	0.251mH	88A	56uH	
	55kW	50Hz	118A	0.206mH	107A	46uH	
	75kW	50Hz	161A	0.151mH	146A	34uH	4. Switching frequency only for output reactor-5kHz
	90kW	50Hz	192A	0.127mH	174A	28uH	
	110kW	50Hz	234A	0.104mH	212A	23uH	Notes:
	132kW	50Hz	278A	0.088mH	252A	20uH	Herein data of input reactor only apply to VFD with positive torque operation such as crane.
	160kW	50Hz	336A	0.073mH	305A	16uH	
	200kW	50Hz	421A	0.058mH	382A	13uH	
	250kW	50Hz	526A	0.047mH	478A	11uH	
	315kW	50Hz	656A	0.037mH	596A	9uH	As to input reactors applying to light torque running such as fans, pumps and compressors, the inductance should be
	400kW	50Hz	832A	0.03mH	756A	7uH	
	500kW	50Hz	984A	0.025mH	894A	6uH	
200V	5.5kW	50Hz	25A	0.58mH	22A	255uH	
	7.5kW	50Hz	33A	0.425mH	30A	187uH	
	11kW	50Hz	48A	0.297mH	43A	131uH	
	15kW	50Hz	63A	0.224mH	57A	50uH	
	18.5kW	50Hz	77A	0.182mH	70A	41uH	
	22kW	50Hz	92A	0.154mH	83A	34uH	
	30kW	50Hz	125A	0.113mH	113A	25uH	
	37kW	50Hz	153A	0.092mH	139A	21uH	
	45kW	50Hz	182A	0.078mH	165A	17uH	
	55kW	50Hz	220A	0.064mH	200A	15uH	
	75kW	50Hz	297A	0.048mH	270A	11uH	
	90kW	50Hz	358A	0.040mH	325A	9uH	

〈50Hz－690V，1140V〉

voltage grade	power	frequency	input reactor (VD=2%)		output reactor		remark
			current	inductance	current	inductance	
690V	30kW	50Hz	39A	1.15mH	35A	503uH	1.permissible error of inductance±5%
	37kW	50Hz	47A	0.96mH	42A	419uH	
	45kW	50Hz	55A	0.8mH	50A	176uH	
	55kW	50Hz	68A	0.66mH	61A	145uH	2. permissible inductance over current-over 80% of inductance at 150% current
	75kW	50Hz	93A	0.48mH	84A	105uH	
	90kW	50Hz	110A	0.4mH	100A	88uH	
	110kW	50Hz	135A	0.33mH	122A	73uH	
	132kW	50Hz	160A	0.28mH	145A	61uH	3. permissible temperature(100% load)-inductor temperature is under 100 centigrade at the ambient 40 centigrade
	160kW	50Hz	193A	0.23mH	175A	51uH	
	200kW	50Hz	242A	0.19mH	220A	40uH	
	250kW	50Hz	303A	0.15mH	275A	32uH	
	315kW	50Hz	378A	0.12mH	343A	26uH	4. Switching frequency only for output reactor-5kHz
	400kW	50Hz	479A	0.1mH	435A	21uH	
	500kW	50Hz	599A	0.08mH	544A	17uH	Notes:
	630kW	50Hz	737A	0.06mH	670A	14uH	Herein data of input reactor only apply to VFD with positive torque operation such as crane.
1140V	110kW	50Hz	81A	0.96mH	73A	210uH	
	132kW	50Hz	91A	0.85mH	82A	187uH	
	160kW	50Hz	114A	0.68mH	103A	149uH	
	200kW	50Hz	141A	0.55mH	128A	120uH	As to input reactors applying to light torque running such as fans, pumps and compressors, the inductance should be subject to both capacitor group volume of VFD and whether DC reactor is built-in installed.
	250kW	50Hz	171A	0.45mH	155A	99uH	
	315kW	50Hz	223A	0.35mH	202A	76uH	
	400kW	50Hz	281A	0.28mH	255A	60uH	
	500kW	50Hz	308A	0.25mH	280A	55uH	
	560kW	50Hz	385A	0.2mH	350A	44uH	
	630kW	50Hz	444A	0.18mH	403A	38uH	

4.2.2 Dynamic Brake Resistor

See table 4.2-1 for the standard brake resistor of HPVFV.
Please, ask the factory or the head office for details on recommended DBR for vertical loads and equipments that have a high frequency in use.

电压区分	变频器型号	DBR电阻值 [Ω]	DBR容量[kW] 60%ED	DBR容量[kW] 25%ED
400V	HPVFV0405D502	70.7	3.3	1.4
	HPVFV0407D502	51.9	4.5	1.9
	HPVFV0401102	35.4	6.6	2.8
	HPVFV0401502	24.2	9.0	3.8
	HPVFV0418D502	19.6	11.1	4.6
	HPVFV0402202	16.5	13.2	5.5
	HPVFV0403002	12.1	18.0	7.5
	HPVFV0403702	9.8	22.2	9.0
	HPVFV0404502	8.1	27.0	11.0
	HPVFV0405502	6.6	33.0	14.0
	HPVFV0407502	4.8	45.0	19.0
	HPVFV0409002	4.0	54.0	23.0
	HPVFV0411002	3.3	66.0	28.0
	HPVFV0413202	2.7	79.2	33.0
	HPVFV0416002	2.3	96.0	40.0
	HPVFV0420002	1.8	120.0	50.0
200V	HPVFV0405D502	18.1	3.3	1.4
	HPVFV0407D502	13.3	4.5	1.9
	HPVFV0401102	9.0	6.6	2.8
	HPVFV0401502	6.2	9.0	3.8
	HPVFV0418D502	5.0	11.1	4.6
	HPVFV0402202	4.2	13.2	5.5
	HPVFV0403002	3.1	18.0	7.5
	HPVFV0403702	2.5	22.2	9.0
	HPVFV0404502	2.1	27.0	11.0
	HPVFV0405502	1.7	33.0	14.0
	HPVFV0407502	1.2	45.0	19.0
	HPVFV0409002	1.0	54.0	23.0

Caution!
1) Ask the factory for the detail of DBR information
2) Ask the head office for the case of 600VV and 1140V class inverter
3) The above values are calculated by based on following information: Braking torque:100%, Using rating:5%ED
4) Installing fuse is recommended when HPVFV Inverter and breaking resistor are connected.

4.3 Wiring Diagram

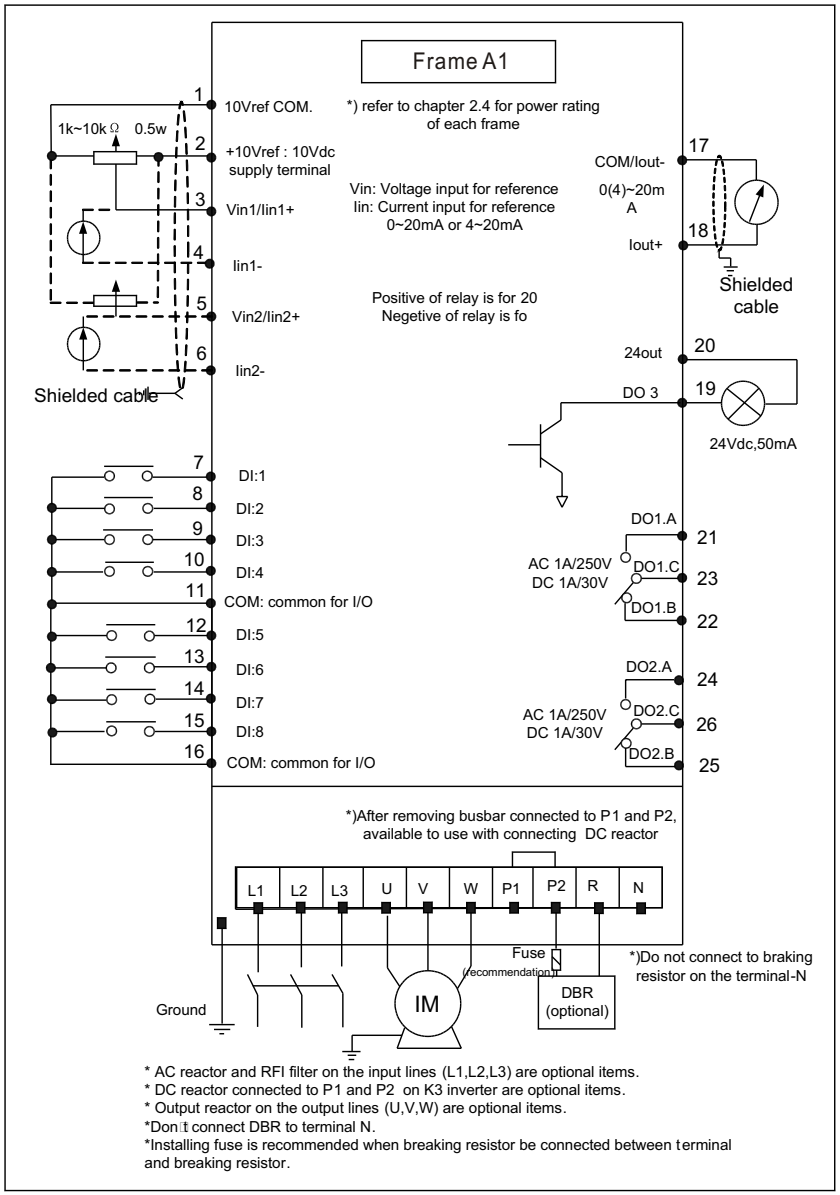


Figure 4.3-1 HPVFVinverter FrameA1

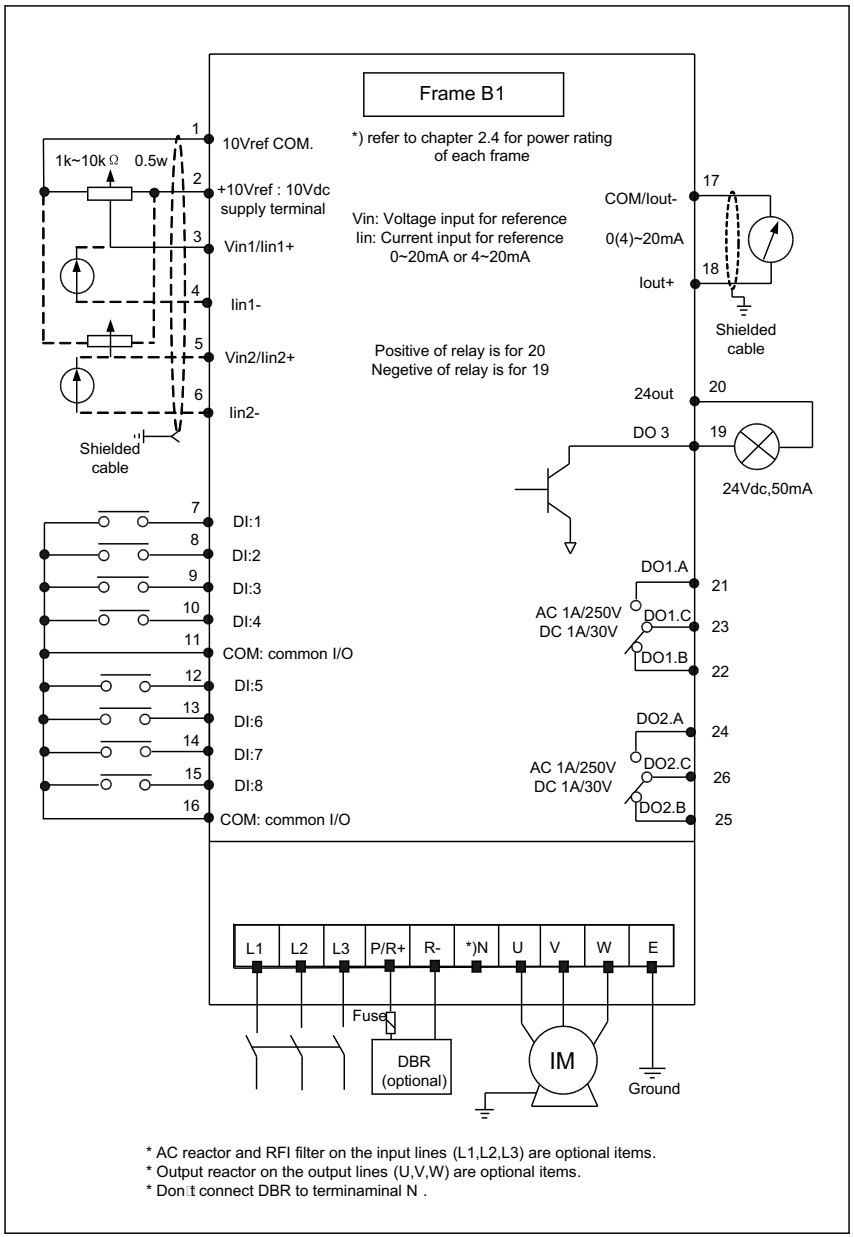


Figure 4.3-2 HPVFV inverter FrameB1

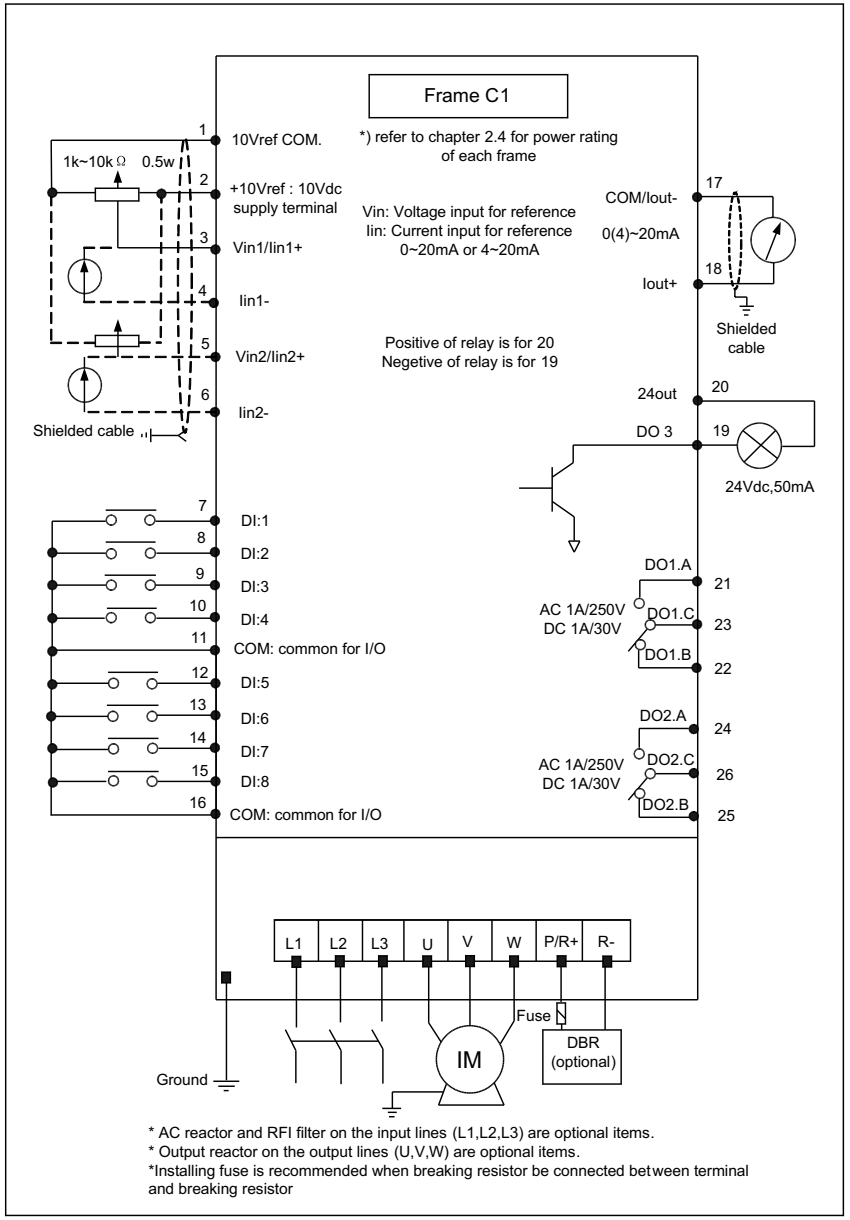


Figure 4.3-3 HPVFV inverter FrameC1

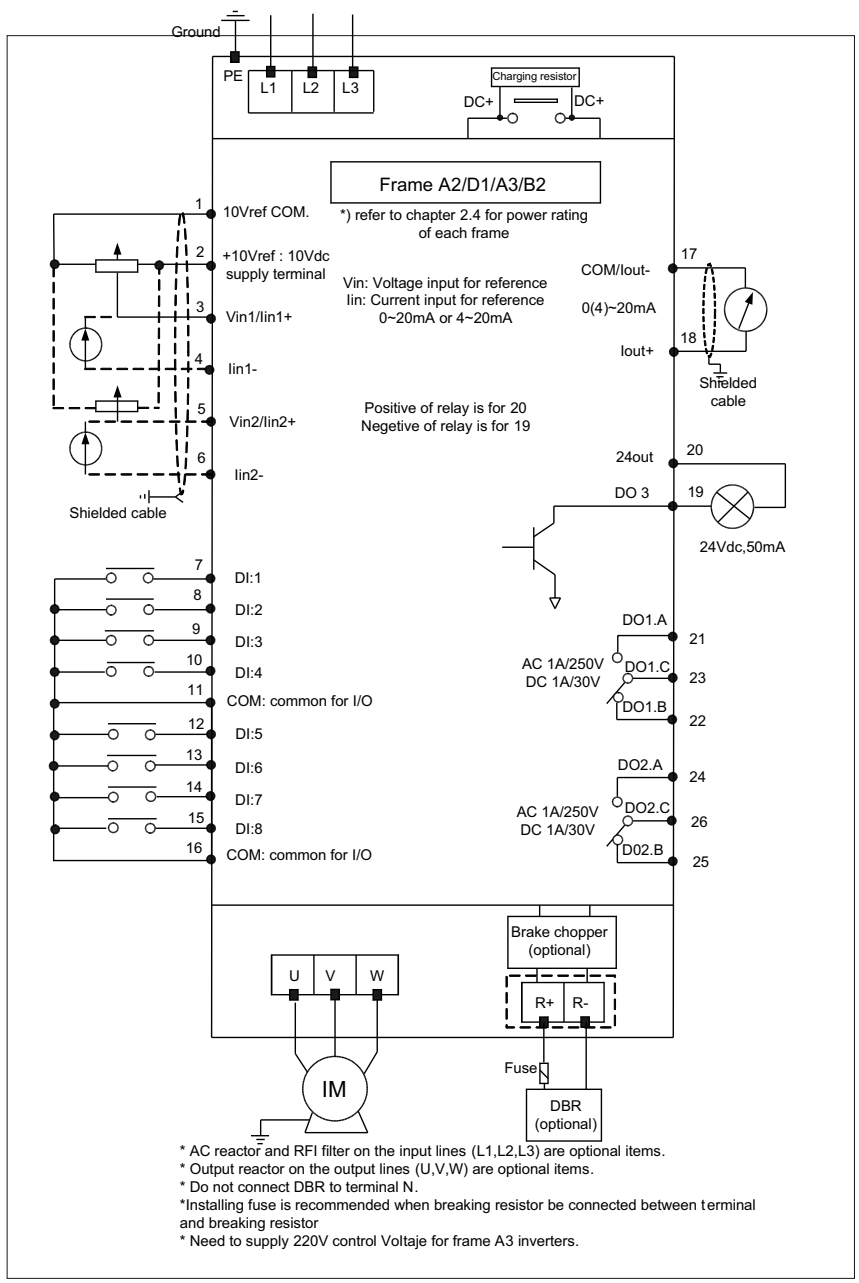


Figure 4.3-4 HPVFV inverter Frame A2/D1/E1/B2/A3

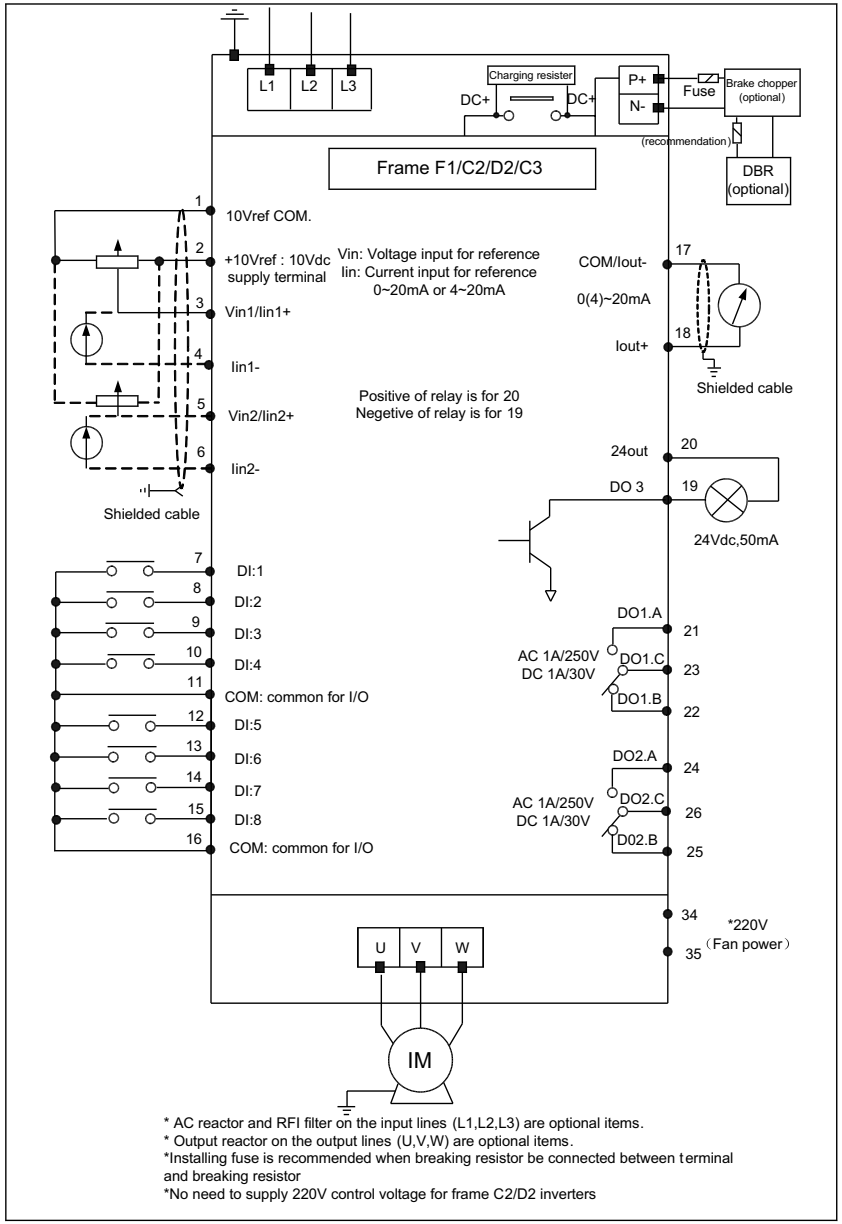
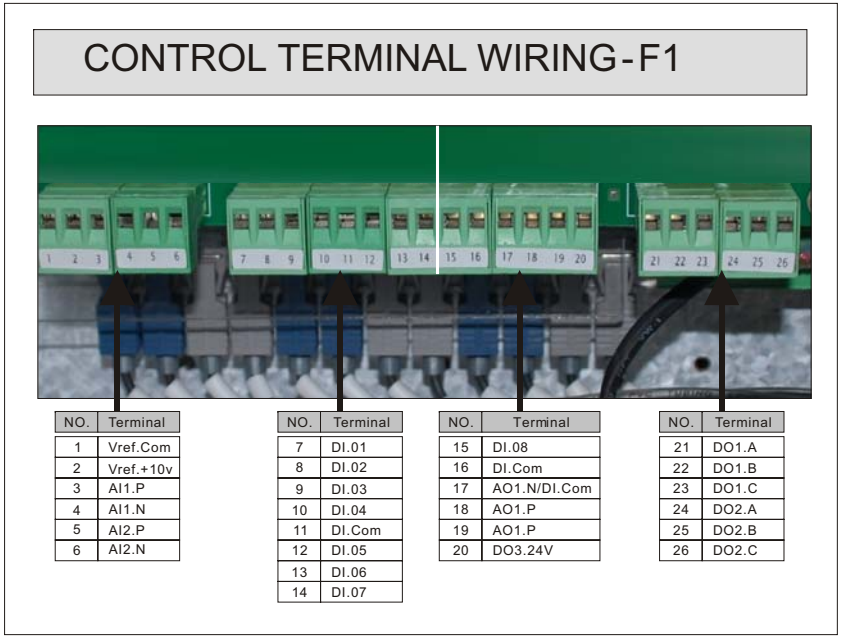


Figure 4.3-6 HPVFV inverter Frame F1/C2/D2/C3

4.4 Power Connections

*F1 Control terminal connections



NO.	Terminal
1	Vref.Com
2	Vref.+10v
3	AI1.P
4	AI1.N
5	AI2.P
6	AI2.N

NO.	Terminal
7	DI.01
8	DI.02
9	DI.03
10	DI.04
11	DI.Com
12	DI.05
13	DI.06
14	DI.07

NO.	Terminal
15	DI.08
16	DI.Com
17	AO1.N/DI.Com
18	AO1.P
19	AO1.P
20	DO3.24V

NO.	Terminal
21	DO1.A
22	DO1.B
23	DO1.C
24	DO2.A
25	DO2.B
26	DO2.C

Use heat-resistant cables (600V, +70℃ or higher). The Power cables and the fuses have to be dimensioned in accordance with the rated output current of the unit and the size of the cables. The minimum dimensions for the Cu-cables and corresponding fuses are given in the table 4.4-1. The fuses have been selected so that they will also function as an overload protection for the cables. If 3 or more cables are used in parallel, Please be cautious for that every cable must have its own overload protection. These instructions concern the cases about that there is one motor and one cable connection from the inverter to the motor. For other cases, ask the factory for more information.

TYPE		FUSE [A]	Cu-Cable In.output/GND[mm2]
400V	5.5 kW	20	4 / 4
	7.5 kW	30	6 / 6
	11 kW	35	16 / 10
	15 kW	45	16 / 10
	18.5 kW	60	16 / 10
	22 kW	70	16 / 10
	30 kW	100	25 / 16
	37 kW	100	25 / 16
	45 kW	100	50 / 16
	55 kW	150	50 / 25
	75 kW	200	70 / 25
	90 kW	250	70 / 25
	110 kW	300	95 / 35
	132 kW	400	95 / 35
	160 kW	400	95 / 35
	200 kW	500	2*(95 / 50)
	250 kW	630	2*(95 / 50)
	315 kW	*	*
	400 kW	*	*
690V	30 kW	50	10/ 10
	37 kW	50	10/ 10
	45 kW	63	16/ 16
	55 kW	63	16/ 16
	75 kW	100	35/ 16
	90 kW	100	35/ 16
	110 kW	125	50 / 25
	132 kW	160	70/ 35
	160 kW	200	50 / 95
	200 kW	250	150/ 70
	250 kW	*	*
	315 kW	*	*
	400 kW	*	*
	500 kW	*	*
1200V	110 kW	*	*
	132 kW	*	*
	160 kW	*	*
	200 kW	*	*
	250 kW	*	*
	315 kW	*	*
	400 kW	*	*
	560 kW	*	*

4.4-1 recommended motor and power cables and fuse ratings * ask manufacturers

4.4.1 Installation Instructions

1 Place the motor cables further away from the other cables.
- Avoid long parallel runs with other signal cables.
- The maximum motor cable is 50m.
- The motor cable should cross other signal cables at a right angle of 90 degrees if inevitable.

2 See chapter 4.5.2 for cable insulation check.

3Connecting cables:
-Remove the cover of the motor and power cables.
-Open the cover of HPVFV inverter
-Connect the motor and control cables to the correct terminals. (refer to Figure 4.4-1~4.3-6)
-Check if control cables do not make any contacts with electrical components in the device.
-Connect the brake resistor cable (optional).
-Ensure the earth cable is connected to the terminal of the inverter and motor.
-Connect the separate shield of power cables to motor, supply panel and the protective earth of the inverter.
-Ensure that the external control cable or internal wirings are not trapped between the cover and the body of the unit.

4.4.2 Cable and Motor insulation check

Order	Check items
CHECK 1	Motor Cable Insulation Check
	Disconnect the motor cables from the output terminals (U, V and W). Measure the insulation resistance of the motor cable between each phase conductor, and measure between each phase conductor and the protective ground conductor. The insulation resistance must be ⩾ 1MΩ.
CHECK 2	Main power cable Insulation Check
	Disconnect the main power cables from the terminals L1, L2 and L3. Measure the insulation resistance of the main power cables between each phase conductor, and measure between each phase conductor and the protective ground conductor. The insulation resistance must be ⩾ 1MΩ.
CHECK 3	Motor Insulation Check
	Disconnect the motor cables from the motor. Measure the insulation resistance of each motor winding. The measurement voltage has to be at least equal to the main voltage but not exceed 1000V. The insulation resistance must be ⩾1MΩ.

4.5 Control Connections

Basic connection diagram is shown in figure 4.3-1~ 4.3-6

4.5.1 Control cable

The control cables should be at least 0.5 mm^2 shielded cables. The maximum wire size fitting in the terminals is 2.5 mm^2.

4.5.2 Encoder cable

For the encoder cable, use the shielded cable containing 6 wires. The wires in the cable should be shielded by two each. See Figure 4.6-1. Pay attention to the cable installation in order to isolate from the main power cable and noise environment.

Figure 4.5-1 Encoder Cable

4.5.3 Control I/O Terminal Signals

No	Terminal	Function	Specification	
1	Vref.COM	Voltage Reference Ground	GND for Voltage reference signal	
2	Vref.+10V	+10V Voltage supply Terminal	+10V output	
3	AI 1 . P	Vref (+) input / Iref (+) input	Voltage 1 / Current 1 Reference Input Signal Signal range : 0(-10VDC) ~ +10VDC Signal range : 0(4) ~ 20mA	
4	AI 1 . N	Iref (-) input		
5	AI 2 . P	Vref (+)input / Iref (+)input	Voltage 2 / Current 2 Reference Signal Signal range : 0(-10VDC) ~ +10VDC Signal range : 0(4) ~ 20mA	
6	AI 2 . N	Iref (-) input		
7	DI 1	Digital Input 1	Forward Operation (Forward Run)	Users can set up
8	DI 2	Digital Input 2	Reverse Operation (Reverse Run)	
9	DI 3	Digital Input 3	Users can set up (refer to the parameter table)	
10	DI 4	Digital Input 4	Users can set up (refer to the parameter table)	
11	DI. COM	Digital Input Ground	Ground for Digital Input	
12	DI 5	Digital Input 5	Users can set up (refer to the parameter table)	
13	DI 6	Digital Input 6	Users can set up (refer to the parameter table)	
14	DI 7	Digital Input 7	Users can set up (refer to the parameter table)	
15	DI 8	Digital Input 8	Users can set up (refer to the parameter table)	
16	DI. COM	COM Digital Input Ground	Ground for Digital Input	
17	AO 1.N	Analog Output (-) / DI.COM	Analog Output (Users can set up) 0~20mA / 4~20mA	
18	AO 1.P	Analog Output (+)		
19	DO3.OC	Digital output 3	Open Collector output : Users can set up	
20	24Vout	24V supply voltage	+24V output (DO3. for Open Collector output terminal)	
21	DO1.A	Digital output 1 (a-contactor)	Relay Output (Users can set up)	
22	DO1.B	Digital output 1 (b-contactor)		
23	DO1.C	Digital output 1 (c-contactor)		
24	DO2.A	Digital output 2 (a-contactor)	Relay Output (Users can set up)	
25	DO2.B	Digital output 2 (b-contactor)		
26	DO2.C	Digital output 2 (c-contactor)		

Table 4.6-1 Description of control terminal

5. Composition of Operation Main Menu

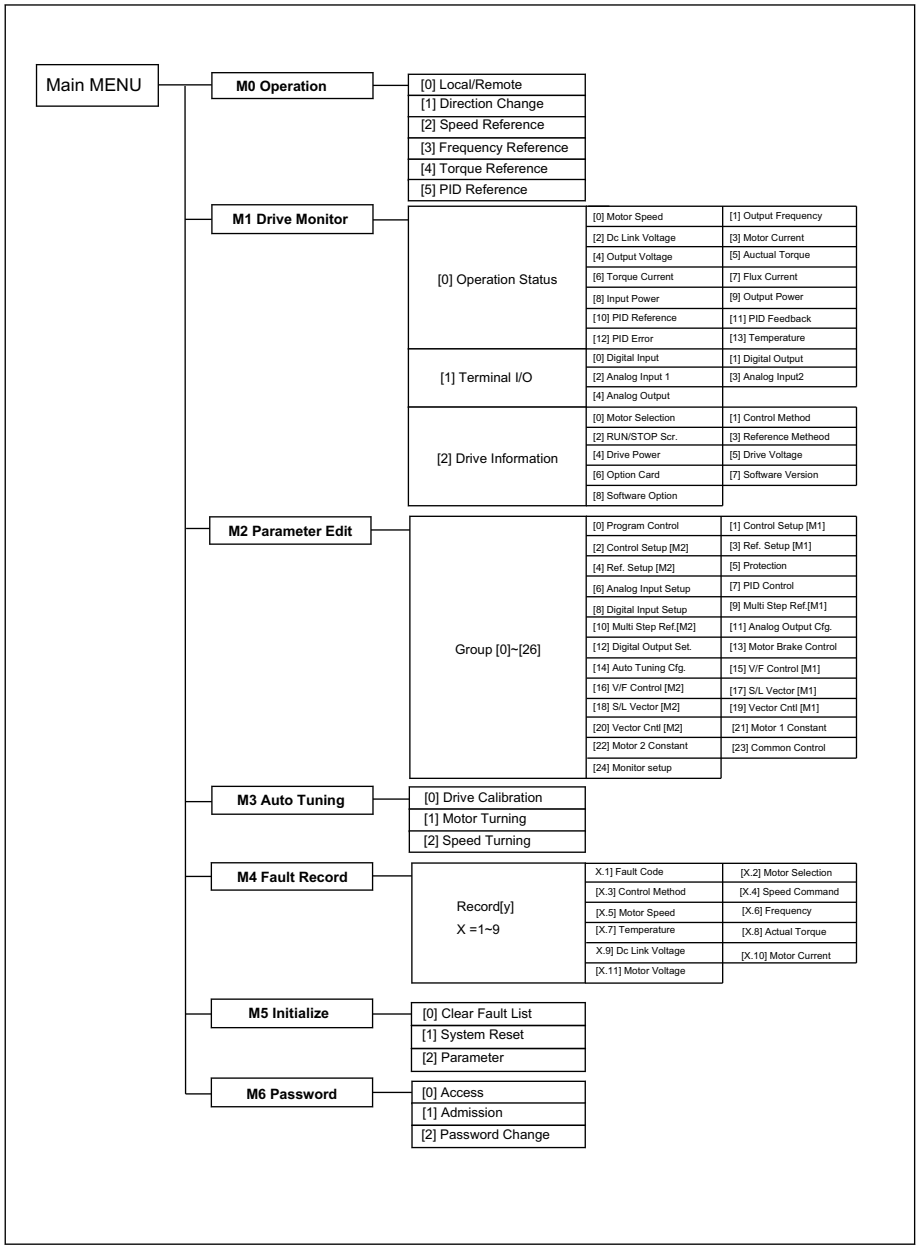


Figure 5-1 Composition of Main Menu for HPVFV inverter

6.Keypad

6.1 Keypad description

The keypad of HPVFV inverter is composed with 9 keys, (ESC, ENTER, RUN, STOP, MENU, Left, Right, UP and Down scroll key). Users can set up parameters and monitor the operation status and start/stop the motor with keypad, etc. See figure 6.1-1.

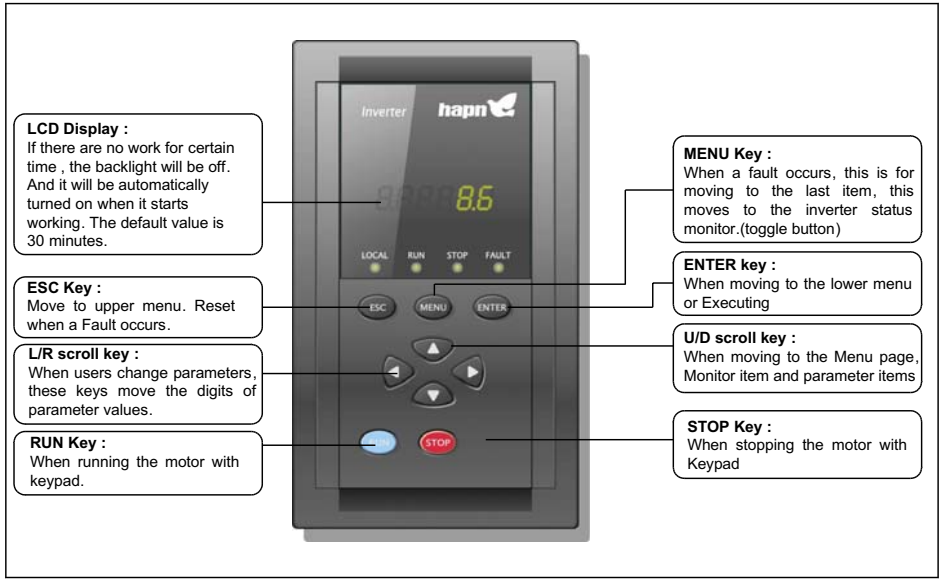


Figure 6.1-1 KEYPAD

6.2 Keypad operation

The data of KEYPAD is composed with Main Menu and low-level sub-Menu as Figure 6.2-1. Push the button, ENTER , to move from Main Menu to low-level sub-menu. And Push the button, ESC , to escape from low-level sub-Menu to Main Menu. Use the buttons, ▲ ▼ ,to Increase or decrease the data value. Use the button, ◀ ◀ , to move cursors when setting-up parameters. When monitoring/checking the status of inverter and listing the Error/Fault, use the button, MENU . When operating by KEYPAD, users can start/stop the motor with the buttons, RUN and STOP The detailed usage can be referred from chapter 6.2.1 ~ 6.2.9.

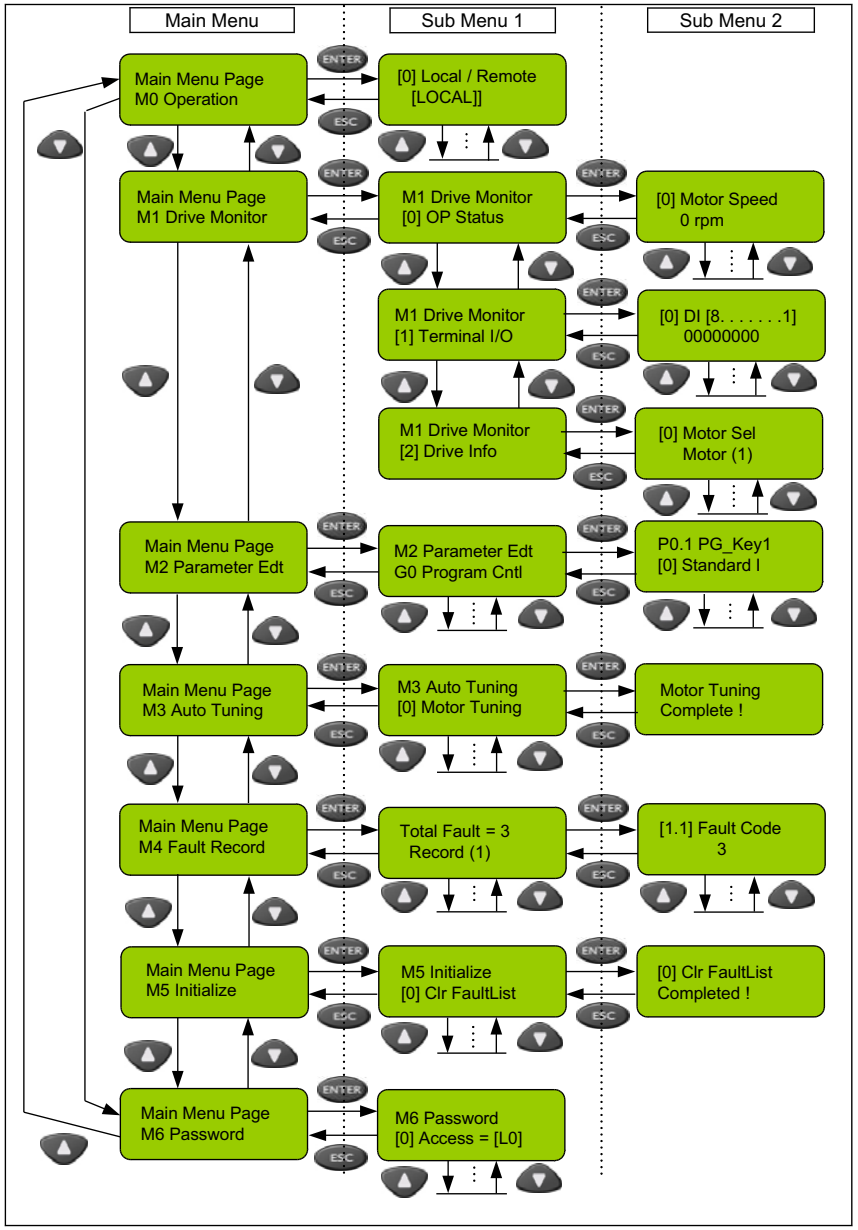


Figure 6.2-1 KEYPAD usage

6.2.1 Main Menu Page[0] Operation

In M0 operation page, when operating motor that is connected to the HPVFV inverter with keypad without any I/O terminal connections, it allows to set up the rotating direction, speed, frequency, torque reference and PID reference. Refer to Figure 6.2-2. When operating (start or stop) the motor by KEYPAD or [0] Local/Remote has to be set to [Local] , use the button, RUN STOP. And Parameter P3.0 and P3.1 have to be set for KEYPAD. Refer to the parameter description for the setting instruction.

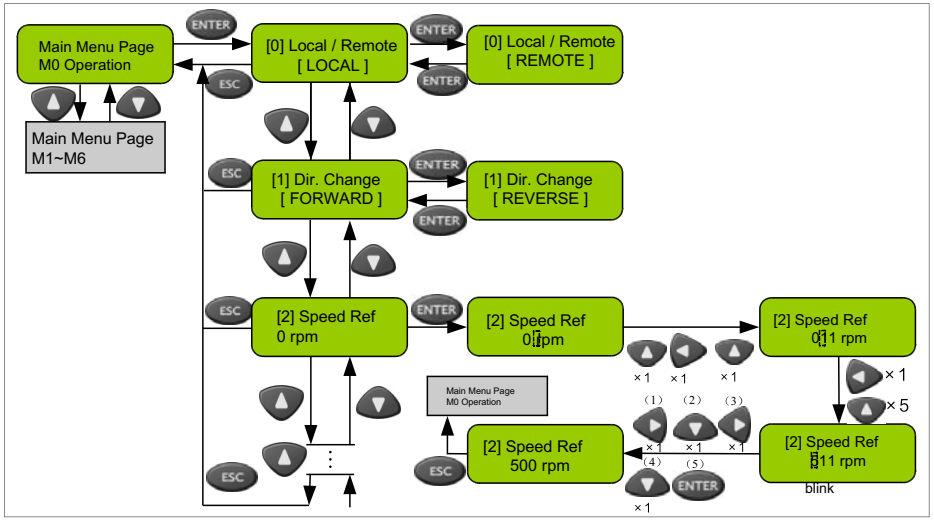


Figure 6.2-2 M0 "Operation" Menu Page usage0

No	M0 Operation		Unit	Description
[0]	Local / Remote			When changing the source of RUN/STOP reference from terminals or communication to Keypad.
	Local	Remote		
[1]	Direction Change			When KEYPAD operation, this sets the direction of rotation of motor whenever users push the button, ENTER
	Forward	Reverse		
[2]	Speed Reference		Rpm	This sets the speed reference if the Control Method is S/L Vector Speed or Vector Speed control.
[3]	Frequency Reference		Hz	This sets the frequency reference if the Control Method is V/F Frequency or V/F Speed control.
[5]	PID Reference		%	This sets the reference for PID process control.

When Keypad is used for a short time

	STEPS	DESCRIPTION
1	Input the main voltage	Caution! There should be no "RUN" signal at the same time of inputting the main voltage.
2	M0 Operation 0 rpm	This is the initial screen when the inverter is ready to operate after it is turned on.
3	Main Menu Page M0 Operation	Move to "M0 -Operation Menu Page"
4	[0] Local / Remote [REMOTE] → ENTER → [0] Local / Remote [LOCAL]	"[LOCAL]" should be set to use keypad. Whe it is set to "[Remote]", keypad cannot be used instead the inverter is operated by the I/O terminals.
5	[3] Freq Ref 0.00Hz → [3] Freq Ref 30.00Hz	Go to the frequency reference screen to change the reference when using keypad for operating. Push the key after changing the value.
6	RUN STOP	The inverter can be operated (RUN/STOP) by the following RUN STOP buttons.
7	Turn off the main voltage	Be sure to turn off the main voltage after stopping the inverter operation.
8	Input the main voltage again	Caution! There should be no "RUN" signal at the same time of inputting the main voltage.
9	[0] Local / Remote [REMOTE] → ENTER → [0] Local / Remote [LOCAL]	M0-[0] Local/Remote item gets back to the default value which is [REMOTE] when the main voltage is inputted again after it is turned off. Therefore, it should be set to [LOCAL] again to use keypad operation.
10	[3] Freq Ref 30.00Hz	Go back to the frequency reference screen operating by keypad. Users can check that the old value is stored. The reference can be changed to the desired value again.
11	RUN STOP	If [LOCAL] is set at M0-[0]Local/Remote item in step 9, the inverter can be operated (RUN/STOP) by keys RUN STOP

When Keypad is used Continuously

	STEPS	DESCRIPTION
	Input the main voltage	Caution! There should be no „RUN„ signal at the same time of inputting the main voltage.
	M0 Operation 0 rpm	This is the initial screen when the inverter is ready to operate after it is turned on.
	Main Menu Page M2 Parameter Edit	Move to M2 Parameter Edit Page. Then, set the followings: P3.0 (RUN/STOP Method) = [1]Keypad P3.1 (Reference Method) = [1]Keypad
	Main Menu Page M0 Operation	Move to M0-Operation Menu Page
	[3] Freq Ref 0.00Hz → [3] Freq Ref 30.00Hz Push the □enter□button after changing frequency reference	Go to the frequency reference screen to change the reference when using keypad for operating. Push the key after changing the val
	RUN STOP	The inverter can be operated (RUN/STOP) by the following buttons RUN STOP
	Turn off the main voltage	Be sure to turn off the main voltage after stopping the inverter operation.
	Input the main voltage again	Caution! There should be no "RUN" signal at the same time of inputting the main voltage.
	RUN STOP	The inverter can be operated (RUN/STOP) by the following buttons. RUN STOP . At this time, the frequency reference is the value that was set in step 5. If it needs to be changed again, go back to the step 5. Then, follow the description.

6.2.2 Main Menu Page[1] Drive Monitor

In M1 Drive Monitor Page, it allows to monitor the operation status of inverter, I/O reference status and setting information. Refer to Figure 6.2-3 for the setting instruction and usage of KEYPAD.

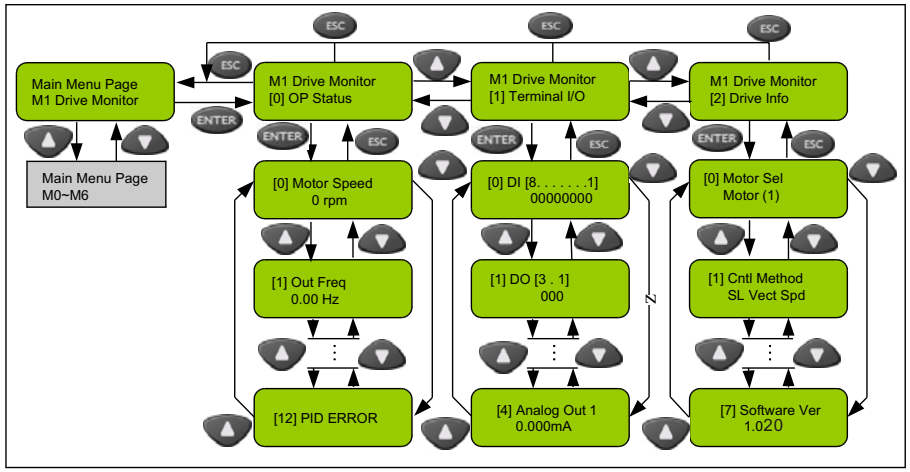


Figure 6.2-3 "M1 Drive Monitor" Menu Page.

M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[0] Operation Status	[0] Motor Speed	rpm	Indication of motor speed
	[1] Output Frequency	Hz	Indication of output frequency
	[2] DC Link Voltage	Vdc	Indication of DC Link Voltage
	[3] Motor Current	Arms	Indication of Motor Current
	[4] Output Voltage	Vrms	Indication of Output Voltage
	[5] Actual Torque	Nm	Indication of motor Torque
	[6] Torque Current	A	Indication of Torque current
	[7] Flux Current	A	Indication of Flux current
	[8] Input Power	kW	Indication of Input Power
	[9] Output Power	kW	Indication of Output Power
	[10]PID Reference		
	[11]PID Feedback		
	[12]PID Error		
	[13]Temperature	℃	Indication of the inverter temperature (inside) or temperature of heat sink.

M1 Drive Monitor Menu Page			
Sub Menu	Item	Unit	Description
[1] Terminal I/O	[0] Digital Input		Indication of status for digital input. Refer to Figure 5.2-3(a)
	[1] Digital Output		Indication of status for digital input. Refer to Figure 5.2-3(b)
	[2] Analog Input 1	V or mA	Indication of Analog Voltage(0[-10]~10V) or Analog Current (0[4]~20mA) for AI 1 port
	[3] Analog Input 2	V or mA	Indication of AI 2 Analog Voltage (0[-10]~10V) or Analog Current (0[4]~20mA) for AI 2 portport
	[4] Analog Output1	MA	Indication of Analog output current (0[4]~20mA)
[2] Drive Information	[0] Motor Sel		Indication of selected motor if multi-motor control.
	[1] Control Method		Indication of Motor Control Method
	[2] RUN/STOP Source		Indication of the source where start/stop signal for the motor comes from. (KEYPAD, I/O Terminal, communication, etc.)
	[3] Reference Method		ndication of the source where frequency, speed and torque Reference are supplied from (KEYPAD, I/O Terminal, communication, etc.)
	[4] Drive Power	kW	Indication of the inverter rated power
	[5] Drive Voltage	V	Indication of the inverter Voltage Range Ex) 04 : 400V class inverter
	[6] Option Card		Indication of option card number (0: not installed / 1:installed.
	[7] Software Version		Indication of the inverter program version
	[8] Software Option		Indication of the option program that is installed to the inverter. (0: standard HPVFV Program / over 1 : the installed option program)

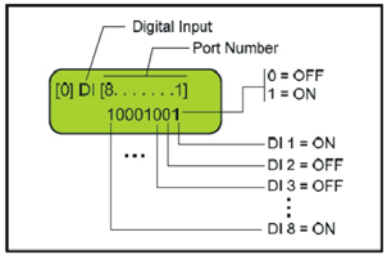


Figure 6.2-3(a) Status of Digital input

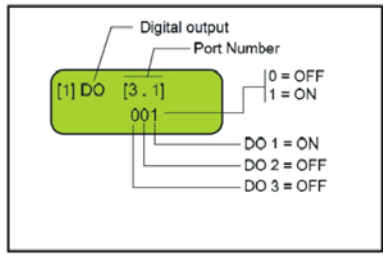


Figure 6.2-3(b) Status of Digital Output

6.2.3 Main Menu Page[2] Parameter Edit

In M2 Parameter Edit Page, The parameter can be set depending on the motor spec., control method and external I/O reference method, etc. The user-prohibited parameter groups or items would be skipped without any indication. Refer to the parameter description of Appendix D for parameter groups and items. After finishing the set-up for parameters, move to the indicating screen that shows Main "Menu Page" so the changed parameters would be saved. Then, the inverter would keep the saved parameters after the main power is off. If a user turns off the main power at the parameter item indicating screen, parameters will be returned to the old data when the main power is back again.
Refer to Figure 6.2-4 for KEYPAD usage and the setting instruction in M2 Parameter Edit page.

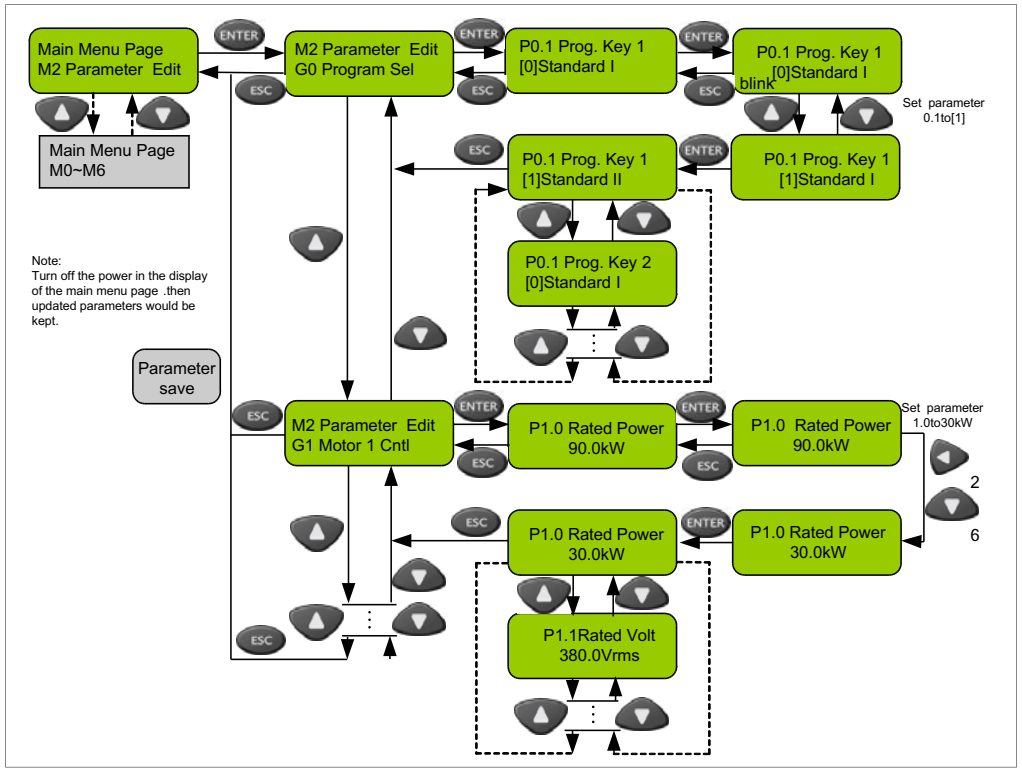


Figure 6.2-4 M2 "Parameter Menu" Page

6.2.4 Main Menu Page[3] Auto Tuning

In M3 Auto Tuning Page, in the case of using speed control or torque control for motor, users can use Auto Tuning to find parameter values that are not easy to find for users and gain value of speed control loop or torque control loop. The usage of Auto Tuning is restricted by installed environment and condition of motor and parameters for motor control method (par.1.6). Even if the motor is not running, the output of inverter is still generating so please be more careful. Carry out the process after certainly knowing the method of Auto Tuning first at chapter 7.3. Refer to Figure 6.2-5 for KEYPAD usage and the setting instruction for Auto Tuning.

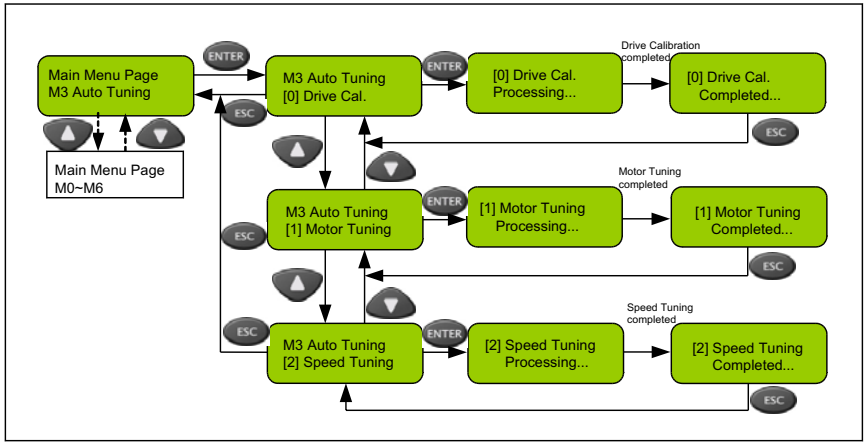


Figure 6.2-5 "M3 Auto Tuning" Menu Page

No	M3 Auto Tuning	Description
[0]	Drive Calibration	Adjust automatically sensor-related parameters of Drive after initializing parameters or changing the switching frequency of the inverter
[1]	Motor Tuning	Recognize the parameter value of motor and set the related parameters automatically
[2]	Speed Tuning	Set the related parameter automatically after finding the gain value of speed control loop Carry out this motor tuning when using S/L Vector Speed Control or Vector Speed Control No need to use this when using V/F Frequency Control or V/F Speed control method.

6.2.5 Main Menu Page[4] Fault record

In M4 Fault record page, users can monitor the number of Faults, Fault code and operation status when it occurs. Total 9 Faults are saved from Record(1) to the last occurred Fault. If Faults are occurred more than 9, the oldest Fault record is erased. Refer to Figure 6.2-6 for KEYPAD usage and the setting instruction.

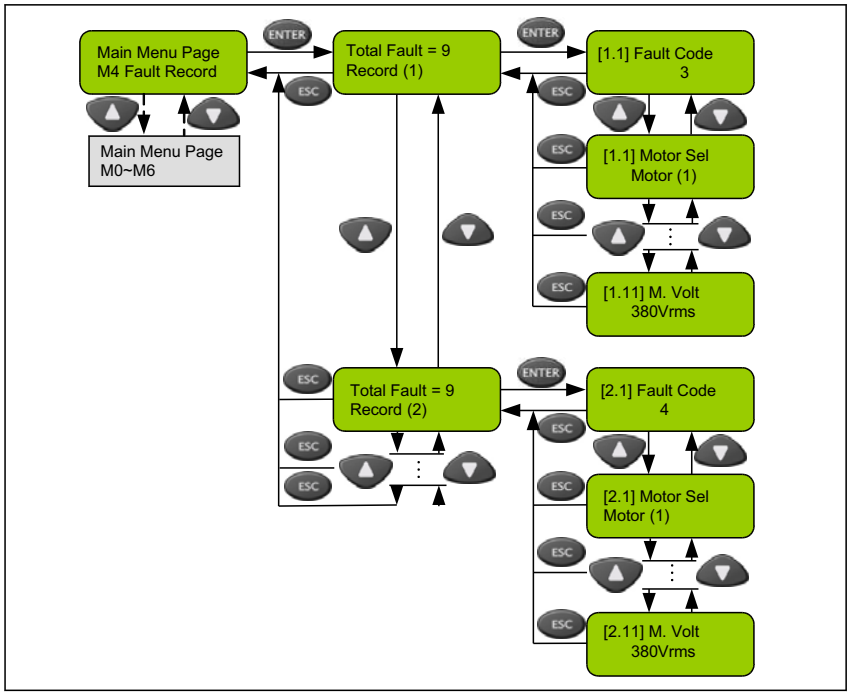


Figure 6.2-6"Faults reard"method instruction

M4	No	Unit	Description
Total = x (x : Total occurred Faults number)	[X.1] Fault Code		Fault details (Refer to the Fault Code table)
	[X.2] Motor Selection		Indication of the used motor
	[X.3] Control Method		Indication of control method when Faults occur
	[X.4] Speedcommand	rpm	Indication of speed command when Faults occur
Record(y)y: occurred order Y=1~9	[X.5] Motor Speed	rpm	Indication of Motor Speed when Faults occur
	[X.6] Frequency	Hz	Indication of output frequency when Faults occur
	[X.7]Termerature	℃	Indication of heat sink termerature when Faults occur
	[X.8] Actual Torque	Nm	Indication of output torque when Faults occur
1 = the laxest occurred Fault	[X.9] DC Link Voltage	Vdc	Indication of DC link voltage when Faults occur
	[X.10] Motor Current	Arms	Indication of Motor Current when Faults occur
	[X.11] Motor Voltage	Vrms	Indication of Motor Voltage when Faults occur

6.2.6 Main Menu Page[5] Initialize

In M5 Initialize page, users can remove of the recorded Fault list, reset the system of inverter Drive and return to the default parameter values.
Refer to Figure 6.2-7 for KEYPAD usage and the setting instruction.

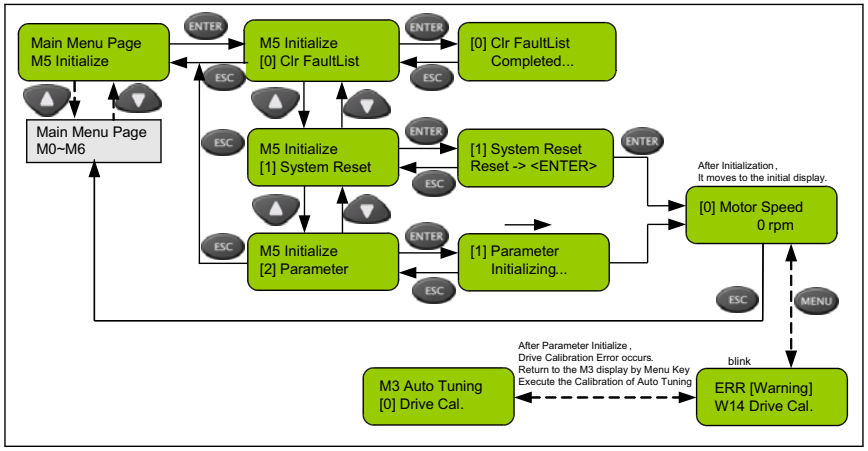


Figure 6.2-7 "M5 Initialize" Menu Page

No	M5 Initialize	Description
[0]	Clear Fault List	remove the recorded fault details
[1]	System Reset	reset the system of the inverter (Same effect to give the main power back again after turn off the inverter.)
[2]	Parameter Restore	return all the parameters to the default value If Drive Calibration Warning (W14) occurs, this carries out theDrive Calibration function of Auto Tuning[0] of Main Menu Page[3]

6.2.7 Main Menu Page[6] Password

In M6 password Page, users can check what access level of parameters can be edited. If a user wants to change the inverter parameters for more professional level, the user must be certified for higher level access. Certifying the higher level access can be done at "Admission" with the relevant password for each level. Then, the parameters of the higher level can be accessed. It is recommended to use Access level from 0 to 1 for normal users (L[0] ~ L[1]). If users want higher level, please contact the head office. If users are certified higher than L[1], it will be returned to L[0] automatically after 1 hour passes.
Refer to Figure 6.2-8 for KEYPAD usage and the setting instruction.

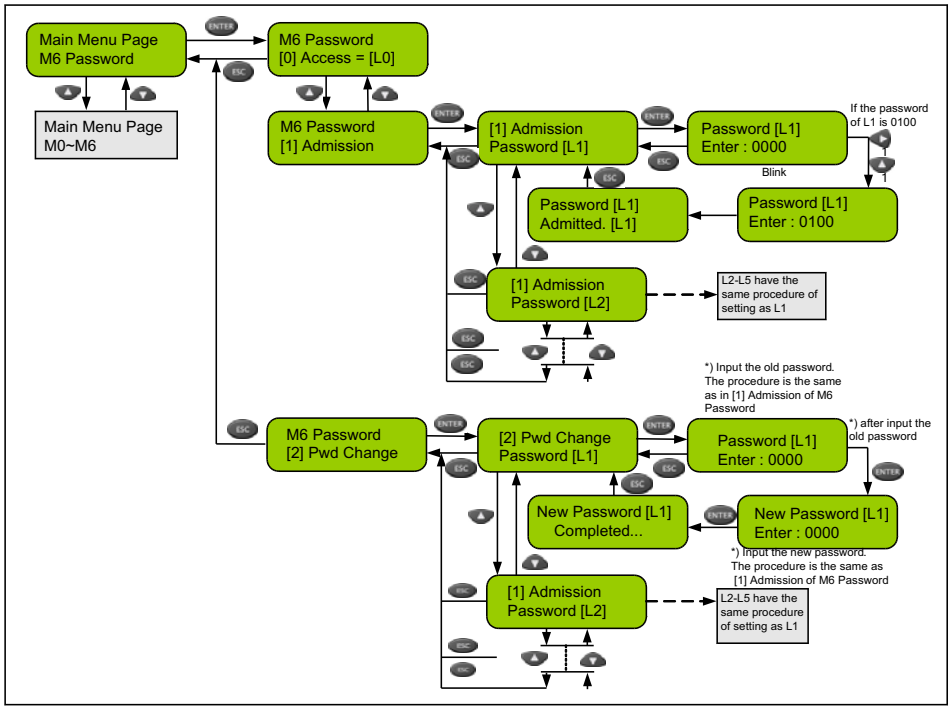


Figure 6.2-8 "M6 Password" Menu Page

No	M6 Password	Description
[0]	Access Level	Indication of certified Access level
[1]	Admission	L[1] : Password 0 0 0 0
		L[2]:L[5] Consult with our compang
[2]	Password Change	Change the password for the certified level (users can directly change the password)

6.2.8 Usage of Menu key (Error, Warning occurrence and inverter status)

MENU key is used to return to the normal screen when error or warning occurs. And it is also used to indicate the current status of the inverter. Refer to Figure 6.2-9. In cases of error or warning, the source of the trouble is indicated. Push the "MENU" button, and return to the normal screen then correct the relevant parameters or remove the occurrence source by checking the status of inverter. If the occurrence source is not removed, the error or warning sign appears every 10 seconds while operating KEYPAD. In this case, hit the "MENU" button, and then it will return to the last setting screen. Refer to Figure 6.2-9 for KEYPAD operation.

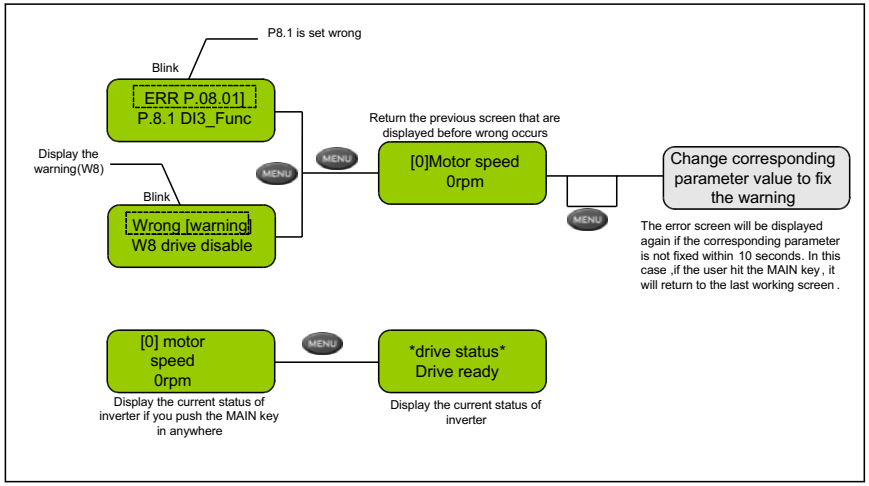


Figure 6.2-9 Checking Error, Warning and inverter status by using Menu key

7.Inverter Turning-on Procedure

7.1 Inverter Turning-on Procedure

In order to connect a main voltage to an inverter, as Figure 7.1-1, check the main voltage to connect the inverter, motor, DBR(Dynamic Brake Resister), and etc. If a brake is connected to the motor, the brake should be opened forcedly or a device that can control the brake to be opened or closed.

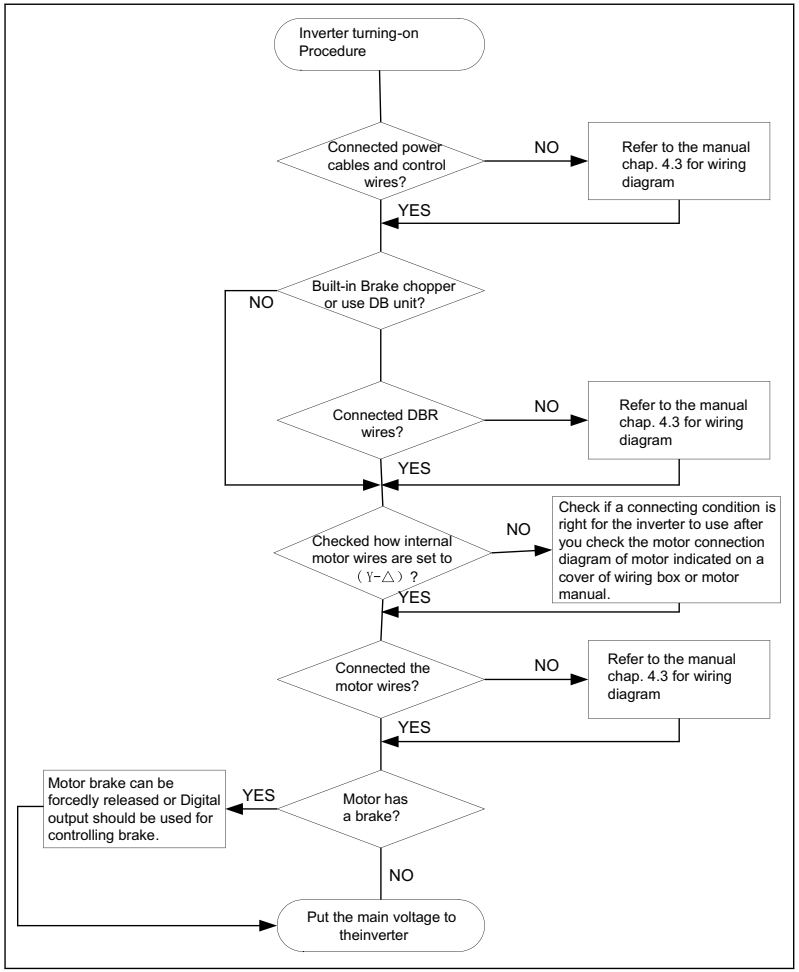


Figure 7.1-1 The processing flowchart of turning on the inverter

7.2 Inverter operation procedure (setup for the control method)

If you finish with preparation for connecting the main voltage to the inverter, you can operate the motor after setting a control method as Figure 7.2-1. There are control methods, which are V/F Frequency & Speed Control, Open loop control of S/L Vector speed & torque control, and Closed loop control of Vector speed & Torque control. Except for the V/F Frequency control method, the rest of control methods will work only when you operate Auto Tuning. Refer to the chapter 7.3 for Auto Tuning.

7.2.1 Open Loop Control Procedure

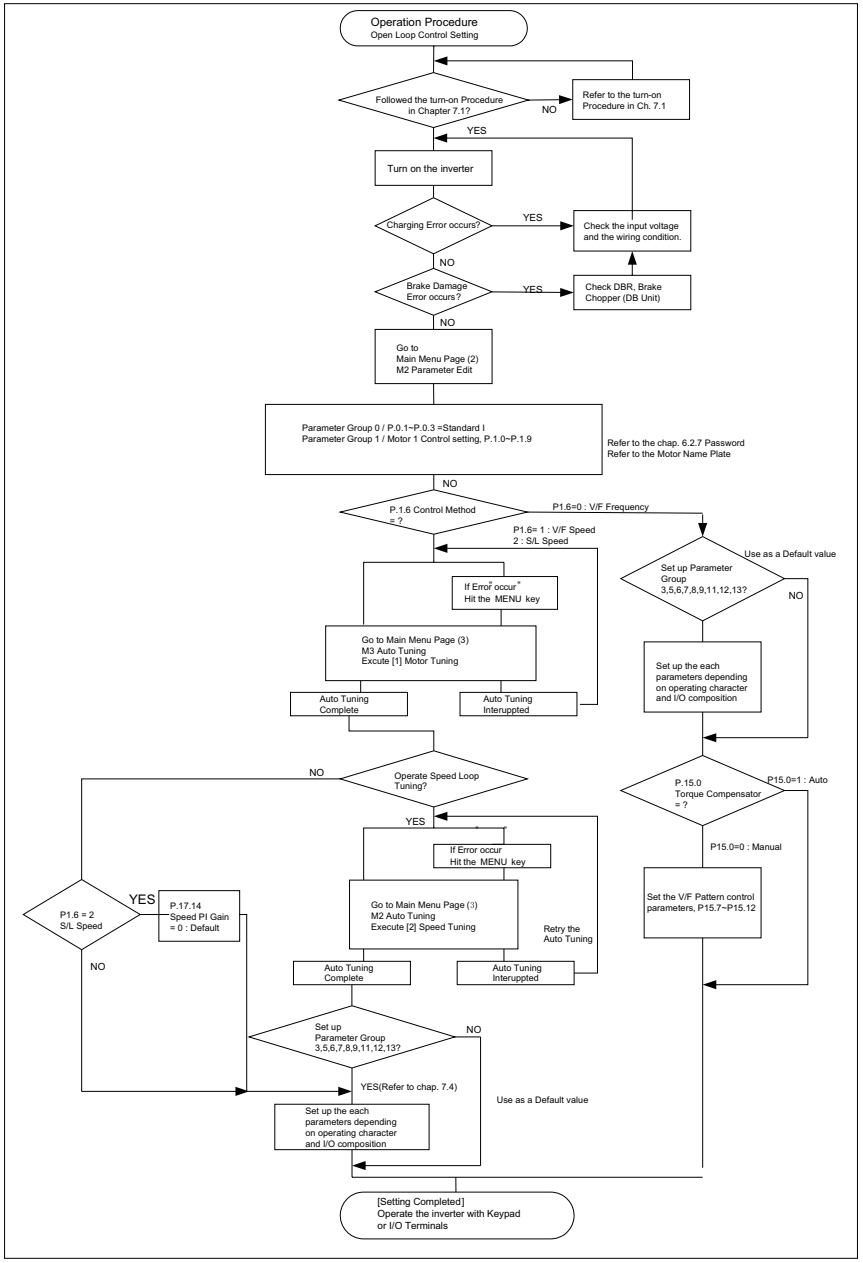


Figure 7.2-1 The processing flowchart of open Loop Control operation

7.2.2 Close Loop Control Procedure

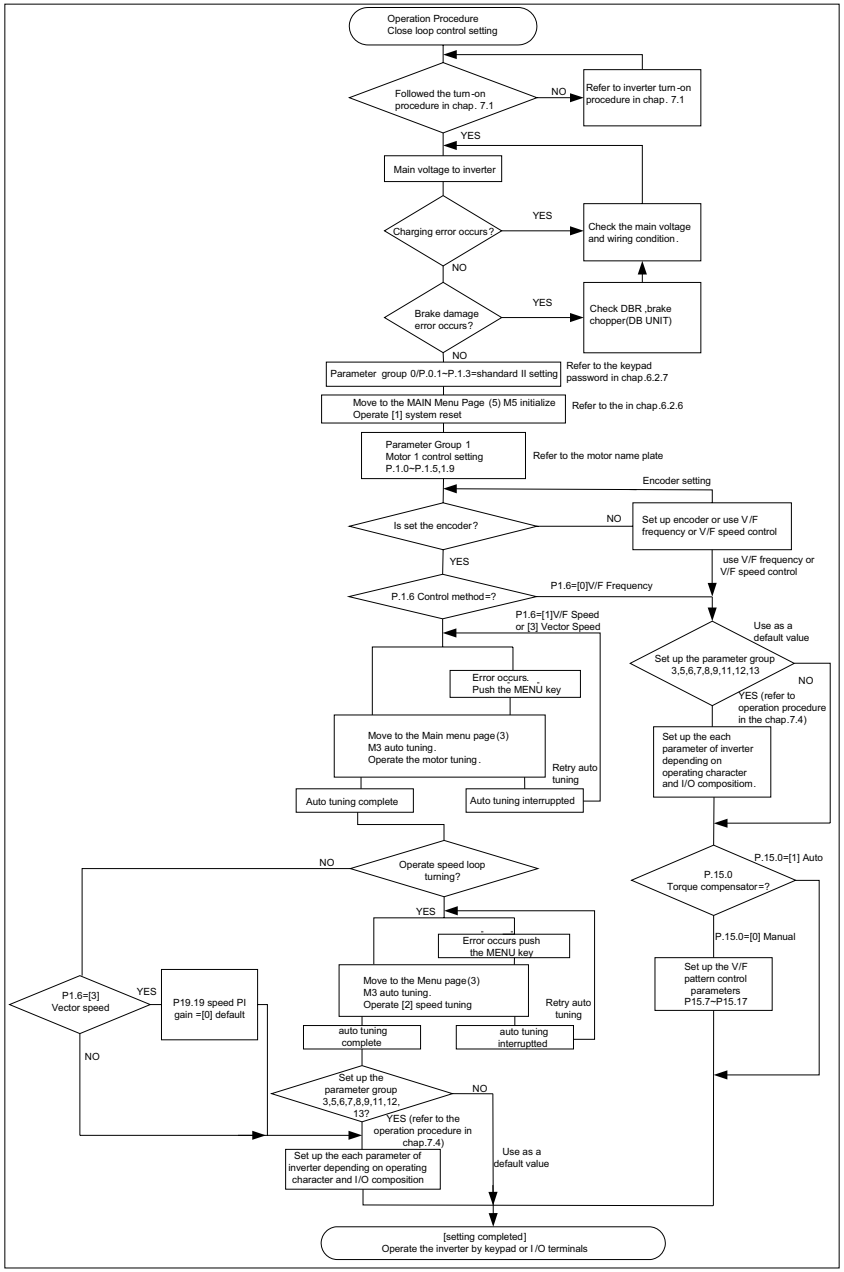


Figure 7.2-2 The processing flowchart of Close Loop Control operation

7.3 Auto-Tuning Procedure

7.3.1 Checking point before Auto Tuning

Step	Checklist
Check 1	Is a motor Shaft connected to the other machine?
	In a process of Auto Tuning the motor can rotate up to about 5% of the rated speed. In this case, if the motor is connected to a processing line or other machine, check out whether or not there is any effect from the motor rotation. If there is a possibility of causing a fatal problem, you need to operate Auto Tuning after you separate the motor from other device. If it is difficult to separate you need to make a condition for operation that will not cause any problem even if the motor rotates. The best condition of Auto Tuning is when there is no load of the motor and mechanical devices are connected as they are. Especially in Speed Tuning, you can get more exact result when the entire mechanical devices are connected.
Check 2	Does the motor have any load or is it connected to a Mechanical Brake?
	If the Brake is installed to the motor, it should possibly be released during the Auto-Tuning process. You can release the Brake by your hands or connect the Brake Control Circuit to the Digital Output terminal of the inverter. If the Brake can be released, check if P.14.0=0(free). After it is released, if the load that is more than 50% of the rated load is impressed, Auto tuning may not be smooth. If you are in a situation that you have to operate Auto Tuning while the Brake is closed, you need to set up P.14.0=1(Locked). And only Motor Tuning is possible to operate, but not a Speed Tuning. If the Speed Tuning does not operate, set P17.14, P18.14, P19.19, P20.19 to 0(Default) and then use. In this case, you use the factory-setting values for a speed controller.
Check 3	Is there a big difference between the motor power and the inverter power?
	Auto Tuning may not operate well if power of the motor to connect to the inverter is too small in comparison with that of the inverter. The motor power should be at least over 1/5 of the inverter power.
Check 4	Did you input the motor specification in Parameter Group1?
	Set up the rated power, voltage, current, speed, and number of poles of the motor to the parameter items that are conformed to the Parameter Group 1. Refer to the rating plate information on the motor.
Check 5	Is an encoder connected to the motor?
	In case of using Vector Control, an encoder should be installed to the motor. But without installing it, V/F Control or S/L Vector Control can operate Auto Tuning.

7.3.2 Auto Tuning Operation & Completion

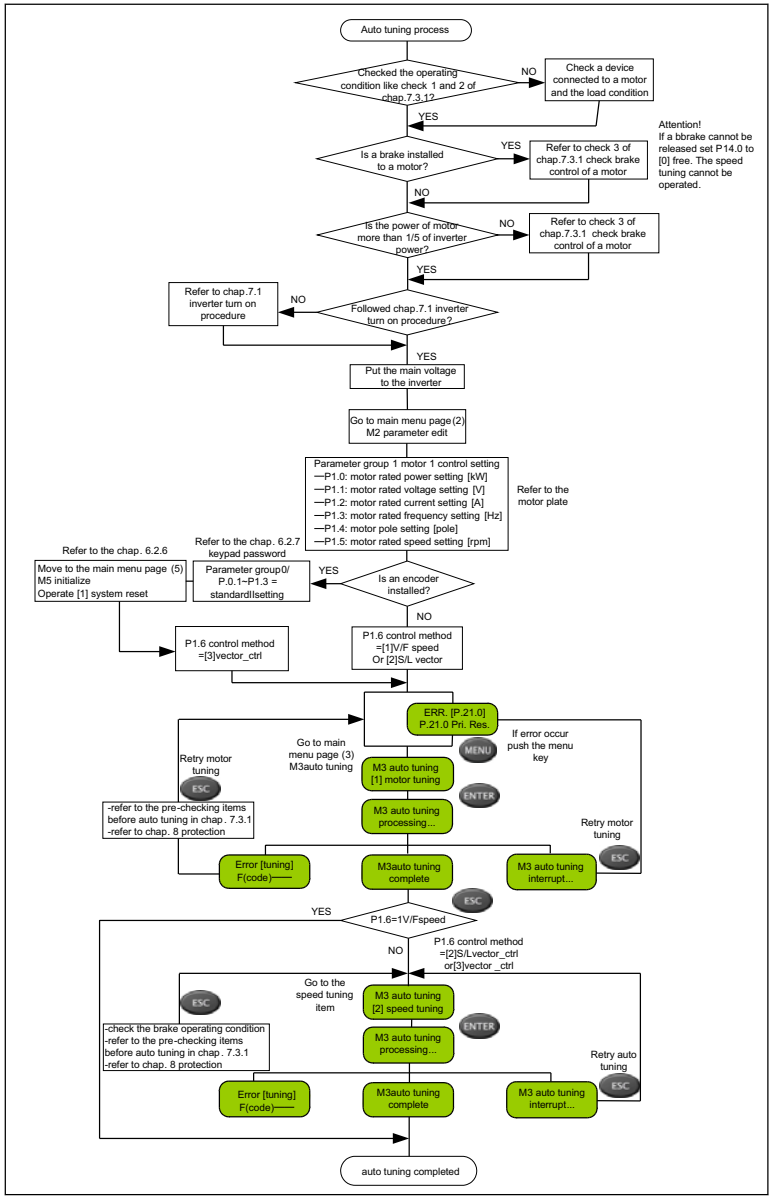


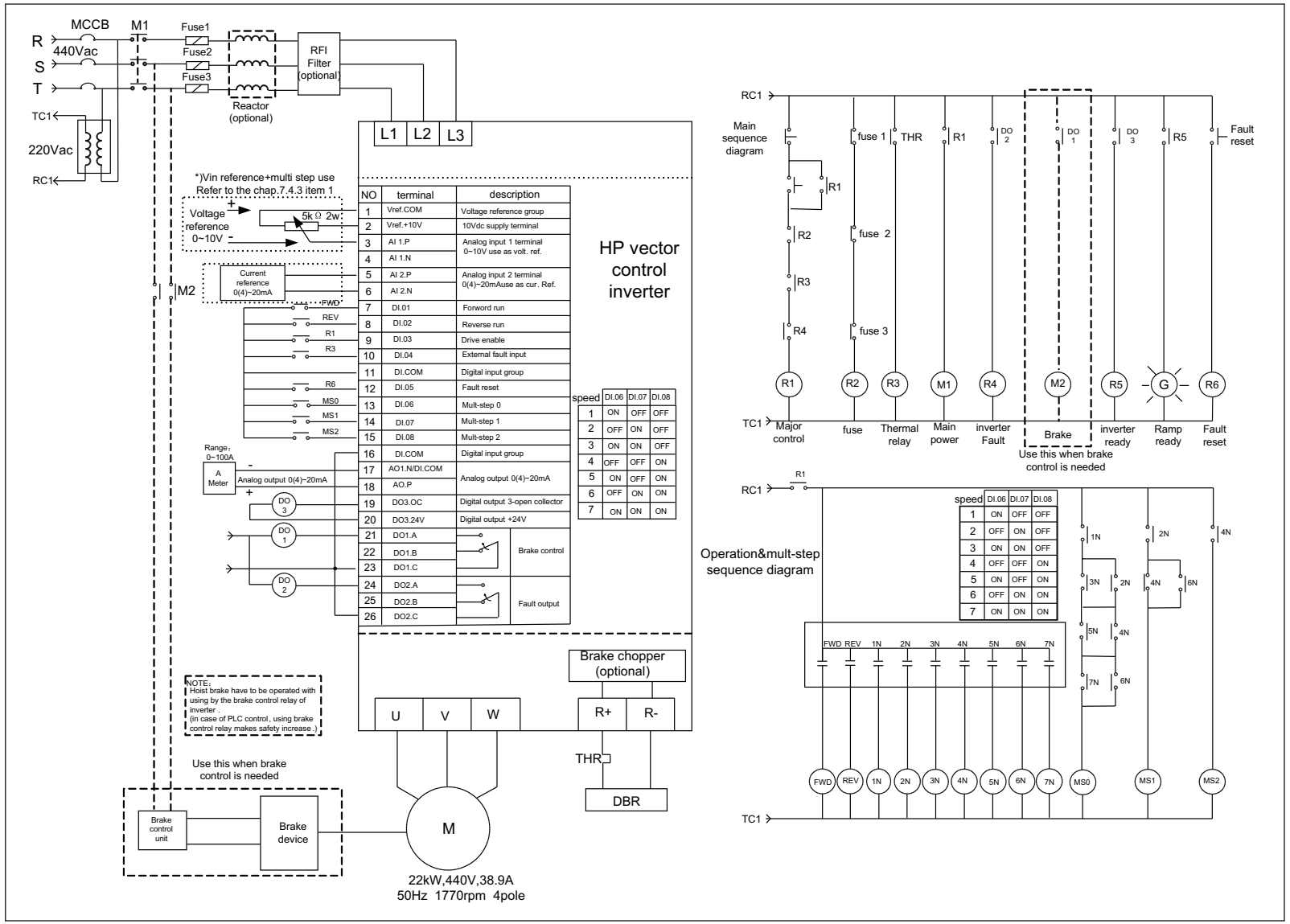
Figure 7.3-1 The processing flowchart of Auto Tuning

7.4 Basic Open Loop Control Operation Procedure

The chapter 7.4 explains the most basic application method for operating the inverter with Open Loop Control.

7.4.1 Basic Design

The following design allows you to use all the basic I/O functions when you use HPVFV inverter. You can adjust it depending on the given condition on the field.



7.4.2 Motor Specification & Open Loop Control Method Setting

This is how you set up a parameter for the motor specification and Open Loop Control method when you use the same motor specification as below.

The rated specification of the motor to be used for the inverter system					
Power	22 kW	Current	38.9 A	Speed	1770 rpm
Voltage	440 V	Frequency	50 Hz	Pole	4 pole

(1) Parameter Setting for Motor Specification

Order	Parameter Group1: Control Setup [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P1.0	Rated Power	22 kW	Rated power of motor
2	P1.1	Rated Voltage	440 V	Rated voltage of motor
3	P1.2	Rated Current	38.9 A	Rated current of motor
4	P1.3	Rated Frequency	50 Hz	Rated frequency of motor
5	P1.4	Number of Poles	4 Pole	Number of poles of motor
6	P1.5	Rated Speed	1770 rpm	Rated speed of motor

(2) Motor Control Setting

① V/F Frequency Control Setting
▶When you use Automatic Torque Compensation (recommended)

Order	Parameter Group1: Control Setup [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P1.6	Control Method	[0] V/F Frequency Control	V/F Frequency Control
	Parameter Group 15: V/F Control Motor 1			
2	P15.0	Torque Compensation	[1] Auto	Automatic Torque Compensation (recommended)

"Refer to the Speed or Frequency reference and Digital Input Setting" Go to the Chapter7.4.3

▶Refer to Figure 7.4-2 if you want to adjust the output rated voltage (V) or the rated frequency (F) of your own accord

Order	Parameter Group1: Control Setup [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P15.0	Torque Compensation	[0] Manual	Users can adjust the amount of compensation
2	P15.6	V/F Pattern	[2] Custom	Users can adjust the V/F curve
3	P15.7	Zero Frequency Voltage	1.5 %	100% = 440V (P.1.1 set value)
4	P15.8	Mid. Frequency	5 Hz	Mid-point frequency
5	P15.9	Mid. Frequency Voltage	10 %	Output voltage at mid-pointfrequency(P15.8)
6	P15.10	Max. Voltage Frequency	50 Hz	Frequency at maximum output voltage
7	P15.11	Max. Output Voltage	100 %	Output Voltage at mid-point frequency(P15.10)

"Refer to the Speed or Frequency reference and Digital Input Setting Go to the Chapter 7.4.3

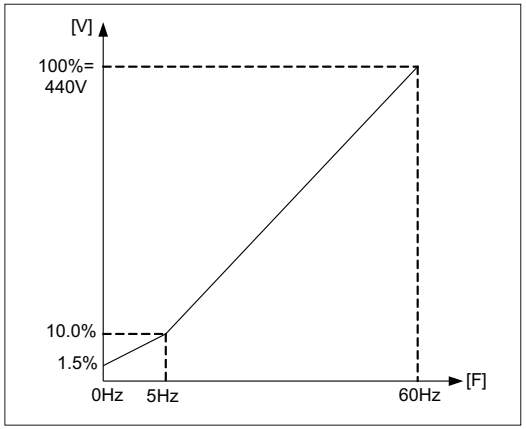


Figure 7.4-2 V/F pattern user setting example

②V/F Speed Control Setting

Order	Parameter Group1: Control Setup [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P1. 6	Control Method	[1] V/F Speed Control	V/F Speed ControlIntrol
	Parameter Group 14: Auto Tuning Configuration			
2	P1.2	Brake Condition	[0] Free	When a Brake is not installed to a motor, or can be released during Auto Tuning
			[1] locked	When a Brake is installed to a motor, and it cannot be released during Auto Tuning
	Main Menu Page[3] Auto Tuning			
3	M3-[1]	Operate Motor Tuning (see the Chapter 7.3)		

"Refer to the Speed or Frequency reference and Digital Input Setting" Go to the Chapter7.4.3

③ S/L Speed Control Setting
When a Brake is not installed to a motor or can be released during Auto Tuning

Order	Parameter Group 1 : Motor 1 Control			
	Code	Parameter Name	Set Value	Explanation
1	P1. 6	Control Method	[2] S/L Speed Control	Sensor less Speed Control
Parameter Group 14 : Auto Tuning Configuration				
2	P14.0	Brake Condition	[0] Free	Motor is not in a stall status
Parameter group 17:s/lvector1				
3	P17.4	Speed gain	[1]Auto-tuning	Speed control P1 Auto tuning gain
Main Menu Page[3] Auto Tuning				
4	M3-[1]	Operate Motor Tuning (see the chapter 7.3)		
5	M3-[2]	Operate Speed Tuning (see the chapter 7.3)		

"Refer to the Speed or Frequency reference and Digital Input Setting" Move to the Chapter 7.4.3
▶ There alreudy has brake decice on moter ,Auto tuning is not availa lole M3 Auto Tuning = [2] Speed Tuning "isnot available.

There already has a brake delice on motor,Auto tuning is not availa ble "M3 auto-tuning=[2] Speed tuning" is not available.

Order	Parameter Group 1 : Motor 1 Control			
	Code	Parameter Name	Set Value	Explanation
1	P1. 6	Control Method	[2] S/L Speed Control	Sensor less Speed Control
	Parameter Group 14 : Auto Tuning Configuration			
2	P14.0	Motor Locked Condition	[1] lock	Motor is not in a stall status
	Main Menu Page[3] Auto Tuning			
3	M3-[1]	Operate Motor Tuning (see the chapter 7.3)		
	Parameter Group 17 : Sensor less Vector Control			
4	P17.14	Speed PI Gain	[0] Default Gain	Use Default value for PI Gain of Speed Control Loop. If needed, change P.17.18, P17.19.

" Refer to the Speed or Frequency reference and Digital Input Setting " Move to the Chapter 7.4.3

7.4.3 Speed or Frequency Reference & Digital Input Setting

This is a parameter setting when you configure Reference and I/O with Analog Input and Digital Input as the Figure 7.4-1. When there is no Multi-Step Digital Input, Analog Inputs are automatically recognized as speed or frequency references. The Multi-Step references are automatically recognized if there is more than one Digital Input related to Multi-Step signals.

(1) Parameter Setting for Speed or Frequency Reference + Multi Step (0[-10]~10V)

Order	Parameter Group 1 : Motor 1 Control			
	Code	Parameter Name	Set Value	Explanation
1	P3. 0	RUN/STOP Method	[0] Terminal	RUN/STOP with DI.01 & DI.02
2	P3. 1	Reference Method	[0] Terminal	Use Analog input and Multi Step for speed or frequency reference
	Parameter Group 6: analog Input Setup			
3	P6. 0	Reference Mode	[1]AI1 only	Use only r1 for Analog Input
4	P6. 1	Analog Input 1 Function	[1] reference 1	Use Analog Input 1 for r1
5	P6. 2	Analog Input 1 Type	[0] 0~10(5)V	Use Voltage Input(0~10V) for Speed Reference
	Parameter Group 8 : Digital Input Setup			
6	P8. 0	RUN/STOP Control	[0] 1.FWD /2.REV	Set Digital Inputs for RUN/STOP
7	P8. 1	DI.03 Function	[1] Drive En.	Set DI.03 Function to "Drive Enable"
8	P8. 2	DI.04 Function	[10] External Fault A	Set DI.04 Function to "External" Fault (A contact)
9	P8. 3	DI.05 Function	[6] Fault Reset	Set DI.05 Function to "Fault Reset"
10	P8. 4	DI.06 Function	[2] Multi Step 0	Set DI.06 Function to "Multi Step 0"
11	P8. 5	DI.07 Function	[3] Multi Step 1	Set DI.07 Function to "Multi Step 1"
12	P8. 6	DI.08 Function	[4] Multi Step 2	Set DI.08 Function to "Multi Step 2"

"Digital & Analog Output Setting" Go to the Chapter 7.4.4

(2) Parameter Setting for Current(0[4]~20mA) Input Reference + Multi Step

Order	Parameter Group 1 : Motor 1 Control			
	Code	Parameter Name	Set Value	Explanation
1	P3. 0	RUN/STOP Method	[0] Terminal	RUN/STOP with DI.01 & DI.02
2	P3. 1	Ramp Function Input Source	[0] Terminal	Set Reference Mode to [0]
	Parameter Group 6 : Analog Input Setup			
3	P6. 0	Analog Reference Source	[2] Ai2	Use only AI2 for Analog Input
4	P6. 15	Analog Input Function	[1]AI	Use Analog Input 1 for AI
5	P6. 16	Analog Input 2 Type	[2] 4 - 20mA	Use Current Input 4~20mA
			[3] 0 - 20mA	Use Current Input 0~20mA
	Parameter Group 8 : Digital Input Setup			
6	P8. 0	RUN/STOP	[0]FWD→DI.01 REV→DI.02	Use Digital Input for RUN/STOP
7	P8. 1	DI.03 Function	[1] Drive Enable	Set DI.03 Function to Drive Enable
8	P8. 2	DI.04 Function	[10] External Fault A	Set DI.04 Function to "ExternalFault (A contact)"
9	P8. 3	DI.05 Function	[6] Fault Reset	Set DI.05 Function to "Fault Reset"
10	P8. 4	DI.06 Function	[2] Multi Step 0	Set DI.06 Function to "Multi Step 0"
11	P8. 5	DI.07 Function	[3] Multi Step 1	Set DI.07 Function to "Multi Step 1"
12	P8. 6	DI.08 Function	[4] Multi Step 2	DI.08 Function to "Multi Step 2"

"Digital & Analog Output Setting" Go to the Chapter 7.4.4

7.4.4 Digital and Analog Output Setting

This is a parameter setting for configuring with Digital Output as Figure 7.4-1 Basic Design.

Order	Parameter Group 1 : Motor 1 Control			
	Code	Parameter Name	Set Value	Explanation
1	P11. 0	AO 1Output Selection	[2] Current	In parameter setting, set Analog Output to Motor Current
2	P11. 1	AO 1 Type	[0] 0~20mA	A range of Analog output is 0~20mA
			[1] 4~20mA	A range of Analog output is 4~20mA
3	P11. 5	AO 1 Output at 20mA	100	This is an output setting value when Analog output is 20mA. (if a user wants 60Hz at 20mA, set this to 60. If a user wants 315A at 20mA, set this to 315. The reference is depends on the analog output selection. P11.0

Order	Parameter Group 12 : Digital Output Setup			
4	P12. 0	DO 1 Function	[4] Motor_Brake	Set Digital Output Function to Magnetic Brake of Motor. (When you use Motor Brake Control, refer to the Chapter 7.4.6 Brake Control Setting) (referto#21#22#23terminals)
5	P12. 1	DO 2 Function	[2] Fault OutA	When Fault occurs set Digital Output Function to work (A OPt)(refer to #24 #25 #26 terminals)
6	P12. 2	DO 3 Function	[1] Drive Ready	Operate when the inverter is ready

"Refer to the Operation Pattern Setting" Go to the Chapter 7.4.5

7.4.5 Operation Pattern Setting

It explains parameter settings when you set the Operation Pattern as Figure 7.4-3 and 7.4-4. The Figure 7.4-1 shows the basic input method.
(1) When you use V/F Frequency and V/F Speed Control

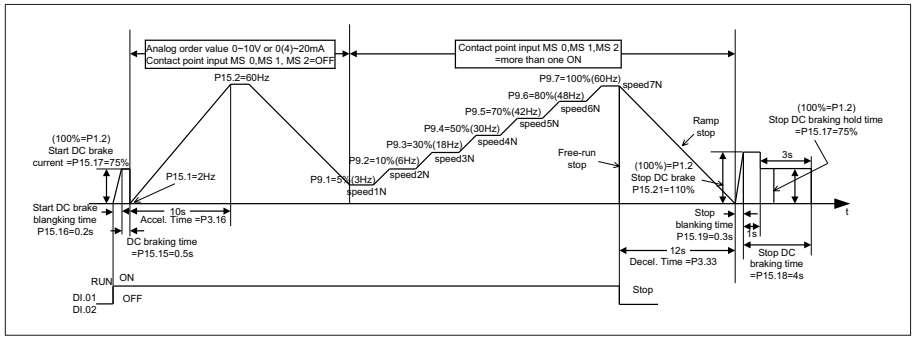


Figure 7.4-3 Operation Pattern Setting of V/F Frequency and V/F Speed Control

① Reference Setup Setting

Order	Parameter Group 3 : Reference Setup			
	Code	Parameter Name	Set Value	Explanation
1	P3.3	STOP Mode	[0] Ramp Stop	When Run-Input signal is turned OFF, inverter stops after Decel Time
			[1] Free-Run Stop	When Run-Input Signal is turned OFF, Inverter output is also turned OFF immediately.
2	P3.9	Accel.Switching Ref[1-2]	100%	100% = Rated Speed or Rated Frequency of Motor
3	P3.16	Accel.Time Region 1	10s	Accel.Time Region 1 See the explanation of parameter

Order	Parameter Group 3 : Reference Setup			
	Code	Parameter Name	Set Value	Explanation
1	P3.26	Decel.Switching Ref[1-2]	100%	100% = Rated Speed or Rated Frequency of Motor
2	P3.33	Decel.Time Region 1	12s	Decel.Time Region 1 See the explanation of parameter

② Multi Step Reference Setting

Order	Parameter Group 9: Multi Step Reference (100% = Rated Speed or Rated Frequency of Motor)			
	Code	Parameter Name	Set Value	Explanation
1	P9.1	Multi Step 1 Reference	5%	60Hz X 5% = 3Hz
2	P9.2	Multi Step 2Reference	10%	60Hz X 10% = 6Hz
3	P9.3	Multi Step 3 Reference	30%	60Hz X 30% = 18Hz
4	P9.4	Multi Step 4 Reference	50%	60Hz X 50% = 30Hz
5	P9.5	Multi Step 5 Reference	70%	60Hz X 70% = 42Hz
6	P9.6	Multi Step 6 Reference	80%	60Hz X 80% = 48Hz
7	P9.7	Multi Step 7 Reference	100%	60Hz X 100% = 60Hz

③ Parameter Setting for V/F Frequency or V/F Speed Control

Order	Parameter Group 15 : V/F Control [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P15.1	Minimum output Frequency	2 Hz	Set up for Minimum Output Frequency
2	P15.2	Maximum output Frequency	60 Hz	Set up for Maximum Output Frequency
3	P15.15	Start DC Brake [Time]	0.5s	Operating time of DC Brake while running
4	P15.16	Start DC Brake [Blank Time]	0.2s	When starting, Accel time for DC Brake current
5	P15.17	Start DC Brake [Current]	75%	When starting, DC Brake current
6	P15.18	Stop DC Brake [Time]	4s	Operating time of DC Brake while stopping
7	P15.19	Stop DC Brake [Blank Time]	0.3s	When stopping, Accel time for DC Brake current
8	P15.20	Stop DC Brake [Current]	75%	When stopping, DC Brake current
9	P15.21	Stop DC Brake [Frequency]	110%	Operating frequency of DC Brake while stopping (100=P1.2)

<Inverter Setting completed!> *When you use the Brake Control of Motor go to "The Chapter 7.4.6. Brake Control Setting using Digital Output"

(2) When you use S/L Vector Speed Control

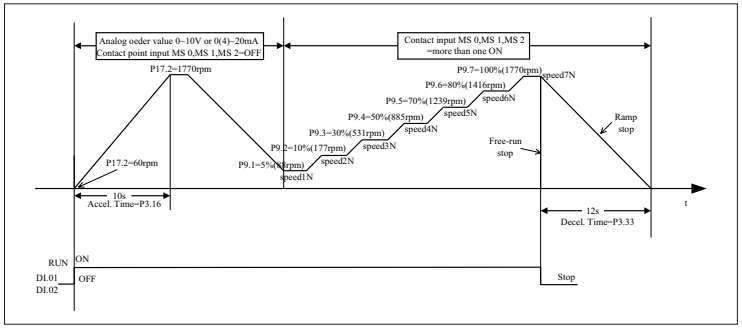


Figure 7.4-4 Operation Pattern Setting of S/L Vector Speed Control

①Reference Setup Setting

Order	Parameter Group 15 : V/F Control [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P3.3	STOP Mode	[0] Ramp Stop	When Run-Input signal is turned OFF, inverter stops after Decel Time
			[1] Free-Run Stop	When Run-Input Signal is turned OFF, Inverter output is also turned OFF immediately.
2	P3.9	Accel.Switching Ref[1-2]	100%	100% = Rated Speed (P1.3) or RatedFrequency of Motor(P1.5)
3	P3.16	Accel.Time Region 1	10s	Accel.Time Region 1 See the explanation of parameter
4	P3.26	Decel.Switching Ref[1-2]	100%	100% = Rated Speed(P1.3) or Rated Frequency of Motor(P1.5)
5	P3.33	Decel.Time Region 1	12s	Decel.Time Region 1 See the explanation of parameter

② Multi Step Reference Setting

Order	Parameter Group 9: Multi Step Reference (100% = Rated Speed or Rated Frequency of Motor)			
	Code	Parameter Name	Set Value	Explanation
1	P9.1	Multi Step 1 Reference	5%	1770rpm X 5% = 88rpm
2	P9.2	Multi Step 2Reference	10%	1770rpm X 10% = 177rpm
3	P9.3	Multi Step 3 Reference	30%	1770rpm X 30% = 531rpm
4	P9.4	Multi Step 4 Reference	50%	1770rpm X 50% = 885rpm
5	P9.5	Multi Step 5 Reference	70%	1770rpm X 70% = 1239rpm
6	P9.6	Multi Step 6 Reference	80%	1770rpm X 80% = 1416rpm
7	P9.7	Multi Step 7 Reference	100%	1770rpm X 100% = 1770rpm
8	P9.16	Unit Selection	[0] Percent[%]	Percent as per percent

③ Operation Pattern Setting for Using S/L Speed Control

Order	Parameter Group 15 : V/F Control [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P17.1	Minimum Speed	60 rpm	Set up Minimum Speed
2	P17.2	Maximum Speed	100%	Set up Maximum Speed (P1.5×100%)
3	P17.3	Over Speed Limit	125%	Set up Over Speed Limit (P1.5×125% =2212 rpam)

<Completed Inverter Setup!> *When you use the Brake Control of Motor go to the Chapter 7.4.6.
Brake Control Setting using Digital Output

7.4.6 Brake Control Parameter Setting Using Digital Output

This explains a parameter setting when you control the Brake that is connected to a motor as Figure 7.4-1, using Digital Output as Figure 7.4-5 and Figure 7.4-6.

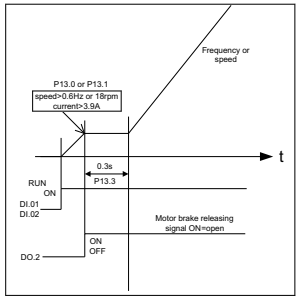


Figure 7.4-5 Mechanical Brake Releasing Signal

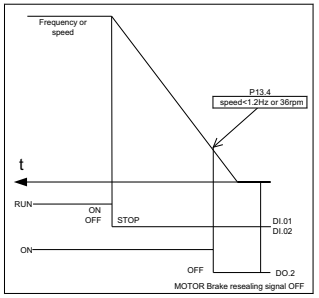


Figure 7.4-6 Mechanical Brake Closing Signal

Order	Parameter Group 15 : V/F Control [Motor 1]			
	Code	Parameter Name	Set Value	Explanation
1	P12.1	DO.2 Function	[4] Motor BrakeSet	D0.2 For brake chpper device
	Parameter Group 13 : Magnetic Brake Control			
2	P13.0	M1 Locked state Up_ref	1%	Digital Output ON for Frequency or Speed Reference (60Hz,1770rpm) X 1%= 0.6Hz, 18rpm
3	P13.1	M1 Locked state Down_ref	1%	
4	P13.2	M1 Open Current	10%	Current of Digital Output ON 38.9A X 10% = 3.9A
5	P13.3	M1 Open Response Time	0.3s	Set up for the time that passes until the Brake is completely opened after Digital Output is ON. The speed or frequency reference is maintained for the M1 Open Response Time.
6	P13.4	M1 Close Reference	2%	Frequency of Digital Output OFF & Speed Reference (60Hz,1770rpm) X 2%= 1.2Hz, 36rpm
7	P13.5	M1 Brake Open TorqueBuild Time	0.2s	This is delay time until contact point output is turned into 'on', after inputting the operating signal. At this time, output current must be more than set value in P13.2

< Digital Output Setting for Brake Control Completed!>

8. Parameter

8.1 Parameter table

Parameter Group 0: Program Control

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P 0.1	Program Boot_Key1 Prog_Key 1		0	[0] Standard I [1] Standard II [2] Application	1	
P 0.2	Program Boot_Key2 Prog_ Key 2		0	[0] Standard I [1] Standard II [2] Application	1	
P 0.3	Program Boot_Key3 Prog_Key 3		0	[0] Standard I [1] Standard II [2] Application	1	
P 0.12	Initialization_ Permission_Key ParIni_Key	[Hex]	0	0 ~ 39321	1	
P 0.13	Drive Voltage Class Volt_Class		0	[0] 200 / 400 / 500 [1] 600V	1	
P 0.14	Norminal_Frequency Class Freq_Class		1	[0] 50 Hz [1] 60 Hz	1	
P 0.15	Thermal_Monitor Class ThermalMon		1	[0]Thermal_Rly [1] NTC_Thermistor	1	

Parameter Group 1: Control Setup [Motor 1]

Changing the default value by the model and capacity of inverter.

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P 1.0	Rated Power M1_Rtd_Pwr	kW	0	0 ~ 1000	0	
P 1.1	Rated Voltage M1_Rtd_Volt	Vrms	0	0 ~ 1500	0	Refer to motor's name plate
P 1.2	Rated Current M1_Rtd_Curr	Arms	0	0 ~ 2000	0	
P 1.3	Rated Frequency M1_Rtd_Freq	Hz	0	0 ~ 3000	0	Refer to motor's name plate
P 1.4	Number of Poles M1_Pole	Pole	0	0 ~ 24	0	
P 1.5	Rated Speed M1_Rtd_Spd	rpm	1800	0 ~ 60000	2	Refer to motor's name plate
P 1.6	Control Method M1_Control		0	[0] V/F Freq [1] V/F Speed [2] S/L_Vector [3] Vector_Ctrl	0	
P 1.7	PWM Frequency M1_PWM_Freq	kHz	2.5	0.8 ~ 10	1	
P 1.9	Supply voltage Supply_Volt	Vrms	0	0 ~ 1500	0	Refer to motor's name plate

Parameter Group 2: Control Setup [Motor 2]

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P 2.0	Rated Power M2_Rtd_Pwr	kW	0	0 ~ 1000	2	
P 2.1	Rated Voltage M2_Rtd_Volt	Vrms	0	0 ~ 1500	2	Refer to motor's name plate
P 2.2	Rated Current M2_Rtd_Curr	Arms	0	0 ~ 2000	2	
P 2.3	Rated Frequency M2_Rtd_Freq	Hz	0	0~3000	2	Refer to motor's name plate
P 2.4	Number of Poles M2_Pole	Pole	0	0~24	2	
P 2.5	Rated Speed M2_Rtd_Spd	rpm	0	0~60000	2	Refer to motor's name plate

P 2.6	Control Method M2_Control		0	[0] V/F Freq [1] V/F Speed [2] S/L_Vector [3] Vector_Ctrl	2	
P 2.7	PWM Frequency M2_PWM_Freq	kHz	2.5	0.8 ~ 10	2	
P 2.9	Supply voltage Supply_Volt	Vrms	0	0~1500	2	Refer to motor's name plate

Parameter Group 3: Reference Setup [Motor1]

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P 3.0	RUN/STOP Method RUN/STOP		0	[0] Terminal [1] Operator [2] Sync Ctrl Bus [3] Fieldbus (Profibus,Modbus, CANbus) [4] Free_Func	0	
P 3.1	RampFunc_Input_Src Ramp_Input		0	[0] Terminal (Digital, Analog) [1] Operator(RS 232C) [2]Syncctrlbus [3] Free Func	0	
P 3.2	Stop command Deteltion Time Stop Detcet		s	0 ~ 10	0	
P 3.3	STOP Mode STOP Mode		0	[0] Ramp STOP [1] Free-Run STOP [2] Mixed STOP	0	
P 3.4	STOP Hold Time StopHold_Tm	S	0.00	0 ~ 300	0	
P 3.5	Output Off Hold Time Out_off _Tm	S	1.00	0.1 ~ 30	0	
P 3.6	Mixed_mode Stop Reference OUT_off_Ref	%	20.0	0 ~ 500	0	
P 3.7	Acc/Dec Ramp Function Acc/Dec_En		1	[0] Disabled [1] Enabled	0	

P 3.8	Acceleration Time Range AccTm_Range		0	[0] 1 sec [1] 10sec	0	
P 3.9	Acc Switching Ref 1-2 AccSw 1-2	%	100.0	0 ~ 300	0	
P 3.10	Acc Switching Ref 2-3 AccSw 2-3	%	150.0	0 ~ 300	0	
P 3.11	Acc Switching Ref 3-4 AccSw 3-4	%	200.0	0 ~ 300	0	
P 3.12	Acc Switching Ref 4-5 AccSw 4-5		225.0	0 ~ 300	2	
P 3.13	Acc Switching Ref 5-6 AccSw 5-6	%	250	0 ~ 300	0	
P 3.14	Acc Switching Ref 6-7 AccSw 6-7	%	275	0 ~ 300	0	
P 3.15	Acc Switching Ref 7-8 AccSw 7-8	%	300.0	0 ~ 300	0	
P 3.16	Acc Time I.1 Acc_Tm I.1	S	10.00	0.01 ~ 300	0	
P 3.17	Acc Time I.2 Acc_Tm I.2	S	5.00	0.01 ~ 300	0	
P3.18	Acc _Time I.3	S	5.00	0.01 ~ 300	0	
P3.19	Acc Time I.4 Acc_Tm I.4	S	5.00	0.01 ~ 300		
P3.20	Acc Time I.5 Acc_Tm I.5	S	5.00	0.01 ~ 300		
P3.21	Acc Time I.6 Acc_Tm I.6	S	5.00	0.01 ~ 300		
P 3.22	Acc Time I.7 AccTm I.7	S	5.00	0.01 ~ 300		
P 3.23	Acc Time I.8 Acc_Tm I.8	S	5.00	0.01 ~ 300		
P 3.24	Acc Time II Acc_Tm II	S	10.00	0 ~ 300	0	DI=[14]ACC/DEC
P 3.25	Decel Time Range DecTm_Rnge	S	0	[0] 1 sec [1] 10sec	0	[0]0~300S [1]0~3000S
P 3.26	Dec Switching Ref 1-2 DecSw 1-2	%	100.0	0 ~ 300	0	
P 3.27	Dec Switching Ref 2-3 DecSw 2-3	%	150.0	0 ~ 300	0	

P 3.28	Dec Switching Ref 3-4 DecSw 3-4	%	200.0	0 ~ 300	0	
P 3.29	Dec Switching Ref 4-5 DecSw 4-5	%	225.0	0 ~ 300	0	
P 3.30	Dec Switching Ref 5-6 DecSw 5-6	%	250.0	0 ~ 300	0	
P 3.31	Dec Switching Ref 6-7 DecSw 6-7	%	275.0	0 ~ 300	0	
P 3.32	Dec Switching Ref 7-8 DecSw 7-8	%	300.0	0 ~ 300	0	
P 3.33	Decel Time I.1 Dec_Tm I.1	s	5.00	0 ~ 300	0	
P 3.34	Decel Time I.2 Dec_Tm I.2	s	5.00	0 ~ 300	0	
P 3.35	Decel Time I.3 Dec_Tm I.3	s	5.00	0.01 ~ 300	0	
P 3.36	Decel Time I.4 Dec_Tm I.4	s	5.00	0.01 ~ 300	0	
P 3.37	Decel Time I.5 Dec_Tm I.5	s	5.00	0.01 ~ 300	0	
P 3.38	Decel Time I.6 Dec_Tm I.6	s	5.00	0.01 ~ 300	0	
P 3.39	Decel Time I.7 Dec_Tm I.7	s	5.00	0.01 ~ 300	0	
P 3.40	Decel Time I.8 Dec_Tm I.8	s	5.00	0.01 ~ 300	0	
P 3.41	Decel Time II Dec_Tm II	s	10.00	0 ~ 300	0	DI=[14]Acc/ Dec
P 3.42	Counter Deceleration Ramp Function C_Decel_En		0	[0] Disabled [1] Enabled	0	
P 3.43	Counter Deceleration Time C_Decel_Tm	s	5.00	0 ~ 300	0	
P 3.49	Emergemcy_Stop MODE ES_Mode		0	[0] Ramp STOP [1] Free-Run [2] Mixed STOP	0	
P 3.50	Emergemcy_STOP Decel_Time ES_DecTime	s	1.00	0.001 ~ 30	0	

P 3.51	Continuous OP Mode CONTINU_OP		1.00	[0]Disabled [1]Enabled	0	
P 3.52	Reverse_DIR_ Operation Rev_Dir_EN		1	[0]Disabled [1]Enabled	0	

Parameter Group4:Referenence setup (motor2)

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P4.0	RUN/STOP Method RUN/STOP		0	[0] Terminal [1] Operator (RS 232C) [2] Synchronous_Ctrl [3]Fieldbus(Profibus, Modbus, CANbus) [4] Free Function Logic	2	
P4.1	RampFunc_Input_Src Ramp_Input		0	[0] Terminal (Digital, Analog) [1] Operator (RS 232C) [2] SyncctrlBus [3] Free -Func	2	
P4.2	Stop Command Detection Time STOP Detect	s	0	0 ~ 10	2	
P4.3	STOP Mode STOP Mode		0	[0] Ramp STOP [1] Free-Run STOP [2] Mixed STOP	2	
P4.4	STOP Hold-Time StopHold_Tm	s	0	0 ~ 300	2	P4.3=[0] ramp stop
P4.5	Output OFF Hold-Time Out_off_Tm	s	1.00	0.1~300	2	P4.3=[1] Free-run stop
P4.6	Mixed-Mode STOP Reference Out_off_Ref	%	20.0	0 ~ 500	2	P4.3=[2] Mixed stop
P4.7	Acc/Dec Ramp Enable Acc/Dec_En		1	[0]Disabled [1]Enabled	2	
P4.8	Accel_Time Range AccTm_Range		0	[0]1sec [1]10sec	2	
P4.9	Acc Switching Ref 1-2 AccSw 1-2	%	100.0	0 ~ 300	2	
P4.10	Acc Switching Ref 2-3 AccSw 2-3	%	150.0	0 ~ 300	2	
P4.11	Acc Switching Ref 3-4 AccSw 3-4	%	200.0	0 ~ 300	2	
P4.12	Acc Switching Ref 4-5 AccSw 4-5	%	225.0	0 ~ 300	2	

P4.13	Acc Switching Ref5-6 AccSw 5-6	%	250.0	0 ~ 300	2	
P4.14	Acc Switching Ref6-7 AccSw 6-7	%	275.0	0 ~ 300	2	
P4.15	Acc Switching Ref7-8 AccSw 7-8	%	300.0	0 ~ 300	2	
P4.16	Acc Time I.1 Acc_Tml.1	S	5.00	0.01 ~ 300	2	
P4.17	Acc Time I.2 Acc_Tml.2	S	5.00	0.01 ~ 300	2	
P4.18	Acc Time I.3 Acc_Tm I.3	S	5.00	0.01 ~ 300	2	
P4.19	Acc Time I.4 Acc_Tm I.4	S	5.00	0.01 ~ 300	2	
P4.20	Acc Time I.5 Acc_Tm I.5	S	5.00	0.01 ~ 300	2	
P4.21	Acc Time I.6 Acc_Tm I.6	S	5.00	0.01 ~ 300	2	
P4.22	Acc Time I.7 Acc_Tm I.7	S	5.00	0.01 ~ 300	2	
P4.23	Acc Time I.8 Acc_Tm I.8	S	5.00	0.01 ~ 300	2	
P4.24	Acc Time II Acc_Tm II	S	10.00	0.01 ~ 300	2	
P4.25	Decel Time Range DecTm_Rnge		0	[0] 1sec [1] 10sec	2	
P4.26	Dec Switching Ref 1-2 DecSw 1-2	%	100.0	0 ~ 300	2	
P4.27	Dec Switching Ref 2-3 DecSw 2-3	%	150.0	0 ~ 300	2	
P4.28	Dec Switching Ref 3-4 DecSw 3-4	%	200.0	0 ~ 300	2	
P4.29	Dec Switching Ref 4-5 DecSw 4-5	%	225.0	0 ~ 300	2	
P4.30	Dec Switching Ref 5-6 DecSw 5-6	%	250.0	0 ~ 300	2	
P4.31	Dec Switching Ref 6-7 DecSw 6-7	%	275.0	0 ~ 300	2	
P4.32	Dec Switching Ref 7-8 DecSw 7-8	%	300.0	0 ~ 300	2	

P 4.33	Decel Time I.1 DecTmI.1	s	5.00	0.01 ~ 300	2	
P 4.34	Decel Time I.2 DecTm I.2	s	5.00	0.01 ~ 300	2	
P 4.35	Decel Time I.3 DecTm I.3	s	5.00	0.01 ~ 300	2	
P4.36	Decel Time I.4 DecTm I.4	s	5.00	0.01 ~ 300	2	
P4.37	Decel Time I.5 DecTm I.5	s	5.00	0.01 ~ 300	2	
P4.38	Decel Time I.6 DecTm I.6	s	5.00	0.01 ~ 300	2	
P4.39	Decel Time I.7 DecTm I.7	s	5.00	0.01 ~ 300	2	
P4.40	Decel Time I.8 DecTm I.8	s	5.00	0.01 ~ 300	2	
P4.41	Decel Time II Dec_Tm II	s	10.00	0.01 ~ 300	2	
P4.42	Counter Deceleration Ramp Function C_Decel_En		0	[0] Disabled [1] Enabled	2	
P4.43	Counter Deceleration Time C_Decel_Tm	s	5.00	0.01 ~ 300	2	
P4.49	Emergency_STOP Mode ES_Mode		0	[0] Ramp STOP [1] Free-RUN [2] Mixed STOP	2	
P4.50	Emergency_STOP Decel_ Time ES_DecTime	s	1.00	0.01~10	2	
P4.51	Continuous OP_Mode CONTINU_OP		1.00	[0] Disabled [1] Enabled	2	
P4.52	Reverse_DIR_ Operation Rev_Dir_EN		1.00	[0] Disabled [1] Enabled	2	

Parameter Group 5: Protection

Par.NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P5.0	Current Limit [Motor1] I_Limit[M1]	%	145.0		1	

P5.1	Current Limit [Motor2] I_Limit[M2]	%	130.0		2	
P5.7	Max. Continuous Current MaxCon_Curr	%	95.0	0 ~ 250	1	
P5.8	Over-Load current Over_Load	%	135.0	0 ~ 250	1	
P5.9	Over-Load Time OL_TimeOver	s	60.00	0 ~ 300	1	
P5.10	Over-Load Fault [Action] OL_Action		0	[0] STOP [1] E_STOP [2] Ctrl-OFF [3] IGNORE	0	
P5.11	Over-Current Trip [motor1] OC_Trip_M1	%	220.0	0 ~ 350	2	
P5.12	Zero-sequence Current Trip ZC_Trip	%	15.0	0 ~ 100	2	
P5.13	Over-Voltage Limiting Function OV_Ltd_Fn		0	[0] Disabled [1] Enabled	1	
P5.14	Over Voltage Limit OV Limit	V	350.0	0 ~ 850	1	
P5.15	Over Voltage trip OV Trip	V	360.0	0 ~ 900	2	
P5.16	UV compensation _Voltage UV_Comp_Fn		1	[0] Disabled [1] Enabled	1	
P5.17	UV compensation_ Voltage UV_Comp_V	V	450	0 ~ 1000	1	
P5.18	Under Voltage Trip UV_Trip	V	360	0 ~ 1000	2	
P5.19	Open Phase Protection OP_Ph_Trip		1	[0]Disabled [1]Enabled	0	
P5.20	Supply Frequency Input_Freq	Hz	60.0	0 ~ 100	0	
P5.21	Built-in Dynamic Brake BIt-in_DB		1	[0] Disabled [1] Enabled_RUN [2] En_RUN_STOP	0	

P5.23	DB Start DB_Start_V	V	690	300 ~ 850	1	
P5.24	DB Full Voltage DB_Full_V	V	710.0	300 ~ 850		
P5.25	Over-Temperature Trip [Action] OT_Action		2	[0] STOP [1] E_STOP [2] CTRL_OFF [3] IGNORE [4] SPEED_DOWN	1	
P5.30	Auto Restart Count RestartCnt		0	0 ~ 10	1	Restart delay time
P5.31	Retry Delay Time Retry_Dly	S	1.5	0 ~ 100	1	
P5.32	Auto Reset (OC) A.Rst_OC		0	0 ~ 100	1	
P5.33	Auto Reset (OV) A.Rst_OV		0	[0]Disabled [1]Enabled	1	
P5.34	Auto Reset (UV) A.Rst_UV		0	[0] Disabled [1]Enabled	1	
P5.37	Out of Control Auto-Reset A.Rst_CnEr		0	[0]Disabled [1]Enabled	1	
P5.38	Out of Control Time CntlErr_Tm	S	5.0	0.1 ~ 1000	1	
P5.39	Out of Control Current Ctrl_Err_I	%	90.0	50 ~ 97.5	1	
P5.40	Over Temperature Over_Temp	Deg	75.0	60~125	5	
P5.41	Over-Current Trip[II] OC_Trip_M2	%	200	0 ~ 800	3	

Parameter Group 6: Analog Input

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P6.0	Analog Reference Source AI_Ref_Src		1	[0] Disabled [1] AI 1Ref [2] AI 2Ref	0	
P6.1	AI.1 Function AI1 Func		1	[0] Disabled [1] Analog-In	0	
P6.2	AI.1_Type AI1 Type		0	[0] 0 ~ 10(5)V [1] -10 ~ 10V [2] 4 ~ 20mA [3] 0 ~ 20mA	0	

P6.4	AI.1 Filter Time Const Ai1 Tm_Ct	ms	25.0	1 ~ 2000	0	
P6.5	AI.1 Offset AI1 Offset	mA/ V	0.000	-10 ~ 10	0	
P6.6	AI.1 min Voltage AI1 Min_V	V	0.000	0 ~ 9	0	
P6.7	AI.1 min Current AI1 Min_mA	mA	0.00	0 ~ 18	0	
P6.8	AI.1 Minimum AI1 Min.	%	0.0	0 ~ 500	0	
P6.9	AI.1 Max Voltage AI1 Max_V	V	10.00	1 ~ 10	0	
P6.10	AI.1 max Current AI1 Mx_mA	mA	20.00	2 ~ 20	0	
P6.11	AI.1 Maximum AI1 Max.	%	100.0	0 ~ 500	0	
P6.12	AI.1 Inversion AI1 Inv		0	[0]Disabled [1]Enabled	0	
P6.13	AI.1 Discreteness AI1 D_Step		0	[0]Disabled [1]128Steps [2]64Steps [3]32Steps [4]16Steps [5]8Steps	0	
P6.14	AI. 1 Dead-Zone AI1 Dead-Z		0	[0] Disabled [1] Enabled	0	
P6.15	AI.2 Function AI2 Func		1	[0] Disabled [1] Analog-In	0	
P6.16	AI.2 Type AI2 Type		3	[0] 0 ~ 10(5)V [1] -10 ~ 10V [2] 4 ~ 20mA [3] 0 ~ 20mA	0	
P6.18	AI.2 Filter Time Const AI2 Tm_Ct	Ms	25.0	1 ~ 2000	0	
P6.19	AI.2 Offset AI2 Offset	mA/ V	0.000	-10 ~ 10	0	
P6.20	AI.2 Min Voltage AI2 Min_V	V	0.000	0 ~ 9	0	
P6.21	AI.2 Min Current AI2 Min_mA	mA	0.000	0 ~ 18	0	

P6.22	AI.2 Minimum AI2 Min.	%	0.0	0 ~ 500	0	
P6.23	AI.2 Max Voltage AI2 Max_V	V	10.00	1 ~ 10	0	
P6.24	AI.2 Max Current AI2 Mx_mA	mA	20.00	2 ~ 20	0	
P6.25	AI.2 Maximum AI2 Max.	%	100.0	0 ~ 500	0	
P6.26	AI.2 Inversion AI2 Inv.		0	[0]Disabled [1]Enabled	0	
P6.27	AI.2 Discreteness AI2 D_Step		0	[0] Disabled [1] 128 Steps [2] 64 Steps [3] 32 Steps [4] 16 Steps [5] 8 Steps	0	
P6.28	AI. 2 Dead-Zone AI2 Dead-Z		0	[0]Disabled [1]Enabled	0	
P6.29	AI.3 Function AI3 Func		0	[0] Disabled [1] Analog-In	2	
P6.30	AI.3 Type AI3 Type		0	[0] 0 ~ 105V [1] -10 ~ 10V [2] 4 ~ 20mA [3] 0 ~ 20mA	2	
P6.32	AI.3 Filter Time Const Ai3 Tm_Ct	ms	25.0	1 ~ 2000	2	
P6.33	AI.3 Offset Ai3 Offset	mA/ V	0.000	-10 ~ 10	2	
P6.34	AI.3 Min Voltage Ai3 Min_V	V	0.000	0 ~ 9	2	
P6.35	AI.3 Min Current Ai3 Min_mA	mA	0.000	0 ~ 18	2	
P6.36	AI.3 Minimum AI3 Min.	%	0.0	0 ~ 500	2	
P6.37	AI.3 Max Voltage AI3 Max_V	V	10.00	1 ~ 10	2	
P6.38	AI.3 Max Current AI3 Mx_mA	mA	20.00	2 ~ 20	2	
P6.39	AI.3 Maximum AI3 Max.	%	100.0	0 ~ 500	2	
P6.40	AI.3 Inversion AI3 Inv.		0	[0] Disabled [1] Enabled	2	

P6.41	AI.3 Discreteness AI3 D_Step		0	[0]Disabled [1]128 Steps [2]64Steps [3]32Steps [4]16Steps [5]8Steps	2	
P6.42	AI. 3 Dead-Zone AI3 Dead-Z		0	[0] Disabled [1] Enabled	2	
P6.43	AI.4 Function AI4 Func.		0	[0] Disabled [1] Analong-In	2	
P6.44	AI.4 Type AI4 Type		0	[0] 0 ~10(5)V [1] -10 ~ 10V [2] 4 ~ 20mA [3] 0 ~ 20mA	2	
P6.46	AI.4 Filter Time Const AI4 Tm_Ct	ms	25.0	1 ~ 2000	2	
P6.47	AI.4 Offset AI4 Offset		0.000	-10 ~ 10	2	
P6.48	AI.4 Min Voltage AI4 Min_V	V	0.00	0 ~ 9	2	
P6.49	AI.4 Min Current AI4 Min_mA	mA	0.00	0 ~ 18	2	
P6.50	AI.4 Minimum AI4 Min	%	0.0	0 ~ 500	2	
P6.51	AI.4 Max Voltage AI4 Max_V	V	10.00	1 ~ 10	2	
P6.52	AI.4 Max Current AI4 Mx_mA	mA	20.00	2 ~ 20	2	
P6.53	AI.4 Maximum AI4 Max.	%	100.0	0 ~ 500	2	
P6.54	AI.4 Inversion AI4 Inv.		0	[0] Disabled [1] Enabled	2	
P6.55	AI.4 Discreteness AI4 D_Step		0	[0]Disabled [1]128Steps [2]64Steps [3]32Steps [416Steps [5]8Steps		
P6.56	AI. 4 Dead-Zone AI4 Dead-Z		0	[0]Disabled [1]Enabled	2	
P6.57	AI.5 Function AI.5 Func.		0	[0] Disabled [1] Analog-InI	2	

P6.58	AI.5 Type AI5 Type		0	[0] 0 ~ 10(5)V [1] -10 ~ 10V [2] 4 ~ 20mA [3] 0 ~ 20mA	2	
P6.60	AI.5 Filter Time Const AI5 Tm_Ct	ms	25.0	1 ~ 2000	2	
P6.61	AI.5 Offset AI5 Offset	mA/ V	0.000	-10 ~ 10	2	
P6.62	AI.5 Min Voltage AI5 Min_V	V	0.00	0 ~ 9	2	
P6.63	AI.5 Min Current AI5 Min_mA	mA	0.00	0~18	2	
P6.64	AI.5 Minimum AI5 Min.	%	0.0	0 ~ 500	2	
P6.65	AI.5 Max Voltage AI5 Max_V	V	10.00	1 ~ 10	2	
P6.66	AI.5 Max Current AI5 Mx_mA	mA	20.00	2 ~ 20	2	
P6.67	AI.5 Maximum AI5 Max.	%	100.0	0 ~ 500	2	
P6.68	AI.5 Inversion AI5 Inv.		0	[0] Disabled [1] Enabled	2	
P6.69	AI.5 Discreteness AI5 D_Step		0	[0] Disabled [1] 128 Steps [2] 64 Steps [3] 32 Steps [4] 16 Steps [5] 8 Steps		
P6.70	AI.5 Dead-Zone AI5 Dead-Z		0	[0] Disabled [1] Enabled		

Parameter Group 7: PID Control

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P7.0	PID Control Mode PID Mode		0	[0] Disabled [1] Process PID [2] Compensator [3] FreeFnc- PID	0	
P7.1	Reference_Mode Reference		2	[0] Operator(Keypad) [1] Set-value [2] AI1Ref [3] AI2Ref [4] Free-Func	0	

P7.2	Fixed Set-Point Fixed_SetPt	%	0.0	0 ~ 400	0	
P7.3	Feedback_Src Feedback		1	[0] AI 1Fb [1] AI 2Fb [2] Free Func	0	
P7.4	Reference Sign Change REF_Sgn_Neg		0	[0]Disabled [1]Enabled	0	
P7.5	Feedback Sign Change FB_Sng_Neg		0	[0]Disabled [1]Enabled	0	
P7.6	Control Period Cntl Period	ms	10	1 ~ 1000	0	
P7.7	Proportional Gain P-Gain	%	5.0	0 ~ 3000	0	
P7.8	Integration Time Integ_Time	S	30.00	0 ~ 300	0	
P7.9	Differentiator Time Constant Diff_Time	ms	0	0 ~ 30000	0	
P7.10	Feedforward Gain FF-Gain	%	0.0	0 ~ 200	0	
P7.11	Zero-Shift Factor 1 ZERO_Adj 1	%	100.0	5 ~ 100	0	
P7.12	Proportional Gain 2 P-Gain 2	%	5.0	0 ~ 1000	0	
P7.13	Integration Time 2 Int_Time 2	S	30.00	0 ~ 300	0	
P7.14	Differentiator Time Constant 2 Dif_Time 2	ms	0	0 ~ 30000	0	
P7.15	Feed-Forward Gain2 FF-Gain 2	%	0.0	0 ~ 200	0	
P7.16	Zero-Shift Factor 2 ZERO_Adj 2	%	100.0	5 ~ 100	0	
P7.17	Output Inversion Output_INV		0	[0] Disabled [1] Enabled	0	
P7.18	Integrator Lower Limit Int_Lo_Lmt	%	0.0	-300 ~ 300	0	
P7.19	Integrator Upper Limit Int_Up_Lmt	%	100.0	-300 ~ 300	0	
P7.20	Output Lower Limit Out_Lo_Lmt	%	0.0	-300 ~ 300	0	

P7.21	Output Upper Limit Out_Up_Lmt	%	100.0	-300 ~ 300	0	
P7.22	Output_Scale Func Src Out_Scale		0	[O] Null Data (0)	0	
P7.23	Integrator_Ini_Value Int_St_Val		0	[O] Null Data (0)	0	
P7.24	AUTO RUN/STOP Auto_RN_ST		0	[0] Disabled [1] Enabled	0	
P7.25	Auto Stop Delay Time AutoSt_Dly	S	0.0	0 ~ 3000	0	
P7.26	Auto Start Error Condition AutoSt_Err	%	10.0	0 ~ 50	0	
P7.27	Set_Pt Func_Src Ref_Fn_Src		0	[O] Null Data (0)	0	
P7.28	Feedback Func_Src Fbk_Fn_Src		0	[O] Null Data (0)	0	

Parameter Group 8: Digital Input Setup

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P8.0	Run/Stop Control RUN/STOP		0	[0] 1.FWD / 2.REV [1] 1.RUN /2.DIR	0	
P8.1	DI 3 Function DI.3 Func.		0	[0] None [1] Drive- En. [2] Mutistep-0 [3] Mutistep-1 [4] Mutistep-20 [5] Mutistep-3 [6] Fault Reset [7] JOG [8] AI_REF_EN [9] AI_LOL-Remo [10] Ext- Fault A [11] Ext- Fault B [12] Motor -Sel. [13] Mt-Brk-St [14] Accel/Decel [15] Ref_up [16] Ref_Doun [17] Acc/Dec_Byp [18] PID-Bypass		
P8.2	DI 4 Function DI.4 Func.		10			
P8.3	DI 5 Function DI.5 Func.		6			
P8.4	DI 6 Function DI.6 Func.		2			
P8.5	DI 7 Function DI.7 Func.		3			
P8.6	DI 8 Function DI.8 Func.		4			
P8.7	DI 9 Function DI.9 Func.		0		2	
P8.8	DI 10 Function DI.10 Func.		0			
P8.9	DI 11 Function DI.11 Func		0			

P8.10	DI 12 Function DI.12 Func	0		[19] AUTO-PID [20] PID-GAIN [21] Rst-PID-INT [22] Trq_Opt_Byp [23] Trq-Sign [24] Trq-2ro-Out [25] Inching-Run [26] Slave_RUN [27]Slu-Opt-Byp [28] Flying_Start [29] Disable P/B		
P8.15	Blank Time after M.C. Blank	s	0.50	0.1 ~ 2	0	
P8.16	Ref. Up/Down Time Ref. UP/DN	s	50.00	1 ~ 30	0	
P8.17	Flying Start Fly_start	s	0	[0] Disabled [1] Enable	0	
P8.18	RUN Delay Time RUN_Delay	s	0.00	0 ~ 2	0	
P8.19	Inching-Tm	s	0.00	0~30	0	

Parameter Group 9: Multi-Step Reference [Motor 1]

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P9.0	JOG Set JOG_SetPt	%	20.0	0 ~ 300	0	
P9.1	Step [1] Set M_Step 1	%	15.0	0 ~ 300	0	
P9.2	Step [2] Set M_Step 2	%	30.0	0 ~ 300	0	
P9.3	Step [3] Set M_Step 3	%	50.0	0 ~ 300	0	
P9.4	Step [4] Set M_Step 4	%	100.0	0 ~ 300	0	
P9.5	Step [5] Set M_Step 5	%	100.0	0 ~ 300	0	
P9.6	Step [6] Set M_Step 6	%	100.0	0 ~ 300	0	
P9.7	Step [7] Set M_Step 7	%	100.0	0 ~ 300	0	

P9.8	Step [8] Set M_Step 8	%	100.0	0 ~ 300	0	
P9.9	Step [9] Set M_Step 9	%	100.0	0 ~ 300	0	
P9.10	Step [10] Set M_Step 10	%	100.0	0 ~ 300	0	
P9.11	Step [11]Set M_Step 11	%	100.0	0 ~ 300	0	
P9.12	Step [12] Set M_Step 12	%	100.0	0 ~ 300	0	
P9.13	Step [13] Set M_Step 13	%	100.0	0 ~ 300	0	
P9.14	Step [14] Set M_Step 14	%	100.0	0 ~ 300	0	
P9.15	Step [15] Set M_Step 15	%	100.0	0 ~ 300	0	
P9.16	Unit Selecting Unit [%/Hz]		0	[0] Percent [%] [1] Frequency [Hz]	0	

Parameter Group 10: Multi-Step Reference [Motor 2]

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P10.0	JOG Reference JOG_SetPt	%	20.0	0 ~ 300	3	
P10.1	Step [1] Set M_Step 1	%	15.0	0 ~ 300	3	
P10.2	Step [2] Set M_Step 2	%	30.0	0 ~ 300	3	
P10.3	Step [3] Set M_Step 3	%	50.0	0 ~ 300	3	
P10.4	Step [4] Set M_Step 4	%	100.0	0 ~ 300	3	
P10.5	Step [5] Set M_Step 5	%	100.0	0 ~ 300	3	
P10.6	Step [6] Set M_Step 6	%	100.0	0 ~ 300	3	
P10.7	Step [7] Set M_Step 7	%	100.0	0 ~ 300	3	
P10.8	Step [8] Set M_Step 8	%	100.0	0 ~ 300	3	

P10.9	Step [9] Set M_Step 9	%	100.0	0 ~ 300	3	
P10.10	Step [10] Set M_Step 10	%	100.0	0 ~ 300	3	
P10.11	Step [11] Set M_Step 11	%	100.0	0 ~ 300	3	
P10.12	Step [12] Set M_Step 12	%	100.0	0 ~ 300	3	
P10.13	Step [13] Set M_Step 13	%	100.0	0 ~ 300	3	
P10.14	Step [14] Set M_Step 14	%	100.0	0 ~ 300	3	
P10.15	Step [15] Set M_Step 15	%	100.0	0 ~ 300	3	
P10.16	Unit Selection Unit [%/Hz]		0	[0] [%] [1] [Hz]	0	

Parameter Group 11: Analog Output Configuration

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P11.0	AO.1 output Selection AO1 output		1	[0] Frequency [1] Motor Speed [2] Out Current [3] Out-Voltage [4] Torque [5] Power-Out [6] DC-L-Voct [7] Free_Func [8] Trim 0 mA [9] Trim 4 mA [10] Trim 20 mA	0	
P11.1	AO.1 Type AO1 Type		0	[0] 0 ~ 20mA [1] 4 ~ 20mA	0	
P11.2	AO.1 Adjustment [0mA] AO10 _Adj	p • u	0.0530	0 ~ 0.5	0	
P11.3	AO.1 Adjustment [4mA] AO1 4_Adj	p • u	0.2143	0.15 ~ 0.5	0	
P11.4	AO.1 Adjustment [20mA] AO120_Adj	p • u	0.8560	0.5 ~ 1	0	
P11.5	AO.1 Max_Output AO1 Scale	%	100	0 ~ 300	0	

P11.6	AO.1 Inversion AO1 Inv.		0	[0] Disabled [1] Enabled	0	

Parameter Group 12: Digital Output Setup

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P12.0	DO 1 Function DO.1 Func.		2	[0] None [1] Drive-Ready [2] Fault-Out A [3] Fault-Out B [4] MOTOR-BRAKE [5] RUN/-STATUS [6] WARNING [7] DIRECTION [8] JOG [9] OV-OC-UV-Fn [10]Free Func	0	
P12.1	DO 2 Function DO.2 Func.		5			
P12.2	DO 3 Function DO.3 Func.		1			
P12.3	DO 4 Function DO.4 Func		0		2	
P12.4	DO 5 Function DO.5 Func		0			
P12.5	DO 6 Function DO.6 Func.		0			
P12.6	DO 7 Function DO.7 Func		0			
P12.7	DO 8 Function DO.8 Func		0			

Parameter Group 13: Motor Brake Control

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P13.0	M1 Locked State Up_Spd_Set B1_OP_RefU	%	4.0	-100 ~ 100	0	
P13.1	M1 Locked State Down_Spd_Set B1_OP_RefD	%	0.0	-10 ~ 100	0	
P13.2	M1_Brk Open Current B1_OP_I	%	25.0	0 ~ 200	0	
P13.3	M1 START Delay_ Time B1_OP_Time	s	0.00	0 ~ 5	0	
P13.4	M1 Brk_Close Spd_Set B1_CL_Spd	%	1.0	0 ~ 100	0	
P 13.5	M1_Brk_OPEN_ Torque_Build_Time B1_Trq_Tm	s	0.2	0 ~ 1	0	

P13.6	M2 Locked State UP_Spd_Set B2_OP_RefU	%	4.0	-10 ~ 10	3	
P13.7	M2 Locked State DOWN_Spd_Set B2_OP_RefD	%	0.0	-10 ~ 10	3	
P13.8	M2 OPEN Current B2_OP_I	%	25.0	0 ~ 200	3	
P13.9	M2 START Delay_ Time B2_OP_Time	s	0.00	0 ~5	3	
P13.10	M2_Brk CLOSE Spd_Set B2_CL_Spd	s	1.0	0 ~ 100	3	
P13.11	M2_Brk_OPEN Torque_Build_Time B2_Trq_Tm	s	0.2	0 ~ 1	3	

Parameter Group 14: Auto Tuning Configuration

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P14.0	Motor tuning Condition Tuning_Con		1	[0] Free [1] Locked	0	
P14.1	Excitation stip Frequency Excit_stip	%	70.0	10 ~ 200	1	
P14.2	Min. Tuning Speed Tune_Spd_L	rpm	75	-3000 ~ 3000	1	
P14.3	Max. Tuning Speed Tune_Spd_H	rpm	200	-3000 ~ 3000	1	
P14.4	High-Freq Excitation Frequency HFI_Freq	%	30	10 ~ 100	0	
P14.5	High-Freq Excitation Current HFI_Curr	%	75	10 ~ 100	0	
P14.6	Starting Excitation Current Exc_St Curr	%	75	0 ~ 100	0	
P14.7	Low Speed Excitation Flux Excit_Flix	%	95	0 ~ 100	0	

Parameter Group 15: V/F Control [Motor 1]

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P15.0	Torque Compensation Torq_Comp		0	[0] Manual [1] Auto	0	
P15.1	Min. output Freqency Min_Freq	Hz	0.0	0 ~ 3000	0	
P15.2	Max output Frequency Max_Freq	Hz	60.0	0 ~ 3000	0	
P15.3	Torque Compensation Flux Current FLux_Out_I	%	50	0 ~ 150	0	
P15.4	Torque Compensation Time Constant Trq_Out_Tm	ms	500.0	20 ~ 3000	0	
P15.5	Speed Detection Time Constant Spd_Det_Tm	ms	100.0	20 ~ 3000	0	
P15.6	V/F Pattern V/F Curve		0	[0] Linear [1] Square [2] User [3] Free-Func	0	
P15.7	Zero Frequency Voltage Zr_Freq_V	%	1.5	0 ~ 50	0	
P15.8	Mid. Frequency Mid_Freq	Hz	6.0	1 ~ 3000	0	
P15.9	Mid. Frequency Voltage Mid_Freq-V	%	11.0	0 ~ 100	0	
P15.10	Max Voltage Frequency Max_V_Frq	Hz	99.0	0 ~3000	0	
P15.11	Max. Output Voltage Max_Volt	%	100.0	0 ~ 150	0	
P15.12	Max. Voltage Limiter Max_V_Ltd		0	[0] Disabled [1] Enabled	0	
P15.14	Sq_Crv Voltage Compensation Sq_crv_v	%	25.0	0 ~ 100	3	
P15.15	DC-Brake Time [START] St_Brk_Tm	s	0.0	0 ~ 30	0	
P15.16	DC-Brake Blanking Time [START] St_Brk_B	s	0.00	0 ~ 3	0	

P15.17	DC-Brake Current [START] St_Brk_I	%	75.0	0 ~ 150	0	
P15.18	DC-Brake Time [STOP] Sp_Brk_Tm	s	0.0	0 ~ 30	0	
P15.19	DC-Brake Blanking Time [STOP] Sp_Brk_B	s	0.00	0 ~ 30	0	
P15.20	DC-Brake Hold_Current [STOP] Stp_Brk_Ih	%	75.0	0 ~ 150	0	
P15.21	DC-Brake Starting_ Current [STOP] Stp_Brk_Ih	%	90.0	0 ~ 150	0	
P15.22	Current Ctrl Proportional-Gain CC P-Gain	%	100.0	0 ~ 1000	4	
P15.23	Current Ctrl Integral-Gain CC I-Gain	%	100.0	0 ~ 1000	4	
P15.24	Stabilization Time Constant /StbT_Cons	ms	0.8	0.8 ~ 10	0	
P15.25	Stabilization Gain Stb_Gain	%	10.0	0 ~ 50	0	
P15.26	Stabilization Limit Stb_Limit	%	0.70	0 ~ 2	0	
P15.27	High_Speed Unity_ Current_Range Unity_I_f	%	300.0	100 ~ 2000	0	
P15.28	Accel_OC_Protection Ctrl_Gain Acc_OC_Gn	%	100	0 ~ 3000	0	

Parameter Group 16: V/F Control [Motor 2]

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P16.0	Torque Compensation Mode Trq_Comp		0	[0] Manual [1] Auto	3	
P16.1	Min. Output Freqency Min_Freq	Hz	0.0	0 ~ 3000	3	
P16.2	Max.Output Frequency Max_Freq	Hz	60.0	0 ~ 3000	3	
P16.3	Torque Compensation Flux Current Flux_Out_I	%	50.0	10 ~ 150	3	
P16.4	Torque Compensation Time Constant Trq_Out_Tm	ms	500.0	20 ~ 3000	0	
P16.5	Speed Detection Time Constant Spd_Det_Tm	ms	100.0	20 ~ 3000	0	

P16.6	VVVF Pattern V/F Curve		0	[0] Linear [1] Square [2] User [3] Free-Func	3	
P16.7	Zero Frequency Voltage Zr_Freq_V	%	1.5	0 ~ 50	3	
P16.8	Mid. Frequency Mid_Freq	%	6.0	1 ~ 3000	3	
P16.9	Mid. Frequency Voltage Mid_Freq-V	%	11.0	0 ~ 100	3	
P16.10	Max Voltage Frequency Max_V_Frq	%	99.0	0 ~ 3000	3	
P16.11	Max output Voltage Max_Volt	%	100.0	0 ~ 150	3	
P16.12	Voltage Limiter Max_V_Ltd		0	[0]Disabled [1]Enabled	3	
P16.14	Sq_Crv Voltage Compensation Sq_crv_v	%	25.0	0 ~ 100	3	
P16.15	DC-Brake Time [START] St_Brk_Tm	s	0.0	0 ~ 30	3	
P16.16	DC-Brake Blanking Time [START] St_Brk_B	s	0.00	0 ~ 3	3	
P16.17	DC-Brake Current [START] St_Brk_I	%	75.0	0 ~ 150	3	
P16.18	DC-Brake Time [STOP] Sp_Brk_Tm		0.0	0 ~ 30	3	
P16.19	DC-Brake Blanking Time [STOP] Sp_Brk_B	s	0.00	0 ~ 30	3	
P16.20	DC-Brake Hold_Current [STOP] Stp_Brk-In	%	75.0	0 ~ 150	3	
P16.21	DC-Brake Starting_Current [STOP] Stp_Brk_Is	%	90.0	0 ~ 150	3	
P16.22	Current Ctrl Proportional-Gain CC P-Gain	%	100.0	0 ~ 1000	4	
P16.23	Current Ctrl Integral-Gain CC I-Gain	%	100.0	0 ~ 1000	3	

P16.24	Stabilization Time Constant StbT_Cons	ms	0.8	0.8 ~ 10	3	
P16.25	Stabilization Gain Stb_Gain	%	10.0	0 ~50	3	
P16.26	Stabilization Limit Stb_Limit	%	0.7	0 ~ 2	3	
P16.27	High_Speed Unity_Current_Range Unity_I_f	%	300.0	100 ~ 500	3	
P16.28	Accel_OC_Protection Ctrl_Gain Acc_OC_Gn	%	100.0	0 ~ 1000	3	

Parameter Group 17: Sensor less Vector Control [Motor 1]

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P17.0	Speed Detection time _constant Spd_Dt_Tm	ms	10.0	2 ~ 50	0	
P17.1	Min. Speed Min. Speed	rpm	50	0 ~ 30000	0	
P17.2	Max. Speed Max. Speed	%	100	0 ~ 300	0	
P17.3	Over Speed Limit OS_Limit	%	125	0 ~ 300	0	
P17.5	Starting Flux Start_Flux	%	125	50 ~ 140	0	
P17.6	Base Flux Base Flux	%	100.0	50 ~ 140	0	
P17.7	Start Flux-END Speed SF_End_Spd	%	5.0	0 ~ 50	0	
P17.8	Base Flux-START Speed BF_St_Spd	%	25.0	0 ~ 120	0	
P17.9	Field_ Weakening Voltage FW_Voltage	%	99.00	50 ~ 150	0	
P17.10	Field_ Weakening Time Constant FW_Tm_Con	ms	10.0	1 ~ 1000	0	
P17.11	Current Ctrl Proportional -Gain CC P-Gain	%	100.0	0 ~ 1000	0	

P17.12	Current_Ctrl Integra - Gain CC_I-Gain	%	100.0	0 ~ 1000	0	
P17.13	CC Zero_S	%	99	10 ~ 99	0	
P17.14	Speed_Ctrl PI Gain Spd_Gain		0	[0] Default Set [1] Auto-Tuning	0	
P17.15	Load Observer Activation Load_Comp		0	[0] Disabled [1] Enabled	0	
P17.16	Load Observer Time Constant LC_Tm_Con	ms	100.0	25 ~ 500	0	
P17.17	Load Compensation Start Frequency LC_Freq	Hz	0	0.2 ~ 300	0	
P17.18	Spd_Ctrl Proportional-Gain SC P-Gain	%	100.0	0 ~ 500	0	
P17.19	Spd_Ctrl Integral-Gain SC I-Gain	%	100.0	0 ~ 500	0	
P17.20	Spd_Ctrl Ref_Weight_Factor SC Zero_S	%	99.9	5 ~ 99.9		
P17.25	Max_Delta_ Lambda_Coeff		0.05	0 ~ 0.05		
P17.26	Max_Delta_ Theta_ Coeff		0.05	0 ~ 0.05		
P17.29	Zero_Spd_Range Integral_Gain_Scale Zr_Hold_G	%	100.0	0 ~ 500		
P17.30	Zero_Spd_Region [0~Freqeuncy] Zr_Hold_F	Hz	0.0	0 ~ 10	0	
P17.31	Zero Spd STOP_Holding_ Flux Brk_Flux	%	100.0	60 ~ 100	0	
P17.32	Speed Ctrl Gain Schedule Source SC_G_Adj		0	[0] Disable [1] AI 2 [2] Free -Func	0	
P17.33	Torque Set_Value Source Trq_R_Src		0	[0] Spdctrl-Out [1] AI 2 [2] Operator (Keypad, Laptop) [3] SyncctrlBus [4] Free -Func	0	

P17.34	Torque Offset Source Trq_Os_Src		0	[0] Disable [1] AI2 [2] Free-Func	0	
P17.35	Torque Limit Source Trq_L_Src		0	[0] Int-limit [1] AI2 [2] SyncCtrlBus [3] Free-Func	0	
P17.36	Speed_Limiting_ Selection Spd_Limit		1	[0] Max-spd-lmt [1] Speed-Setpt [2] Free-Func	0	
P17.37	Speed Limit Control Action S_Ltd_Act		0	[0] Trq - Nullify [1] Spd_Ctrc [2] Free-Func	0	
P17.38	Spd_Limiting Ctrl_Offset S_Ltd_off	rpm	43	0 ~ 3000	0	
P17.39	Speed Limiting Control Gain Spd_Ltd_G	%	100	0 ~ 500	0	
P17.40	Trq_Err Compensation Trq_Comp		0	[0] Disable [1] Enable	0	
P17.41	Torque Feedback_Src Trq_F_Src		0	[0] AI2 [1] Free Function	0	
P17.42	Trq Comp Proportional_Gain TC_P_Gain	%	0	0 ~ 1000	0	
P17.43	Trq_Comp Err_ Integration_Time TC_I_Time	ms	0	0 ~ 100	0	
P17.44	Trq_Comp Output_ Limit TC_OutLmt	%	0	0 ~ 100	0	
P17.51	Spd_Accel/Decel Trq_ Compensation Iner_Trq		0.0	[0] Disabled [1] Enabled	0	
P17.52	Inertia_Comp Dfferentiation_Time InerDif_T	ms	100.0	2 ~ 3000	0	

Parameter Group 18: Sensorless Vector Control [Motor 2

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P18.0	Speed Detection time constant Spd_Dt_Tm	ms	10.0	2 ~ 50	3	
P18.1	Min. Speed Min. Speed	rpm	50	0 ~ 30000	3	
P18.2	Max. Speed Max. Speed	%	100	0 ~ 300	3	
P18.3	Over-Speed Limit OS_Limit	%	125	0 ~ 300	3	
P18.5	Starting Flux Start_Flux	%	125	50 ~ 140	3	
P18.6	Base Flux Base Flux	%	100.0	50 ~ 140	3	
P18.7	Start Flux END Speed SF_End_Spd	%	5.0	0 ~ 50	3	
P18.8	Base Flux START Speed BF_St_Spd	%	25.0	0 ~ 120	3	
P18.9	Field_ Weakening Voltage FW_Voltage	%	99.00	50 ~ 150	3	
P18.10	Field_Weakening Time_Constant FW_Tm_Con	ms	10.0	1 ~ 1000	3	
P18.11	Current Ctrl Proportional-Gain CC P-Gain	%	100.0	0 ~ 1000	3	
P18.12	Current_Ctrl Integral-Gain CC_I-Gain	%	100.0	0 ~ 1000	3	
P18.13	CC Zero_S	%	99	10 ~ 99	0	
P18.14	Speed_Ctrl PI Gain Spd_Gain		0	[0] Default-Set [1] by Auto-Tuning	3	
P18.15	Load Observer Activation Load_Comp		0	[0] Disabled [1] Enabled	3	
P18.16	Load Observer Time Constant LC_Tm_Con	ms	100.0	25 ~ 500	3	
P18.17	Load Compensation Start Frequency LC_Freq	Hz	0	0.2 ~ 300	3	

P18.18	Spd_Ctrl Proportional -Gain SC P-Gain	%	100.0	10 ~500	3	
P18.19	Spd_Ctrl Integral-Gain SC I-Gain	%	100.0	10 ~ 500	3	
P18.20	Spd_Ctrl Ref_Weight_ Factor SC Zero_S	%	99.9	5 ~ 99.9	3	
P18.29	Zero_Spd_Range Integral_Gain_ Scale Zr_Hold_G	%	100	0 ~ 500	3	
P18.31	Reserved	%	100.0	50~140	3	
P18.30	Zero_Spd_Region [0~Freqeuncy] Zr_Hold_F	Hz	0	0 ~ 10		
P18.32	Speed Ctrl Gain Schedule Source SC_G_Adj	%	0	[0] Disable [1] AI2 [2] Free-Func	3	
P18.33	Torque Set_ Value Source Trq_R_Src		0	[0] SpdItrl-Our [1] AI2 [2] Operator (Keypad, Laptop) [3] Sync_SyncctrlBus [4] Free-Func		
P18.34	Torque Offset Source Trq_Os_Src		0	[0] Disable [1] AI2 [2] Free- Func	3	
P18.35	Torque Limit Source Trq_L_Src		0	[0] Int-linit [1] AI2 [2] SyncctrlBus [3] Free-Func	3	
P18.36	Speed_Limiting_Ctrl Limit_Src Spd_Limit		1	[0] Max-Spd-Imt [1] Speed-Setpt [2] Free- Func	3	
P18.37	Speed Limit Control Action S_Ltd_Act		0	[0] Trq - Nullify [1] Spd_Ctrl [2] Free- Func	0	
P18.38	Spd_Limiting Ctrl_ Offset Spd_Ltd_off	rpm	43	0 ~ 3000	3	
P18.39	Speed Limiting Control Gain Spd_Ltd_G		100	0 ~ 500	3	
P18.40	Trq_Err Compensation Trq_Comp		0	[0] Disable [1] Enable		

P18.41	Torque Feedback_Src Trq_F_Src		0	[0] AI2 [1] Free Function		
P18.42	Trq Comp Proportional_Gain TC_P_Gain	%	0	0 ~ 1000		
P18.43	Trq_Comp Err_Integration_Time TC_I_Time		0	0 ~ 100		
P18.44	Trq_Comp Output_Limit TC_OutLmt	%	0	0 ~ 100		
P18.48	Reserved	0.0		[0] dDisable		
P18.49	Reserved	ms	100.0	2~3000		
P18.51	Spd_Accel/Decel Trq_Compensation Inner_Trq		0	[0] Disabled [1] Enabled		
P18.52	Inertia_Comp Differentiation_Time InerDif_T	%	100.0	2 ~ 3000		

Parameter Group 19: Vector Control 1

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	
P19.0	Number of Encoder Pulses N_PG_Pulse	ppr	1024	0 ~ 30000	0	
P19.1	Inversion of PG Direction PG_DIR_Inv		0	[0] Disabled [1] Enabled	2	
P19.2	Speed Detection Time_Constant Spd_Det_tm	ms	3.0	1 ~ 100	0	
P19.3	Min. Speed Min_Speed	rpm	0	0 ~ 10000	0	
P19.4	Max. Speed Max_Speed	%	100	0 ~ 3000	0	
P19.5	Over-Speed Limit OS_Limit	%	125	0 ~ 300	0	
P19.7	Starting Flux Start_Flux	%	105.0	50 ~ 140	0	
P19.8	Base Flux Base_Flux	%	100.0	50 ~ 140	0	
P19.9	Start Flux END Speed SF_E_Spd	%	5.0	0 ~ 50	0	
P19.10	Base Flux START Speed BF_St_Spd	%	25.0	10 ~ 120	0	
P19.11	Field_Weakening Voltage FW_Volt	%	95.00	50 ~ 150	0	

P19.12	Flux Profile Time Constant FW_Tm_Con	ms	5	1 ~ 100	0	
P19.13	Current Ctrl Proportional-Gain CC P-Gain	%	100.0	0 ~ 500	0	
P19.14	Current_Ctrl Integral - Gain CC_I-Gain	%	100.0	0 ~500	0	
P19.15	Current_Ctrl Ref-Weight_Factor CC Zero_S	%	99.9	10 ~ 99.9	0	
P19.16	Fluxt Ctrl Proportional-Gain FC_P-Gain	%	100.0	0 ~ 500	0	
P19.17	Fluxt_Ctrl Integral-Gain FC_I-Gain	%	100.0	0 ~ 500	0	
P19.18	Max Field Current MxField_I	%	100.0	20 ~ 130	0	
P19.19	Speed_Ctrl PI-Gain Selection Spd_Gain		0	[0] Default-Set [1] Auto-Tuning	0	
P19.20	Load Observer Activation Load_Comp		0	[0] Disabled [1] Enabled	0	
P19.21	Load Observer Time Constant LC_Tm_Con	ms	75.0	2.5 ~ 500	0	
P19.22	Spd_Ctrl Proportional-Gain SC P-Gain	%	100.0	10~ 500	0	
P19.23	Spd_Ctrl Integral-Gain SC I-Gain	%	100.0	10 ~ 500	0	
P19.24	Spd_Ctrl Ref_Weight _Factor SC Zero_S	%	99.9	5.0~ 99.9	0	
P19.25	Speed Ctrl Gain Schedule Src SC_G_Adj		0	[0] Disable [1] AI 2 [2] Free Function	0	
P19.26	Torque Set_Value Source Trq_R_Src		0	[0] Speed_Ctrl_Out [1] AI 2 [2] Operator (Keypad, Laptop) [3] Sync_CommBus [4] Free Function	0	

P19.27	Torque Offset Source Trq_Os_Src		0	[0] Disable [1] AI 2 [2] Free-Func	0	
P19.28	Torque Limit Source Trq_L_Src		0	[0] Int- Limit [1] AI 2 [2] Sync_CtrlBus [3] Free-Func	0	
P19.29	Speed_Limiting_Ctrl Limit_Src Spd_Limit		1	[0] Max-Spd-Lmt [1] Speed-Stpt [2] Free- Func	0	
P19.30	Speed Limit Control Action S_Ltd_Act		1	[0] Trq - Nullify [1] Spd_Ltrl [2] Free Func	0	
P19.31	Spd_Limiting Ctrl_Offset Spd_Ltd_off	rpm	43	0 ~ 3000	0	
P19.32	Speed Limiting Control Gain Spd_Ltd_G	%	100	0 ~ 500	0	
P19.33	Trq_Err Compensation Trq_Comp		0	[0] Disabled [1] Enable	0	
P19.34	Torque Feedback_Src Trq_F_Src		0	[0] AI2 [1] Free Function	0	[0]AI [1]Free function
P19.35	Trq Comp Proportional_Gain TC_P_Gain	%	100	0 ~ 1000	0	
P19.36	Trq_Comp Err_ Integration_Time TC_I_Time		0	0 ~ 100	0	
P19.37	Trq_Comp Output_ Limit TC_OutLmt	%	0	0 ~ 100	0	
P19.38	Spd_Accel/Decel Trq_Compensation Iner_Trq	ms	0	[0] Disabled [1] Enable	0	
P19.39	Inertia_Comp Differentiation_Time InerDif_T	ms	100	20 ~ 3000	0	
P19.40	Rotor Adaptive_Ctrl Adap_Ctrl		0	[0] Disabled [1] Enable	0	
P19.41	Rotor Adaptive_Ctrl Start_Spd Adpa_Spd	%	100	0 ~ 1000	0	

Parameter Group 20: Vector Control 2

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P20.0	Number of Encoder Pulses N_PG_Pulse	ppr	1024	100 ~ 30000	3	
P20.1	Inversion of PG Direction PG_DIR_Inv		0	[0] Disabled [1] Enabled	3	
P20.2	Speed Detection Time_Constant Spd_Det_tm	ms	3	1 ~ 100	3	
P20.3	Min. Speed Min_Speed	rpm	0	0 ~ 30000	3	
P20.4	Max. Speed Max_Speed	%	100	0 ~ 300	3	
P20.5	Over-Speed Limit OS_Limit	%	125	0 ~ 300	3	
P20.7	Starting Flux Start_Flux	%	105	50~ 140	3	
P20.8	Base Flux Base_Flux	%	100.0	50 ~ 140	3	
P20.9	Start Flux END Speed SF_E_Spd	%	5	0 ~ 50	3	
P20.10	Base Flux START Speed BF_St_Spd	%	25	10 ~ 120	3	
P20.11	Field_Weakening Voltage FW_Volt	%	95.00	50 ~ 150	3	
P20.12	Flux Profile Time Constant FW_Tm_Con	ms	5	1 ~ 100	3	
P20.13	Current Ctrl Proportional-Gain CC P-Gain	%	100.0	0 ~ 500	3	
P20.14	Current_Ctrl Integral Gain CC_I-Gain	%	100.0	0 ~ 500	3	
P20.15	Current_Ctrl Ref Weight_Factor CC Zero_S	%	99.9	10 ~ 99.9	3	
P20.16	Flux Ctrl Proportional-Gain FC_P-Gain	%	100.0	10 ~ 5000	3	
P20.17	Flux_Ctrl Integral-Gain FC_I-Gain	%	100.0	10~ 500	3	
P20.18	Max Field Current MxField_I	%	100	20 ~ 150	3	

P20.19	Speed_Ctrl PI-Gain Selection Spd_Gain		0	[0] Default- Set [1] Auto-Tuning	3	
P20.20	Load Observer Activation Load_Comp		0	[0] Disabled [1] Enabled	3	
P20.21	Load Observer Time Constant LC_Tm_Con	ms	75.0	2.5 ~ 500	3	
P20.22	Spd_Ctrl Proportional Gain SC P-Gain	%	100	10 ~ 500	3	
P20.23	Spd_Ctrl Integral-Gain SC I-Gain	%	100	10 ~ 500	3	
P20.24	Spd_Ctrl Ref_Weight _Factor SC Zero_S	%	99.9	5.0 ~ 99.9	3	
P20.25	Speed Ctrl Gain Schedule Src SC_G_Adj		0	[0] Disable [1] AI 2 [2] Free Function	3	
P20.26	Torque Set_Value Source Trq_R_Src		0	[0] Speed_Ctrl_Out [1] AI 2 [2] Operator (Keypad, Laptop) [3] Sync_CommBus [4] Free Function	3	
P20.27	Torque Offset Source Trq_Os_Src		0	[0] Disable [1] AI 2 [2] Free-Func	0	
P20.28	Torque Limit Source Trq_L_Src		0	[0] Int-l Limit [1] AI 2 [2] Sync_CtrlBus [3] Free- Func	3	
P20.29	Speed_Limiting_Ctrl Limit_Src Spd_Limit		1	[0] Max-Spd-lmt [1] Ext_Speed Set_Valuespeed -stpt [2] Free- Func	3	
P20.30	Speed Limit Control Action S_Ltd_Act		0	[0] Trq - Nullify [1] Spd_ctrl [2] Free- Func	3	
P20.31	Spd_Limiting Ctrl_Offset Spd_Ltd_off	rpm	43	0 ~ 3000	3	
P20.32	Speed Limiting Control Gain Spd_Ltd_G	%	100	0 ~ 500	3	

P20.33	Trq_Err Compensation Trq_Comp		0	[0] Disabled [1] Enable		
P20.34	Torque Feedback_Src Trq_F_Src		0	[0] AI2 [1] Free Function	[0]AI [1]Free function	
P20.35	Trq Comp Proportional_Gain TC_P_Gain	%	0	0 ~ 1000		
P20.36	Trq_Comp Err_ Integration_Time TC_I_Time	ms	0	0 ~ 100		
P20.37	Trq_Comp Output _Limit TC_OutLmt	%	0	0 ~ 100		
P20.38	Spd_Accel/Decel Trq_Compensation Iner_Trq		0	[0] Disabled [1] Enable	3	
P20.39	Inertia_Comp Differentiation_Time InerDif_T	ms	100	2 ~ 3000	3	
P20.40	Rotor Adaptive_Ctrl Adap_Ctrl		0	[0] Disabled [1] Enable	3	
P20.41	Rotor Adaptive_Ctrl Start_Spd Adpa_Spd	%	100	0 ~ 1000	3	

Parameter Group 21: Motor 1 Constant

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P21.0	Stator Resistance 1 Pri_Res 0	mΩ	0	0 ~ 5000	1	
P21.1	Stator Resistance 2 Pri_Res 1	mΩ	0	0 ~ 5000	1	
P21.2	Rotator Resistance Sec_Res	mΩ	0	0 ~ 5000	1	
P21.3	Stator Inductance Stator_Ind	mh	0	0 ~10000	1	
P21.4	Rotor Inductance Rotor_Ind	mh	0	0 ~10000	1	
P21.5	Leakage Inductance Lkg_Ind	mh	0	0 ~1000	1	

P21.6	Inertia Time Constant (IC) Inertia_Tm	s	0.5	0.01 ~ 320	1	
P21.7	Iron Loss Compensation Iron_Loss	%	0.0	0 ~ 500	1	
P21.8	Biscos Damping Bis_Damp	%	0.0	0~50	1	

Parameter Group 22: Motor 2 Constant

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P22.0	Stator Inductance 1 (IC) Pri_Res 0	mΩ	0	0 ~ 5000	2	
P22.1	Stator Resistance 2 (IC) Pri_Res 1	mΩ	0	0 ~ 5000	2	
P22.2	Rotor Resistance (IC) Sec_Res	mΩ	0	0 ~ 5000	2	
P22.3	Stator Inductance (IC) Stator_Ind	mH	0	0 ~ 10000	2	
P22.4	Rotor Inductance (IC) Rotor_Ind	mh	0	0 ~ 10000	2	
P22.5	Leakage Inductance(IC) Lkg_Ind	mh	0	0 ~ 1000	2	
P22.6	Inertia Time Constant (IC) Inertia_Tm	S	0.5	0.01 ~ 300	2	
P22.7	Iron Loss Compensation Iron_Loss	%	0	0 ~ 500	2	
P22.8	Biscos Damping efficient Bis_Damp	%	0	0~ 50	2	

Parameter Group 24: Monitor Setup

Par. NO	Parameter Name LCD Display	Unit	Default	Range	Access Level	Note
P24.0	LCD Idle Time Keypad_Idl	min	20	1 ~ 250	0	
P24.1	LCD Contrast LCD_Ctrst		5	0 ~ 10	0	
P24.2	Key Repetition Time Key_Rpt_Tm	s	0.5	0 ~ 2	0	
P24.3	Speed Monitor Method Spd_M_Sel		0	[0] Calculation [1] Pulse Generator	0	
P24.4	Speed Detection time _Const Spd_Det_Tm	ms	20.0	1 ~ 100	0	
P24.5	Monitor Filter_Time _Const Mon_Tm_Con	ms	100.0	1 ~ 3000	0	
P24.6	Previous_RUN _Direction DIRECTION		0	0~1		
P24.7	Previous_Speed Set_Pt Speed_Set	rpm	0	0 ~ 30000		
P24.8	Previous_Freqeuncy Set_Pt Freq_Set	hz	0	0 ~ 300		
P24.9	Previous_Torque Set_Pt Trq_Set	%	0	-300 ~ 300		
P24.10	Previous_PID Set_Pt PID_Ref	%	0	-300 ~ 300		
P24.11	Peactive_I_Set_Pt		0	-100~100		
P24.12	Default Monitor Item Ini_Mon		0	0~13	0	[0] DC_Bus Voltage [1] Line Voltage [2] Line Frequency [3] Line Current [4] Active Power [5] Reactive Power [6] Power Factor
P24.13	Left/Right Button Spd_ Set [Hz] L/R_Hz	Hz	0.5	0.01 ~100	0	
P24.14	Left/Right Button Spd_ Set [rpm] L/R_rpm	rpm	10	1 ~ 2000	0	
P24.15			0			
P24.16	RS485 Station ID RS 485_ID		63	0 ~ 63		

8.2. Parameter Description
Parameter Access Level description
Level 0: readable / writable
Level 1: readable /not writable (have to be authorized to write)
Level 2-5: not readable /not writable (have to be authorized to read and write)

8.2.0 Parameter Group 0 : Program selection
P 0.1 Program Key1
P 0.2 Program Key2
P 0.3 Program Key3
Select software to use operations. Program Key 1, 2, 3 should have the same software package. After setting up the software, reset the system in Main Menu Page[5](=initialize). Then, the selected software will be applied. The setting procedure is followed.
Set P 0.1 Program Key 1 ⟶ Set P 0.2 Program Key 2 as P 0.1 ⟶ P 0.3 Program Key 3 as P 0.1 ⟶ Move to Main Menu Page[5] Initialize ⟶ Execute the [1]System Reset. Normally, the software is set up at the factory.

[0] Standard I:
※ V/F Frequency Control
This controls the motor output voltage and output frequency.
Refer to P 1.6 and P 2.6 for setting the control mode.
Related Parameters: Parameter Group 1, 2, 15, 16

※V/F Speed control the basic frequency of pre-setted is according to the motor.

※Sensorless Vector Speed Control
In this control method, it controls a motor with no rotation speed feedback of the motor. Magnetic flux and torque current are controlled respectively. This control can be used when there should be enough torque, or there is a sharp fluctuation in load at start-up or low speed. Related Parameter s: Parameter Group 1, 2, 14, 17, 18, 21, 22. And Auto-Tuning is necessary. The related parameters to Auto-Tuning are Parameter Group 1, 2, 14, 21, 22. The parameters in Group 21 or 22 are auto matically generated by Auto-Tuning.

[1] Standard II:
※V/F Frequency Control
※V/F Speed Control
Refer to [0] Standard I
※ Vector Speed Control
This control method carries out the high special quality and high accuracy performance in speed control. Magnetic flux and torque current are controlled respectively. This control can be used when there should be enough torque, or there is a sharp fluctuation in load at start-up or low speed. Related Parameters Group is 1, 2, 14, 19, 20, 21 and 22. And Auto-Tuning is necessary. The related parameters to Auto-Tuning are Parameter Group 1, 2, 14, 21, 22. The parameters in Group 21 or 22 are automatically generated by Auto-Tuning.

P 0.12 Initialization Permission Key
P 0.13 Drive Voltage Class
[0] 200V / 400V / 500V Class
[1] 600V Class

P 0.14 Nominal Frquency Class
[0] 50Hz Class
[1] 60Hz Class

P 0.15 Thermal Monitor Class
[0] Thermal_State_Relay
[1] NTC_Thermistor

8.2.1 Parameter Group 1 : Control Setup [Motor 1]

P 1.0 Rated Power
Set up the rated power of a motor. Refer to the rating plate on the motor.

P 1.1 Rated Voltage
Set up the rated voltage of a motor. Refer to the rating plate on the motor.

P 1.2 Rated Current
Set up the rated current of a motor. Refer to the rating plate on the motor.

P 1.3 Rated Frequency
Set up the rated frequency of a motor. Refer to the rating plate on the motor.

P 1.4 Number of Poles
Set up number of poles of a motor. Refer to the rating plate on the motor.

P 1.5 Rated Speed
Set up the rated speed of a motor. Refer to the rating plate on the motor.
P 1.6 Control Method

[0] V/F Freq_Ctrl (V/F Frequency Control)
This can be used when Standard I or Standard II is used for Program Key. .
[1] V/F Spd_Ctrl (V/F Speed Control)
This can be used when Standard I or Standard II is used for Program Key.
[2] S/L Vector_Ctrl (Sensorless Vector Speed Control)
This can be used when Standard I is used for Program Key.
[3] Vector_Ctrl (Sensor Vector Speed Control)
This can be used when Standard II is used for Program Key.
[4]PWM Regen_Converter
※ When Standard I is used in P 0.1~P 0.3 Program Keys
One of the following control methods can be selected for a control mode.
[0] V/F Freq (V/F Frequency Control)
[2] S/L Vector(Sensorless Vector Speed Control)
※When Standard II is used in P 0.1~P 0.3 Program Keys
One of the following control methods can be selected for a control mode.
[0] V/F Freq (V/F Frequency Control)
[1] V/F Speed (V/F Speed Control)
[3] Vector_Ctrl (Sensor Vector Speed Control)

P 1.7 PWM Frequency
Set up the switching frequency for the internal switching part of the inverter. If the switching frequency low, the noise signal from inverter gets reduced and the leakage current gets smaller, but the noise sounds become loud.
If it does not bother with high temperature and noise sound, set the switching frequency low. If this parameter is changed, execute [0] Drive Calibration in Main Menu page [3] Auto Tuning.

P 1.9 Supply Voltage
Set up the amount of 3 phase voltage connected to Inverter.

8.2.2 Parameter Group 2 : Control Setup [Motor 2]
These parameters are used when switching to the other motor (motor 2) from one motor (motor 1). In this case, the two motors usually use the different setup values. In Parameter Group 8, Digital Input Setup, Motor 1 or 2 can be selected by setting the Digital Input Function to [11] Motor Selection It should be careful to establish the external circuit not to interrupt each other when switching motors.

P 2.0 Rated Power
P 2.1 Rated Voltage
P 2.2 Rated Current
P 2.3 Rated Frequency
P 2.4 Number of Poles
P 2.5 Rated Speed
P 2.6 Control Method
P 2.7 PWM Frequency
P 2.9 Supply Voltage

Refer to the parameter group 1

8.2.3 Parameter Group 3 : Reference Setup [Motor1]

These parameters are applied when using Motor 1.

P 3.0 RUN/STOP Method

This selects the input method of Run and Stop signal.

[0] Terminal

Use I/O terminals (DI1, DI2 etc.) for the method of inputting the command signals for operation.

[1] Operator (Keypad, PC)

Use Keypad for the method of inputting the command signals for operation.

[2] Syncrous Communication
[3] Fieldbus (Profibus)

Use serial communication through PC or Profibus for the method of inputting the command signals for operation.

[4] Free Function Logic

P 3.1 Ramp Function Input Mode
Set the method of inputting the speed or frequency reference. The reference is displayed by frequency [Hz] for V/F Frequency Control and by speed [RPM] for speed control.

[0] Terminal
Command the speed or frequency by I/O terminals. The reference sources are selected from Voltage, current or multi-steps.
[1] Operator
Command the speed or frequency reference by Keypad.
[2] Sync_Comm (Syncrous Communication)
High speed synchronous communication

[3] Free Function

P 3.2 STOP Command Detection Time
The VD inverter executes the stop mode after elapse of the set time in this parameter. Refer to the figure D 3.1

P 3.3 STOP Mode
This figures how the motor decrease the speed of motor after the stop mode is executed. Refer to the figure D 3.1

[0] Ramp Stop
The speed of motor decreases to 0 within the deceleration time
[1] Free-Run Stop
The inverter cuts off the output immediately as soon as the stop mode is executed.
[2] Mixed STOP
This is the mode that is combined Ramp Stop and Free-Run Stop. On Ramp Stop, if the speed of motor goes down under the reference set by P3.6, this mode is changed to Free-Run Stop.

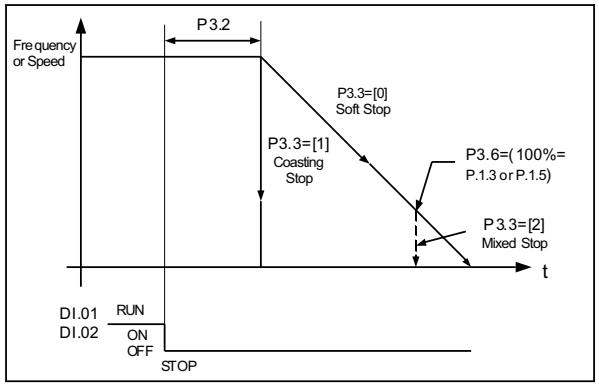


Figure 8.2.1- Inverter Stop Function

P 3.4 STOP Hold Time
The inverter maintains the operation mode for the set time in parameter even though the speed of motor is 0. And when set time is passed out,Inverter is changed to Stop mode.This function is only applied when P3.3 Stop mode is set up [0] RampSTOP. Refer to the Figure 8.2-2.

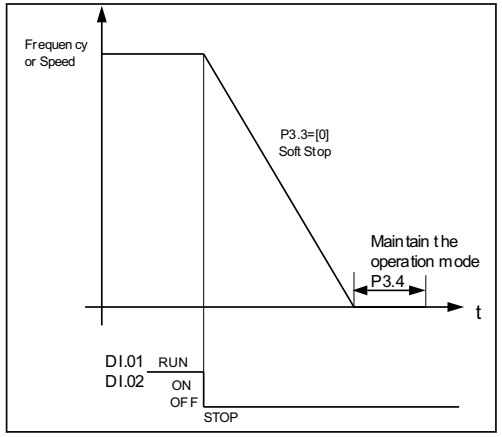
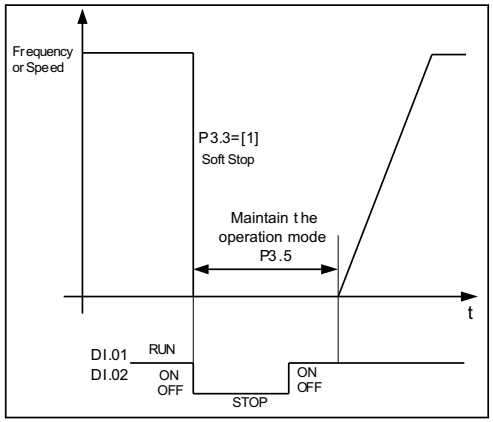


Figure 8.2-2 Stop Hold Time

P 3.5 Output Off Hold Time
This sets the time from the moment that the inverter is stopped until the inverter generates the output again in operation mode. After stopped motor, Inverter doesn't generate output even though the operation signal comes in the Inverter within the time set by parameter.
Refer to the Figure 8.2-3 This function is only applicable Free-Run Stop.



P3.6 Mixed-mode STOP Reference
This sets the speed reference that converts Ramp Stop to Free-Run Stop when the stop mode is the Mixed Stop. Refer to the Figure 8.2-1.

P 3.7 Acceleration / Deceleration Ramp Enable
[0] Disable
There is no Acceleration./ Deceleration time.
[1] Enable
The speed of motor is accelerated or decelerated by the set value of Acceleration/ Deceleration time.

P 3.8 Acceleration Time Range
[0] X 1 sec
Use this option when the acceleration time is between 0 and 300 [s].
[1] X 10 sec
Use this option when the acceleration time is over 300 and goes up to 3000 [s].
(The acceleration time should be over 300.)

P 3.9 Acceleration Switch Ref 1-2
This is the frequency or speed reference that determines □acceleration range 1□
Refer to the figure 8.2-4

P 3.10 Acceleration Switch Ref 2-3
This is the frequency or speed reference that determines □acceleration range 2□
Refer to the figure 8.2-4

P 3.11 Acceleration Switch Ref 3-4
P 3.12 Acceleration Switch Ref 4-5
P 3.13 Acceleration Switch Ref 5-6

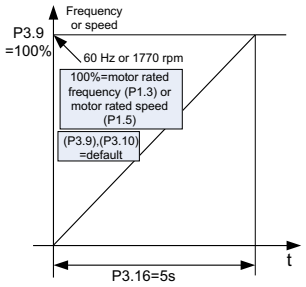
P 3.14 Acceleration Switch Ref 6-7
P 3.15 Acceleration Switch Ref 7-8

P 3.16 Acceleration Time l.1
This is the acceleration time from 0 to P3.9. (Acceleration range 1)
Refer to the figure 8.2-4

P 3.17 Acceleration Time l.2
This is the acceleration time from P3.9 to P3.10.
(From Acceleration range 1 to Acceleration range 2)
Refer to the figure 8.2-4

P 3.18 Acceleration Time l.3
This is the acceleration time from P3.10 to the maximum reference.
(Acceleration range 3) Refer to the figure 8.2-4
P 3.19 Acceleration Time l.4
P 3.20 Acceleration Time l.5
P 3.21 Acceleration Time l.6
P 3.22 Acceleration Time l.7
P 3.23 Acceleration Time l.8

Refer to the following figure 8.2-4 for detailed setting instructions.

<table>
<tr><td>Condition</td><td colspan="3">#Speed or Frequency reference:0 ~ 10V#motor rated frequency or speed : 60Hz, 1770rpm</td></tr>
<tr><td>Operation Up to the Motor rated Frequency Or Motor rated speed (operation up to100%)</td><td>When there is Only one range</td><td> 
</td><td>P1.3 = 60Hz (motor rated freq.)
P1.5=1770rpm (motor rated spd)
P3.9 = 100% (default)
P3.10 = 200% (default)
P3.16 = 5s
P3.17, P3.18 = not used
P6.6 = 0.00V (AI 1 Min. Volt)
P6.8 = 0 % (AI 1 Min. Scale)
P6.9 = 10.00 V (AI 1 Max. Volt)
P6.11 = 100 % (AI 1 Max. Scale)
P15.2 = 60 Hz (Max. Freq.)
P17.2 = 1770 rpm (Max. Speed)
P.19.4 = 1770 rpm (Max. Speed)</td></tr>
</table>

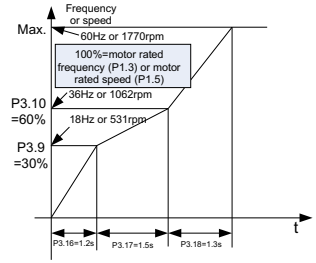
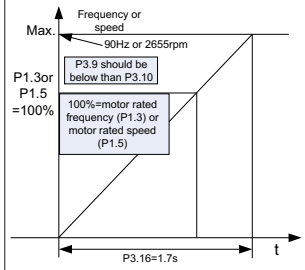
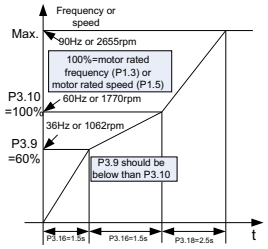
<table>
<tr><td></td><td>When the operation range is divided.</td><td> 
</td><td>P1.3 = 60Hz (motor rated freq.)
P1.5=1770rpm (motor rated spd)
P3.9 = 30%
P3.10 =60%
P3.16 = 1.2 s
P3.17 = 1.5s
P3.18=1.3s
P6.6 = 0.00V (AI 1 Min. Volt)
P6.8 = 0 % (AI 1 Min. Scale)
P6.9 = 10.00 V (AI 1 Max. Volt)
P6.11 = 100 % (AI 1 Max. Scale)
P15.2 = 60 Hz (Max. Freq.)
P17.2 = 1770 rpm (Max. Speed)
P.19.4 = 1770 rpm (Max. Speed)</td></tr>
<tr><td>Operation over the Motor rated Frequency Or Motor rated speed (operation over 100%)</td><td>When There is only one range</td><td> 
</td><td>P1.3 = 60Hz (motor rated freq.)
P1.5=1770rpm (motor rated spd)
P3.9 = 150%
P3.10 = 200%
P3.16 = 7 s
P3.17 ,P3.18=not used
P3.18 = 1.3s
P6.6 = 0.00V (AI 1 Min. Volt)
P6.8 = 0 % (AI 1 Min. Scale)
P6.9 = 10.00 V (AI 1 Max. Volt)
P6.11 = 150 % (AI 1 Max. Scale)
P15.2 = 90 Hz (Max. Freq.)
P17.2 = 2655rpm (Max. Speed)
P.19.4 = 2655 rpm (Max. Speed)</td></tr>
<tr><td></td><td>When the operation range is divided.</td><td> 
</td><td>P1.3 = 60Hz (motor rated freq.)
P1.5=1770rpm (motor rated spd)
P3.9 = 60%
P3.10 = 100% (default)
P3.16 = 1.5s
P3.17=3.0s
P3.18=2.5s
P3.17, P3.18 = not used
P6.6 = 0.00V (AI 1 Min. Volt)
P6.8 = 0% (AI 1 Min. Scale)
P6.9 = 10.00 V (AI 1 Max. Volt)
P6.11 = 150% (AI 1 Max. Scale)
P15.2 = 90 Hz (Max. Freq.)
P17.2 = 2655 rpm (Max. Speed)
P.19.4 = 2655 rpm (Max. Speed)</td></tr>
</table>

Figure 8.2-4 setting for Acceleration time and range.

P 3.24 Acceleration Time II

When DI Function is set to [14] Acc./Dec Switching, the value of Acceleration Time II is applied to the Acceleration time from zero speed (or frequency) to the rated speed (or frequency) as DI receives the switching signal.

P 3.25 Deceleration Time Range

[0] X 1 secretary

Use this option when the deceleration time is between 0 and 300 [s].

[1] X 10 sec

Use this option when the deceleration time is over 300 and goes up to 3000 [s].
(The deceleration time should be over 300.)

P 3.26 Deceleration Switch Ref 1-2

This is the frequency or speed reference that determines deceleration range 1
Refer to the figure 8.2-5

P 3.27 Deceleration Switch Ref 2-3

This is the frequency or speed reference that determines "deceleration range 2"
Refer to the figure 8.2-5

P 3.28 Deceleration Switch Ref 3-4
P 3.29 Deceleration Switch Ref 4-5
P 3.30 Deceleration Switch Ref 5-6 " "
P 3.31 Deceleration Switch Ref 6-7
P 3.32 Deceleration Switch Ref 7-8
P 3.33 Deceleration Time I.1

This is the deceleration time from Max. reference to P3.27. (Deceleration range 3)
Refer to the figure 8.2-5

P 3.34 Deceleration Time I.2

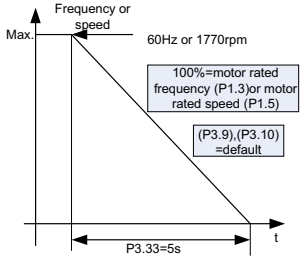
This is the deceleration time from P3.27 to P3.26. (Deceleration range 2)
Refer to the figure 8.2-5

P 3.35 Deceleration Time I.3

This is the deceleration time from P3.26 to 0. (Deceleration range 1)
Refer to the figure 8.2-5

P 3.36 Deceleration Time I.4
P 3.37 Deceleration Time I.5
P 3.38 Deceleration Time I.6
P 3.39 Deceleration Time I.7
P 3.40 Deceleration Time I.8

Refer to the following figure 8.2-5 for detailed setting instructions.

Condition	#Speed or Frequency reference:0 ~ 10V #motor rated frequency or speed : 60Hz, 1770rpm		
Operation Up to the Motor rated FrequencyOr Motor rated speed (operation up to100%)	When there is Only one range		P1.3 = 60Hz (motor rated freq.) P1.5 = 1770rpm (motor rated spd) P3.26 = 100% (default-) P3.27 = 200% (default) P3.33 = 5s P3.34, P3.35 = not used P6.6 = 0.00V (AI 1 Min. Volt) P6.8 = 0 % (AI 1 Min.Scale) P6.9 = 10.00 V (AI 1 Max. Volt) P6.11 = 100 % (AI 1 Max.Scale) P15.2 = 60 Hz (Max. Freq.) P17.2 = 1770 rpm (Max. Speed) P.19.4 = 1770 rpm (Max.Speed)

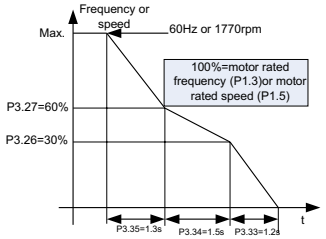
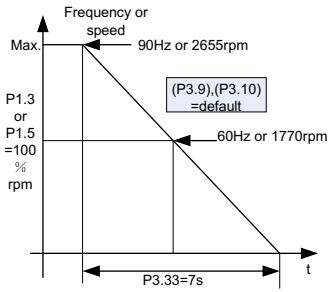
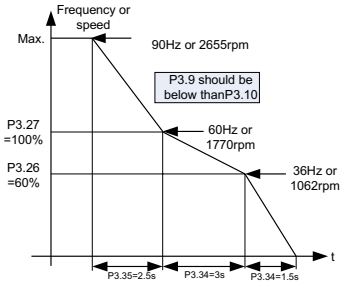
	When the operation range is divided.		P1.3 = 60Hz (motor rated freq.) P1.5 = 1770rpm (motor rated spd) P3.26 = 30% P3.27 = 60% P3.33 = 1.2 s P3.34 = 1.5s P3.35 = 1.3s P6.6 = 0.00V (AI 1 Min. Volt) P6.8 = 0 % (AI 1 Min.Scale) P6.9 = 10.00V (AI 1 Max. Volt) P6.11 = 100 % (AI 1 Max.Scale) P15.2 = 60 Hz (Max. Freq.) P17.2 = 1770 rpm (Max. Speed) P.19.4 = 1770 rpm (Max. Speed)
	When there is only one range		P1.3=60Hz(motor rated freq) P1.5=1770rpm(motor rated spd) p3.26=150% p3.27=200% (default) p3.33=7s P3.17,P3.18=(not used) P6.6=0.00V(AI1VMin.Volt) P6.8=0% (AI1Min .Scale) P6.9=10.00V(AI1V Max.Volt) P6.11=150% (AI1 Max.Scale) P15.2=90Hz(Max.Freq) P17.2=2655rpm(Max.Speeq.) P19.4=2655rpm(Max.Speeq.)
	When the operation range is divided.		P1.3 = 60Hz (motor rated freq.) P1.5 = 1770rpm (motor rated spd) P3.26 = 60% P3.27 = 100% P3.33 = 1.5 s P3.34 = 3.0 s P3.35 = 2.5 s P6.6 = 0.00V (AI 1 Min. Volt) P6.8 = 0% (AI 1 Min.Scale) P6.9 = 10.00 V (AI 1 Max. Volt) P6.11 = 150% (AI 1 Max.Scale) P15.2 = 90 Hz (Max. Freq.) P17.2 = 2655 rpm (Max. Speed) P.19.4 = 2655 rpm (Max.Speed)

Figure 8.2-5 setting for Deceleration time and range

P 3.41 Deceleration Time II

When DI Function is set to [14] Acc./Dec Switching, the value of Deceleration Time II is applied to the Deceleration time from the rated speed (or frequency) to zero speed (or frequency) as DI receives the switching signal.

P 3.42 Counter Deceleration Function

This selects whether the inverter uses the counter deceleration function or not.

P 3.43 Counter Deceleration Time

This sets the counter deceleration time. When P3.42=[1]

P 3.49 Emergency Stop Mode

Emergency Stop Mode stops the motor as Enable signal is removed while the operating. Digital Input Function should be set to [1] Drive Enable.Refer to the STOP Mode.Ref P3.3 Stop method.

[0] Ramp Stop
[1] Coasting Stop
[2] Mixed Stop

P 3.50 Emergency Stop Deceleration Time

Emergency Stop Mode sets the deceleration time for stopping as Enable signal is removed while the operating. Digital Input Function should be set to [1] Drive Enable.This is only applied when the stop mode is the Ramp stop mode.P3.49=[0].

P 3.51 Continuous OP Mode
Select the operation mode.
[0] Disable
While the inverter is stopping, the inverter runs again after the complete stop even though the inverter gets run signal.
[1] Enable
While the inverter is stopping, the inverter runs immediately if it gets the run signal.

P 3.52 Reverse Direction Operation
[0] Disabled
[1] Enable

8.2.4 Parameter Group 4 : Reference Setup [motor 2]

Set up in case that one inverter make two motors work. In parameter group 8 Digital Input Setup, available to choose Motor 1 or 2 as setting the function of contact point inputting to [12] Motor Sel..Install carefully the external circuit not to interrupt each motor while they are working.

P 4.0 RUN/STOP Method
P 4.1 Ramp Function Input Method
P 4.2 STOP Command Detection Time
P 4.3 STOP Mode
P 4.4 STOP Hold Time
P 4.5 Output Off Hold Time
P 4.6 Mixed mode STOP Reference
P 4.7 Acceleration/Deceleration Bypass
P 4.8 Acceleration Time Range
P 4.9 Acceleration Switch Ref 1-2
P 4.10 Acceleration Switch Ref 2-3
P 4.11 Acceleration Switch Ref 3-4
P 4.12 Acceleration Switch Ref 4-5
P 4.13 Acceleration Switch Ref 5-6
P 4.14 Acceleration Switch Ref 6-7
P 4.15 Acceleration Switch Ref 7-8

P 4.16 Acceleration Time I.1
P 4.17 Acceleration Time I.2
P 4.18 Acceleration Time I.3
P 4.19 Acceleration Time I.4
P 4.20 Acceleration Time I.5
P 4.21 Acceleration Time I.6
P 4.22 Acceleration Time I.7
P 4.23 Acceleration Time I.8
P 4.24 Acceleration Time II
P 4.25 Deceleration Time Range
P 4.26 Deceleration Switch Ref 1-2
P 4.27 Deceleration Switch Ref 2-3
P 4.28 Deceleration Switch Ref 2-3
P 4.29 Deceleration Switch Ref 3-4
P 4.30 Deceleration Switch Ref 4-5
P 4.31 Deceleration Switch Ref 5-6
P 4.32 Deceleration Switch Ref 6-7
P 4.33 Deceleration Time I.1
P 4.34 Deceleration Time I.2
P 4.35 Deceleration Time I.3
P 4.36 Deceleration Time I.4
P 4.37 Deceleration Time I.5
P 4.38 Deceleration Time I.6
P 4.39 Deceleration Time I.7
P 4.40 Deceleration Time I.8
P 4.41 Deceleration Time I
P 4.42 Counter Deceleration Function
P 4.43 Counter Deceleration Time
P 4.49 Emergency Stop Mode
P 4.50 Emergency Stop Deceleration Time
P 4.51 Continuous OP Mode
P 4.52 Reverse Direction Operation
Refer to the parameter group 3

8.2.5 Parameter Group 5 : Protection
P 5.0 Current Limit [Motor 1]
Limit to flow over current that can be caused problems to Inverter or motors. Set up the value of parameterfollowing rated motor current connected to Inverter. (100%=the set value of rater motor current,P1.2,P2.2)

P 5.1 Current Limit [Motor 2]
Limit to flow over current that can be caused problems to Inverter or motors. Set up the value of parameter following rated motor current connected to Inverter.(100% = the set value of rated motor current, P1.2, P2.2)

P 5.7 Max. Continuous Current

Set the maximum current for the possible continuous operation.
(100%= the value of rated motor current, P1.2, P2.2) Refer to the figure 8.2-7.
P 5.8 Over-Load Current
P 5.9 Over-Load Time-over

The protection function starts working when output current with the current value set in P5.8 is exceeded to the time set in P5.9.Also, the protection function starts working when the output current is over P5.7 or under P5.8 in above the time set in P5.9. Refer to the figure 8.2-6.

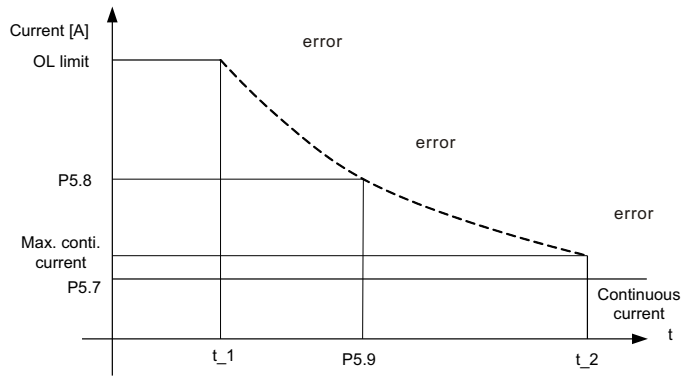


Figure 8.2-6 Set up overload

P 5.10 Over Load Fault [Action]
Select Stop function when Over Load Fault occurs.
[0] Normal Stop : Stopping Inverter in the mode set in P3.3 or P4.3.
[1] STOP
[2] Ctrl_OFF
[3] IGNORE: Keeping operation of Inverter Warning.

P 5.11 Over Current Trip
The Fault occurs when the output exceeds the Over Current trip level.
(100%= the value of rated motor current, P1.2, P2.2)

P 5.12 Zero-sequence Current trip
If the current addition of the three phases is less than the set value, the protection starts working.

P 5.13 Over Voltage Limiting Function
Select whether it uses the Over Voltage Limiting Function or not.
[0] Disable : Not use the over voltage limiting function
[1] Enable: Use the over voltage limiting function

P 5.14 Over Voltage Limit
Set the output voltage that controls the Over Voltage Limiting Function in normal status. This operates as only setting in P5.13="[1] Enable" If the Over Voltage Limiting Function is working on deceleration, the deceleration time gets slower than the set value.

P 5.15 Over Voltage Trip
Determine when to start the Over Voltage Function.

P 5.16 Under Voltage Compensation
Determines whether it compensate or not for the Under Voltage case.
[0] Disable : Not use the under voltage compensation function
[1] Enable : Use the under voltage compensation function

P 5.17 Under Voltage Compensation Limit
Determine the level of compensation for the Under Voltage case.
This operates as only setting in P5.16="[1] Enable".
When DC Link current is under the set value of the parameter, it prevents that the set value of DC Link current is under the set value due to automatically adjusting output frequency or speed.

P 5.18 Under Voltage trip
Fault occurs if the inverter input voltage is below the Under Voltage Trip level.

P 5.19 Open Phase Protection
The inverter generates a fault when the open phase happens.
[0] Disable : Not use the open phase protection function
[1] Enable : Use the open phase protection function

P 5.20 Supply Frequency
The frequency of Input Voltage

P 5.21 Built-in DB(Dynamic Brake)
Select whether using brake chopper or not inside of Inverter. Unless the brake chopper is installed, set up [0] Disabled
[0] Disable
[1] Enable

P 5.23 DB Start voltage
P 5.24 DB Full Voltage

P 5.25 Over-Heating Fault[Action]
Select the Over Heat Function when the fault conditions occur.
[0] STOP: Stopping Inverter in the mode set in P3.3 or P4.3.
[1] E-STOP
[2] Ctrl_Off: Stopping Free-Run.
[3] IGNORE: Keeping operation of Inverter Warning.
[4] SPEED_DOWN

P 5.30 Auto-Restart Count
This is for the case when users want to keep operating even though a protection is still working. After the output is broke, the inverter starts again automatically if the condition for restarting is qualified. This parameter sets the numbers how many times the inverter allows to restart. Refer to the figure 8.2.-8.

P 5.31 Retry Delay Time
This sets the minimum stand-by time until restarting even though cancellation conditions are qualified after a fault occurs. Refer to the figure 8.2.-7.

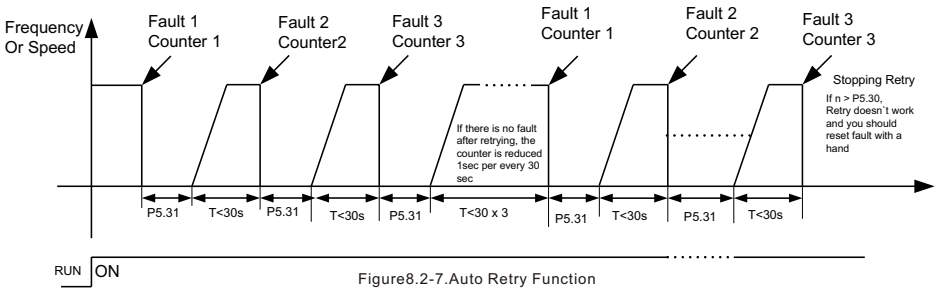


Figure8.2-7.Auto Retry Function

P 5.32 Auto Reset (Over Current)
Determines whether the inverter uses the Auto-Reset function or not when Over Current Protection is working.
[0] Disable
[1] Enable

P 5.33 Auto Reset (Over Voltage)
Determines whether the inverter uses the Auto-Reset function or not when Over Voltage Protection is working.
[0] Disable
[1] Enable

P 5.34 Auto Reset (Under Voltage)
Determines whether the inverter uses the Auto-Reset function or not when Over Voltage Protection is working.
[0] Disable
[1] Enable

P 5.37 Out of Control Auto Reset

The inverter can reset the functions with fault message when its status is out of control.
P 5.38 Out of Control Time
The inverter gives a fault when the time value of P5.39 is elapsed in out-ofcontrol status.
P 5.39 Out of Control Current

It is revised the amount of current in the state of out of control of Inverter.
100% of this parameter is the set value of Current Limit in P5.0 or P5.1.
As an example, when the set value of the rated motor current is 50[A] and the set value of Current Limit is 180%, the current value is (50[A]x180%)x95%=85.5[A] with setting in P5.38 as 95% in the state of the out of control of Inverter.
※**In case that P1.6 Control Mode is [0] V/F Freq or [1]V/F Speed.**
If the output frequency is fewer than 5% of the rated motor frequency and the output current is generated over the value set in P5.38 and these conditions are continued over the set time, Control Disable Fault occurs.
※**In case that P1.6 Control Mode is S/L or Vector Control.**
If the standard value of speed and real value of speed have a difference, the output current is generated over the value set in P5.38 and this condition is continued over the time set in P5.37, Control Disable Fault occurs.
P5.40 Over Temperature Trip
If output frequency of inverter exceeds by 45Hz while operating, overheat fault occurs when temperature on the heat sink is evaluated over set value in P 5.40. If output frequency of inverter is less than 45Hz, the overheated detection temperature of inverter can be changed as output current and output frequency in P5.40.
P5.41 Over Current Trip

8.2.6 Parameter Group 6 : Analog Input
P 6.0 Analog Reference Source
This case is only suitalole for P6.1(AI.1) .P6.15(AI.2).P6.29(AI.3).P6.43(AI.4).P6.57(AI.5)[1]Standard 1(r10 or[2]standarad 2(r2)
[0] Disable
Not use the Analog Input Terminals.
[1] AI 1
When Analog Input Function is set to [1] AI 1 in P6.1, the order value which is input to analog input terminal is used as operation order signal.
[2] AI 2
When Analog Input Function is set to [1] AI 2 in P6.1, the order value which is input to analog input terminal is used as operation order signal.

P 6.1 Analog Input 1 Function (Analog Input Function)
Selects the function of AI.1
[0] Disable
[1] AI 1

P 6.2 Analog Input 1 Type
Select the signal that is connected to AI.1 in analog input terminals.
[0]0-10(5)V
[1]-10~+10V: The direction of rotation is determined by polarity.
[2]4-20mA
[3]0-20mA
P 6.4 Analog Input 1 Filter Time Constant
Set the filtering time constant of the Analog Input reference. (For AI.1)
P 6.5 Analog Input 1 Offset adjustment
Set the Offset value of the Analog Input reference. (For AI.1)
P 6.6 Analog Input 1 min Voltage
P 6.7 Analog Input 1 min Current
P 6.8 Analog Input 1 Minimum
P 6.9 Analog Input 1 max. Voltage
P 6.10 Analog Input 1 max. Current
P 6.11 Analog Input 1 Maximum

Refer to the Figure 8.2-8.

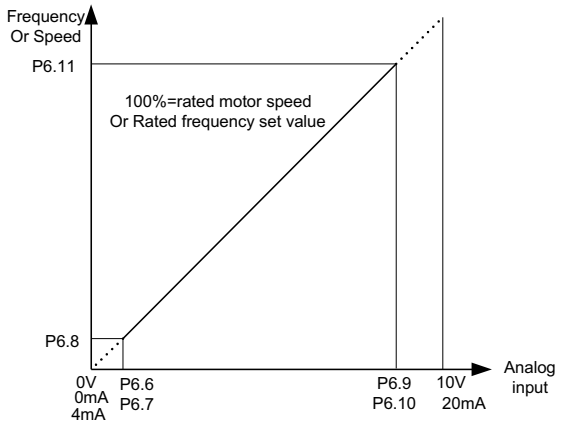


Figure 8.2-8 Setting the Analog Input Scale

P 6.12 Analog Input 1 Inversion
Determine whether the Analog Input reference from AI.1 is inverted or not.
[0] Disabled
[1] Enable

P 6.13 Analog Input 1 Discreteness
Divide steps up to the maximum frequency, and they have same output in the same steps. Overall, it is non-continuous, but it can have the same output in the same step.

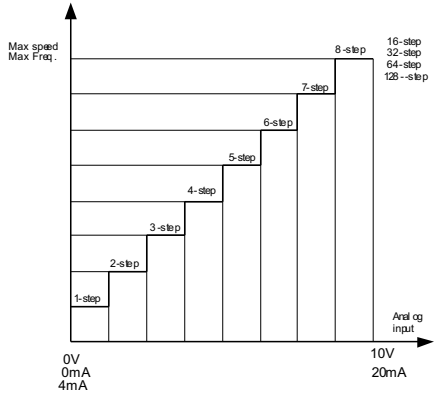


Figure 8.2-9 Setting the Analog Input Step

P 6.14 Analog input 1 Dead-Zone

This is the zone that the inverter is not operating. If the analog input reference is smaller than the value of P6.6 or P6.7, the inverter does not generate the output even though the "RUN" signal comes in. Refer to the figure 8.2-10.

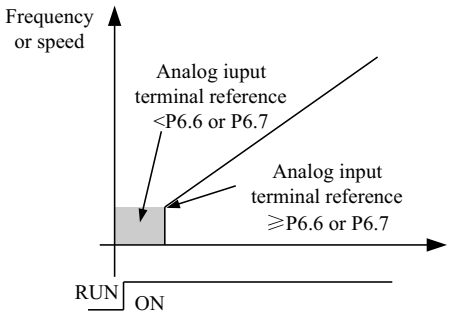


Figure 8.2-10 The Dead-Zone of Analog Input.

P 6.15 Analog Input 2 Function
P 6.16 Analog Input 2 Type
P 6.18 Analog Input 2 Filter Time Const
P 6.19 Analog Input 2 Offset adjustment
P 6.20 Analog Input 2 min Voltage
P 6.21 Analog Input 2 min Current
P 6.22 Analog Input 2 Minimum
P 6.23 Analog Input 2 max. Voltage
P 6.24 Analog Input 2 max. Current
P 6.25 Analog Input 2 Maximum
P 6.26 Analog Input 2 Inversion
P 6.27 Analog Input 2 Discreteness
P 6.28 Analog input 2 Dead-Zone
Refer to the parameters from P6.1 to P6.14
P 6.29 Analog Input 3 Function
P 6.30 Analog Input 3 Type
P 6.32 Analog Input 3 Filter Time Const
P 6.33 Analog Input 3 Offset adjustment
P 6.34 Analog Input 3 min Voltage
P 6.35 Analog Input 3 min Current
P 6.36 Analog Input 3 Minimum
P 6.37 Analog Input 3 max. Voltage
P 6.38 Analog Input 3 max. Current
P 6.39 Analog Input 3 Maximum
P 6.40 Analog Input 3 Inversion
P 6.41 Analog Input 3 Discreteness

P 6.42 Analog input 3 Dead-Zone
Set the parameters when the option card is installed to your inverter.
Refer to the parameters from P6.1 to P6.14

P 6.43 Analog Input 4 Function
P 6.44 Analog Input 4 Type
P 6.46 Analog Input 4 Time Const
P 6.47 Analog Input 4 Offset Adjustment
P 6.48 Analog Input 4 min Voltage
P 6.49 Analog Input 4 min Current
P 6.50 Analog Input 4 Minimum
P 6.51 Analog Input 4 max. Voltage
P 6.52 Analog Input 4 max. Current
P 6.53 Analog Input 4 Maximum
P 6.54 Analog Input 4 Inversion
P 6.55 Analog Input 4 Discreteness
P 6.56 Analog input 4 Dead-Zone

Set the parameters when the option card is installed to your inverter.
Refer to the parameters from P6.1 to P6.14

P 6.57 Analog Input 5 Function
P 6.58 Analog Input 5 Type
P 6.59 Analog Input 5 Filter
P 6.60 Analog Input 5 Filter Time Const
P 6.61 Analog Input 5 Offset Adjustment
P 6.62 Analog Input 5 min Voltage
P 6.63 Analog Input 5 min Current
P 6.64 Analog Input 5 Minimum
P 6.65 Analog Input 5 max. Voltage
P 6.66 Analog Input 5 max. Current
P 6.67 Analog Input 5 Maximum
P 6.68 Analog Input 5 Inversion
P 6.69 Analog Input 5 Discreteness
P 6.70 Analog input 5 Dead-Zone
Set the parameters when the option card is installed to your inverter.
Refer to the parameters from P6.1 to P6.14

8.2.7 Parameter Group 7 : Process PID Control

PID can control processes by the amount of flowing water, airflow, pressure and etc.
PID Process Controller is added to the outside of speed control loop, so it can realize multi-functions without using separate PID Controller or PLC.
Process PID Controller can be used by selecting [2] PID Process Control of P 3.1

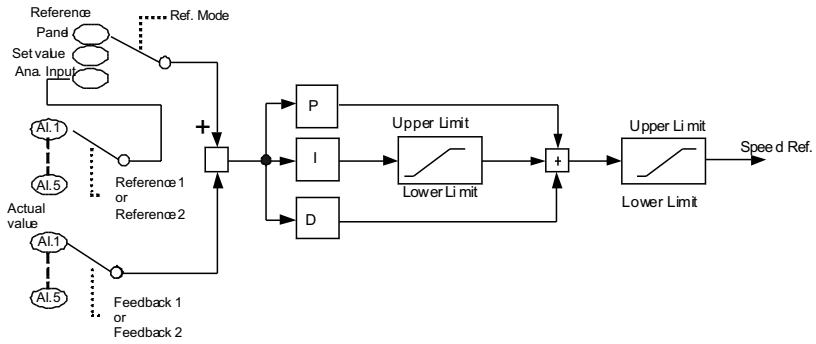


Figure 8.2-11. PID Control

P 7.0 PID Control Mode
[0] Disable
NOT use PID Function
[1] Process PID Control
This applies to the systems that are controlled by temperature, pressure, amount of water, height of water, amount of wind and etc. Only forward operation is available in this control mode.
[2] Compensation PID Control
This is a PID Control for general purposes. In this mode, forward and reverse operations are available.
[3] Free Function PID

P 7.1 Reference Mode
Selects a reference input method when PID operation is used.
[0] Keypad
Set the reference of Process PID Controller by KEYPAD.
The range is from -100% to +100%.
[1] Fixed Value by Parameter Setting
[2] Analog Input Ref1
The reference of Process PID Controller uses the analog input value.
Use [1] Reference 1(r1) set in the analog input function of the parameter group 6.
[3] Analog Input Ref2
Use[2] Reference 2(r2) set in the analog input function of the parameter group 6.
[4] Free Function

P 7.2 Fixed Set-Point [Parameter]
The value in [1] of P7.1

P 7.3 Feedback Mode
Set the Analog input terminals of Feed back.
AI.1 and AI.2 can be selected by user's convenience. The input range is 0-10[V] or 0-20[mA] or 4-20[mA].
A option card is needed to use for AI.3 through AI.5.
[0] Ai1 feedback
Parameter Group 6.0: When [4] Feedback 1 of Analog Input function is set, F1 is only used for Feed back signal.
[1] AI 2 feedback
Parameter Group 6.0: When [5] Feedback 2 of Analog Input function is set, F2 is only used for Feed back signal.
[2] Free Function
Parameter group6.0:Both [4]feedback1(f1)and[5]feedback2(f2)Were set ,the two is used to feedback signal.
P 7.4 Reference Sign Change
P 7.5 Feedback Sign Change
Change to opposite sign for reference of PID and feedback signal. (+ -> - and --> +)
P 7.6 Control Period
Set the PID control Periods.
P 7.7 Proportional Gain
Set the proportional Gain for the PID Controller.

P 7.8 Integration Time
Set the integration Time for PID Controller.
The integrator is effective to remove the errors for the steady input, but it makes the whole system unstable. To make the system stable, use the Proportion and Integration controller. If a user increases the proportional gain, and decreases the integration time, the response gets faster, but the system is unstable. . If a user decreases the proportional gain, and increases the integration time, the response get slower. This is the time that takes to the 100% output level when there is 100% error between reference and the actual value.

P 7.9 Differential Time Constant
Set the differential time constant.

P 7.10 Feed-forward Gain
Set the gain that generates proportional output to the setting value.

P 7.11 Zero-Shift Factor 1
This is used to reduce the over shoot in transient response of PID output. If this parameter is 100%, there could be over shoot for the PID Gain. In that case, reduce the value of this parameter to reduce the over shoot.
P 7.12 Proportional Gain 2
P 7.13 Integration Time 2
P 7.14 Differentiator Time Constant 2
P 7.15 Feed-Forward Gain 2
P 7.16 Zero-Shift Factor 2
Refer to the P7.7 to P7.11
P 7.17 Output Inversion
This reverses the PID Output.

P 7.18 Integrator Lower Limit
P 7.19 Integrator Upper Limit
Set the lower and upper limit of the integrator.
P 7.20 Output Lower Limit
Set the lower limit of Integrator output and PID Controller output.
Set in percentage (%) of the maximum operating speed.

P 7.21 Output Upper Limit
Set the Upper limit of Integrator output and PID Controller output.
Set in percentage (%) of the maximum operating speed.

P 7.22 Output Scale
Adjust the output scale of the PID output.

P 7.23 Intergrator Ini Value
[0] Speed Set Value
[1] Torque Set Value
[2] torque Offset
[3] Torque Limit

P 7.24 Auto RUN/STOP
When the Auto Stop Delay time is elapsed with the condition of that PID output is below the Output Lower Limit (P7.0=[1], the inverter stops automatically.

P 7.25 Auto STOP Delay Time
When output value is kept for the time that is set in P7.25 under output lower limit (P 7.20), the inverter is a utomatically stopped.

P 7.26 Auto START Error Condition
When the number of PID errors that is set in P7.25 "Auto Start Error condition" is occurred, the inverter restarts automatically.
P 7.27 Set Point Function
P 7.28 Feedback Function

8.2.8 Parameter Group 8 : Digital Input
Refer to the chapter 4 for the location of terminals.

P 8.0 Run/Stop Control
Set the function of DI1 and DI2.
[0] 1. FWD/2. REV
DI 1 -> FWD, DI 2 -> REV
DI 1 : Run signal & Forward
DI 2 : Run signal & Reverse
The first entering signal will have the priority.
[1] 1. RUN/2. DIR
DI 1 -> RUN, DI 2 -> DIR
DI 1 : Run signal. DI 2 : Open Forward, Close Reverse

P 8.1 DI 3 Function(teminal9)
P 8.2 DI 4 Function(timinal10)
P 8.3 DI 5 Function(timinal12)
P 8.4 DI 6 Function(timinal13)
P 8.5 DI 7 Function(timinal14)

P 8.6 DI 8 Function(timinal15)
It sets the Functions for Digital Input Terminals.
[0] None
Using the contact point input terminal is prohibited or is not.
[1] Drive En. (Drive Enable)
The signal is used for inverter operation ready.
[2] Multi-Step 0
Use the signal for Multi-Step 0.
[3] Multi-Step 1
Use the signal for Multi-Step 1.
[4] Multi-Step 2
Use the signal for Multi-Step 2.
[5] Multi-Step 3
Use the signal for Multi-Step 3.
[6] Fault Reset
Use the signal for releasing the faults.
[7] JOG
Use the signal for JOG run
[8] AI_REF_Active
In case of taking the Analog input signal from DI terminal, the Analog input signal is disregarded when the signal [7] is taken in the set terminal.
[9] AI_Loc_REMOTE (AI_Local / Remote)
Use the signal for Local or Remote selection.
[10] Ext. Fault A (External Fault A)
Use the signal for external fault input.
[11] Ext. Fault B (External Fault B)
Use the signal for external fault input.
[12] Motor Sel. (Motor Selection)
Use the signal for motor selection.
Open = Select motor 1
Close = Select motor 2
[13] MB BRAKE STATE
Use the signal for activating the external Magnetic Brake.
[14] Accel/Decel (Acceleration/Deceleration Switching)
Use the signal for selecting the Acc./Dec. time 1 or 2.
[15] Ref_ Tuning [INC] (Reference Increment)
[16] Ref_ tuning [DEC] (Reference Decrement)
If a signal enters to the terminal, the reference value is increased or decreased. And then, if there is no signal, the speed is continued. If a signal reenters to the terminal, the reference value is increased or decreased. The speed re-operated after stopped is same speed as before stopped. If the power is turned off and then turned on again, the speed is back the initial reference speed.
[17] Acc/Dec_Byp (Accel/Decel Bypass)
If a signal enters to the terminal, controller ignores the Acc./Dec. time.
[18] PID Cntl_Enable (PID Control Enable)
This decides whether PID is used or not by the terminal. This option can be used when P7.0(PID Control Mode) is selected.
If PID is not used, the inverter receives references by the set condition of P3.0 and P3.1
[19]AUTO_PID (AUTO PID Mode)
This is the same as P7.23, and this is set by terminals.
[20]PID_Gain (PID Gain Selection)
If this terminal is activated, The gain constants of P7.7~P7.10 are used.
If the terminal is not activated, the gain constants of P7.12~P7.15 are used.

[21] RST_PID_INT (PID Integrator Reset)
This makes the output of integrator to zero.
[22] Trq_Ref Opt_Bypass
[23] Torque_Sign
[24] Torque_Output_Zero
[25] Timer_RUN Enable
[26] Slave_RUN Status
[27] Sync_Ctrl_Option_Bypass
[28] Flying_Start
[29] Disable Profibus

P 8.7 DI 9 Function
P 8.8 DI 10 Function
P 8.9 DI 11 Function
P 8.10 DI 12 Function
P 8.11 DI 13 Function
P 8.12 DI 14 Function
P 8.13 DI 15 Function
P 8.14 DI 16 Function
This is only used as installing option board.

P 8.15 Blank Time after Motor change
This is a waiting time when the motor is changed from Motor 1 to Motor 2 or from Motor 2 to Motor 1 by the terminal function of [12] Motor Selection.

P 8.16 Reference Up/Down Time
This is the Acc./Dec. time for the terminal function of [15] Reference Increment and [16] Reference decrement.

P 8.17 Start Delayed JOG Detection
Set up the time that is delayed to recognize the JOG signal to run the Inverter.
After recognizing JOG signal, the operation is delayed as set time.

P 8.18 "RUN" Delay Time
Set up he time that is delayed to recognize the RUN signal to run the Inverter.
After recognizing RUN signal, the operation is delayed as set time.

P 8.19 Tmr_RUN Time
8.2.9 Parameter Group 9 : Multi-Step Reference [Motor 1]
These parameters set the multi-step speed and jogging speed for Motor 1.

P 9.0 JOG Reference
Set the Jogging reference in percentage of the motor rated speed.

P 9.1 P 9.15: Multi Step.1 Ref Multi Step.15 Ref
These parameters are used for the speed reference when the multi-step operation is used. If P9.16 is [0]Hz, set the demanded frequency as each step. If P9.16 is [1]%, set the percentage(%) for the rated motor speed(frequency). If there is no any multi-stage speed signal, the motor is operated with the reference of the analog or the minimum speed

Step / Input	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Multi-step 0	ON	X	ON	X	ON	X	ON	X	ON	X	ON	X	ON	X	ON
Multi-step 1	X	ON	ON	X	X	ON	ON	X	X	ON	ON	X	X	ON	ON
Multi-step 2	X	X	X	ON	ON	ON	ON	X	X	X	X	ON	ON	ON	ON
Multi-step 3	X	X	X	X	X	X	X	ON	ON	ON	ON	ON	ON	ON	ON

P 9.16 Unit Selection
[0] Percent [%]
[1] Frequency [Hz]8.2.10 Parameter Group 10 : Multi-Step Reference [Motor 2]
Set in case of operating two motors with one Inverter. Select Motor 1 or 2 with setting the contact function to "[12] Motor Sel." in Group 8 "Digital Input Setup."
Install carefully external circuit to prevent that Motor 1 and 2 are not interrupted each other.

P 10.0 JOG Reference
P 10.1~P 10.15: Multi Step.1 Ref ~ Multi Step.7 Ref.
P 10.16 Unit Selection
Refer to the parameter group 9.

8.2.11 Parameter Group 11 : Analog Output Configuration
These parameters are related to Analog Output.
P 11.0 Analog Output 1 selection
Set the function of Analog output 1. Use the terminal number 17 and 18 on Control Board..
[0] Frequency (Output Frequency)
[1] Motor Speed
[2] Output Current (Motor Current)
[3] Drive Output Voltage
[4] Torque (Actual Torque)
[5] Power Out (Output Power)
[6] DC_L Volt (DC_Link Voltage)
[7] Free_Func Output
[8] Trim 0 mA
[9] Trim 4 mA
[10] Trim 20 mA

P 11.1 Analog Output 1 Type
Select the range of output signal from Analog output 1 terminal.
[0] 0— 20mA
[1] 4— 20mA

P 11.2 Analog Output 1 Adjustment 0 mA
First set P11.0 to [7] Trim 0mA, and then, adjust the value of this parameter until the output current becomes 0mA. This is for fine tuning.

P 11.3 Analog Output 1 Adjustment 4 mA
First set P11.0 to [8] Trim 4mA, and then, adjust the value of this parameter until the output current becomes 4mA. This is for fine tuning.

P 11.4 Analog Output 1 Adjustment 20 mA
First set P11.0 to [9] Trim 20mA, and then, adjust the value of this parameter until the output current becomes 20mA. This is for fine tuning.

P 11.5 Analog Output 1 Output at 20mA
Set the value of Analog output selection of P11.0 when the analog output is 20mA.
[0] Output Frequency = 100% = P1.1
[1] Motor Speed = 100% = P1.5
[2] Motor Current = 100% = P1.2
[3] Motor Voltage = 100% = P1.1
[4] Torque
[5] Power Output = 100% = P1.0
[6] DC Link Voltage
P11.6 A0.1 signal invesion
[0] disable
[1] enable
Use only when a option board is installed.
This is about parameter related to analog output 2, 3 (AO2, AO3).
Refer to P11.0 to P11.6

8.2.12 Parameter Group 12 : Digital Output

P 12.0 DO 1 Function
P 12.1 DO 2 Function
P 12.2 DO 3 Function
Select the Function of Digital Output.
[0] Disable / Aux_SW_Ctlr
Not use the Digital Output Function.
[1] Drive Ready
It is activated when the inverter operation is ready.
[2] Fault Out [A]
It is activated when a fault occurs.(Aterminal NO)
[3] Fault Out [B]
It is activated when a fault occurs. (Bteminal NC)
[4] DM_Brake (Motor Brake)
If the conditions of Brake control of Motor 1 meet the requirements, it is activated or inactivated.
[5] RUN / STOP STATUS
It is activated when inverter is operating.
[6] WARNING (Warning Status)
It is activated when a warning occurs.
[7] Direction
It is activated when reverse signal enters.
[8] JOG State (Jog Input State)
It is activated when Jogging signal enters.
[9] OV/OC/UV Limit (OV/OC/UV Limiting Function)
It is activated when Over Voltage limiting function or Over Current limiting Function is running.
[10] Free Function

P 12.3 DO 4 Function
P 12.4 DO 5 Function
P 12.5 DO 6 Function
P 12.6 DO 7 Function
P 12.7 DO 8 Function
Refer to P12.0~P12.2
Option Board is needed to use these extra terminals.

8.2.13 Parameter Group 13 : Motor Brake Control
Set up the condition for controlling a brake, thronge DO terminal, when the brake is installed to a motor.
Use the contact output terminal set in [4] Motor Brake [5]AUxDM_Brake in the contact output function of the parameter 12.

P 13.0 B1 Locked State UP_ Reference
P 13.1 B1 Locked State DOWN_ Reference
P 13.2 B1 Brake OPEN Current
P 13.3 B1 Start Delay Time
P 13.4 B1 Brake Close Speed Set
P 13.5 B1 Brake Open Torque Build Time
1. Output Speed (Frequency) > P13.0 or P 13.1
2. Output Current > P13.2
3. Taking time after inputting RUN signal > P13.3
It is the taking time of which a brake is physically opened completely after entering a signal that opens the brake.
Apply an approximate value because this value is not correct in general.
If an output speed (frequency) is below the set value of this parameter, the contact output signal for controlling the brake is off, and it lets the brake be closed.

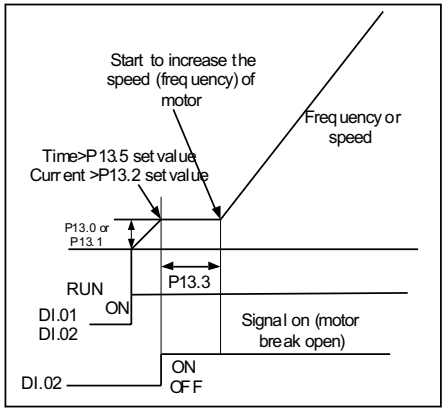


Figure 8.2-12 Motor Brake On-signal

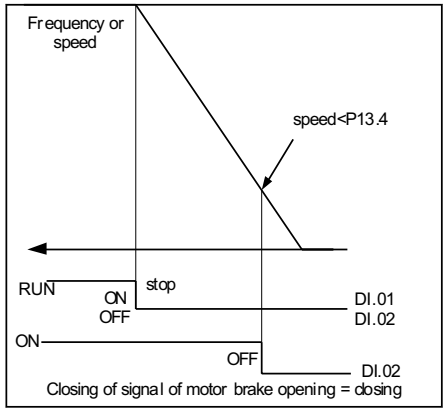


Figure8.2-13 Motor Brake Off-signal

P 13.6 B2 Locked State UP_Reference
P 13.7 B2 Locked State DOWN_Reference
P 13.8 B2 Brake OPEN Current
P 13.9 B2 Start Delay Time
P 13.10 M2 Brake Open Torque Build Time
P 13.11 M2_Brk_OPEN_Torque_Build_Time B2_Trq_Tm
It is the parameter when motor 2 is applied. Refer to P 13.0 ~ P 13.4

8.2.14 Parameter Group 14 : Auto Tuning Configuration
It is the parameter that sets necessary details for Auto Tuning.

P 14.0 Motor tuning Condition
It is a precondition for auto tuning a motor.
[1] Free Rotor: In the state that the motor has no any load or motor is available to open.
[2] Locked Rotor: In the state that the motor has a load or motor is unavailable to open.

P 14.1 Excitation Slip Frequency
Set up a slip frequency for motor tuning while the motor is stalled. Mark this with the percentage of a rated slip frequency.

P 14.2 Min. Tuning Speed
Set up the minimum tuning speed in case of operating Speed Tuning
P 14.3 Max. Tuning Speed
Set up the maximum tuning speed in case of operating Speed Tuning

P 14.4 High Frequency Excitation Frequency
P 14.5 High Frequency Excitation Current
P 14.6 Starting Excitation Current
P 14.7 Low Speed Excitation Flux

8.2.15 Parameter Group 15 : V/F Control [Motor 1]
These are the V/F Control parameters for Motor 1

P 15.0 Torque Compensation
When V/F Control is used, generating torque could be weak. This parameter sets up the Torque Compensation Method to in low frequency range for Motor 1.
[0] Manual
Manual Torque compensation selection
The output voltage is generated for compensation depending on the following parameters: P15.6, P15.7, P15.8, P15.9, P15.10, and P15.11
[1] Auto
Automatic Torque Compensation selection (Recommended)
The output voltage for compensating torque is generated automatically depending on the load. In this case, only excitation current is generated. The output current is increased if the load is increased. The parameters that are related to the Manual torque compensation would be ignored excepting P 15.11 Maximum output voltage.
P 15.1 Min. Output Frequency
Set the minimum operating frequency
P 15.2 Max. Output Frequency
Set the maximum operating frequency
P 15.3 Torque Compensation Flux Current
Set up the Flux Current at DC(0 Hz) if P1.6=[1] V/F Speed Control or P15.0=[1] Auto Compensation is used
P 15.4 Torque Compensation Time Const
Sets up the Torque compensation time constant if P1.6=[1] V/F Speed Control or P15.0=[1] Auto Compensation is used
P 15.5 Speed Detection Time Constant
Sets up the time constant for detecting a motor speed if P1.6=[1] V/F Speed Control is used.
P 15.6 V/F Pattern
Set up the output voltage curve for the inverter output frequency
[0] Linear V/F Curve
It is used for the application of a constant torque. The inverter output voltage, from the speed of zero to the field weakening point, changes in proportion to the output frequency. Refer to the Figure 8.2-19.
[1] Square V/F Curve
The output voltage, from the speed of zero to the field weakening point, changes into a square-law reduced curve for the output frequency. It is used for the square-law reduced load like a fan or pump and etc. Refer to the Figure 8.2-19.
[2] Custom V/F Curve
The user's random curve can make a V/F curve appointing three points by user's own desire. Refer to the Figure 8.2-15.
[3] Free Function

P 15.7 Zero Frequency Voltage
Set up the output voltage at 0 Hz.
You can use it only when a manual torque compensation (P15.0 = [0]) or the V/F Frequency Control mode (P1.6 = [0]).
P 15.8 Mid. Frequency
Set up the mid-point frequency when using a user's random curve
You can use it only when a manual torque compensation (P15.0 = [0]) or the V/F Frequency Control mode (P1.6 = [0]).

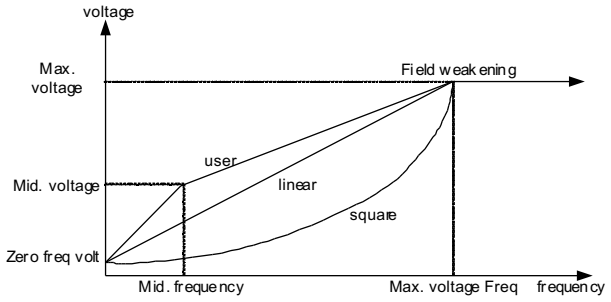


Figure 8.2-14 V/F Pattern

P 15.9 Mid. Frequency Voltage
Set up the output voltage at the mid point frequency when using the user's random curve. You can use it only when a manual torque compensation (P15.0=[0]) or the V/F Frequency Control mode (P1.6 = [0]).
P 15.10 Max Voltage Frequency
Set up the frequency of which the maximum voltage is generated. You can use it only when a manual torque compensation (P15.0 =[0]) or the V/F Frequency Control mode (P1.6 = [0]).
P 15.11 Max output Voltage
Set up the inverter output voltage in a frequency range of field weakening operation.
You can use it only when a manual torque compensation (P15.0 = [0]) or the V/F Frequency Control mode (P1.6 = [0]).
P 15.12 Voltage Limiter
If this is enabled, the output voltage is limited by the value of P15.11
[0] Disable
The output voltage can be generated as long as the output voltage allows the input voltage. Limit is eliminated.
[1] Enable
The output voltage does not generate output more than the value set in P15.11 Max Output Voltage.
P 15.14 Square Curve Voltage Compensation
Compensate the output voltage to the percentage of the rated voltage on decelerating.
Torque compensation is only available to use in manual. (P15.0=[0]Manual)
P 15.15 Start DC Brake [Time]
Set up the time that generates braking current when starting When this parameter is set to 0, there will be no braking current when starting.
P 15.16 Start DC Brake [Blank time]
Set up the acceleration time of braking current when starting. In case that there is braking current during the high-speed rotation, inverter can generate the excitation current without an inverter trip for the set time.
P 15.17 Start DC Brake [Current]
Set up the amount of braking current to output when starting. (100% = P1.2)
P 15.18 Stop DC Brake [Time]
Set up the time that generates the braking current when stopping.
The set time is the sum total of 1 sec. for DC brake starting and time for DC brake hold. If the time sets less than 1 sec, only P15,21 occurs. There will be no braking current if this is set to 0.
P 15.19 Stop DC Brake Blanking Time [STOP]
Set up the acceleration time of the braking current when stopping
In case that the braking current is generated during the high-speed rotation, inverter can generate the excitation current without an inverter trip during the set time.
P 15.20 Stop DC Brake Hold Current [STOP]
DC brake current occurs and set up the amount of DC braking current to output when stopping in P15.21.
P 15.21 Stop DC Brake Starting Current [STOP]
Set up the amount of the DC braking current when stopping. (100% = P1.2)
Occur for 1 second after the speed(frequence) order value of inverter is zero.
Figure 8.2-15 Set up DC Brake

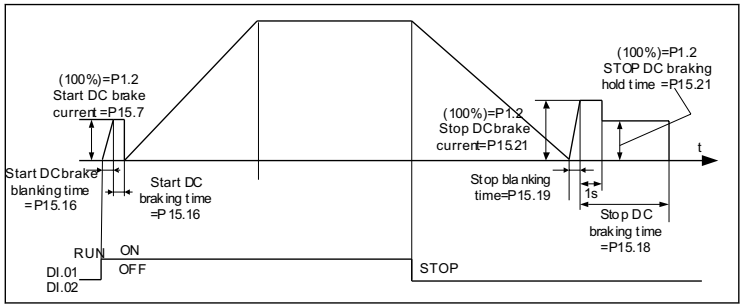


Figure 8.2-15 Set up DC Brake

P 15.22 CC Proportional-Gain
Set up the Proportional Gain that is used for the current controller
P 15.23 CC Integral-Gain Scale
Set up the Integral Gain that is used for the current controller
P 15.24 Stabilization Time Const
Set up the stabilization time constant for the stabilization controller.
The stabilization controller can reduce the resonance of motor or other unstable problems, which is automatically detected by the stabilization controller.
P 15.25 Stabilization Gain
Set up the Gain of the stabilization controller
P 15.26 Stabilization Limit
This sets the upper limit of control output for the stabilization controller. If the resonance of motor or other unstable problems is not reduced, increase this value to remove the problems.
P 15.27 Unity Current Range: Freq
Set up the frequency of which the current controller starts to change in the range of filed weakening operation. It is set automatically if you operate the auto-tuning function. This is used when the operation is in high speed over the rated frequency, and this parameter is for controlling smooth current in high speed range.

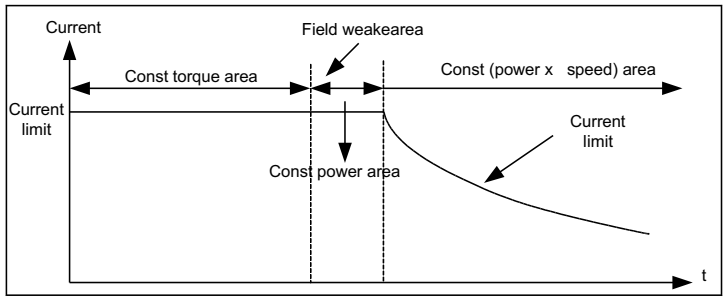


Figure 8.2-16 Operating unite current range

P 15.28 Over Current Control Gain (Acceleration)
This is applied when the motor is accelerating and in constant speed.
P 15.29 Over Current Control Gain (Deceleration)
This is applied when the motor is decelerating.
The controller reduces the frequency a little bit if the output current exceeds the current limit while accelerating or decelerating or in constant speed. Then, it keeps increasing the output frequency trying not to exceed the current limit.
P15.28 and P15.29 determine the slope when the controller lowers the current.

8.2.16 Parameter Group 16 : V/F Control [Motor 2]
These are the V/F Control parameters for Motor 2

P 16.0 Torque Compensation
P 16.1 Min. Output Frequency
P 16.2 Max. Output Frequency
P 16.3 Torque Compensation Flux Current
P 16.4 Torque compen sation time
P 16.5 Speed detection time
P 16.6 V/F Pattern
P 16.7 Zero Frequency Voltage
P 16.8 Mid. Frequency
P 16.9 Mid. Frequency Voltage
P 16.10 Max Voltage Frequency
P 16.11 Max output Voltage
P 16.12 Voltage Limiter
P 16.14 Square Curve Voltage Compensation
P 16.15 Start DC Brake Time
P 16.16 Start DC Brake Blank time
P 16.17 Start DC Brake Current
P 16.18 Stop DC Brake Time
P 16.19 Stop DC Brake Blank Time
P 16.20 Stop DC Brake Current
P 16.21 Stop DC Brake Frequency
P 16.22 CC P-Gain
P 16.23 CC I-Gain Scale
P 16.24 Stabilization Time Const
P 16.25 Stabilization Gain

P 16.26 Stabilization Limit
P 16.27 Unity Current Range: Freq
P 16.28 Over Current Control Gain (Acceleration)
Refer to the Parameter Group 15

8.2.17 Parameter Group 17 : Sensor less Vector Control [Motor 1]
These are Motor 1-parameters for operation of S/L Vector control.
P 17.0 Speed Detection time
Set up the time constant for speed detection
P 17.1 Min. Speed
Set up the minimum operation speed
P 17.2 Max. Speed
Set up the maximum operation speed
P 17.3 Over Speed Limit
In case that the estimated motor rotational speed exceeds the set value, the inverter output is immediately cut off and display the fault signal.
P 17.5 Starting Flux
Set up the amount of flux to be applied from the speed of zero to the speed of Par.17.7
P 17.6 Base Flux
Set up the amount of flux to be used from the speed of Par.17.8
P 17.7 Start Flux-END Speed
The flux of Par.17.5 is applied to the speed from zero to Par.17.7.
The start flux-end speed is set in the percentage of the maximum speed. (Par.17.2)
P 17.8 Base Flux-START Speed
Set up the speed of which the flux of Par.17.6 starts to be applied.
The base flux-start speed is set in the percentage of the maximum speed.(Par.17.2)
P 17.9 FW Voltage
This parameter sets the electromotive Force (EMF). If this value is too high, the output voltage becomes increased in the field weakening area, and if the value is too low, the output voltage becomes decreased in the field weakening area. If this value is over than 100%, the condition of torque control cannot be good because there might be not eno-ugh voltage for operating the current controller.In that case, reduce the value if the motor cannot run up to the maximum set speed.
P 17.10 FW Profile Time Const (Field Weakening Time Constant)
Set up the time constant for the flux changes in the field weakening operation
P 17.11 CC P-Gain Scale
Set up the scale in percentage of P-Gain of the current controller that is gained from auto tuning.
P 17.12 CC I-Gain Scale
Set up the scale in percentage of I-Gain of the current controller that is gained from auto tuning.

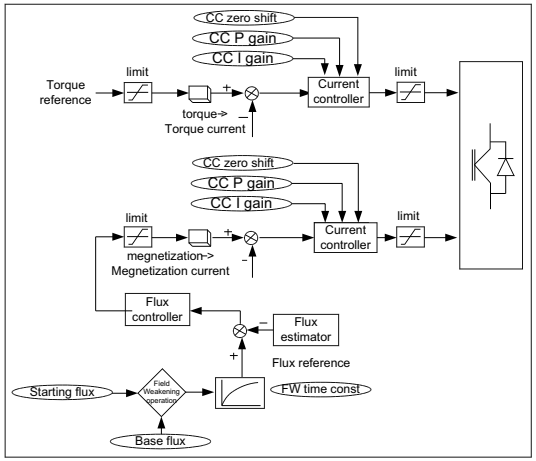


Figure 8.2-17 sensorless vector control block

P 17.14 Speed PI Gain
In order to set the PI Gain to be used for the speed controller, apply the set gain as a fixed value or use the gain that is set automatically by auto tuning.
[0] Default (Default Gain)
[1] Result by Auto-Tuning (Auto-Tuning Gain)
P 17.15 Load Observer Activation
Decides the usage of Load Observer.
P 17.16 Load Observer Time Constant
Set up the time constant of Load Observer.
P 17.17 Load Compensation Start Frequency
Set up the starting Frequency of Load Observer.
P 17.18 SC P-Gain
Set up the P-Gain of speed controller by auto tuning in percentage
P 17.19 SC I-Gain
Set up the I-Gain of speed controller by auto tuning in percentage

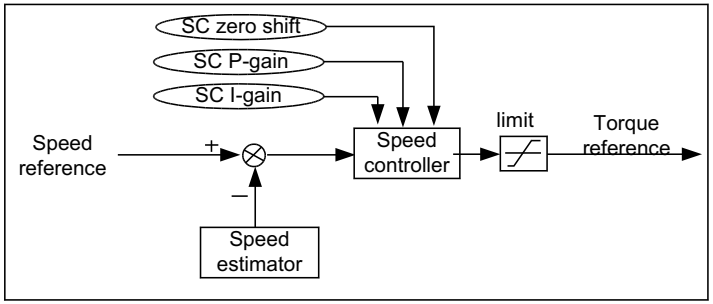


Figure 8.2-18 Speed Control Block

P 17.20 SC Ref Weight Factor
It moves a point of zero of PI controller in speed controller to the high frequency band, and reduces the speed overshoot.
P 17.25~ P 17.51
Don't change anything users own option. If you need to change things, please contact us.
8.2.18 Parameter Group 18 : Sensor less Vector Control [Motor 2]
Theses are the parameters for Sensor Less operation of Motor 2
P 18.0 Spd Detect time Constant
P 18.1 Min. Speed
P 18.2 Max. Speed
P 18.3 Over Speed Limit
P 18.5 Starting Flux
P 18.6 Base Flux
P 18.7 Start Flux-END Speed
P 18.8 Base Flux-START Speed
P 18.9 FW Voltage
P 18.10 Profile Time Const (Field Weakening Time Constant)
P 18.11 CC P-Gain Scale
P 18.12 CC I-Gain Scale
P 18.13 CC zero Shift factor
P 18.14 Speed PI Gain
P 18.15 Load Observer Activation
P 18.16 Load Observer Time Constant
P 18.17 Load Compensation Start Frequency
P 18.18 SC P-Gain
P 18.19 SC I-Gain
P 18.20 SC Ref Weight factor
P 18.29~ P 18.49
Refer to the Parameter Group 17.

8.2.19 Parameter Group 19 : Vector Control 1 [Motor 1]
These are Motor 1- parameters for sensor vector control operation.
P 19.0 Number of Encoder Pulse
Set up the number of encoder pulse that is attached to an electric motor
P 19.1 Inversion of PG Direction
When a motor is running forward, this function makes the A or B phase go in advance. If the connection of A and B phase is switched, or U, V and W phase are switched, this parameter can change the order of phase in software without disconnect the real wires.
P 19.2 Speed Detect time Constant
Set up the time constant for detecting the motor rotation speed from encoder
P 19.3 Min. Speed
Set up the minimum operation speed
P 19.4 Max. Speed
Set up the maximum operation speed
P 19.5 Over speed Limit
In case that the motor rotation speed measured from encoder exceeds the set point, the inverter output is immediately cut off and display a fault signal.
P 19.7 Starting Flux
Set up the amount of flux to be applied from the speed of zero to the speed set in Par.19.9
P 19.8 Base Flux
Set up the amount of flux to be applied from the speed set in Par.19.10
P 19.9 Start Flux-END Speed
The flux set in Par.19.7 is applied from the speed of zero to the speed set in Par.19.9. Set the start flux-end speed in percentage of the maximum operation speed. (P19.4)
P 19.10 Base Flux-START Speed
Set up the speed that the flux of Par.19.8 starts to be applied
Set the base flux-start speed in percentage of the maximum operation speed
P 19.11 FW Voltage
This parameter sets the electromotive Force (EMF). If this value is too high, the output voltage becomes increased in the field weakening area, and if the value is too low, the output voltage becomes decreased in the field weakening area. If this value is over than 100%, the condition of torque control cannot be good because there might be not enough voltage for operating the current controller.
In that case, reduce the value if the motor cannot run up to the maximum set speed.
P 19.12 FW Profile Time Constant
Set up the time constant for the flux change in the range of field weakening operation.
P 19.13 CC P-Gain (Current Control)
Set up the P-Gain of current controller by auto tuning in the percentage
P 19.14 CC I-Gain (Current Control)
Set up the I-Gain of current controller by auto tuning in the percentage
P 19.15 CC Ref Weight Factor(Current Control)
It moves a point of zero of PI controller in current controller to the high frequency band, and reduces the overshoot of output current.

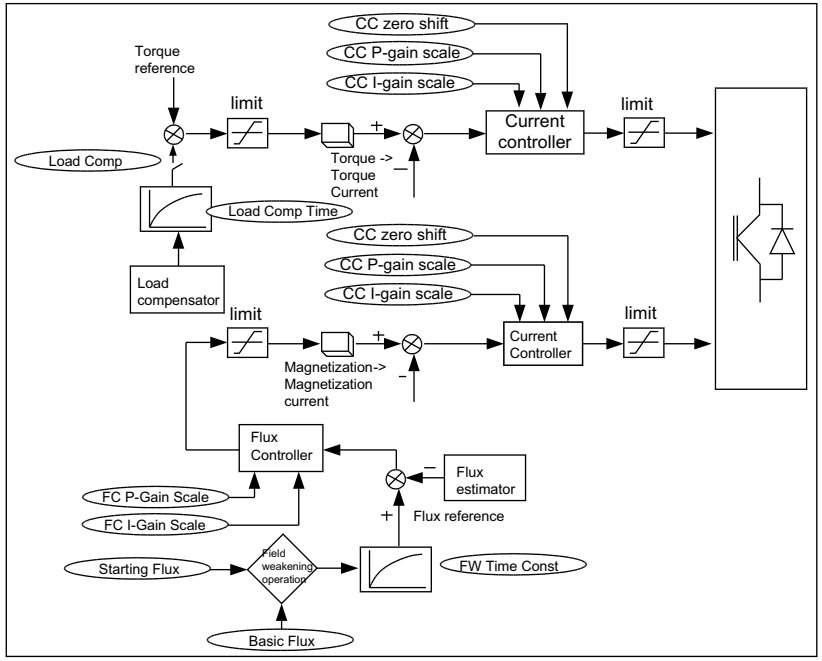


Figure 8.2-19 vector control block

P 19.16 FC P-gain (Flux Control)
Set up the P-Gain of flux controller by auto tuning in percentage
P 19.17 FC I-Gain (Flux Control)
Set up the I-Gain of flux controller by auto tuning in percentage
P 19.18 Max. Field Current
Set up the limit for the maximum field current when starting
P 19.19 Speed PI Gain Selection
You can set up auto tuning in order to get PI Gain automatically to be used for speed controller
[0] Default Setting
[1] Result by Auto-Tuning
P 19.20 Load Observer
Set up the existence of torque compensation for a rapid load change
[0]= Disabled
[1] =Enable
P 19.21 Load Observer Time Constant
Set up the time constant for the torque compensation when there is a load change
P 19.22 SC Proportional Gain (Speed Control)
Set up the P-Gain of speed controller by auto tuning in percentage
P 19.23 SC Integral Gain (Speed Control)
Set up the I-Gain of speed controller by auto tuning in percentage
P 19.24 SC Ref Weight Factor(Speed Control)
It moves a point of zero of PI controller in speed controller to the high frequency band, and reduces the speed overshoot.

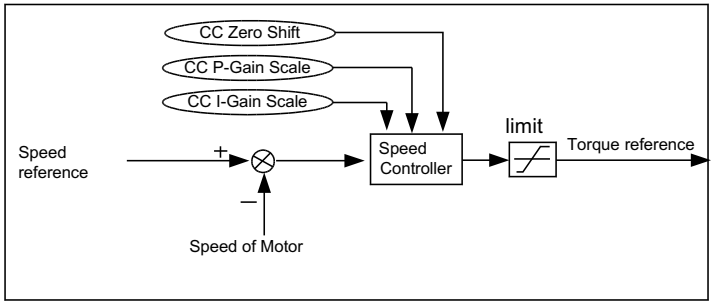


Figure 8.2-20 speed vector control block

8.2.20 Parameter Group 20 : Vector Control [Motor 2]
These are Motor 2- parameters for sensor vector control operation.
P 20.0 Number of Encoder Pulse
P 20.1 Inversion of PG Direction
P 20.2 Speed Detect time Constant
P 20.3 Min. Speed
P 20.4 Max. Speed
P 20.5 Over speed Limit
P 20.6 Flux Excitation Time
P 20.7 Starting Flux
P 20.8 Base Flux
P 20.9 Start Flux-END Speed
P 20.10 Base Flux-START Speed
P 20.11 FW Voltage
P 20.12 FW Profile Time Const
P 20.13 CC Proportional Gain (Current Control)
P 20.14 CC Integral Gain (Current Control)
P 20.15 CC Ref Weight Factor (Current Control)
P 20.16 FC P-gain (Flux Control)
P 20.17 FC I-Gain (Flux Control)
P 20.18 Max. Field Current
P 20.19 Speed PI Gain Selection
P 20.20 Load Observer Activation
P 20.21 Load Observer Time Constant
P 20.22 SC P-Gain (Speed Control)
P 20.23 SC I-Gain (Speed Control)
P 20.24 SC Ref Weight factor(Speed Control)
P 20.25~P20.41
Refer to the Parameter Group 19.

8.2.21 Parameter Group 21 : Motor 1 Parameter
These are the parameters that are automatically formed by Motor 1 auto-tuning
P 21.0 Stator Resistance 1
Set up the stator resistance 1 of a motor
P 21.1 Stator Resistance 2
Set up the stator resistance 2 of a motor
P 21.2 Rotator Resistance
Set up the rotator resistance of a motor
P 21.3 Stator Inductance
Set up the rotator stator rotator inductance of a motor
P 21.4 Rotator Indmctance

P 21.5 Leakage Inductance
Set up the leakage inductance of a motor
P 21.6 Inertia Time Constant
Set up the rotational inertia of a motor
P 21.7 Iron Loss Compensation
An iron loss impacts on the efficiency of control in the high-speed section. It can reduce controlling efficiency due to the compensation for excessive loss or lack of loss. You can improve its function through adjusting the amount of iron compensation.
P21.8 Biscos Damping Efficient

8.2.22 Parameter Group 22 : Motor 2 Parameter
These are the parameters that are automatically formed by Motor 2 auto-tuning.
P 22.0 Stator Resistance 1
P 22.1 Stator Resistance 2
P 22.2 Rotator Resistance
P 22.3 Stator Inductance
P 22.4 Rotor Inductance
P 22.5 Leakage Inductance
P 22.6 Rotational Inertia
P 22.7 Iron Loss Compensation
P 22.8 Biscos Damping Efficient
Refer to the Parameter Group 21

8.2.24 Parameter Group 24 : Monitor Setup
P 24.0 LCD Idle Time
A power of a keypad's backlight is cut off in case of the passage of a set time
P 24.1 LCD Contrast
Adjust the luminosity of a keypad's window
P 24.2 Key Repetition Time
The reaction time of a keypad's button
P 24.3 Speed Monitor Selection
[0] Calculation
The motor rotation speed that is displayed on a keypad indicates the calculated speed.
[1] Pulse Generator
The motor rotation speed that is displayed on a keypad indicates the actual rotation speed gained from encoder.
P 24.4 Speed Detection time Constant
In case of that the Speed Monitor Selection is set to Encoder, and this sets up the filtering time when measuring a motor speed from encoder.
P 24.5 Monitor Filter Time Constant
Set the Filtering Time for the Keypad display values
P 24.6 Previous Run Direction
[0] Forward (Upward)
[1] Reverse (Downward)
P 24.7 Previous Speed Set
P 24.8 Previous Frequency Set
P 24.9 Previous Torque Set
P 24.10 Previous PID Set
P 24.12 Default Monitor Item
When inputting the main power to the Inverter, set the monitor items displayed initially on the keypad.
[0] Dc_Bus Voltage
[1] Line Voltage
[2] Line Frequency
[3] Line Current
[4] Active Power
[5] Reactive Power
[6] Power Factor
P 24.13 Left/Right Button Speed Set [Hz]
P 24.14 Left/Right Button Speed Set [rpm]
P 24.16 RS485 Station ID

9.Protection

9.1 warning

State	Indication	Type	Specific ation
Warning ERR [Warning] *) These are only applied to VDC PWM	W1 Under Volt	Under	If DC_Link Voltage is lower than the Under-Voltage
	Voltage	Voltage	Limit (P.5.18), the warning occurs.
	W2 Over Volt[S]	Over Voltage1	If DC_Link Voltage exceeds the Over-Voltage limit (P.5.14), the warning occurs (Software manages).
	W3 Over Volt[H]	Over Voltage2	It happens when there is a detection of Over Voltage by hardware.
	W4 Sensor Error	Sensor Error	It happens when there is a problem of current sensor & circuit..
	W5 Over Load	Over Load	This occurs if the output current satisfies the over-load condition of P5.8 and P5.9. If P5.10=[1] ignore, it doesn't occur.
	W6 ZeroSeq. Curr	Zero sequence current	There is a detection of current leakage that exceeds P15.12 (ZC Trip).
	W7 Over_Temp	Over Temperature	It happens when the temperature of heat sink of inverter exceeds 90.
	W8 Device_Short	Device Short	It happens when there is a problem with a switching device of inverter.(P5.40)
	W9 Drv. Disable	VD Drive Disable	It happens if there is no Enable input signal from the digital input terminal when Digital Input function is set to Drive Enable.
	W10 AR1 Disable	AR1 Disable	Analog Reference is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W11 AR2 Disable	AR2 Disable	Analog Reference 2 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W12 Pre-Charging	AF1 Disable	Analog Feedback 1 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W13 ReverseVD_13	AF2 Disable	Analog Feedback 2 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.
	W14 Drive Cal.	Drive Calibration Disorder	It occurs after parameter initialization of changing switching Frequency. Execute by [0] Drive Calibration of Auto Tuning.
	W15 ReverseVD_15	AR3 Disable	Analog Reference 3 is not chosen in the Analog Input Function of P6.1, P6.15 and P6.29.

State	Indication	Type	Specific ation
	W16 Drv_Cooling	Drive Cooling	Once the inverter gets over-heated, the controller waits until the temperature goesdown above75?. Then, it continues operating.
	W17 Tuning_Stop	Auto Tuning Failure	This means that Auto-tuning is not completed well. Any operation cannot be used with this warning. Turn-off the main power and then, turn it on again to use the operation that does not need auto-tuning (etc. V/F). The drive Calibration must be executed. Reset the system to operate again.
	W18 M_Brk_not_Op	Motor Brake not	When motor brake is used,MotorBrake=[4] this warning tells that the cond ition for. opening the motor brake is not qualified. In
		Open	this case, the speed is not accelerated.
	W19 Ext_Fault	External Fault	This tells that inverter gets the external fault signal when it is stopped.[10]Extemal fault(A)or[11]Extemal fault(B)
	W20 Acc/Dec_Byp	V/F Accel/Decel Bypass Error	Acceleration and deceleration time can be prohibited when V/F control is used. Over-Current Fault can be caused. If [17]Accel/Decel Bypass, the terminal function, is usedand V/F control is used, this warning can be generated. In V/F control, If frequency is changed without Accel.or Decel slop, the over-current can occur.
	W21 Low_OV_Limit	Over Voltage Limit	It happens when there is a setting error in OV limit value.
	W22 Syn Com_Errr		
	W23 Slave Error	Slave Error	It happens when there is an error from slaves.
	*)W24 Line_Seq_Err	Line Sequence Err	Line sequence error of VDC PWM converter
	*)W25 Line_UV	Line Under Voltage	It happens when there is Under Voltage.
	*)W26 Line_Disconnection	Line Unbalance	It happens when there is Unbalance input
	*)W27 Line Over-Voltage	Line Connection Test No fulfillment	It happens when there is Test No fulfillment.
	W28 Line Unbalance		
	W29 Line_Connection Check		

State	Indication	Type	Specific ation
	W30 Profibus Error		
	W31 UV Limiting		
	W32 OV Limiting		
	W33 OC Limiting		
	W34 OT Limiting		
	W35 Warning Logic 1		
	W36 Warning Logic 2		
	W37 Warning Logic 3		

9.2 Errors

State	Indication	Type	Specific ation
Parameter Err ERR[Pxx.xx] Parameter Combination Err ERR [Parameter]	Parameter Corruption	Parameter Damage	A flash memory of parameter is damaged.
	kW / V/ A Mismatch	Output power, Voltage Setting Err	Setting error of rated output, rated voltage, and rated current of the motor
	Hz/rpm Mismatch	Frequency Setting Err	Setting error of Frequency, Speed, and number of poles of the motor
	Jumper Setting	Inverter Capacity Setting Err	Setting error of checking inverter power
	ERR[Pxx.xx]	Parameter Setting Err	A number of the parameter is indicated when there is aparameter setting error (Example: ERR[P2.1])

9.3Fault

State	Indication	Type	Specification
Control Fault ERR[Control]	F1 Over Load	Over Load	It happens when output current of inverter meets Over Load condition of P.5.7, P.5.8.
	F2 Over Curr.	Over Current [S]	It happens when output current of inverter exceeds the set value of P.5.9. (Software manages.)
	F3 Over Curr.(H)	Over Current [H]	A state of Over Current by hardware
	F4 Zero Seq Curr.	Zero-sequence current [S]	It happens when Zero-phase -sequence current exceeds the set value of P5.12.
	F5Zero Seq Curr(H).	Zero-sequence current [H]	A detection of Zero-phase -sequence current by hardware
	F6 Under Current	Under Current	It happens when output current of inverter meets the condition of P.5.5, P.5.6 and so the current is un usually low.
	F7 Over_Volt	Over Voltage [S]	It happens when DC_Link voltage of the inside of inverter exceeds the set value of P.5.15. (Software manages.)
	F8 Over_Volt(H)	Over Voltage [H]	It happens when there is a detection of Over Voltage by hardware.
	F9 Under_Volt	Under Voltage	It happens when DC_Link voltage of the inside of inverter is lower than the set value of P.5.18. In case of using S/L Vector Control, it also happens when the connections between motor and inverter are cut.
	F10 Over Speed	Over-speeding Motor	It happens when the motor's rotating speed exceeds the speed that is set to P17.2(P.18.2, P.19.4, P.20.).
	F11 Out of Ctrl	Out of Control	It happens when a control condition is not good due to internal and external factors; when a brake is not released; when a load is extremely big; when an input signal does not go into the encoder.
	F21 Over_Temp	Overheated Inverter	If the output frequency exceeds by 45Hz and the heat sink exceeds temperature by set in P 5, 40, the fault occurs. If the output frequency is less than 45Hz, overheat detection value of inverter is changed by the output current and output frequency. It's necessary to keep watching the output frequency, current and temperature when a fault occurs.
	F22 Device_Short	IGBT/MOTOR Device_Short	It happens when there is a problem with a switching device of inverter.

State	Indication	Type	Specific ation
	F23 Charging Err	Initial Charge Fault	It happens when you fail in charging the DC_link after you turn on the power.
	F24 Brake Damage	Dynamic Brake Chopper (DBR) Damage	It happens when DC_link voltage does not go up due to a problem of built-in Brake Chopper after you turn on the power. And it also happens when over current occurs or a device is damaged while Brake Chopper is at work.
	F25 Ext_Fault	Signal Input of External Fault	It happens when a Fault signal is inputted from external device.
	F26 Zero_Current	Fault Connection Error of gate drive voltage	It happens when time passes the set time of P5.3 with no current in the condition that P5.2=Enabled.
	F27 Open Phase	Open phase Fault	It happens when one of phases is broken or cut.
	F28 Motor Lock	Capacitor Bank Damage	It happens when there is a fault in capacitor bank.
	F29 Keypad_Error	Keypad Error	It happens when keypad is not connected well.
	F30 Sync_Com_Err	Synchronous Com. Error	It happens when synchronous communication has an error.
	*)F31 Line_UV	Line Under Voltage	It happens when input is low.
	*)F32 Line_Open	Line Unbalance	It happens when input is not stable.
	*)F33 Line Sequence Change	Line Over Voltage	It happens when input is over the rated voltage.
	F34 Line Over Voltage		
	F35 Line Unbalance		
	F36 Profibus Error		
	F37 Fault_Logic 1		
	F38 Fault_Logic 2		

State	Indication	Type	Specific ation
	F39 Master_Emergency		
Auto Tuning Fault ERR [Tuning]	F41 Wrong Conn.	Motor Connection Fault	It happens when a connection between inverter and motor is separated.
	F42 High_Freq Res	Motor Tuning Error 1	It happens when the gained value from a process of Motor Tuning has errors.
	F43 High_Freq Ind	Motor Tuning Error 2	It happens when the gained value from a process of Motor Tuning has errors.
	F44 Stator Res [Rs]	Motor Tuning Error 3	It happens when the gained value from a process of Motor Tuning has errors.
	F45 Rotor Res [Rs]	Motor Tuning Error 4	It happens when the gained value from a process of Motor Tuning has errors.
	F46 Stator Ind [Ls]	Motor Tuning Error 5	It happens when the gained value from a process of Motor Tuning has errors.
	F47 Rotor Lnd [Lr]	Motor Tuning Error 6	It happens when the gained value from a process of Motor Tuning has errors.
	F48 Inertia [Jm]	Motor Tuning Error 7	It happens when the gained value from a process of Motor Tuning has errors.
	F49 Motor Stall	Motor is in a stall status	Auto Tuning fails because a motor is stalled.
	F50 Tn_Time_Over	Auto Tuning Time Over	It happens when Auto Tuning time is over.

10. Troubleshooting

Condition		Check items	Management
When there is no rotation of motor	Inverter output does not occur.	Does the input voltage of inverter work properly	Check the input voltage of inverter (L1, L2, L3)
		Is the KEYPAD of inverter on	Call anage when inverter does not get turned on, even though a contact of KEY PAD is OK
		Is the operation mode & Reference of inverter properly set?	Check a set value of parameter
		Is an operation signal inputted to the inverter	Check if an operation signal is properly inputted

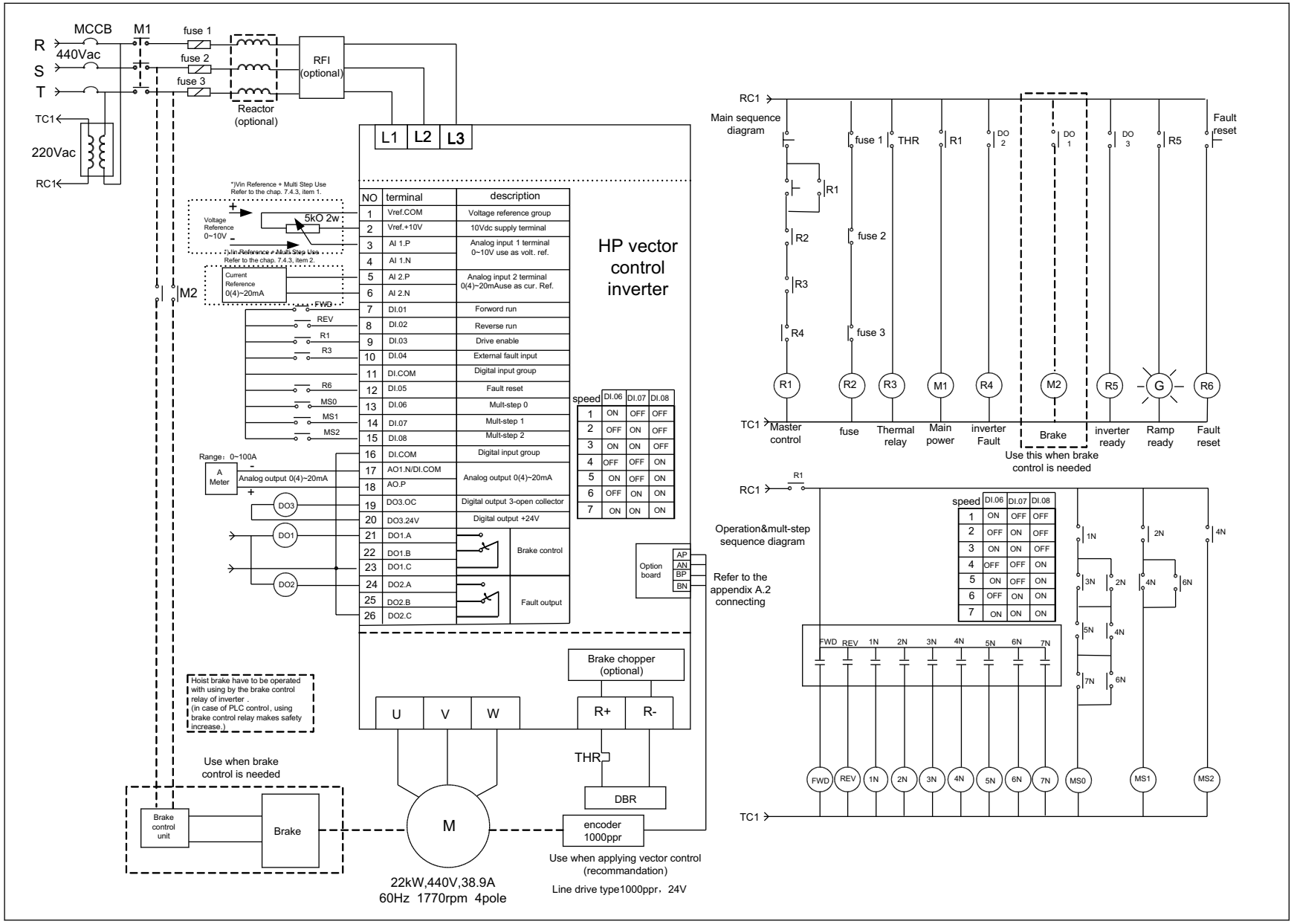
Condition		Check items	Management
		Is a speed signal 0?	Check the connection of speed signal and the change of the signals at the terminal
		Did several warnings or faults occur?	Rerun after you release warnings and faults
	Inverter output occurs	Is a motor properly connected?	Connect the inverter output U, V, and W to the motor input U, V, and W for each phase
		Is a motor stalled or is a load big?	Release or reduce a load
		Check if a Brake properly works when it is attached to a motor?	Open a Brake and then operate
When there is no rotation of motor	Inverter output does not occur	Check if an open-phase occurred to a motor?	Connect the inverter output U, V, and W to the motor input U, V, and W for each phase
		Is an output current of inverter equal to, or bigger than a set limit of curren?t	Check if a parameter setting is right and then increase speed by extending accelerating time
When a motor rotates in the opposite direction		Is an inverter output of U, V, and W in its right place respectively?	Change the terminal location of V phase and W phase
		Are the forward and reverse operating signals connected properly?	Change the location of the forward and reverse operating signals.
A speed does not increase		Isn't a load big?	Release or reduce a load Extend an accelerating time
A speed does not decelerate smoothly		Is a resistor connected to inverter?	Connect a resistor to inverter
		Isn't a deceleration smooth even though a resistor is connected?	Extend a decelerating time
		Isn't a load big?	Release or reduce a load
		When a load is big, isn't the Main Input voltage getting reduced?	Check the input voltage of the inverter
		Is there any factor that stalls motor?	Get rid of stall factor
		Is an Auto-Tuning properly operated?	Rerun Auto-Tuning
		Does a current of motor resonate?	Reset a parameter
		Is a load unsettled?	Recalculate the power
		Does a speed signal change?	Settle a speed signal

11. Maintenance and Inspection

Checking part	Check list	Checking item	Checking period		Checking method	Criterion
			Daily	Regular interval		
General matter	Surroundings	Check a temperature around you, humidity, dust, harmful gas, oil remnants, and etc.	O		Check with your eyes, taste, thermometer and hygrometer	The surrounding temperature should be10~40℃ There should be no dewdrops in 20~90% RH of the surrounding humidity. (No condensation allowed)
	General device	Unusual vibration and sound	O		Check with your eyes and ears	There should be no problem.
	Power supply voltage	Check if a voltage changes or is low	O		Check the input voltage of the inverter	It should not exceed ±10% of the rated voltage.
Main Circuit	General matters	Insulation resistance		O	Use 500V-mega (insulation tester) between main circuit terminal and earth terminal	There should be no problem.
		Check if a screw is loose		O	Check with your eyes	
		Check if there is a mark of overheating		O	Check with your eyes	
	Terminal Block	Damage		O	Check with your eyes	There should be no damage.
	Smoothing Condenser	Liquid leakage, Deformation	O		Check with you eyes and ears	
	Relay	Tremble		O	Check with your ears	
	Resistor	Crack, Discoloration		O	Check with your eyes	

Checking part	Check list	Checking item	Checking period		Checking method	Criterion
			Daily	Regular interval		
Main Circuit	Cooling Fan	Vibration, abnormal sound	O		Check with your ears	
	Cooling Water System	Dust, dirt		O	Check with your eyes	
	Wire	Deformed, Stripped		O	Check with your eyes	
	Inverter Output	The 3 phase-output		O	Multi-meter Voltmeter	The 3-phase output has to be equal for each phase.
	Motor	Vibration	O		Tightening Output Current of inverter	It should be fine. The 3-phase output has to be equal for each phase.
		Overheating	O		Cooling FAN condition	There should be no disorder.
Control Circuit	Operation	Protective circuit		O	Operate of your own accord	There should be no problem.
	Connection	Tightening		O	Check with your eyes and hands	There should be no problem.
	KEYPAD	Indication, working condition		O	Check with your eyes and hands	There should be no problem.

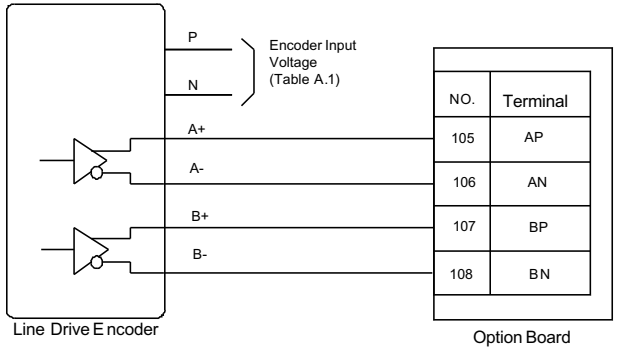
A. Closed Loop Application (Vector Control) Operation Procedure



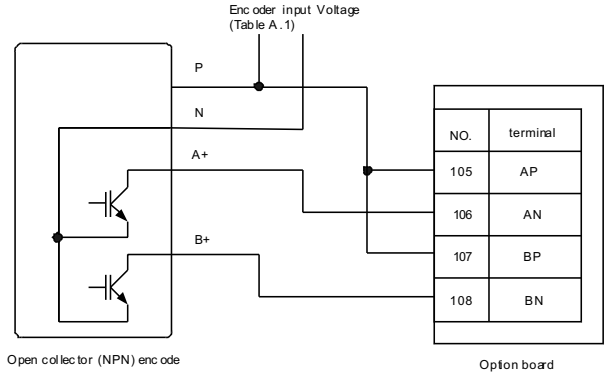
A.2 Connecting Encoder to Option Board

Encoder	S1 Dip-Switch Setting				S1 Dip-Switch Setting
	1	2	3	4	
24V	OFF	OFF	OFF	OFF	
15V	ON	OFF	ON	OFF	
5V	ON	ON	ON	ON	

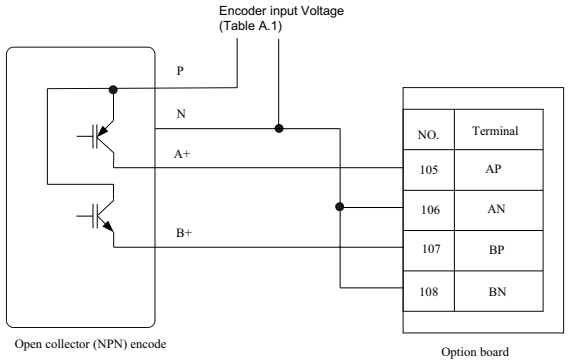
(1) Line Drive Encoder
For Line Drive Encoder, over 1024PPR is recommended. (24V)



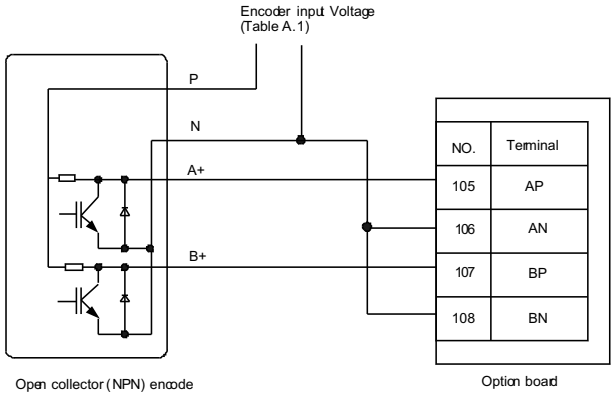
(2) Open Collector (NPN) Encoder



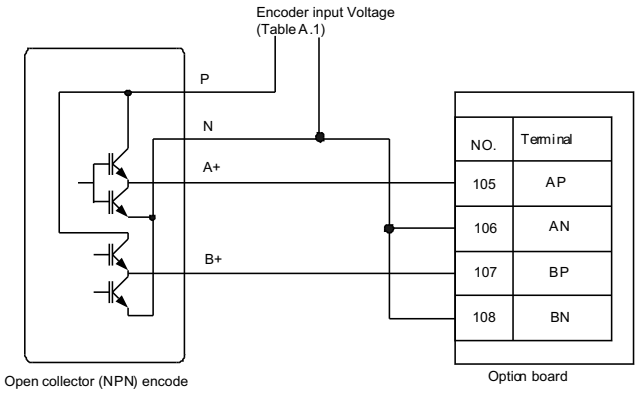
(3) Open Collector (PNP) Encoder



(4) Voltage Output Encoder



(5) Complemented Type Encoder



A.3 Motor Spec. and Setting of Closed Loop Control

Rated specification of the motor					
Rated Power	22 kW	Rated Current	38.9 A	Rated Speed	1770rpm
Rated Voltage	440 V	Rated Frequency	60 Hz	Pole	4pole

(1) Selecting Program

Setting order	Parameter Group D : Program Control			
	Par.Number	Parameter name	Set Value	Description
1	P 0.1	Program Boot Key 1	[1] Standard II	Selecting software
2	P 0.2	Program Boot Key 2	[1] Standard II	Selecting software
3	P0.3	Program Boot Key 3	[1] Standard II	Selecting software
	Main Page [5] Initialize			
4	M[5]-[1]	"System Reset"		Reset the inverter system

(2) Setting parameters for motor spec.

Setting order	Parameter Group 1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 1. 0	Motor Rated Power	22 kW	Rated Power of motor
2	P 1. 1	Motor Rated Voltage	440 V	Rated Voltage of motor
3	P 1. 2	Motor Rated Current	38.9 A	Rated Current of motor
4	P 1. 3	Motor Rated Frequency	60 Hz	Rated Frequency of motor
5	P 1. 4	Number of Poles	4 Pole	Number of Pole
6	P 1. 5	Motor Rated Speed	1770 rpm	Rated Speed of motor

(3) Setting of motor Control Method (An encoder should be installed to the motor)
When a Brake is not installed to the motor or it can be released while auto-tuning

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 1. 6	Control Method	[3] Vector Speed Control	Vector Speed Control

Parameter Group 14 : Auto Tuning Configuration : Setting of Auto-Tuning

2	P14.0	Motor Tuning Condition	[0] Free	Motor is not in stall condition.

Parameter Group 19 : Vector Control 1

3	M3-[1]	Execute the "Motor Tuning" (Refer to chapter 7.3)
4	M3-[2]	Execute the "Speed Tuning" (Refer to chapter 7.3)

Move to "Chapter A.4 Speed reference and setting of Digital input"

When a brake is installed to the motor and it cannot be opened while auto-tuning
(Auto Tuning = [2] Speed Tuning cannot be executed in this case)

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 1. 6	Control Method	[3] = Vector Speed Control	Vector Speed Control
Parameter Group 14 : Auto Tuning Configuration : Auto-Tuning Setting				
2	P14.0	Motor Tuning Condition	[1] = Locked	Motor is in stall condition
Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
3	M3-[1]	Execute the "Motor Tuning" (Refer to the chapter 7.3)		

Parameter Group 19 : Vector Control [Motor 1]

4	P19.19	Speed PI Gain	[0] = Default Gain	Use Default values for PI Gain of Speed Control Loop P19.22, P19.23 can be adjusted for user's desire.

A.4 Speed Reference and Setting of Digital Input

This is the setting method to compose the system using analog input and Digital input like figure A-1 Basic Design. In this case, HPVFV inverter recognizes the Analog input as a speed reference if the multi-step digital input is not detected. If there is one or more multistep digital input is detected, the inverter automatically recognizes it as the speed reference.

(1) Parameter setting for Voltage (0[-10]~10V) reference + Multi-Step speed reference

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 3. 0	RUN/STOP Method	[0] = Terminal	RUN/STOP with DI.01 and DI.02
2	P 3. 1	Reference Method	[0] = Terminal	Use Analog or Digital input for speed or frequency reference
Parameter Group 6 : Analog Input Setup : Setting for Analog input				
3	P 6. 0	Reference Mode	[1] = r1 only	Use only r1 for analog input
4	P 6. 1	Analog Input 1 Function	[1] = reference 1	Use r1 for Ai1
5	P 6. 2	Analog Input 1 Type	[0] = 0~10V	The type of speed reference Use 0 ~ 10 V
Parameter Group 8 : Digital Input Setup : Setting for Digital input				
6	P 8.0	RUN/STOP	[0] = FWD-DI.01 REV - DI.02	Setting digital input for RUN/STOP
7	P 8.1	DI.03 Function	[1] = Drive Enable	Set DI.03 function to "Drive Enable"
8	P 8.2	DI.04 Function	[9] = External Fault A	Set DI.04 function to "External Fault A"
9	P 8.3	DI.05 Function	[5] = Fault Reset	Set DI.05 function to "Fault Reset"
10	P 8.4	DI.06 Function	[2] = Multi Step 0	Set DI.06 function to "multi step 0"
11	P 8.5	DI.07 Function	[3] = Multi Step 1	Set DI.07 function to "multi step 1"
12	P 8.6	DI.08 Function	[4] = Multi Step 2	Set DI.08 function to "multi step 2"

Move to "chapter A.5 Setting of Digital output and Analog output"

(2) Parameter setting for current(0[4]~20mA) input reference + Multi-step reference

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 3. 0	RUN/STOP Method	[0] = Terminal	RUN/STOP with DI.01 and DI.02
2	P 3. 1	Reference Method	[0] = Terminal	Use Analog or Digital input for speed or frequency reference.
Parameter Group 6 : Analog Input Setup : Setting for Analog input				
3	P 6. 0	Reference Mode	[1] = r1 only	Use only r1 for analog input
4	P 6. 15	AI.2 Function AI 2 Func	1	[0] Diisabled [1] Analog_In
5	P 6. 16	AI.2 Type AI 2 Func	3	[0] 0~10(5)V [1] -10~10V [2] 4~20mA [3] 0~20mA
Parameter Group 8 : Digital Input Setup : Setting for Digital input				
6	P 8.0	RUN/STOP	[0] = FWD→DI.01 REV→DI.02	Setting digital input for RUN/STOP
7	P 8.1	DI.03 Function	[1] = Drive Enable	Set DI.03 function to "Drive Enable"
8	P 8.2	DI.04 Function	[10] = External Fault A	Set DI.04 function to "External Fault A"
9	P 8.3	DI.05 Function	[6] = Fault Reset	Set DI.05 function to "Fault Reset"
10	P 8.4	DI.06 Function	[2] = Multi Step 0	Set DI.06 function to "multi step 0"
11	P 8.5	DI.07 Function	[3] = Multi Step 1	Set DI.07 function to "multi step 1"
12	P 8.6	DI.08 Function	[4] = Multi Step 2	Set DI.08 function to "multi step 2"

A.5 Setting of Digital Output and Analog Output

Figure A-1 This is the setting method for digital output composition like basic design

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 11.0	AO 1 Output Selection	[2] = Motor Current	Set the Analog Output to "Motor Current"
2	P 11.1	AO.1 Type Ao1 Type	[0] = 0~20mA	Set the Analog Output range to "0~20mA"
			[1] = 4~20mA	Set the Analog Output range to "4~20mA"

3	P 11.5	AO.1 Max_Output Ao1 Scale	100	Set the output value when Analog Output is 20mA. (The maximum display of the used current meter in design is 100A, so set this to100)
Parameter Group 12 : Digital Output Setup : Setting for Digital Output				
4	P 12.0	DO 1 Function	[4] = Motor Brake	The Digital Output 1 is set to "brake control" (Refer to chapter 7.4.6)
5	P 12.1	DO 2 Function	[2] = Fault Out A	This is activated when Fault occurs. (A contact)
6	P 12.2	DO 3 Function	[1] = Drive Ready	This is activated when the inverter is in "Drive ready" condition.

Move to "chapter A.6 Setting of operation pattern"

A.6 Setting of Operation Pattern

This explains the parameter setting for the following operation pattern as Figure A-2.
The basic input method is figure A-1.

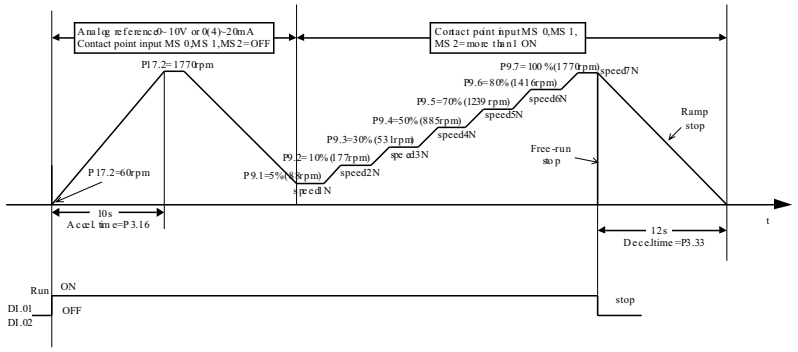


Figure A-2 Example of "Vector Speed Control" operation pattern.

1.Setting of Reference Setup

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 3. 3	STOP Mode	[0] = Ramp Stop	Inverter controls the output until the motor stops completely after RUN signal is OFF.
			[1] = Free-Run Stop	Inverter cuts off the output immediately as RUN signal is OFF.
2	P 3. 9	Accel.Switching Ref[1-2]	100%	100% = Max. Speed or Max. Frequency
3	P 3. 16	Accel.Time I 1	10s	Accel range 1 refer to the description
4	P 3. 26	Decel.Switching Ref[1-2]	100%	100% = Max. speed or Max. Frequency
5	P 3. 33	Decel.Time I 1	12s	Decel range 1 refer to the description

2.Setting for Multi Step Reference

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P 9.1	Multi Step 1 Reference	5%	1770rpm X 5% = 88rpm
2	P 9.2	Multi Step 1 Reference	10%	1770rpm X 10% = 177rpm
3	P 9.3	Multi Step 1 Reference	30%	1770rpm X 30% = 531rpm
4	P 9.4	Multi Step 1 Reference	50%	1770rpm X 50% = 885rpm
5	P 9.5	Multi Step 1 Reference	70%	1770rpm X 70% = 1239rpm
6	P 9.6	Multi Step 1 Reference	80%	1770rpm X 80% = 1416rpm
7	P 9.7	Multi Step 1 Reference	100%	1770rpm X 100% = 1770rpm

3.Operation pattern setting for Vector Control

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P18.1	Minimum Speed	60 rpm	Setting for Min. Speed
2	P18.2	Minimum Speed	100%	Setting for Max. Speed
3	P18.3	Over Speed Limit	125%	Setting for Limit for over speed

<Setting completed!> If Brake control is used, refer to A.7

A.7 Setting the Brake Control Parameters Using Digital Output

This explains the related parameters when the brake is controlled using digital output as figure A-3 and A-4 like the basic design of Figure A-1.

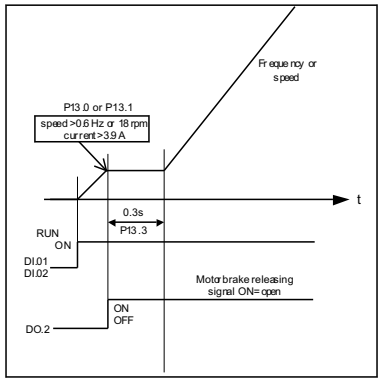


Figure A-3 Brake open signal

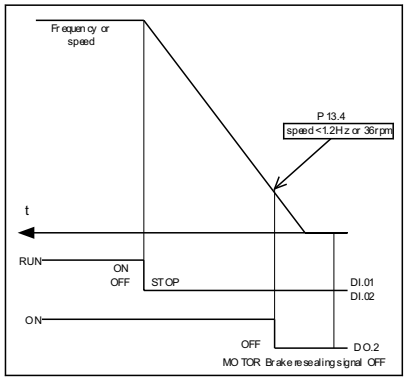


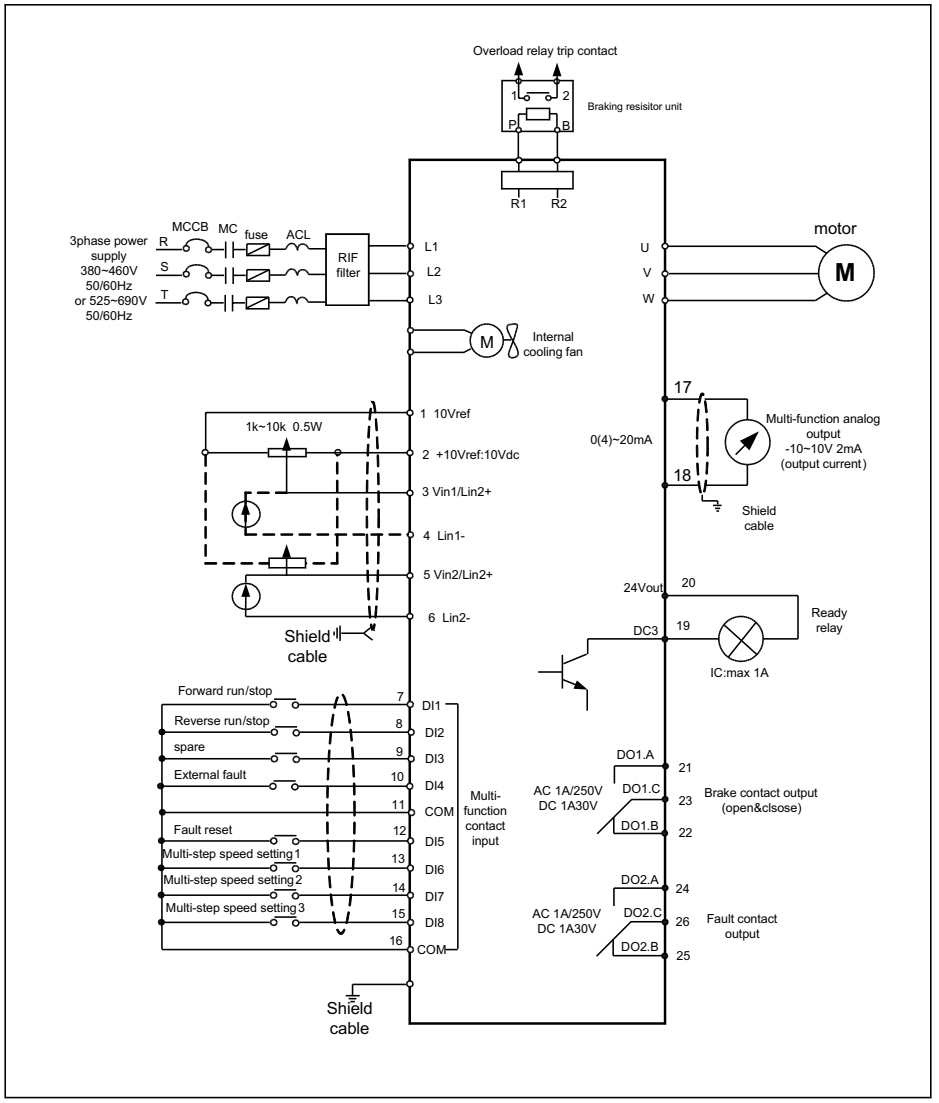
Figure A-4 Brake close signal

Setting order	Parameter Group1 : Control Setup[Motor 1]			
	Par.Number	Parameter name	Set Value	Description
1	P12. 1	DO.2 Function	[4] = Motor Brake	Set DO.2 to "motor brake"
	Parameter Group 13 : Magnetic Brake Control : setting for motor brake control			
2	P13.0	B1 Locked state Up_Ref	1%	Speed or frequency reference when digital output is ON. (60Hz,1770rpm) X 1% = 0.6Hz, 18rpm
3	P13.1	B1 Locked state Down_Ref	1%	
4	P13.2	B1 Open Current	10%	Do=No Signal 38.9Ax10%=3.9A
5	P13.3	B1 Open Response Time	0.3s	The speed or frequency reference is kept for the set value of time. The time should be set depending on the elapsed time until the brake is opened completely after digital output is ON.
6	P13.4	B1 Close Reference	2%	Speed or frequency reference when digital output is OFF. (60Hz,1770rpm) X 2% = 1.2Hz, 36rpm
7	P13.5	B1 Brake Open Torque Build Time	0.2s	This is delay time until contact point output is turned into 'on', after inputting the operating signal. At this time, output current must be more than set value in P13.2

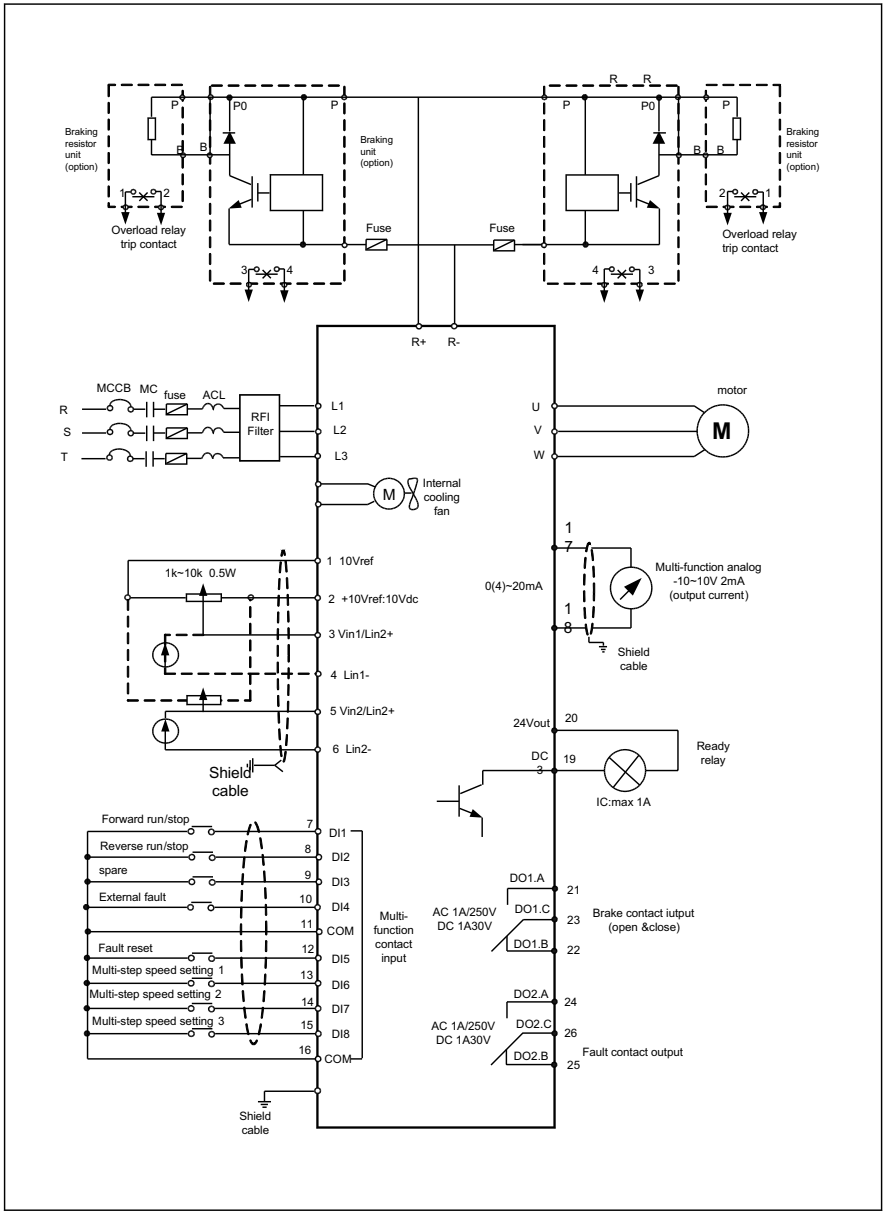
<Digital output setting is completed for brake control>

B. Wiring Diagram for Crane Application

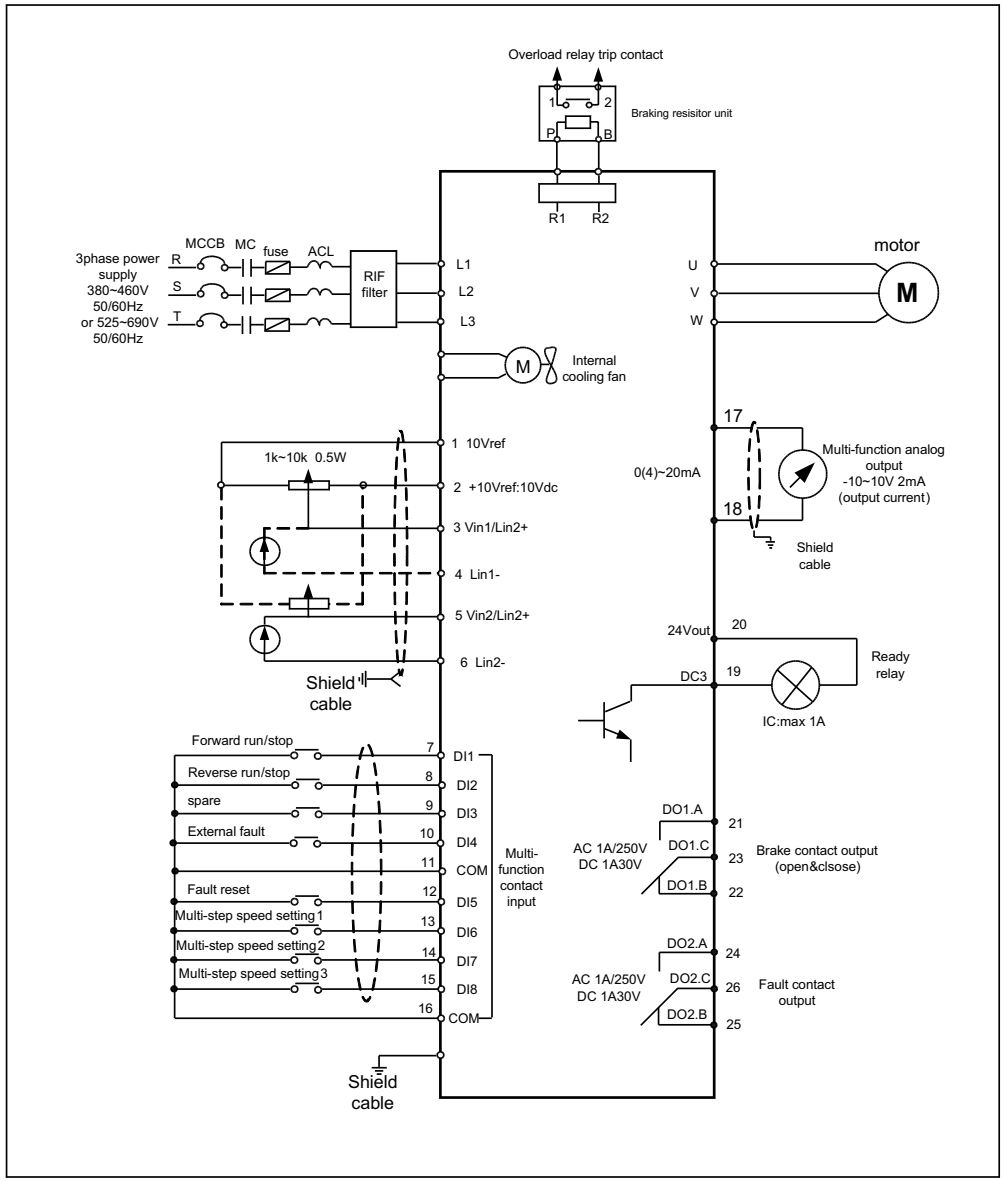
B.1 Hoist Motion (380V~460V / 5.5~200kW)



B.2 Hoist Motion (380V~460V / 250~400kW)



B.3 Traversing & Traveling Motion (380V~460V / 5.5~200kW)



Appendix 1

Calculation of braking resistor value
Application: crane control
Herein we give a case to demonstrate how we calculate the value of braking resistor for a frequency inverter applied to a crane.

Motor power:
45kw for Main hook, 11kw x 2 for travelling crane, 3.7kw for trolley system
Frequency inverter configure:
HPVFV04-75G for Main hook
HPVFV04-37G for travelling crane
HPVFV04-5.5G for trolley system
Motor voltage：380V

1. Main hook
   R=V*V/P=690*690/45000=10.58Ω,considering lifting load,the calculation will be based on 150% overload, so it will be 10.58/1.5=7.05Ω, in view of improving redundancy of running, additional 25% overload will be added, namely, the final value: 7.05Ω/1.25=5.6Ω
   The value of resistor is calculated based on the motor power, so the value should be equal or higher than the corresponding minimum value allowed in the Form 1. For example, the allowed min value of HPVFV04-75G is 3Ω.the calculated value is 5.6Ω which is higher than 3Ω,therefore, the calculated value 5.6Ω is ok.
   In case the value of braking resistor is calculated to be lower than the corresponding min value in the Form1, then the braking resistor shall apply the min value in the Form1. The same way applies to travelling crane and trolley system.
   Resistor power for lifting: i. 50~60% of motor power is applicable for lifting range lower 10m
   ii. above 60% of motor power is applicable for lifting range higher 10m
   Consequently, the final resistor model selection for main hook is to be 25kw,100%ED,690VDC,5Ω

2. Travelling crane(T/L):R=V*V/P=690*690/22000=21.64Ω,
   calculate based on overload of 125%, 21.64/1.25=17.3Ω
   resistor power for horizontal travelling load: 25~40% of motor power applicable

   consequently, the selection of travelling crane resistor will be as follows,
   8KW100%ED,690VDC,15Ω (15Ω is higher than the min value of 6Ω in the form)

3. Trolley system(T/S): R=V*V/P=690*690/3700=128.7Ω,
   calculate based on overload of 125%, 128.7/1.25=103Ω
   resistor power for horizontal travelling load: 25~40% of motor power applicable
   consequently, the selection of travelling crane resistor will be as follows,
   8KW100%ED,690VDC,85Ω (85Ω is higher than the min value of 69Ω in the form)

The above calculation of braking resistor take crane application as example, covering mainhook(vertical load),travelling crane(horizontal load) and trolley system(horizontal load). For other industry applications, the above calculation can be referred regarding vertical load and horizontal load.

Sheet1:Parameter of Built-in Braking Chopper

HPVFV INVERTER BRAKE CHOPPER					
Power 【kW】	Rated Voltage 【V】	BC_start_Volt 【Vdc】	DBR recommend Value【Ω】	DBR Minimun Value【Ω】	Brake Chopper Maximum Current 【Adc】
5.5	380	690Vdc	100.0	69.0	12.5
7.5	380	690Vdc	74.0	50.0	17.5
11.0	380	690Vdc	51.0	35.0	25.0
15.0	380	690Vdc	37.0	22.0	40.0
18.5	380	690Vdc	30.0	17.0	50.0
22.0	380	690Vdc	25.0	12.0	70.0
30.0	380	690Vdc	18.0	8.0	110.0
37.0	380	690Vdc	15.0	6.0	150.0
45.0	380	690Vdc	12.0	6.0	150.00
55.0	380	690Vdc	10.0	3.0	300.0
75.0	380	690Vdc	7.2	3.0	300.0
90.0	380	690Vdc	6.2	3.0	300.0
110.0	380	690Vdc	5.0	2.0	540.0
132.0	380	690Vdc	4.2	2.0	540.0
160.0	380	690Vdc	3.5	2.0	540.0
200.0	380	690Vdc	2.8	1.5	720.0