

Content

Chapter I Product introduction

1.1 Product introduction.....	3
1.2 Product inspection.....	4
1.3 Nameplate information.....	4
1.4 Model description.....	4
1.5 Operating environment.....	5
1.6 Summary of control methods.....	6

Chapter II Wiring diagram

2.1 Basic wiring, wiring diagram of terminal block.....	9
2.2 Wiring of main circuit.....	12
2.3 Wiring of control circuit terminal.....	15
2.4 Precautions for wiring.....	18

Chapter III Setting of running mode (parameters)

3.1 Functions of the Digital Operator.....	19
3.2 Types of operating mode.....	21
3.3 Control method switch.....	21
3.4 Access level of parameters.....	22

Chapter IV Autotuning

4.1 AUTOTUNING procedure.....	24
4.2 AUTOTUNING operation.....	25

Chapter V Detailed description on parameter groups

5.1 Group 1: Parameters of environment setting mode.....	31
5.2 Group 2: Parameters of application.....	35
5.2.1 Running mode selection.....	35
5.2.2 DC brake.....	39
5.2.3 Speed search.....	40
5.2.4 TIMER function.....	41
5.2.5 PID control.....	42
5.2.6 DWELL Function.....	49
5.2.7 DROOP Function.....	50
5.2.8 Energy-saving control.....	51
5.2.9 Zero servo.....	52
5.3 Group 3: Autotuning parameter	
5.3.1 Accelerating & decelerating time.....	53
5.3.2 S curve characteristic.....	55
5.3.3 Slip compensation.....	56
5.3.4 Torque compensation.....	58
5.3.5 Speed control.....	60
5.3.6 Carrier frequency.....	62
5.3.7 Hunting prevention function.....	63
5.3.8 Parameters for factory adjustment.....	63
5.4 Group 4 Reference parameter	

5.4.1 Frequency reference.....	64
5.4.2 Upper and lower limit of frequency.....	65
5.4.3 Setting of forbidden frequency.....	66
5.4.4 Frequency reference holding.....	67
5.4.5 Torque control.....	68
5.5 Group 5: Motor parameter	
5.5.1 V/f characteristic.....	70
5.5.2 Motor parameter.....	75
5.5.3 Control mode of motor 2.....	77
5.5.4 V/f characteristic of motor 2.....	77
5.5.5 Parameters of motor 2.....	78
5.6 Group 6: Parameter of interface card	
5.6.1 PG speed control card ..	80
5.7 Group T: Parameter of control circuit terminal	
5.7.1 Multi-functional input.....	83
5.7.2 Multi-functional output.....	101
5.7.3 Multi-functional analog input.....	105
5.7.4 Multi-functional analog output.....	110
5.7.5 MODBUS communication.....	112
5.8 Group P: Protection function parameter	
5.8.1 Motor protection function.....	113
5.8.2 Treatment for transient power failure.....	114
5.8.3 Stall prevention function.....	115
5.8.4 Frequency detection.....	119
5.8.5 Fault restart.....	120
5.8.6 Over torque detection.....	121
5.8.7 Torque limit.....	123
5.8.8 Hardware protection.....	124
5.9 Group O: Parameter of operator	
5.9.1 Display setting/selection.....	126
5.9.2 Multi-functional selection.....	127
5.10 Group M: Parameter of driving mode (Monitoring mode parameter).....	129
5.11 List of parameter setting.....	135
Chapter VI Description of fault and countermeasures	
6.1 Fault reference and countermeasures.....	144
6.2 Common failure analysis.....	155
Chapter VII Specification	
7.1 Standard specification of inverter.....	158
Chapter VIII Appendix	
8.1 Maintenance and inspection.....	160
8.2 Installation dimension.....	161
8.3 Operation steps of parameter storage.....	163
8.4 Matching list of braking unit and braking resistor.....	164
Memo	165

Chapter I Product Introduction

1.1 Product Introduction

Thank you for using Q9000 Current Torque Vector Controlled Universal Inverter developed by Qma Technical Company, featuring high-performance and ultra-low noise. In order to fully make use of functions of the inverter and to ensure users' safety, please read this instruction manual carefully. In the course of using, in case of any problems not covered by this manual, please contact local agents or engineering technical personnel from our company. Our professional staff is glad to serve you. Please continue to use this product.

【Application Guide】

Inverter is the power electronic equipment. For the sake of your safety, the "Danger", "Attention" and other symbols in this manual are to remind you of the security matters in moving, install, operating and checking.

【Danger】 Improper use may cause casualties. Please don't disassemble, install or change the internal connection or circuit and component of the inverter without permission.

【Caution】 Improper use may cause the damage to the inverter or mechanical system.

【Danger】

- Please don't touch the circuit boards, parts or components after power-off before the "Charge" indicator light is off.
- Please don't disassemble, install or change the internal connection or circuit and component of the inverter without permission.
- Please don't take wiring when power is supplied; please don't check the components, parts or signals on the circuit board when the inverter is running.
- Please correctly ground the earth terminals of the inverter. 220V Class: the third grounding; 440V Class: special grounding.

【Caution】

- Please don't carry out pressure test for internal parts or components of the inverter, because these semi-conduct parts or components are easy to be damaged by high voltage.
- You mustn't connect the output terminals of the inverter U, V, W to the input terminals AC power source (R, S, T) correctly.
- Please don't touch the main board, because the CMOSIC component on the circuit board of the inverter is easy to be affected or damaged by static electricity.

【Security Precaution under Operation】

Danger

- Please don't disassemble the front cover when the inverter is powered, in order to avoid electric shock.
- Please don't approach to the machine if you set the automatic restart function, because the motor will be restarted after the machine stop.
- The "Stop" switch function is available after setting. It is different from urgent "Stop" switch in use, please pay attention to it.

Caution

- Please don't touch the heating components such as radiator and brake resistor, in order to avoid scald and electric shock.
- Please input the permissible speed range of the motor and the machine, because it is easy for the inverter to raise speed from low to high.
- Please pay attention to the relative settings when using the brake.
- Please don't test the signal on the circuit board when the inverter is running.
- Please don't discretionarily adjust the parameters, because the inverter was set well before leaving factor.

1.2 Product Inspection

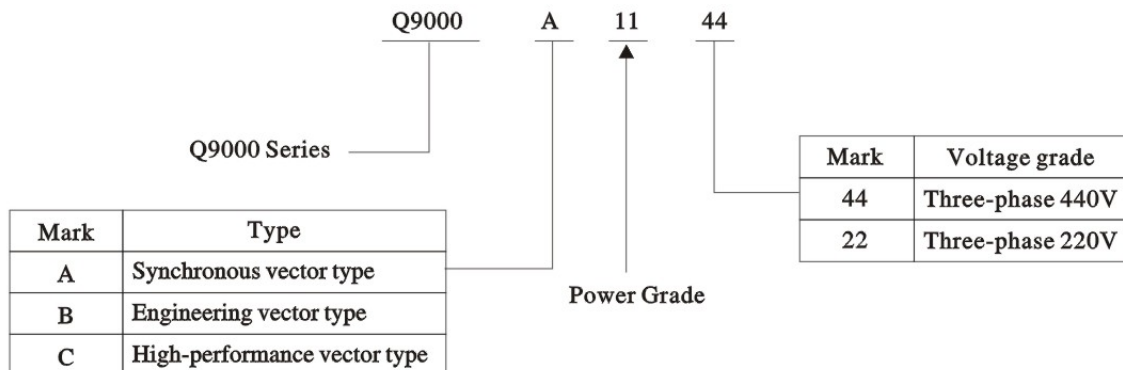
Confirmation Items	Confirmation Method
Inverter model	Confirm the nameplates at the front and side of Q9000
Damaged during delivery	Look at the overall appearance
Vibration in screws and other fastening parts	If necessary, check it with a screwdriver

1.3 Nameplate Information

The following nameplate information is taken three-phase AC 400V 11KW series as an example:

Model →	MODEL: Q9000-A-1144 (AC440V/H15HP)
Input Specification →	SOURCE: 3PH AC440V 50/60HZ
Output Specification →	OUTPUT: 3PH AC0~440V 11KW27A

1.4 Model Description

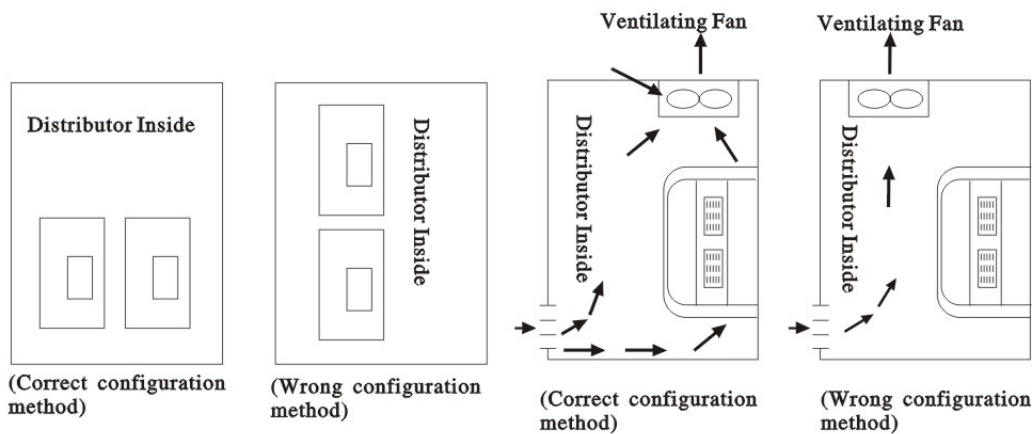


For wiring diagram, refer to page 9-11

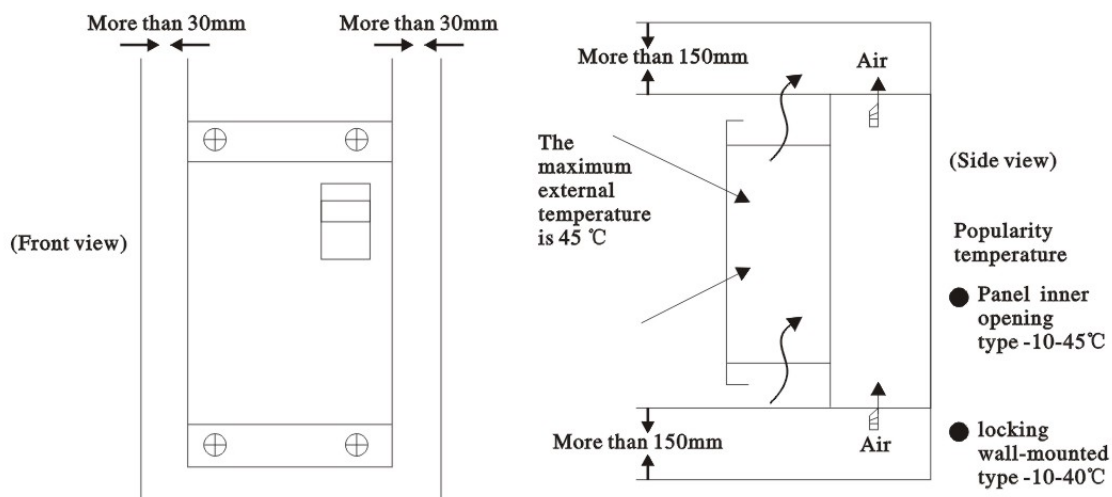
1.5 Operating Environment

The installation environment, which has direct impact on the functions and service life of the inverter, should meet the following conditions:

- Environmental temperature: Panel inner opening type: (-10~45℃/+14~113°F)
Locking wall-mounted type: (-10~40℃/+14~104°F).
- Prevent from rain and moisture.
- Avoid direct sunlight.
- Prevent from oil spray or corrosion by salt.
- Prevent from corrosive liquid or gas.
- Prevents from the invading of dust, cotton wool and fine metal scraps.
- Be far away from radioactive substance and combustible substance.
- Prevents from EMI (for example: EMI from sealing machines or power machine).
- Prevent from vibrations (punch). Please use shims to absorb vibrations if necessary.
- If several inverters are installed in a control board, please correctly lay out them for better heat emission. A ventilating fan should be equipped to keep the temperature below 45℃.



- The front surface of the inverter should face front for better heat emission.
- The installation space must comply with the following regulation: If the inverter is installed in the control board or the environment that is permitted, the upper dust cover can be taken down for better heat emission).



1.6 Summary of Control Methods

Q9000 has four control methods as follows:

- V/F control Without PG
- V/F Control With PG
- Vector Control Without PG
- Vector Control With PG

The so-called PG pulse encoder refers to the vector control, which means the torque control method without mutual-interference between magnetic field and torque.

The current vector control of this product is to control the motor's primary current and phase simultaneously, which respectively control the magnetic field current and torque current, thus to achieve the smooth operation at a very low speed, the large-torque & high-precision speed and the torque control.

Vector control can be switched to the traditional V/f control; if the necessary motor parameter of vector control is unavailable, the motor parameter can be set automatically by the Autotuning function.

Features of Control Methods

Control method	V/F control without PG	V/F control with PG	Vector control without PG	Vector control with PG
Basic control	V/F control	V/F control W/PG FDBK	Current vector without PG (Open loop vector)	Current vector with PG (Flux vector)
Speed detector	Unnecessary	Necessary (With PG)	Unnecessary	Necessary (With PG)
Speed detection	Unnecessary	PGB-2K	Unnecessary	PGB-2K
Speed control range	1:40	1:40	1:100	1:1000
Start torque	150%/3HZ	150%/3HZ	150%/0.5HZ	200%/0HZ
Speed control accuracy	±2%~±3%	±0.03%	±0.2%	±0.02%
Torque control	Unavailable	Unavailable	Unavailable	Available
Low-noise correspondence	Standard correspondence	Standard correspondence	Standard correspondence	Standard correspondence
Applications	1. Drive Multiple motors 2. Motor parameters unknown 3. Autotuning is unavailable	PG is attached at mechanical side	When variable speed needed	1. Simple servo drive 2. High accuracy servo control 3. Torque control

Function Introduction

■ Torque control

Torque control is available under vector control (with PG). Multi-functional analog input signal is used as torque reference to control the torque.

Torque control accuracy is +5%; the switch between torque control and speed control is available.

■ V/f Curve Setting

V/f curve setting is only available under V/f control. There are 15 kinds of pre-set V/f curves or any other V/f curves for different purposes.

■ Types of frequency reference

There are four kinds of frequency reference.

- Setting through numerical value by the digital operator
- Setting through the 0~10v voltage value
- (Reverse operation in case of negative voltage) Setting through 0~+10v voltage value
- Setting through the 4-20 mA current value

Setting through corresponding parameters of any one from the four kinds

There are at most 9 frequency references inside the inverter. If input multi-sectional speed for the inverter externally, there are at most 9 running speeds.

■ Autotuning function

Autotuning function is available under the vector control. Under the difficult circumstances that the motor use is restricted by the motor parameter setting, it can be resolved through the unique Autotuning function.

The inverter can automatically set the motor parameter within the range on the motor nameplate. Both the inverter-duty motor and general motor can use vector control to maximize the function of motor.

For running under the vector control, please implement Autotuning for the motor before running (see details in Chapter IV).

■ PID Control

PID control function can be used to achieve a simple closed-circuit control. The so-called closed-circuit control refers to the control method that uses sensor to feed back the detectable value, making the output frequency of inverter be in accordance with the reference.

PID control is available for the following applications on the basis of the sensor's detectable value.

- Speed control: regardless of the size and speed of load, use pulse generator and other speed sensors or run other motors synchronously.
- Pressure control: the detectable value of pressure sensor is used as feedback value; the controllable pressure is certain.
- Flow control: the flow sensor can control the flow accurately.
- Temperature control: feed back the detectable value of temperature sensor; use the fan to reach the control temperature.

■ Countermeasures for high harmonics

Q9000 series 55kw-300kw machines have built-in DC reactor to inhibit the high harmonics.

2.2kw-45kw inverter can be connected to the DC Reactor (optional).

55kw-300kw inverter has built-in DC reactor.

55kw-300kw inverter can be connected to the AC Reactor (optional).

■ Low-noise design

The output circuit adopts the IGBT (Insulated Gate Bipolar Transistor) and high-carrier sine wave PWM mode, which can greatly reduce the noise caused by metal.

■ DWELL(Pause)

During acceleration and deceleration, the function to maintain the output frequency in a certain period of time, thus the load-driven starter motor also can easily accelerate or decelerate speed.

■ Speed control with feedback

This function is available under speed control with PG. The use of externally inserted PG speed control card can achieve the speed feedback control, thus the speed control accuracy will be improved.

■ Zero servo control

Zero servo control is only available under vector control (with PG); even if the motor speed is zero, more than 150% torque can be generated.

■ Monitoring Function

The following items can be monitored by the digital operator:

Frequency reference, output frequency, output current, motor speed, output voltage reference, DC power of main circuit, output power, torque reference, the status of input terminal, the status of output terminal, running status, elapsed running time, software code, speed deviation, PID feedback, the fault status and fault recording.

All multi-functional analog output data also can be monitored.

■ Order and three types of access level of parameters

In order to achieve multiple features, Q9000 has a lot of parameters.

In order to facilitate setting of these parameters, the parameters are classified by orders in accordance with their functions.

The order and content of sequential parameters "Mode" → "Group" → "Function" → "Parameters" (parameter setting) are as below Table 1.3.

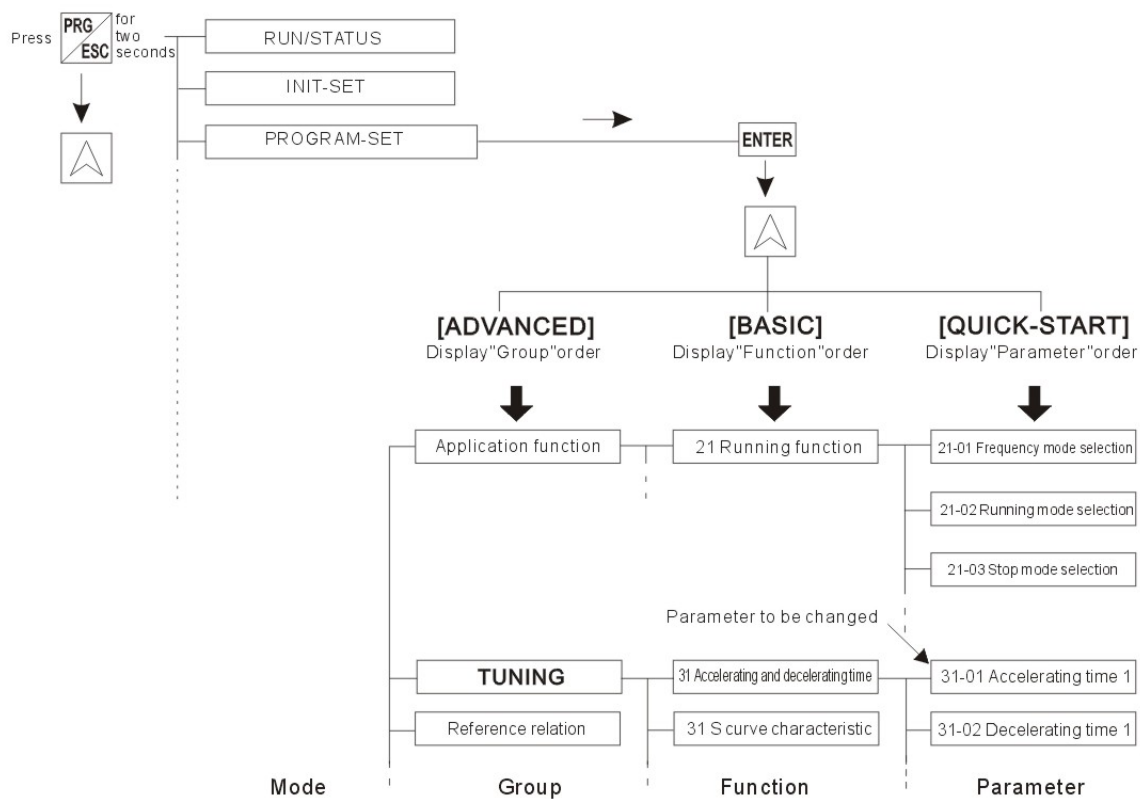
Table 1.3 Parameter Order

Order Name	Content
Mode	Classification of corresponding operating contents Driving mode: running modes of inverter (available for all kinds of monitoring) Environment setting mode: select display language, set access level & preliminary process and select control mode Autotuning mode: automatically calculate and set motor parameters (only under vector control) Program mode: set running parameters Inspection mode: refer to the parameters changed from the factory settings
Group	Classified by purpose
Function	Classified by function (parameter reference)
Parameter	Set parameters one by one

In order to make the parameter setting easier, Q9000 has the following three types of access level. The so-called access-level is the setting range of parameter reference.

QUICK-START	Necessary parameter setting for trial running
BASIC	Parameter reference setting for general use
ADVANCED	All parameter reference settings

When shift from certain order to the lower class order, please press the ENTER key; the orders will be different according to the access levels. In this way, when set occasions with fewer parameters, shift to the QUICK-START parameter order; when set occasions with more parameters, please shift to the ADVANCED group order, which will make the operation easy.

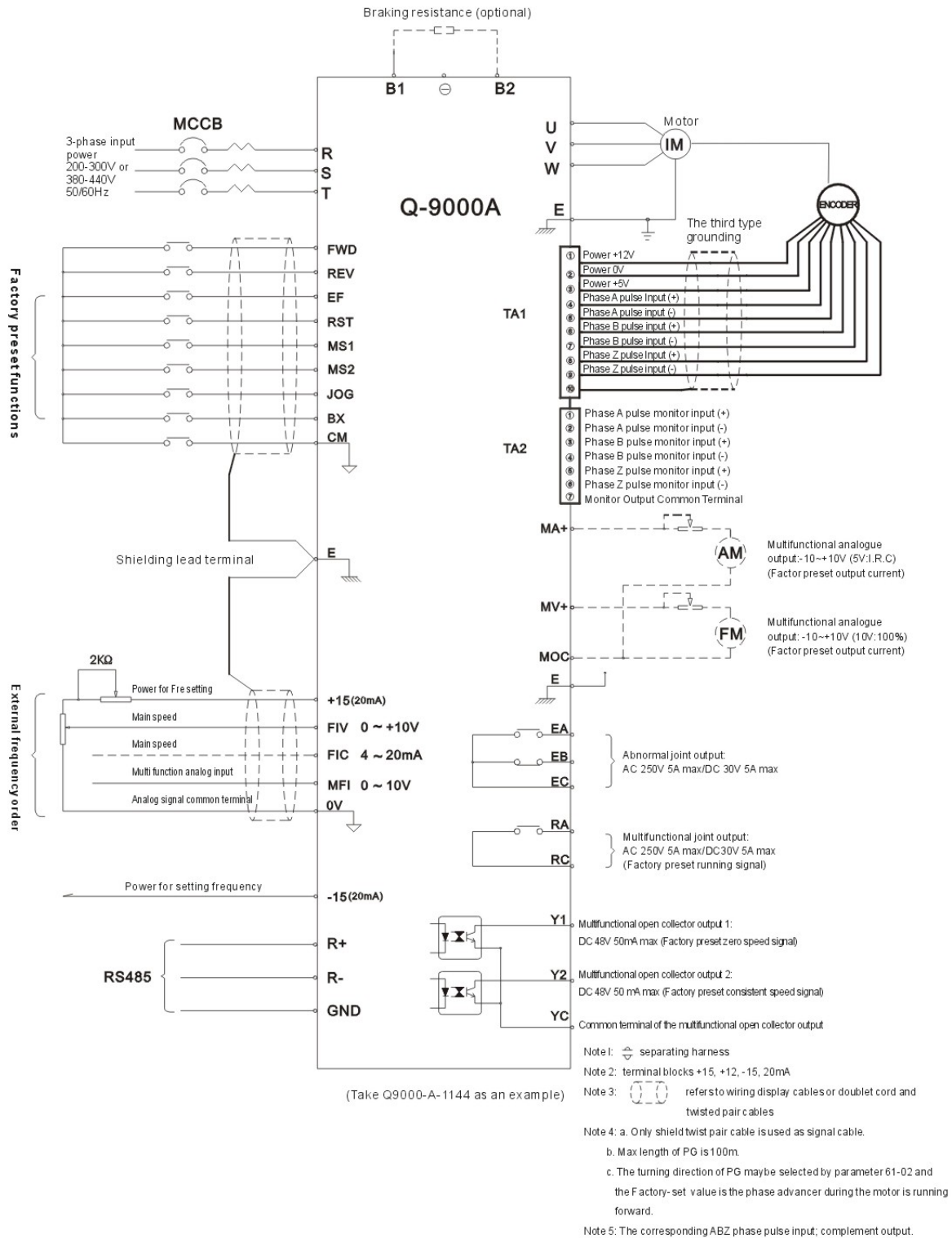


Parameter Level (Part)

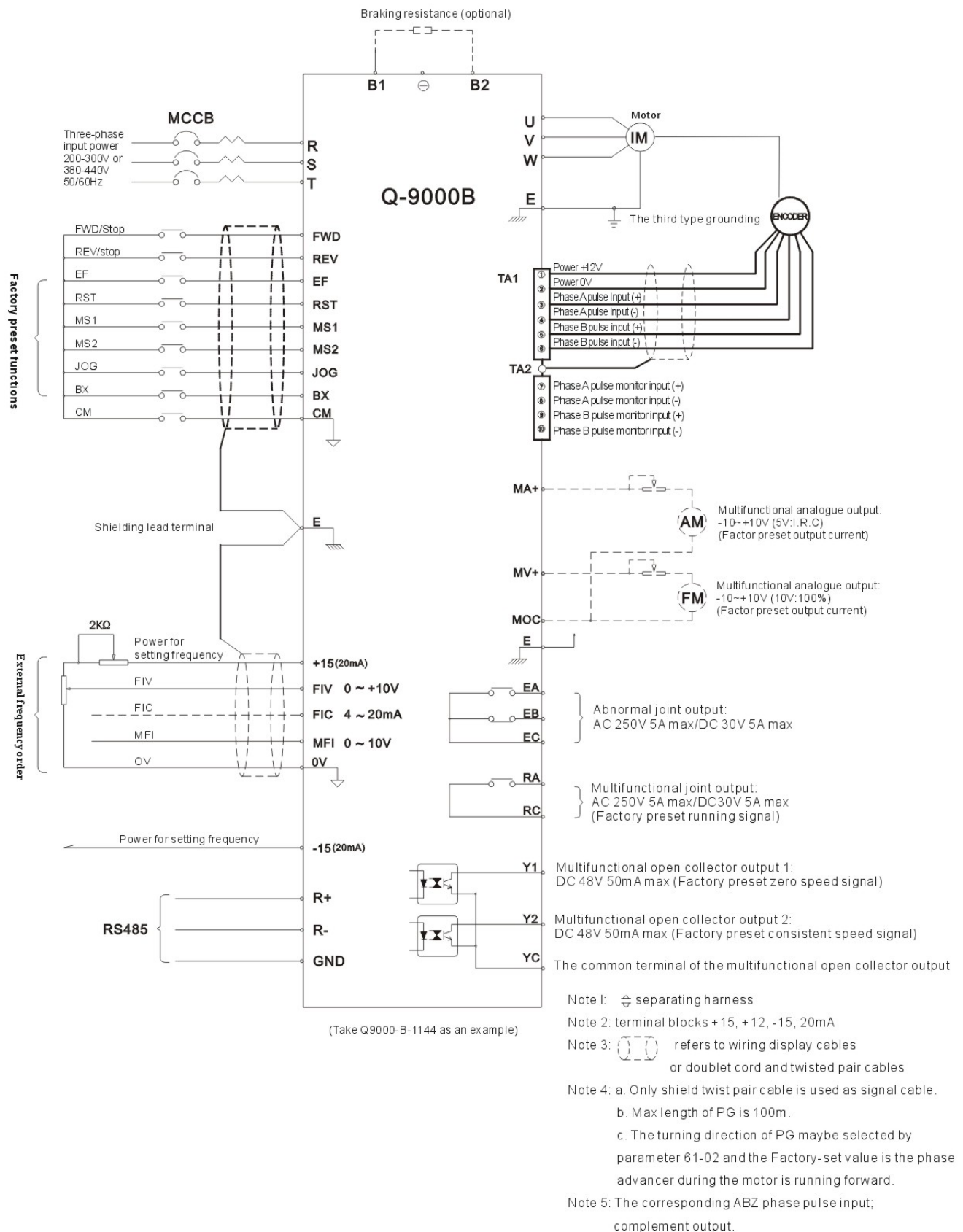
Chapter II Wiring Diagram

2.1 Basic wiring, wiring diagram of terminal block

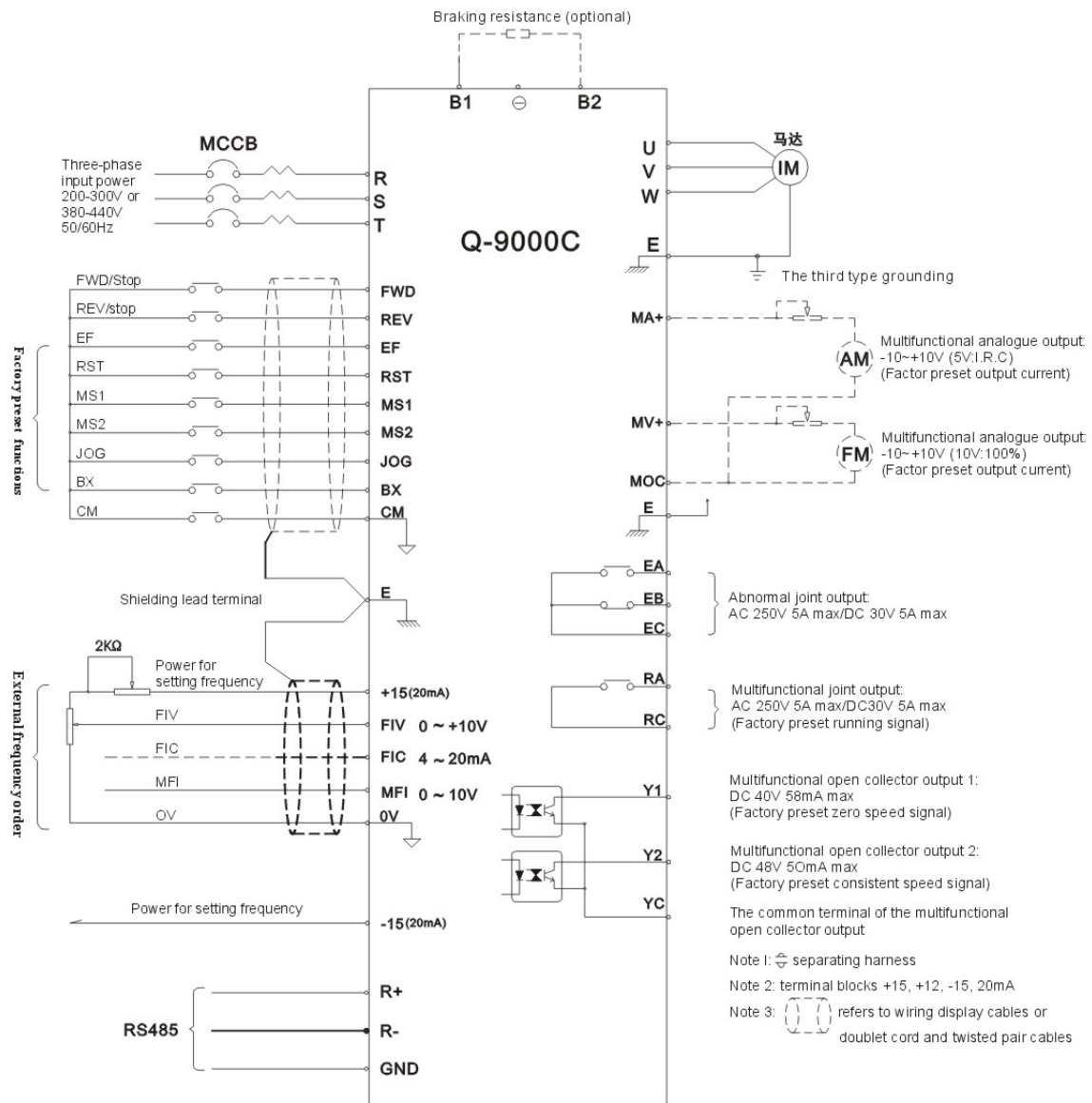
For wiring of Q9000-A Series, Please refer to the figure below



For wiring of Q9000-B Series, Please refer to the figure below



For wiring of Q9000-C Series, Please refer to the figure below



(Take Q9000-C-1144 as an example)

2.2 Wiring of main circuit

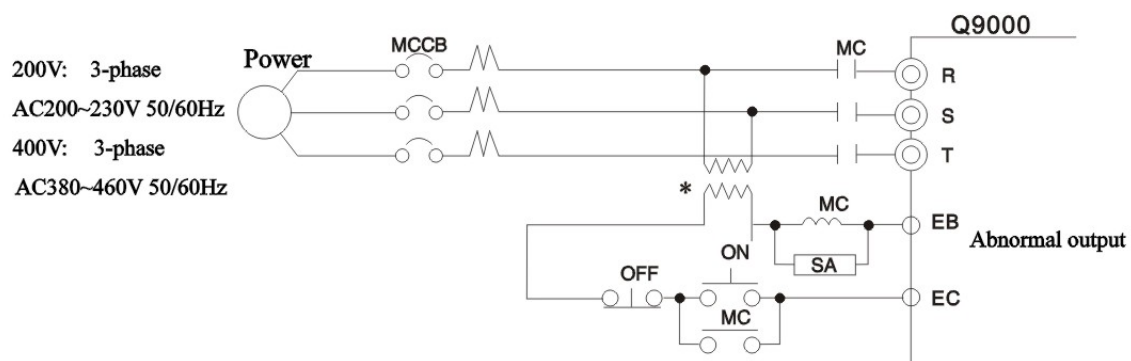
It is the summary of wiring of main circuit input & output and the grounding line.

■ Wiring of main circuit input

Installation of breaker for wiring

A breaker for wiring (MCCB) suitable for the inverter power should be inserted between the power and input terminal.

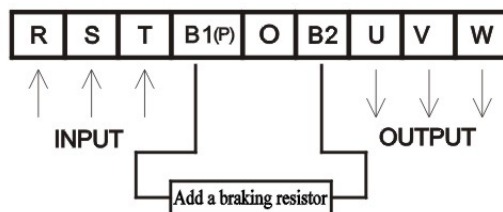
- The MCCB capacity shall be 2 times of the rated current of inverter.
- The time characteristic of MCCB should take fully consideration of the time characteristic of inverter's overheating protection (150% of the rated output current: 1 minute).
- When MCCB is shared with more than two inverters or other equipment, please switch off (OFF) the power through a contactor in accordance with abnormal output connection showed in the figure below.



Setup of breaker for wiring

■ Features of main circuit terminal

Purpose	Terminals	Q9000
For main circuit power input	R,S,T	41 P5~4300
For inverter output	U,V,W	41 P5~4300
For connection of braking resistor modules	B1(P) , B2	41 P5~4045
For the connection of DC reactor	P, Φ	4055~4300
For the connection of braking unit	$\oplus, \ominus$	4055~4300
For grounding	$\oplus$	41 P5~4300

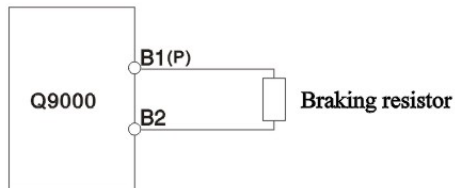


Take Q9000-A-1144 as an example

■ Braking resistor connection

Please connect the braking resistor in accordance with the table below. Before using the braking resistor, please ensure the following settings.

P8-01(Overheat protection selection of braking resistor)	"1"(Overheat protection is available)
P3-04(Stall prevention selection in deceleration)	"0"(Stall prevention function is unavailable)
(Please set according to any one)	"3"(Stall prevention function of breaking resistor is available)



B1, B2 are terminals to be connected with the braking resistor. Please do not connect braking resistor to other terminals, or it will be abnormal, heated and burned.

Braking resistor connection

■ Connection of breaking resistor unit(LKEB Type)/braking unit(CDBR Type)

Please connect the breaking resistor unit and braking unit in accordance with the figure below. The braking resistor should be set according to the following settings.

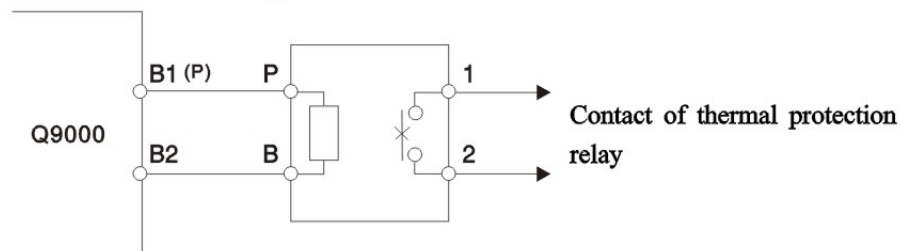
P8-01(Overheat protection selection of braking resistor)	"0"(Overheat protection is unavailable)
P3-04(Stall prevention selection in deceleration)	"0"(Stall prevention function is unavailable)
(Please set it according to any one)	"3"(Stall prevention function of breaking resistor is available)

P8-01 is the parameter for connection of relay contact braking resistor with no thermal protection. When P3-04 is set to be "1" (stall prevention is available), if no breaking resistor unit is used, the decelerating time will not be shortened.

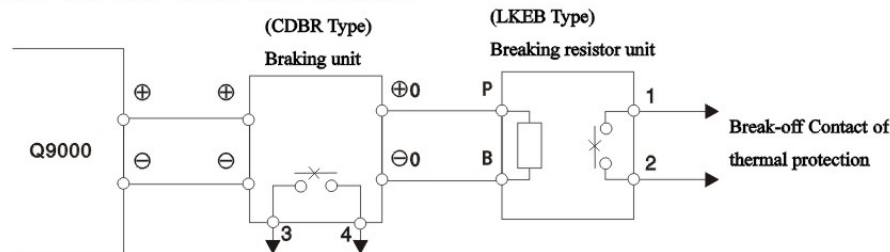
In order to carry out overheat protection for the unit, please use a sequence controller to switch off the circuit of thermal protection contact in accordance with figure below.

200V 2.2~30kW and 400V 2.2~45kW Inverter

(LKEB Type)
Breaking resistor unit



200V 37kW and 400V 55kW above Inverter



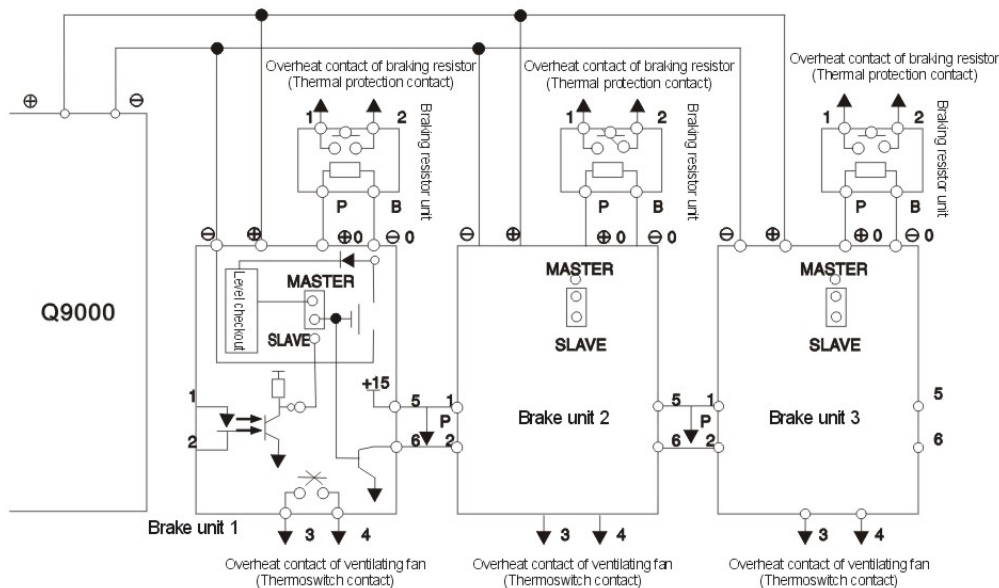
Contact of thermal protection relay

Connection of breaking resistor unit/braking unit

Parallel connection of braking unit

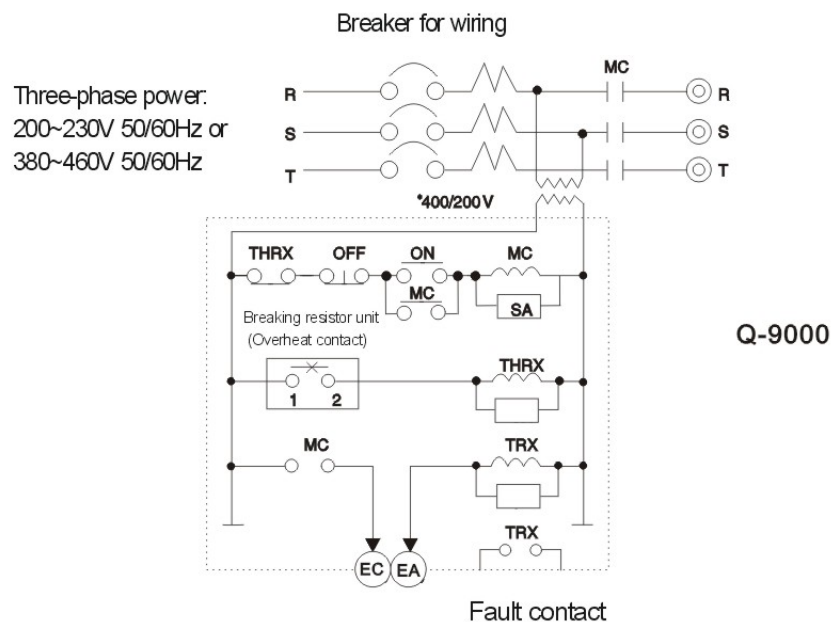
For parallel use of two or more than two braking units, please connect the wire in accordance with the figure and select a switch.

There is a master/slave switch on the braking unit. When only one braking unit is used, please select the MASTER side; when other unit (braking unit 2~) is used, please select the SLAVE side.



Parallel connection of braking unit

Power sequence controller



*For occasion of 400V class, please connect to the 400/200V inverter.

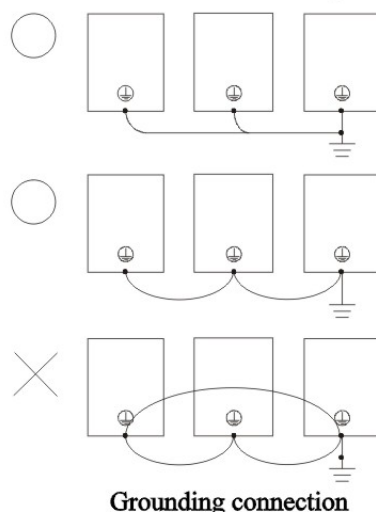
Power Sequence Controller

Wiring distance between inverter and motor

For occasion there is a long wiring distance between inverter and motor, the high harmonic leakage current from cables may have a negative impact on inverter and its peripheral equipments. Please refer to the carrier frequency adjustment (36-01) parameter.

■ Grounding setting

- The grounding terminal must be grounded ⊕
200V Class: the third grounding (Grounding resistance is under 100Ω)
400V Class: the third special grounding (Grounding resistance is under 10Ω)
- Grounding line should not be shared with welding machine and power equipment.
- Grounding line should be the wire that meets the lead specification of Electronic Equipment Technology Standard; and the line length should be as short as possible. As there is a leakage current of inverter, excessive long distance away from the grounding point will result in unstable potential of grounding terminal.
- For occasion there are two or more than two inverters, please do not form a grounding circuit.



2.3 Wiring of control circuit terminal

In order to prevent controlling signal line from being affected by noise, the line length should be limited within 50m and the line should be separated from the power line.

For occasion of external input frequency reference, please use shielded twisted pair wire.

2.3.1 Please use pressing wire terminal that matched with the wire specification

The relation of terminal and wire specification is showed in the table below.

Terminal and wire specification (For all models)

Terminal No.	Terminal screw	Wire diameter (mm ²)	The types of wire
Controller circuit terminal	M3.5	Cord 0.5~1.25 Hard wire 0.5~1.25	Shielded twisted pair wire
Grounding terminal	M3.5	0.5~2	

The relation between the round pressing terminal with specification matched with wire specification and the screw fastening torque is showed in table below.

Specification of round pressing terminal and screw fastening torque

Wire diameter (mm ²)	Terminal screw	Specification of round pressing terminal	Screw fastening torque (N·M)
0.5	M3.5	1.25~3.5	0.8
0.75		1.25~3.5	
1.25		1.25~3.5	
2		2~3.5	

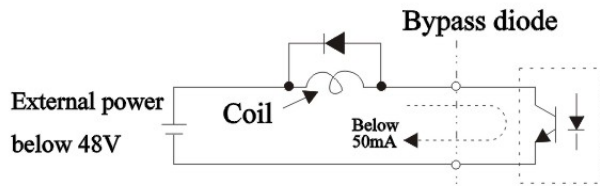
2.3.2 Function of Control Circuit Terminal

The function of terminal sort index of the control circuit is showed in table below; please select the appropriate terminal.

List of the control circuit terminals

Sort	No.	Name	Function of the Terminal		Signal Level
Run input signal	FWD	Forward run/Stop	OFF→Forward run, ON→Stop		DC24V,8mA Optical coupling insulation
	REV	Reverse run/Stop	OFF→Reverse run ,ON?Stop	Terminal EF-BX is multi-functional terminal; please refer to T1-01~T1-06	
	EF	External Abnormal Input	OFF→Abnormal, ON?Normal		
	RST	Abnormal Reset	OFF→Reset		
	MS1	Main speed auxiliary switch	OFF→Auxiliary frequency reference		
	MS2	Multi-terminal speed reference 2	OFF→Multi-terminal speed reference 2 is available		
	JOG	Jogreference	OFF→Jogrunning		
	BX	External stop running	OFF→Inverter stop output		
	CM	Common terminal	Signal output in case of FWD-BX terminal short-circuit		
Analog input signal	+15	Power supply for speed reference +15V	Power supply terminal for speed reference setting, +15V power supply		+15V,20MA
	-15	Power supply for speed reference -15V	Power supply terminal for speed reference setting, -15V power supply		-15V,20MA
	FIV	Main speed frequency reference	0-10V/100a% frequency		0-10V,(20K)
	FIC		-10~+10V/-100%~+100% frequency 4-20Ma/100% frequency		-10+1 (20K) 4-20mA,(20)
	MFI	Auxiliary frequency reference	0-10V/100% frequency -10~+10V/-100%~+100% frequency	Auxiliary analog input T3-01-03	0-10V,(20) 0-20mA,(250)
	0	Common terminal	Common terminal of terminal FIV,FIC, MFI speed reference		
Run output signal	RA	Signal during running	The terminal is connected during running	Multi-functional signal output T2-01-03	Capacity of the connection point AC250V5A, DC30V 5A
	RC	Output (5A connection point)			
	Y1	Zero speed detection	LOW level is lower than the lowest frequency 51-09		Open-set pole output,
	Y2	Speed arrival detection	LOW level is within ±1% of the settling frequency		below 48V
	YC	Common terminal of terminal Y1,Y2			50mA
	EA	Abnormal output signal	If abnormal, terminal EA-EC is off terminal EB-EC is on		Grounding capacity
	EB	EA-EC, A connection point			AC250V 5A
	EC	EB-EC, B connection point			DC30V 5A
Analog output	MV+	Frequency meter output	0-10V/100% frequency	Multi-functional analog output 1 (T4-01, T4-03)	0~+10V Max5%
	MOC	Common terminal	(0~10V/100% current can be set)		
	MA+	Output current monitoring	5V/inverter rated current	Multi-functional analog output 2 (T4-04, T4-06)	Below 20mA

For inductively loaded occasion such as relay driven by the coil, please insert a bypass diode in accordance with the figure.



Please select a bypass diode with rated current larger than circuit current

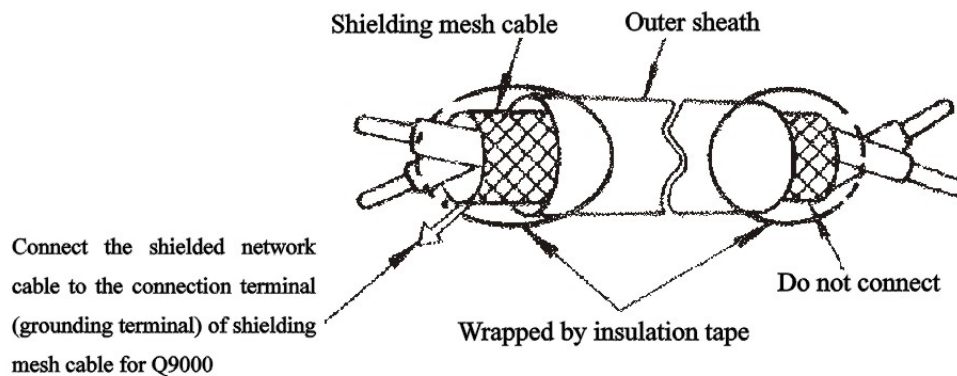
Connection of bypass diode

CM	FIV	FIC	+15	MFI	0	Y1	Y2	YC	-15	EA	EB	EC
FWD	REV	EF	RST	MS1	MS2	JOG	BX	MV+	MOC	MA+	RA	RC

The arrangement of control circuit terminal (Take Q9000-C-1144 as an example)

2.3.3 Precautions for control circuit wiring

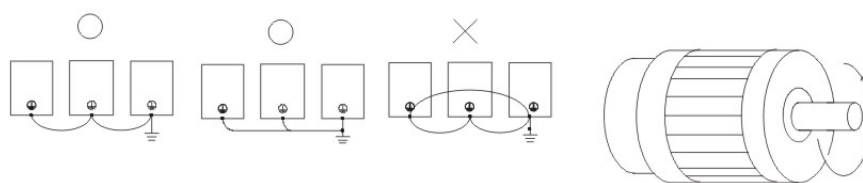
- The control circuit wiring should be separated from other power line or power supply line.
- The wiring of control circuit terminals RA, RC, EA, EB, EC (contact output) and terminals (FWD, REV, EF, RST, MS1, MS2, JOG, BX, MV+, MOC, MA+, Y1, Y2, YC, -15) and (CM, FIV, FIC, +15, MFI, 0) should be separated.
- In order to avoid fault caused by interference, please use the shielded twisted cable or shielded twisted pair cable. The treatment for cable end should be in accordance with the figure below; and the wiring distance should be less than 50m.
- Please connect the shielded network cable to the grounding terminal (E).
- Please do not contact shielding mesh cable to other signal lines and equipment shells; it should be wrapped with insulation tape.



Wrapped end of shielded twisted pair cable

2.4 Precautions for wiring:

- ◆ The selection of wiring parameter specifications and wiring implementation should be in accordance with the provisions of electrician laws and regulations to ensure safety for the wiring.
- ◆ A no-fuse switch should be connected between the major circuit terminals (R, S and T) and the input power of three-phase alternating current. It's the best that a magnetic contactor (M C) is connected in series to cut off the power when the inverter performs protective functions. (It is necessary to install an R-C surging receiver at both ends of the magnetic contactor).
- ◆ The input powers of P, S, T have no phase sequence, and the alternating current power should be not connected to the power outlet terminals of U, V and W of the inverter when they are connected and used randomly.
- ◆ The grounding terminal E is grounded by the third mode. (The ground resistance is less than 100Ω). The ground wire of the inverter should be not grounded with such large current loads of welding machine and large power motor etc., while they should be grounded respectively.
- ◆ The ground circuit should be not formed when a number of inverters are grounded; and the following drawing is for reference:



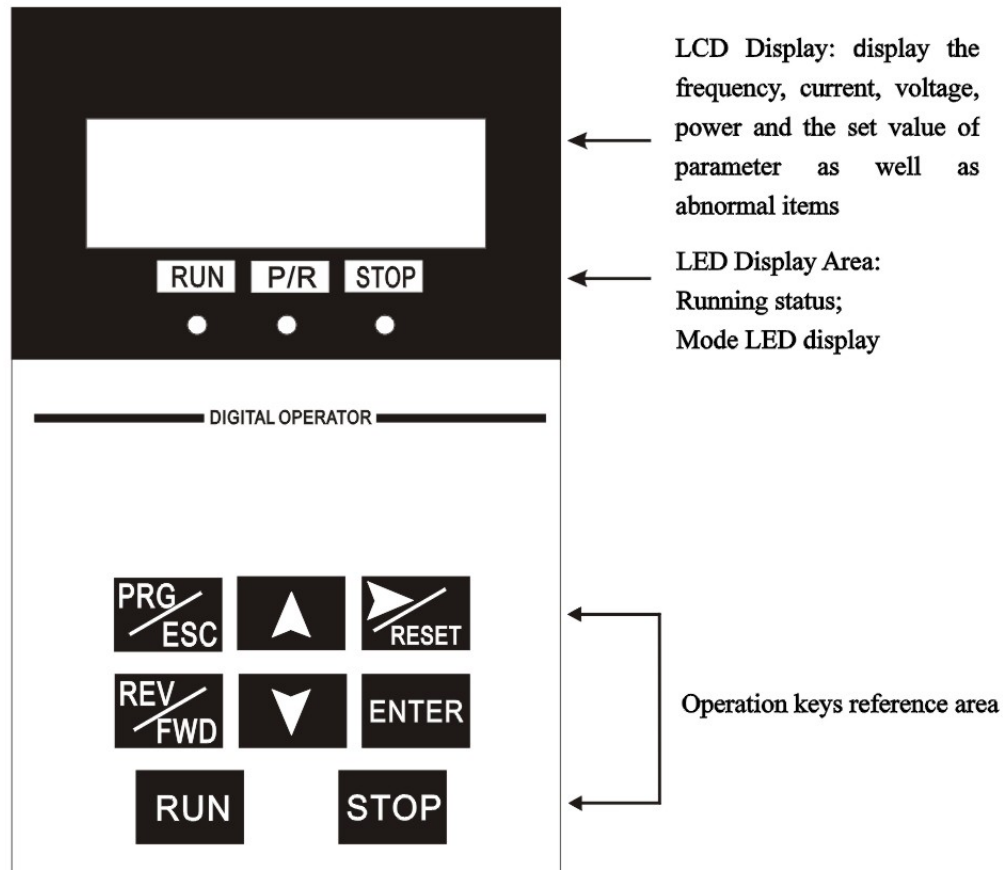
Inversion

- ◆ If the output terminals of U, V and W of the inverter are correspondingly connected to the terminals of U, V and W of the motor, the forward (FWD) indicator lamp of digital control plane of the inverter will be switched on, which means that the inverter rotates forward and the rotation direction of the motor is like the above drawing; if the reverse (REV) indicator lamp is on, the inverter will rotate reversely and the rotation direction will be reserve to the above drawing. While it fails to confirm whether the output terminals of U, V and W are corresponding connected to the terminals of U, V and W of the motor, if the inverter rotates forward, the motor will be in reverse direction. It can be changed by exchanging any two of U, V and W terminals of the motor.
- ◆ Confirm the voltage of the power system and the largest supply capacity.
- ◆ When “digital manipulator” displays, any wiring should be not connected or disassembled.
- ◆ The decelerating time should be prolonged to avoid the driver jumping the voltage protection.
- ◆ The AC power supply should be not connected to the power outlet terminals of U, V and W of the inverter.
- ◆ The screws of the main circuit terminal should be confirmed locking, so as to prevent from spark generating due to vibration.
- ◆ The wiring of the main circuit should be separated from that of the control circuit to prevent from misoperation. If necessary, they should be a across of 90°.
- ◆ If it is necessary to install a noise filter at the power outlet terminals of U, V and W of the inverter, an inductance type L-filter should be used and a phase capacitor or L-C and R-C filters are allowed to be installed.
- ◆ The control wiring should be the shielded wire and the peeling section of the separation net in front of the terminal should not be exposed.
- ◆ The power wiring should be the shielding wire and the shielded layer or both ends of the wire pipe are grounded.
- ◆ If the installation site of the inverter is sensitive to disturbances, a PFI filter should be installed. The shorter distance from the installation position to the inverter is much better. The carrier frequency of PWM is lower, and also the disturbance is less.
- ◆ If a residual current circuit breaker is installed on the inverter to protect leakage faults, please select the residual current circuit breaker that the sensitive current is higher than 200mA and the action time is longer than 0.1s in order to prevent from error leakage breaking.

Chapter III Setting of running mode (parameters)

3.1 Functions of the Digital Operator

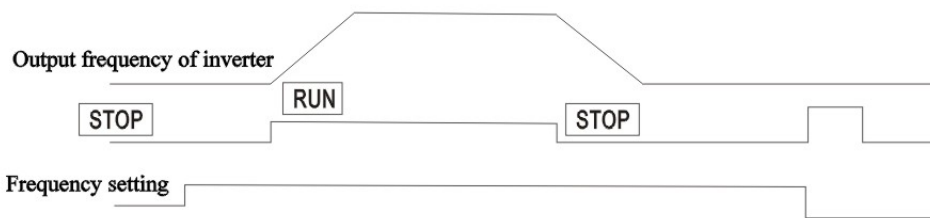
The digital operator will display the initial value as figure after connecting to the main circuit power. Here, take the display of initial value as an example to introduce the name and function of keys on the digital operator (Operator).



Name and function of parts on the digital operator

Description of keys on the digital operator:

Key	Key Description	Function
PRG/ESC	PRC=Programming mode ESC=Return to the previous screen	(1)PRG: Press once to enter the PRG mode; press for 2 seconds to return to Main menu (2)ESC: Press once to return to the previous screen
↑	UP (Increase)	Select the parameter name or modify the set value. UP (Increase)
↓	Down (Decrease)	Select the parameter name or modify the set value. DOWN (Decrease)
→/RESET	Displacement/reset	Set displacement upon modification/reset upon fault
REV/FWD	REV/FWD(Reverse run, Forward run)	REV: Reverse run FWD: Forward run
ENTER	ENTER (Information writing or return to the RUN screen).	Enter: write the recoded information set value and return to the RUN screen.
RUN	RUN (Run)	Run: Start running on the operator. RUN indicator light is on.
STOP	STOP(Stop)	Stop: Stop running on the operator. STOP indicator light is off.



RUN Indicator Light	●	☀	☀	●	☀
STOP Indicator Light	☀	●	☀	☀	☀

☀: On ☀: Flash ●: Off

For RUN STOP indicator light, the corresponding running status will be showed by On, Flash and Off.

Meaning of RUN STOP Indicator Light

3.2 Types of operating mode

As the monitoring of parameters and functional groups (way) of Q9000 is trending to be collectivized, the reference and setting of parameters become easier.

Q9000 has five running modes; see types and main contents of the operating mode in the table below.

Types and main contents of the operating mode

Mode Name	Main Content
RUN/STATUS	Possible running modes of inverter. The monitoring of frequency reference and output current; the display of abnormal contents and abnormal records.
INIT-SET	The reading of parameters and setting of setting level (access level); The selection of control mode and parameter initialization.
PROGRAM-SET	The necessary parameter reading and programming can be divided by functional group as follows. ● Application: running mode selection, DC braking, speed search and etc. ● Adjustment: accelerating and decelerating time, S curve characteristic, carrier frequency and etc. ● Reference: setting of relevant frequency reference; ● Motor parameter: V/f characteristic and motor parameter; ● Option parameter: setting of interface card; ● External terminal function: input and output PLC and setting of analog input & output; ● Operator: selection of display function and key function;
AUTOTUNING*	Motor parameter is available for calculation and setting of unknown motor parameter under vector control.
SET-LIST	Set parameter reading different from the settings before leaving factory.

* For running under vector control, please run Autotuning for the motor before running.

3.3 Control Method Switch:

Press **ENTER** for 2 seconds, it will display RUN/STATUS; then press **[^]** and **[v]** to switch mode.

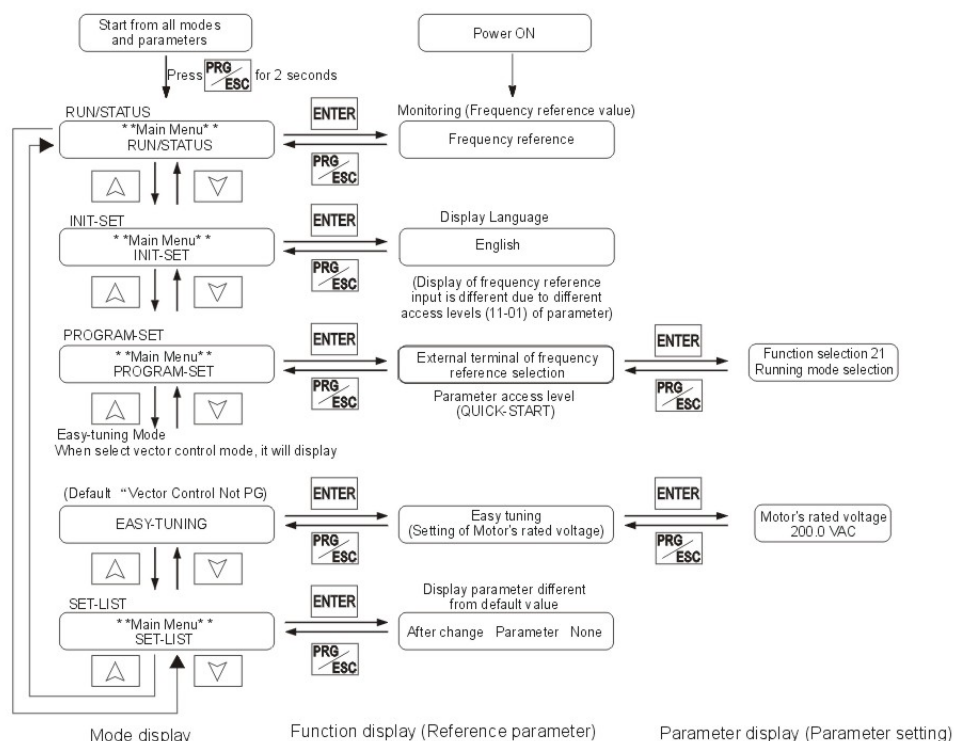
For parameter READING/SETTING, press **ENTER**.

If return from READING/SETTING status, press **PRG/ESC**.

Press **ENTER**, it will display [ENTRY ACCEPTED]; then, press **PRG/ESC** to return to the mode display.

Above are the basic operations, please remember.

Then, if press **ENTER** again, it will return to the mode name display; these are basic operations, please remember!



Mode Switch

3.4 Access level of parameters

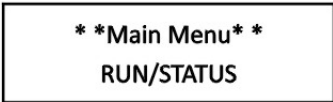
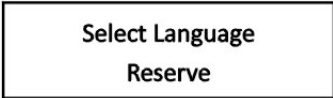
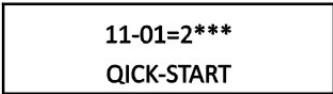
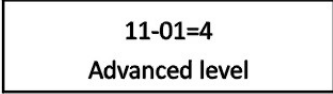
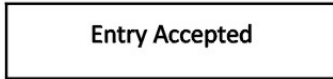
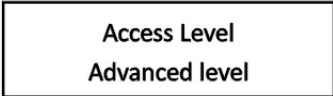
Q9000 has the following three access levels for corresponding different purposes.

QUICK-START	Access; set necessary parameters for simple running (Default)
BASIC	Access; set basic parameters
ADVANCED	Access; set applied parameters (Default)

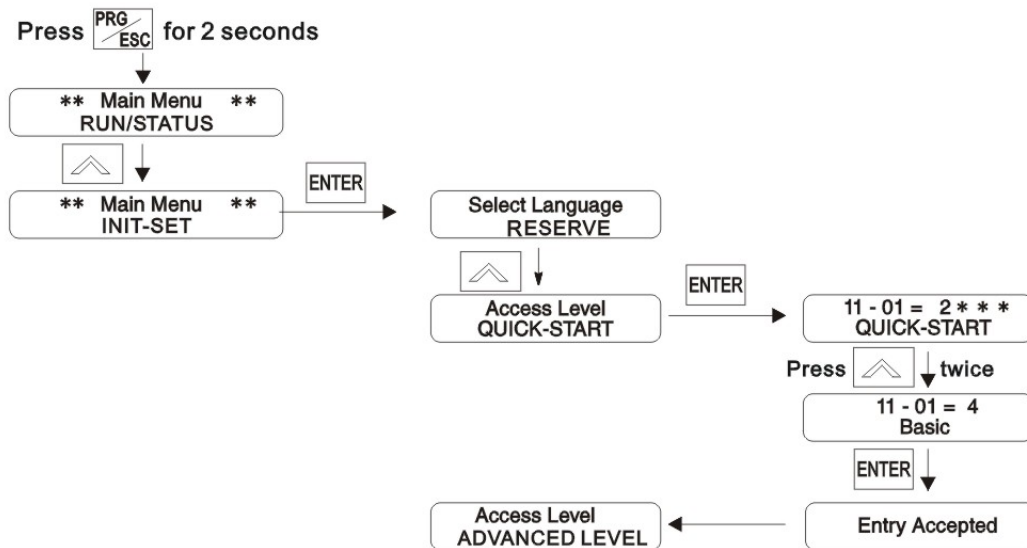
The parameter for reference will be different in accordance with the access level.

The display level will also be changed. Access level can be set in INIT-SET 11-01 (Parameter Access-level).

■ Method for switching from QUICK-START to ADVANCED

Order	Key	Display Menu	Description
1	Press  for 2 seconds		About three seconds later, the display menu of the operator will be shown as left.
2			
3			
4			
5			
6	Press  twice		
7		 	

As above, the QUICK-START has been switched to ADVANCED.
Operation of order 1~7 are shown as figure below:



Method for switching from QUICK-START to ADVANCED

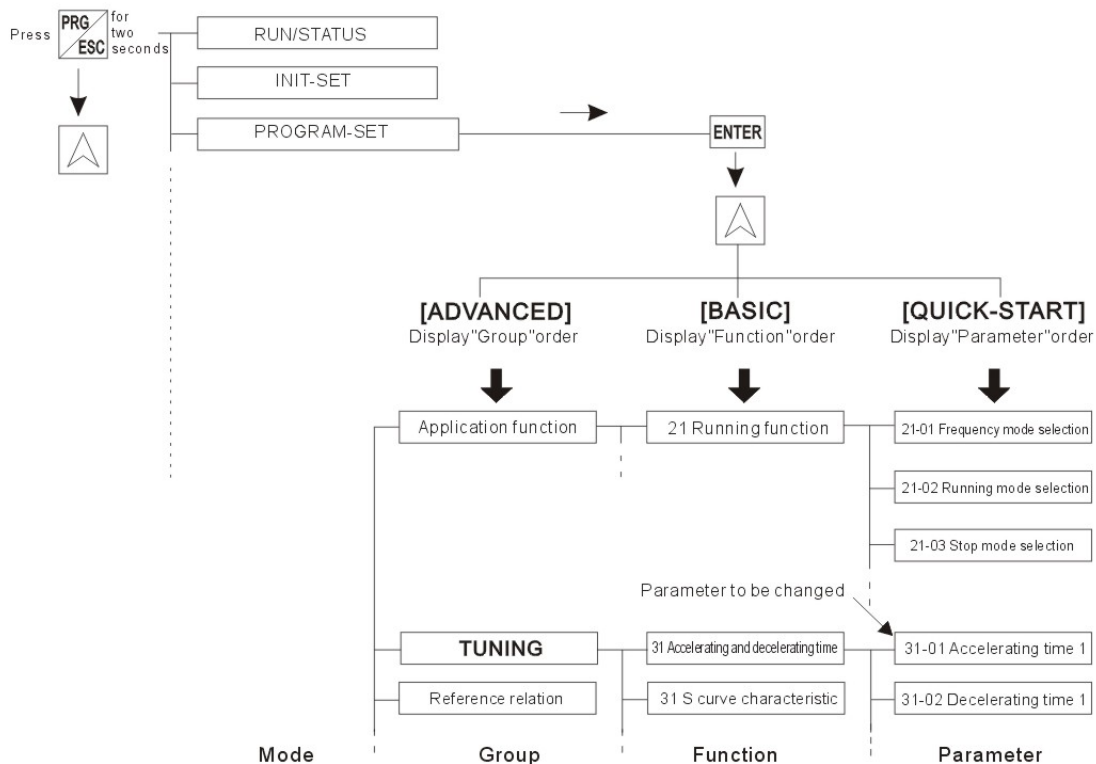
■ Parameter setting at all access levels

Display level of monitoring can be changed on the basis of access level after selecting the PROGRAM-SET. The RUN/STATUS, INIT-SET, Easy-Tuning SET and Check-SET will not change the display level.

The following is the operation instruction taking accelerating time as 20.0(s).

In parameter setting, if  key is not pressed within 1 minute, it will return to the previous set value.

Now, please operate from this figure.



Parameter Level (Part)

Chapter IV AUTOTUNING

4.1 AUTOTUNING Procedure

Please run Autotuning in accordance with the following process.

Item	Content
Setting·Installation ↓	Please set the inverter in accordance with the setting conditions. ● Please confirm whether it satisfied the set conditions.
Wiring ↓	Please connect wire to the power and peripheral equipments. ● Select the appropriate peripheral equipments and connect wires correctly.
Power input ↓	Please input power after confirmation before power input ● Please make sure the power voltage and the connection of power input terminals (R.S.T). 200v Class Three-phase AC200~230V 50/60Hz 400v Class Three-phase AC380~460V 50/60Hz ● Please make sure the connection between motor output terminal and motor. ● Please make sure the connection between control circuit terminal and control device and whether the control circuit terminals are at OFF position. ● Please make sure the connection of PG speed control card, for occasions with the PG speed control card. ● Please keep the motor away from idling condition (not connected to any mechanical load). ● Please input power after confirming the above items.
Display status confirmation ↓	Please confirm whether the inverter is under normal state ● In case of the normal power input, it will display as follows. Data display: [Frequency Ref] ● In case of the abnormal power input, the data display will show it. At this time, please refer to Chapter VI "Fault countermeasure" and implement corresponding countermeasures.
Parameter initialization	Please implement the parameter initialization ● Please implement parameter initialization after confirming that the inverter capacity (KVA) =o2-04.
Autotuning ↓	Please run Autotuning for motor under Vector Control with PG or without PG before running. ● If run the Autotuning, the motor parameters will be set automatically. ● Please adopt V/f control and set V/f cure for non-autotuning occasions. Parameter calculation is unavailable; if the load abandon is unavailable; for detailed advices, please consult us.

4.2 AUTOTUNING Operation

4.2.1 Power input

■ Confirmation items before power input

- Please make sure the connection of power voltage.
200v Class: Three-phase AC200~230V 50/60Hz
400v Class: Three-phase AC380~460V 50/60Hz
- Please make sure the connection between motor output terminal and motor.
- Please make sure the connection between motor output terminal and other control devices.
- Please make sure whether the control circuit terminals are at OFF position.
- Please make sure the connection of PG speed control card.
- Please keep the motor away from idling condition (not connected to any mechanical load).

4.2.2 Display status confirmation

When power input, the normal status of digital operator should be as follows.

[Normal]

Frequency Ref 1
M1-01 = 0.00Hz

Monitoring of frequency
reference is shown on
the data display part

For abnormal status, the display will be different from the above; please refer to Chapter VI "Fault countermeasure" and implement corresponding countermeasures.

[Abnormal]

UV
Under Voltage

The display will be different
in accordance with the
abnormal contents

4.2.3 Parameter initialization

- Please implement parameter initialization after confirming the inverter capacity (KVA) = 0.2-0.4. It is unnecessary to implement parameter initialization for the initial operation of new product.
- For parameter initialization, please set 11-03(initialization) = "2220".

After initialization, access level (11-01) is QUICK-START. The following is the setting method under QUICK-START status.

Please implement parameter initialization according to the following order.

Order	Key	Display Menu	Description
		Frequency Ref 1 M1-01=0.00Hz	Display driven mode
1	Press  for 2 seconds	* *Main Menu* * RUN/STATUS	Display environment setting mode
2		* Main Menu * INIT-SET	Enter into the environment mode Select the initialization
3	Press  for 3 times	Select Language Reserve	Display initialization parameters (11-03) Set 2-wire process initialization as (2220); Set value of "Frequency input" is
4		Init parameters NO. Initialize	
5		11-03= 0*** No. Initialize	
6	Press  for 2 seconds	A1-03=2220 2-Wire Initial	
7		Entry Accepted	displayed for about 0.5 seconds;
		Init parameters NO. Initialize	Back to initialization display
8		**INIT-SET**	Back to environment setting mode

4.2.4 Autotuning

■ Autotuning operation

Input the nameplate information of motor at first and then run Autotuning according to the following order.

Order	Key	Display Menu	Description
1	Press  for 2 times	*Main Menu* INIT-SET	Display program mode
		Main Menu Easy-Tuning	Display autotuning mode
2		Rated Voltage 200.0VAC	Display rated voltage of motor
3		Rated Current 1.90A	Display rated current of motor
4		Rated Frequency 60.0Hz	Display rated frequency of motor
5		Rated Speed 1750RPM	Display rated rotate speed of motor
6		Number of Poles 4	Display pole number of motor
7		Select Motor 1	To display motor selection [Motor 1] (usually the motor parameters are used), please select "1" without changes.
8		PG PULSES/REV 600PPR	Current vector without PG will not be displayed on the menu
9		Tuning Ready? Press RUN key	Start autotuning
10		□Hz□□□□A Tune Successful	("Autotuning process" flash) The autotuning is completed.
11	Press  for 2 times	** Main Menu** RUN-STATUS	Back to driven mode

*1. In case of differences between display value and rated value of motor (nameplate value), please amend the set value.

*2. The simple setting and precise setting may be different, please refer to the table below.

Operator Display	Nameplate value of motor	Precise Setting*
Rated Voltage	Rated voltage of motor	No-load voltage at rated speed
Rated Frequency	Rated frequency of motor	No-load frequency at rated speed

* Motor test report, design data and other detailed information are needed for precise setting.

The rated voltage of special motor under vector control is about 10-20% lower than that of general motors. Please confirm the voltage value in accordance with the motor nameplate and test report.

4.2.5 Abnormal Display and the Countermeasures of AUTOTUNING

The fault display and countermeasures of Autotuning is shown as table below. If fault is detected, it will be displayed on the operator and output through abnormal contact; the running motor will slow down till free stop. The contact output of small fault will not act. For faults, it will display "Autotuning interruption" and the detailed abnormal content is as following flashing.

Abnormal display and the countermeasures of AUTOTUNING

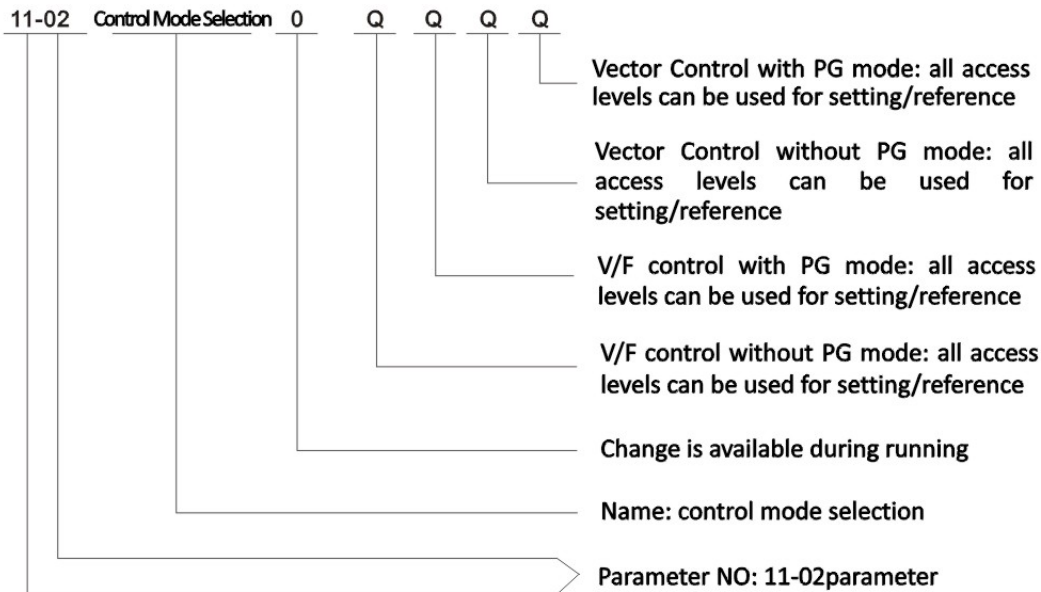
Abnormal Display	Content of Abnormal Display	Description	Countermeasure
Data Invalid	Motor data is abnormal	Motor data input for Autotuning is not correct.	● Verify the input information. ● Verify the capacity of the inverter and the motor.
Saturation-1	Core saturation 1 is abnormal	Autotuning cannot be completed in given time.	● Verify the input data ● Verify the wiring of the motor.
Saturation-2	Core saturation 2 is abnormal		
Resistance	Line-to-line resistance is abnormal		
No-load Current	No-load current is abnormal		
Rated Slip	Rated slip is abnormal		
Accelerate	Acceleration is abnormal	The motor is not accelerated in given time.	● Accelerating time (31-01) is too long ● If lower the torque limit value (P7-01, -02), it will be increased. ● Please abandon the mechanical load of motor when the motor is connected to a mechanical load.
PG Direction	Motor rotation direction is abnormal	Connection between PG of the inverter (A phase, B phase) and the motor (U, V, W) is not good.	● Verify the PG wiring ● Verify wiring of the motor ● Please check the PG rotation direction and parameter (61-05)
ALARM: Over Load (Displayed after completion of auto tuning)	Overload of Autotuning	The torque reference exceeds 20% when TUNING.	● Display the Autotuning of single motor ● Verify the input data, especially the number of PG pulse wave.
Motor Speed	Motor speed is abnormal.	The torque reference is excessive large (100%) when TUNING.	● Please abandon the mechanical load of motor when the motor is connected to a mechanical load. ● Accelerating time (31-01) is too long ● Verify the input information, especially the number of PG pulse wave.
V/f Over Setting	V/f setting is too large	Torque reference during Autotuning is over 100% and with no-load. Current is 70% more than the motor's rated current.	● Please confirm the set value and make amendment. ● Please abandon the mechanical load of motor
Tune Aborted Minor Fault:□□	During minor fault	There is minor fault on inverter.	● Check the minor fault at □□ part

- If press  key, the abnormal situation will be cancelled.
- In case of abnormal situation, the set parameters (motor parameters) will return to the initial value; for next Autotuning, please re-set these parameters.

Chapter V Detailed Description on Parameters

Parameter reading instruction

For example:



Parameter reading method:

Parameter No: Series No. of parameter

Name: Name of parameter

Changes during running: whether the parameters can be changed during running

0...Change is available during running

X... Change is unavailable during running

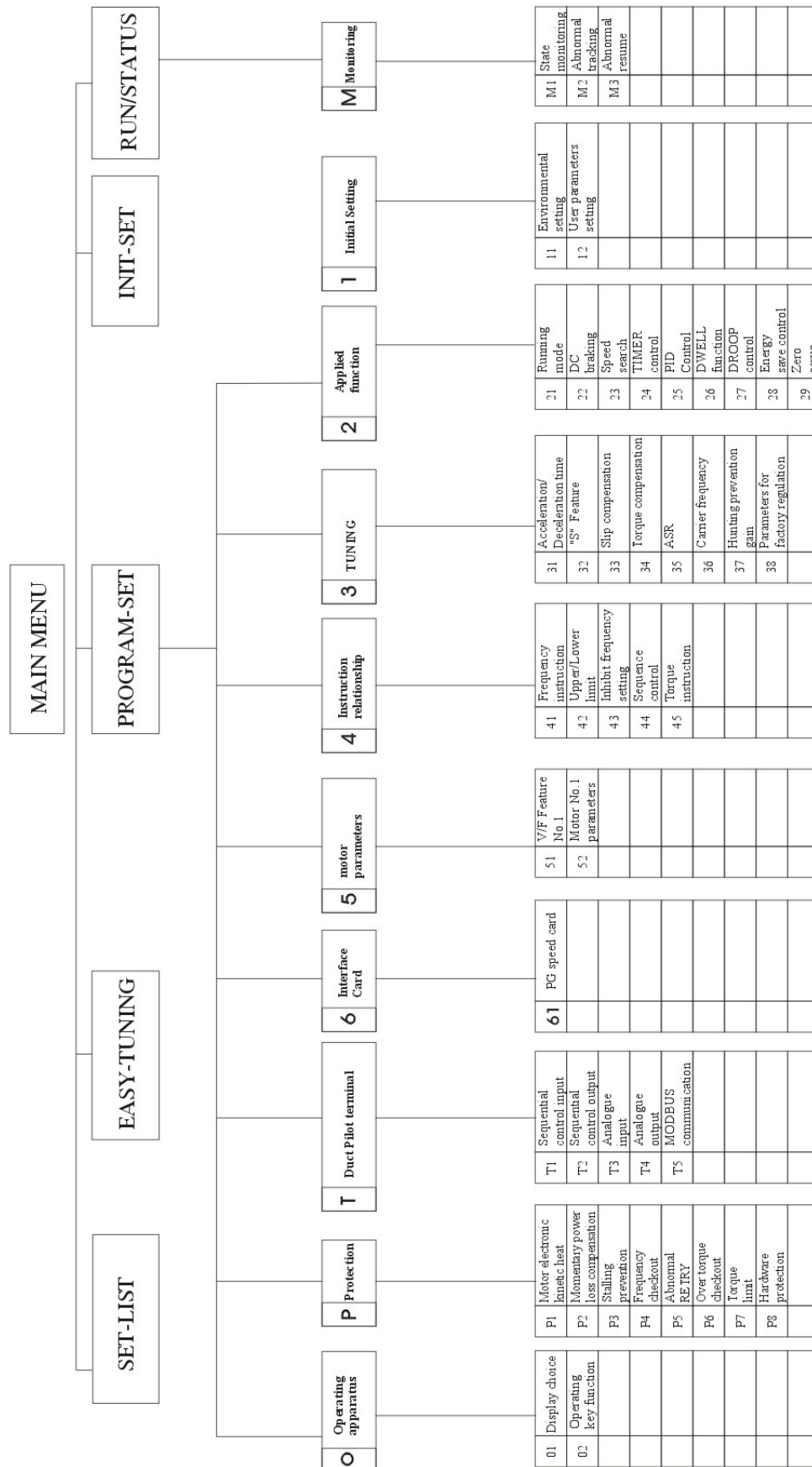
Control mode: Which control mode can be used for Setting/Reference and which access level can be used for Setting/Reference?

Q...All access levels of QUICK-START, BASIC, ADVANCED can be used for Setting/Reference

B...ADVANCED, BASIC items that can be used for Setting/Reference

A...Only ADVANCED item can be used for Setting/Reference

X...Items of this control mode cannot be used for Setting/Reference



Function list of four types of control mode

Group Name	Function	V/f Control With PG	Control Mode			
			V/F No PG	V/F PG	Vector No PG	Vector PG
2 Application	21 Running mode selection	Running mode setting of frequency/running reference	o	o	o	o
	22 DC brake	★Setting of DC brake function	o	o	o	o
	23 Speed search	★Setting of speed search function	o	o	o	o
	24 Timer function	★Setting of timer function	o	o	o	o
	25 PID control	★Setting of PID control function	o	o	o	o
	26 DWELL function	Setting of DWELL function during acceleration and deceleration	o	o	o	o
	27 DROOP control	Setting of DROOP control function	x	x	x	o
	28 Energy saving control	Multi-functional input implements energy-saving function according to the energy-saving reference	o	o	x	x
	29 Zero servo	Setting of zero servo function	x	x	x	o
3 Adjustment	31 Accelerating and decelerating time	Setting of accelerating and decelerating time	o	o	o	o
	32 S curve characteristic	★Setting of S curve characteristic function	o	o	o	o
	33 Slip compensation	★Setting of slip compensation function	o	o	o	o
	34 Torque compensation	★Setting of torque compensation function	o	o	o	x
	35 Speed control	Speed control/adjustment	x	o	x	o
	36 Carrier frequency	★Setting of Carrier frequency	o	o	o	o
	37 Hunting prevention function	Setting of Hunting function	o	o	x	x
	38 Parameters for factory adjustment	Speed reverse adjustment (Only for Vector Control Without PG)	x	x	o	x
3 Reference relation	41 Frequency reference	Setting of frequency reference (for operator)	o	o	o	o
	42 The upper and lower limit of frequency	★Setting of upper and lower limit of frequency	o	o	o	o
	43 Setting of forbidden setting	★Setting of forbidden	o	o	o	o
	44 Reference sampling holding	★Setting of holding of UP, DOWN/Accelerating or decelerating	o	o	o	o
	45 Torque control	Setting and adjustment of torque control	x	x	x	o
5 Motor parameter	51 V/f characteristic	Setting of motor parameter	o	o	o	o
	52 Motor parameter		o	o	o	o
	53 Control mode of motor 2	Control mode selection of motor 2	o	o	o	o
	54 V/f characteristic of motor 2	Setting of V/f characteristic of motor 2	o	o	o	o
	55 Motor parameters of motor 2	Setting of motor parameters of motor 2	o	o	o	o
6 Interface card	61 PG speed control card	Selection of PG speed control mode	x	o	x	o
T Control circuit terminal	T1 Multi-functional input	★Function selection of multi-functional input	o	o	o	o
	T2 Multi-functional output	★Function selection of multi-functional input	o	o	o	o
	T3 Analog input	★Adjustment/Function selection of external analog input	o	o	o	o
	T4 Multi-functional analog output	★Adjustment/Function selection of external analog output	o	o	o	o
	T5 Data bus communication	Setting of data bus communication	-	-	-	-
P Protection function	P1 Motor protection function	★Setting of electronic thermal protection/function for motor protection	o	o	o	o
	P2 Instantaneous power-outage processing	★Selection of processing method for instantaneous power-outage	o	o	o	o
	P3 Stall prevention function	★Selection/Setting of stall prevention function during acceleration or deceleration	o	o	o	o
	P4 Frequency detection	★Setting of frequency detection function	o	o	o	o
	P5 Fault reset retry	★Setting of fault reset retry function	o	o	o	o
	P6 Over torque detection	★Setting of over torque detection function 1,2 (Setting of torque value)	o	o	o	o
	P7 Torque limit	Setting of 4 quadrant individual torque limit	x	x	o	o
	P8 Hardware protection	★Setting of overheating/phase loss protection function of hardware	o	o	o	o
O Operator	O1 Display/Setting selection	★Selection/Setting of display and setting method of operator	o	o	o	o
	O2 Function selection	★Function of operator key and setting of other functions	o	o	o	o

5.1: Parameters of environment setting mode (1)

11-01 Access level of parameters	○	Q	Q	Q	Q
(Access Level)					
Set value					
For monitoring only					[0]
User program					[1]
Quick start setting :Q					※[2]
Base level setting :B					[3]
Advanced level setting :A					[4]
Function					
Access level of parameters (Refer to the setting range)					
Selection description					
Setting of access level of parameters (Refer to the setting range);					
According to the control mode, there also are parameters that are not covered by the setting range;					

11-02 Selection of control method	X	Q	Q	Q	Q
(User Param 1 to 32)					
Set value					
V/F Control without PG (V/F Control)					[0]
V/F Control with PG (V/F control with PG speed card)					[1]
Vector Control without PG (Vector control with internal speed information of inverter)					※[2]
Vector Control with PG (Vector control with PG speed card)					[3]
Function					
Features of inverter control mode (See the table attached)					

Control method	V/F control without PG	V/F control with PG
Basic control	V/f control (Open-loop)	V/f control with speed compensation
Speed detector	Unnecessary	Necessary (Encoder)
Selection card for speed detection	Unnecessary	PG-A2 or PG-D2
Speed control accuracy	1:40	1:40
Start torque	150%/3Hz	150%/3Hz
Speed control range	±2~3%	±0.03%
Torque limit	Unavailable	Unavailable
Torque control	Unavailable	Unavailable
Application scope	1. Drive multiple motors 2. Replace the existing motors with unknown parameters 3. When Autotuning unavailable	1.Simple speed feedback control 2.Purpose of encoder installed on the side of mechanical shaft

Control method	Vector control without PG	Vector control with PG
Basic control	Vector control without PG	Vector control with PG
Speed detector	Unnecessary	Necessary (Encoder)
Selection card for speed detection	Unnecessary	PG-B2 or PG-X2
Speed control accuracy	1:100	1:1000
Start torque	150%/0.5HZ	200%/0HZ
Speed control range	±0.2%	±0.02%
Torque limit	Available	Available
Torque control	Unavailable	Available
Application scope	1. Drive all motors at variable speed	1. Simple servo drive 2. High-accuracy speed control 3. Torque Control

Selection description

An initial parameter chose from the four kinds of control modes that cannot be return to the default value automatically. If you want to return to the default value, please reset it.

11-03 Parameter initialization	X	Q	Q	Q	Q
(Inter-Constants)					

Set value

No initialization	※[0]
User self-reset	[1110]
2-wire reset	[2220]
3-wire reset	[3330]

Function

Inverter mode selection

Selection description

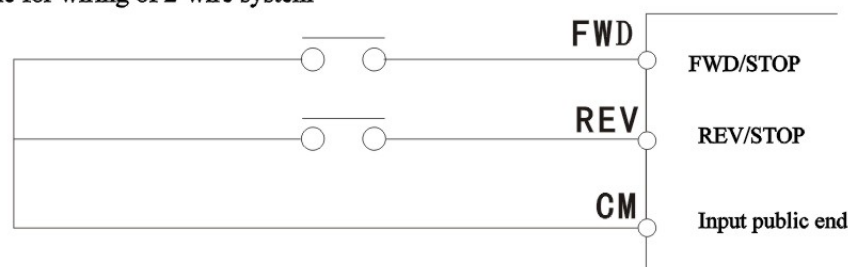
Choose one from the four control modes

The parameter initialization cannot be automatically returned to the default value. If you want to return to the default value, please reset it.

Initialization of user's settings

Initialization of user's settings (1110) refers to the parameters regarded as initial values by users; it is the function to implement initialization function for the parameters of the set values. After setting the parameters, the parameters 02-03 (initial value of user's parameter) will be recorded as "1"; these set values are recorded as initial values; after recording, for occasions that 02-03 is "0", it shall not be set to be "1110" (be not displayed).

- Example for wiring of 2-wire system

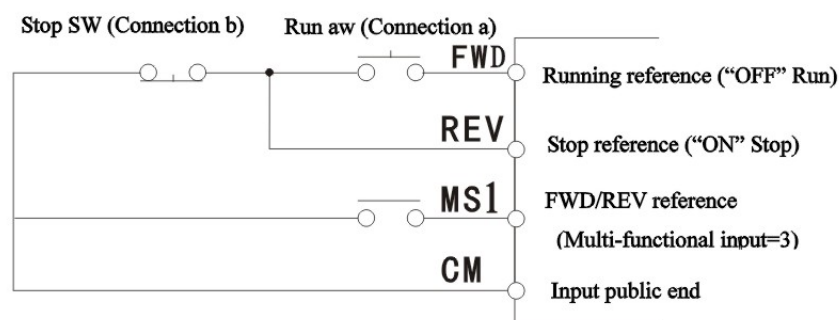


Example for wiring of 2-wire

- Example for wiring of 3-wire system

The initial value of multi-functional input is different from the 2-wire system initialization.

An automatic reset switch can be used for Run/Stop operation for 3-wire system.



Example for wiring of 3-wire system

11-04 Password 1

X Q Q Q Q

(Enter Password)

Set value

0-9999

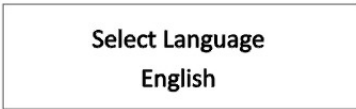
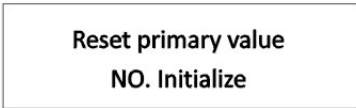
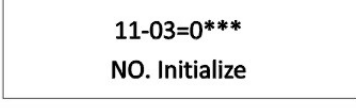
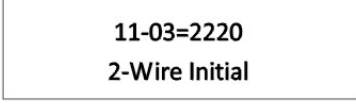
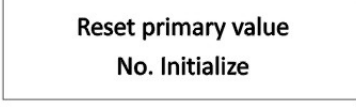
※ [0]

Function

Password can be set in parameter 11-04; inputting password is part of the parameter input function to prohibit environment setting;

[Operation] Example for initialization of 2-wire system

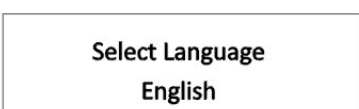
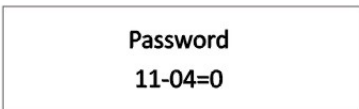
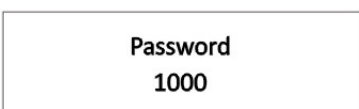
Please follow the following sequence of initialization. This is the operation to return to the factory default.

Order	Key	Display Menu	Description
1	Press  for 2 seconds		Set value is input. About few seconds later, the display menu of the operator will be shown as left.
2			
3			
4	Press  for 3 times		
5			
6			
7			
8			

Now, the 2-wire initialization is completed.

[Operation] Example of setting password as "1000"

Please follow the following sequence of initialization. This is the operation in order to return to the factory default.

Order	Key	Dsisplay Menu	Description
1	Press  for 2 seconds		The left column is flashing. Figure in the flashing column can be changed. Use the increase key. Pressing once, the numerical value will be increased for one. If press for more than 10 times, the numerical value will be remain at "9". To reduce the numerical value, please press the decrease key till obtaining the desired set value. Set value is input. About few seconds later, the display menu of the operator will be shown as left.
2			
3			
4	Press  for 4 times		
5			
6			
7			
8			
9			

Now, the setting of password "1000" is completed.
When cancel the password, please set 11-04=0

12-01 to 12-32 User's parameter	○ Q Q Q Q
(User Param 1 to 32)	

Set value

12-01

※-

Function

The number of parameter for Setting/Reference (maximum 32)

Selection description

■ Access level (11-01) is available if it is set to be "1"(User program).

■ If access level is ADVANCED, parameter reading is unavailable.

The parameter setting is subject to the following restrictions:

RUN/STATUS	Monitoring of Quick-start class is available
INIT-SET	Access and setting of parameters at Quick-start class are available
PROGRAM-SET	Only access and setting of parameters from 12-01 to 12-32 are available
Autotuning	Be not displayed
SET-LIST	Be not displayed

5.2: Parameters for program mode--Parameters of application (2)

5.2.1 Running mode selection: 21

21-01 Frequency reference	○ Q Q Q Q
(Reference selection)	

Set Value

Digital operator

※[0]

Control circuit terminals (Analog input)

[1]

Serial communication

[2]

Optional card

[3]

MEMOBUS transmission

[4]

Function

Input mode selection of frequency reference

Selection description

Select input mode of frequency reference

Description of set value

The frequency reference of control circuit terminal (external terminal) should be set to be "1"; for signal level, please refer to the T3 parameter group.

21-02 Running reference	× Q Q Q Q
(Run Source)	

Set Value

Digital operator

※[0]

Control circuit terminals (Sequence controller input)

[1]

Serial communication

[2]

Optional card

[3]

MEMOBUS transmission

[4]

Function

Setting of input mode for running reference

Selection description

Please set the input position for running reference

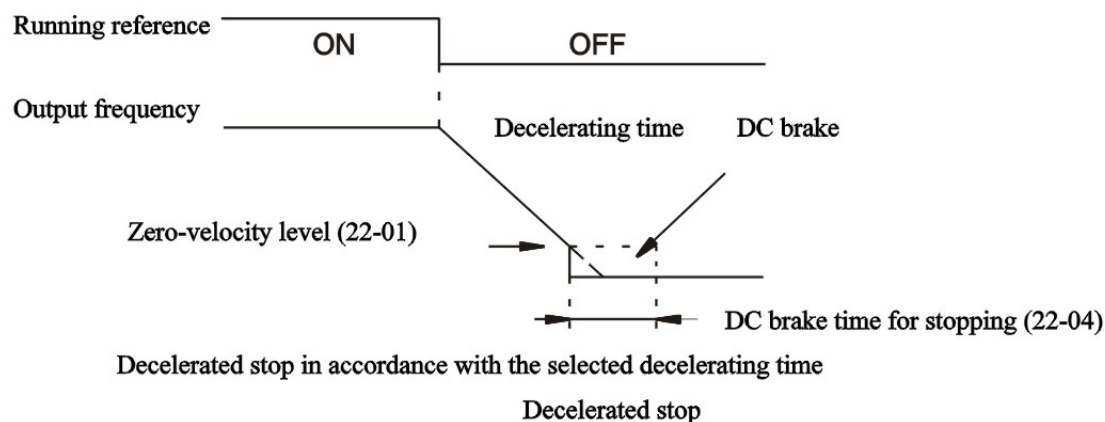
For occasions that have been set as control circuit terminal (external terminal), please run the 2-wire system FWD/STOP and REV/STOP. For initialized 3-wire system occasion and occasions that have been set to be "0" in multi-functional input, please run 3-wire system RUN, STOP and FED/REV.

Refer to parameter 11-03

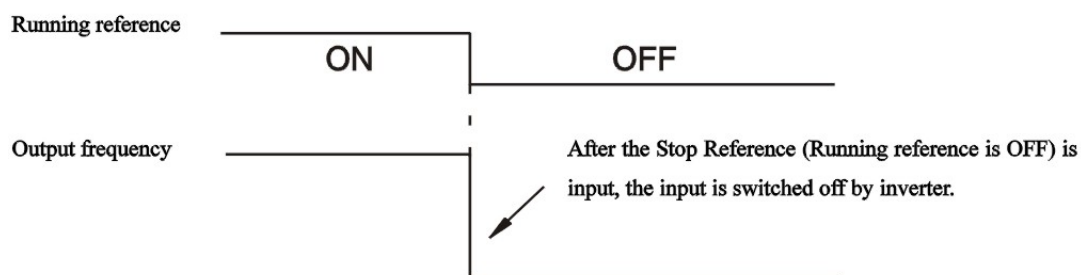
21-03 Stopping method	× Q Q Q Q
(Stopping Method)	
Set value	
Decelerated stop	※[0]
Free stop	[1]
All field DC brake (DB Stop)	[2]
Free stop with time limit	[3]
Function	
Setting of stop method	
Selection description	
Please set the input stop method to stop the input	
For occasions under vector control with PG, only “0” and “1” can be set	
Description of set value	

The following is the illustration for various stop methods:

Decelerating reference (21-03=0)



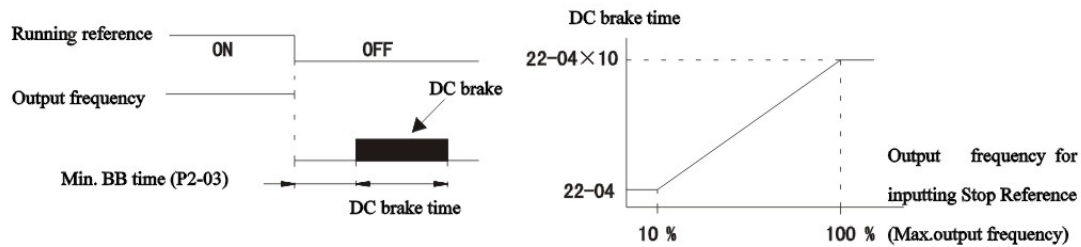
Free Stop (21-03=1)



After the Stop Reference is input before the minimum base blocking (BB) time (P2-03), the Running Reference will be neglected.

Free Stop

All-range DC brake (DB) Stop (21-03=2)



If the Stop Reference is input and after the minimum base blocking (BB) time (P2-03), it will be stopped due to DC brake.

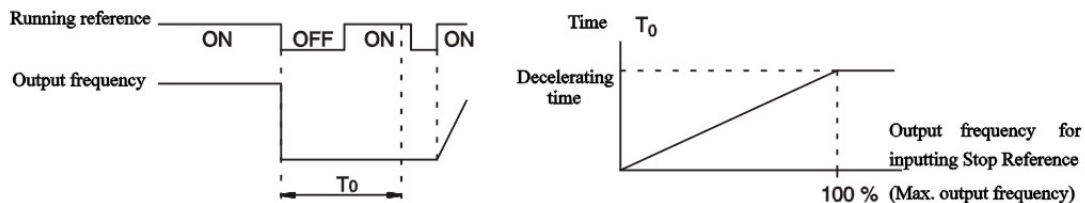
DC brake time is decided by the set value of output frequency upon input and DC brake time (22-04) upon stop.

All-range DC brake (DB) Stop

Important

For OC occasions during stop process, please extend the minimum BB time (P2-03). After the power of induction motor is switched off, electric power is generated due to the changes in magnetic field inside the motor. At this time, plus the DC brake, there will be OC detected.

- Free Stop with time limit (21-03=3)



After the Stop Reference is input, before the “time T_0 ”, the Running Reference will be neglected. The “time T_0 ” will be decided by the output frequency and decelerating time.

Free Stop with time limit

21-04 Reverse run forbidden	X	B	B	B	B
(Reverse Oper)					
Set value					
Reverse run is available					※[0]
Reverse run is forbidden					[1]
Function					
Setting of REV forbidden					
Selection description					
If enter the REV direction reference, please set the motor to run reversely; or regardless of this reference, use it in occasions that motor reverse run is forbidden.					
21-05 Low-frequency running mode	X	X	X	X	A
(Zero-Speed Oper)					
Set value					
Common run					※[0]
Base Block					[1]
51-09 is unavailable					[2]
Zero speed running					[3]
Function					
When the input frequency reference is lower than the minimum output frequency (51-09), set the running mode;					
Selection description					
Select running mode of frequency reference input lower than the minimum output frequency.					
21-06 Terminal scanning time	X	X	X	X	A
(Cntl Input Scans)					
Set value					
For every 2 ms, read twice					[0]
For every 5 ms, read twice					※[1]
Function					
Response setting of program input (FWD/REV, Multi-functional input).					
Selection description					
Please set the response of program input (FWD/REV, Multi-functional input).					
21-07 Running mode switch	X	A	A	A	A
(LOC/REM RUN Sel)					
Set value					
When switch to long-distance, even the running reference is input, it will not run.					※ [0]
When switch to long-distance, it will run in accordance with the running signals.					[1]
Function					
The interlocking operation when running reference is switched from local (operator) to the long-distance (control circuit terminal);					
21-08 Program running mode	X	A	A	A	A
(RUN CMD at PRG)					
Set value					
Running is unnecessary					※[0]
When the digital operator is (21-02=0), the running reference selection is unavailable					[1]
Function					
Interlocking running under the program mode					

5.2.2 DC brake: 22

22-01 Brake start frequency	X	B	B	B	B
(DCIn Start Freq)					

Set value

0.0~10.0

※[0.5]

Function

DC brake start frequency of accelerated stop (Initial excitation start frequency under vector control with PG) is taking unit as Hz;

Selection description

The so-called DC brake function is to supply DC current for motor, to make the motor accelerate speed; there are the following two kinds:

- DC brake at start: the rotated motor will be stopped due to inertia; it will be available till the next startup.
- DC brake at stop: for occasions with larger load, usually deceleration cannot make the motor stop; the inertia will still adjust the rotation. Extending the brake time or increasing the DA brake current can shorten the stop time.
- For zero-speed level (22-01), please set the start frequency of DC brake; for occasions that zero-speed level is lower than the minimum output frequency (51-09), please start from the minimum output frequency and DC brake.
- Due to the zero-speed control start frequency for decelerating, occasions under vector control with PG will neglect the setting of output frequency; the zero-speed control will be started from the zero-speed level.
- Only under vector control with PG, the zero-speed level is used as action frequency of zero servo function.

22-02 DC brake current	X	B	B	B	X
(DCIn Current)					

Set value

0.0~100

※[50]

Function

Rated current of inverter is 100% of DC brake current, taking % as unit.

Selection description

For DC brake current (22-02) parameters, please set output current value for DC brake; the rated current of inverter is taking as 100%, with % as unit.

22-03 Braking time at start	X	B	B	B	B
(DciniTime@Start)					

Set value

0.00~10.00

※[0]

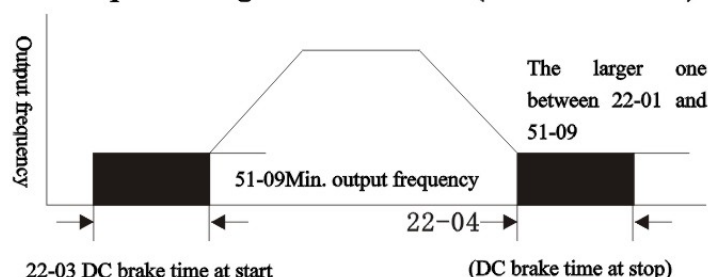
Function

Time of DC brake at start (Vector control with PG is the initial excitation) is taking second as unit.

Selection description

- For time of DC brake at start (22-03) parameter, please set the DC brake action time at the start of motor.
- For shared occasion of DC brake reference (initial excitation reference) of multi-functional input terminal, DC brake can be run within the set time in 22-03 after the terminal output is "ON".

Sequence diagram of DC brake (initial excitation)



※=Factory-set value

22-04 Braking time at stop	X	B	B	B	B
(DCInj Time @Stop)					
Set value					
0.00~10.00					※ [0.50]
Function					
DC brake at stop; Time (of initial excitation under vector control) that takes second as unit					
Selection description					
For DC brake time at stop (22-04) parameter, please set it for the motor					
DC brake action time at stop					
Motor slip to prevent stop					
22-08 Magnetic flux compensation	X	-	-	A	A
(Fidld Comp @ Start)					
Set value					
0~500					※ [0]
Function					
Magnetic flux compensation is taking no-load current value as 100% and taking % as unit.					
Selection description					
If 22-08 parameter was set above 100%, the current of DC brake (initial excitation) at start will be relatively large; the magnetic flux of motor will be reached quickly. If the 22-08 was set as 200%, the reach time will be shortened to half.					
If the 22-08 parameter was set below 100%, the magnetic flux will be reached slowly. (Usually it is not allowed to set 22-08 below 100%, while the action of 22-08=0% is the same as action of 22-08=100%; magnetic flux standard of both two are reached through the set DC brake current (22-02).					
If the set value of magnetic flux compensation (22-08) is increased, the DC brake noise of motor at start will also be increased.					
The electrical time parameter that motor reaches a certain magnetic flux is set by motor parameter 52.					
It is obtained by the formula below:					
Secondary circuit time parameter $T2 = [(52-01^2 - 52-03^2) / (2\pi \times 52-02 \times 52-03)]^{1/2}$ (Sec).					
If there is a delay in control due to DC brake (initial excitation) 22-03 at start, please do not use this function but multi-functional contact input DC brake reference (set value: 60); the magnetic field is established according to the flux held before motor stop.					

5.2.3 Speed search: 23

23-01 Speed search at start	X	A	A	A	A
(SpdSrch at Start)					
Set value					
Speed search is unavailable					※ [0]
Speed search is available					[1]
Function					
Set speed search function at running reference input					
Selection description					
Description of set value					
If use speed search function occasion, please set it to be "1"; speed search will be run for every running reference input.					
For control mode without PG, the speed search is available for any occasion; for multi-functional input (T1-01~T1-06), please set external speed search reference (Set value: 61 or 62).					

23-02 Current of speed search action

X A X A X

(SpdSrch Current).

Set value

0~200

※[100]

Function

Action current of speed search is taking rated current of inverter as 100% and taking % as unit.

Selection description

Current of speed search action (23-02) is to set the action current of speed search. At this time, the set value will not act; please decrease the set value.

23-03 Search decelerating time

X A X A X

(Spdsrch. Dec Time)

Set value

0.1~10.00

※[2.0]

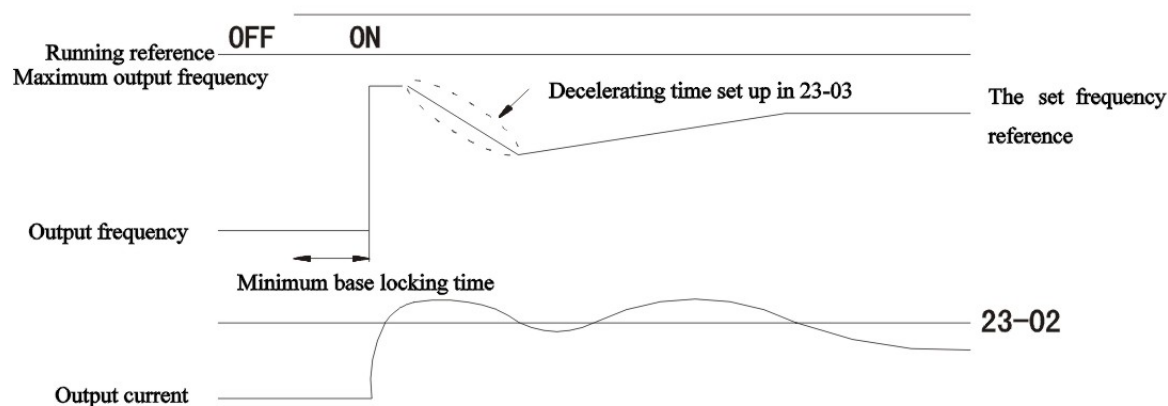
Function

The output frequency decelerating time of speed search action at start is taking second as unit.

Selection description

For speed search decelerating time (23-03), please set and run the output frequency decelerating time in the speed search, which is to set the decelerating time from maximum output frequency to 0Hz.

After setting the speed search and DC brake, the minimum base block time (P2-03) shall also be set; the minimum base block time is the time for motor residual voltage to be decreased to be zero. When the speed search and DC brake are started, if there is OC detected, please increase the set value to prevent fault.



5.2.4 TIMER function: 24

24-01 ON delay time

X A A A A

(Delay-ON Timer)

Set value

0.0~100.00

※ [0.0]

Function

TIMER Function ON Delay Time (non-sensible zone) output due to timer function input is taking second as unit.

Selection description

It will be available if multi-functional input & output, various timer function input (Set value: 18) and timer function output (Set value: 12) are set.

These input and output shall be a universal sequence controller; if the delay time for input & output is set, the oscillation of test and switch can be removed. If the ON Delay Time input is longer than the set value of 24-01 (ON Delay Time), the timer function output is ON.

24-02 OFF delay time	X	A	A	A	A
(Delay-OFF Timer)					

Set value

0.0~300.0

※[0.0]

Function

OFF Delay Time (non-sensible zone) output caused by the timer function input is taking second as unit.

Selection description

It will be available if the multi-functional input & output, various timer function input (Set value: 18) and timer function output (Set value: 12) are set.

These input and output shall be a universal sequence controller; if the delay time for input & output is set, the oscillation of test and switch can be removed. If the OFF Delay time input is longer than the set value of 24-02 (OFF Delay Time), the timer function output is OFF.

5.2.5 PID control: 25

25-01 PID mode	X	Q	Q	Q	Q
(PID Mode)					

Set value

PID control is unavailable

※[0]

PID control is available (Deflection is controlled by D)

[1]

PID control is available (Feedback value is controlled by D)

[2]

PID available (Frequency output+PID+ deflection value is controlled by D)

[3]

PID available (Frequency output+PID+ feedback value is controlled by D)

[4]

Function

Inverter control actions controlled by PID

Selection description

PID is a control mode to make feedback value (detected value) consistent with the set target value. It can be controlled by proportion (P) and combination of Integration (I) & differential (D). It also can control the idle time object (mechanical system). Here, the purpose, parameter setting and adjustment method of PID control are described in details.

Purpose of PID control

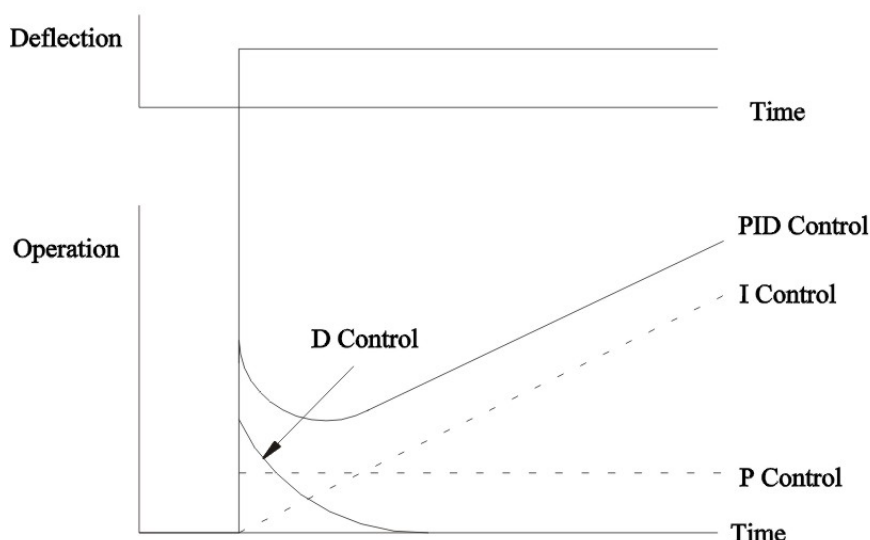
Examples for the purpose of inverter under PID control are shown in the table below.

Examples of PID control purpose

Purpose	Control Content	Detector(example)
Speed control	- Take the mechanical speed information as feedback signal to make the speed consistent with the target value. - Other mechanical speed information is input as target value; the actual speed under synchronization control is used as feedback signal.	Speed sensor
Pressure control	As the feedback signal, the pressure information will control certain pressure.	Pressure detector
Flux control	As the feedback signal, the flux information will control the flux accuracy.	Flux detector
Temperature control	As the feedback signal, temperature information will control the temperature through making the fan rotate.	- Thermoelectric pair - Thermistor

Action of PID control

In order to make the control actions (P control, I control and D control action) of PID control be easy to be understood, the deflection (difference between target value and feedback value) is certain and the changes in operation (output frequency) are shown as the figure below.



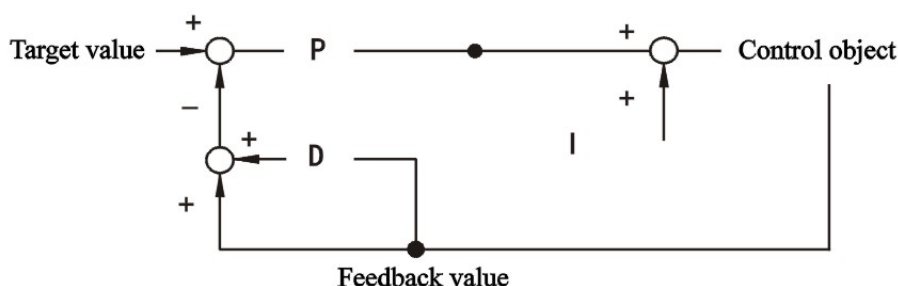
Action of PID control

- P Control: Operation is output by the deflection proportion; when there is only P control, the deflection is zero, which cannot be controlled.
- I Control: Operation is output by the deflection Integration. It will be available when the feedback value is consistent with target value, while the emergent changes cannot be tracked.
- D Control: Operation is output by the deflection differential. The emergent changes can be responded quickly.
- PID Control: Ingeniously combine the advantages of each control to make the best control.

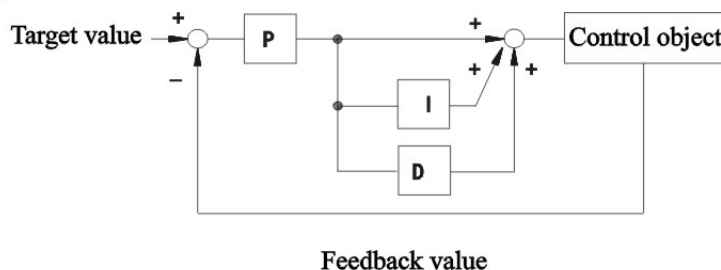
Type of PID control

The inverter has 2 types of PID control; usually the differential PID control on measured value is adopted.

- Differential PID control on measured value is the differential PID control on feedback value; the changes in target value and controlled object can be matched.

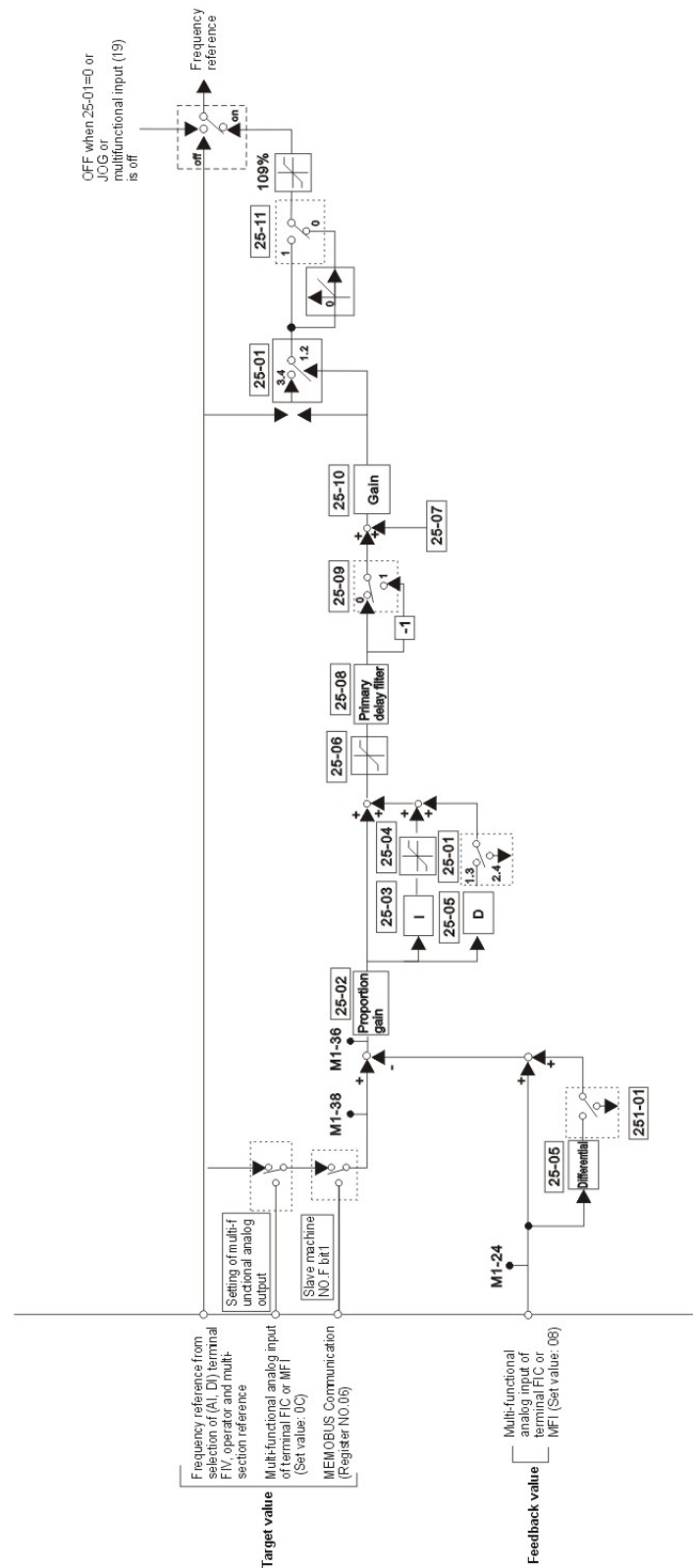


- Basic PID control: is the basic shape of PID control. If the response of D control is adjusted to track the changes in control object, when the target value is changed, there may be shortage or overshoot phenomenon.



PID control function of inverter

PID control inside the inverter is show as the figure below:

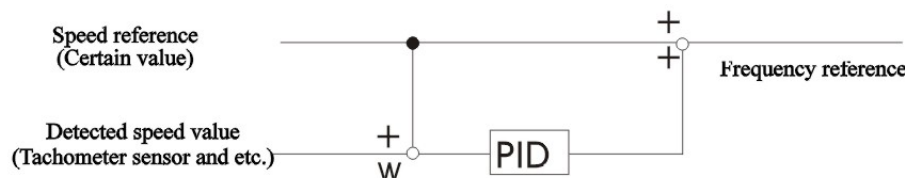


Block diagram of PID control inside the inverter

For PID control, please set from 1 to 4. Usually, the differential PID control on 2, 4 measured value is adopted. If the available occasion of PID control is set, please select any one target value from below.

- For occasion of input target value as 21-01=0 (digital operator), the set value is 21-03=1 (taking % as unit); the target value is input by % value. (When speed reference is switched, 100% is the maximum frequency reference value)
- Feedback value is input by multi-functional analog input terminal or frequency reference. One of multi-functional analog input terminal's function selection (T3-05) or frequency reference (current)

terminal FTC's function selection (T3-09) is set as feedback adjustment of PID feedback value (set value: B); please adopt the gain and deflection of analog input terminal.
As shown, it is the application example of speed control with set value as 3.4.



25-02 Proportional gain

O A A A A

(PID Gain)

Set value

0.00~25.00

※[1.0]

Function

The proportional gain of P control is set as the rate

Selection description

For response of PID control, please adjust the proportional gain (P), integration time (I) and differential time (D). In the actual commissioning, response is adjusted during the load running; when its best condition (see Page 45 [PID adjustment method]) is set to be 0.00, the control (P.I.D control) will not act.

25-03 Integration time

O A A A A

(PID I Time)

Set value

0.00~25.00

※[1.0]

Function

The integration time of I control is taking second as unit.

Selection description

For response of PID control, please adjust the proportional gain (P), integration time (I) and differential time (D). In the actual commissioning, response is adjusted during the load running; when its best condition (see Page 45 [PID adjustment method]) is set to be 0.00, the control (P.I.D control) will not act.

25-04 Integration upper limit

O A A A A

(PID I Limit)

Set value

0.0~100.00

※[100.0]

Function

The upper limit value of PID control is taking maximum output frequency as 100% and taking % as unit.

Selection description

Under the PID control, the calculation value of integration control will not exceed a certain amount of parameters. Usually, it is unnecessary to change the factory-set value. In case of emergent changes in load, load damage caused by inverter response and uncontrolled motor, please reduce the set value. If the set value is too small, the target value will not be consistent with the feedback value.

It is taking maximum output frequency as 100% and taking % as unit.

25-05 Differential time	O A A A A
(DID D Timer)	
Set value	
0.0~10.0	※[100.0]
Function	
The differential time of D control is taking second as unit.	
Selection description	
For response of PID control, please adjust the proportional gain (P), integration time (I) and differential time (D). In the actual commissioning, response is adjusted during the load running; when its best condition (see Page 45 [PID adjustment method]) is set to be 0.00, the control (P.I.D control) will not act.	
25-06 PID upper limit	× Q Q Q Q
(PID Limit)	
Set value	
0~100.0	※[100]
Function	
The upper limit value of PID control is taking maximum output frequency as 100% and taking % as unit.	
Selection description	
PID control is to prevent frequency reference exceeding certain parameter value.	
It is taking maximum output frequency as 100% and taking % as unit.	
25-07 PID bias adjustment	O Q Q Q Q
(PID Offset)	
Set value	
-100.0~+100.0	※[0.0]
Function	
The PID control bias is taking the maximum output frequency as 100% and taking % as unit.	
Selection description	
It is a parameter to adjust the PID control bias	
If both the target value and feedback value are zero, please adjust the output frequency of inverter to be zero.	
25-08 PID delay time	O A A A A
(PID Delay Time)	
Set value	
0.00~10.00	※[0.00]
Function	
The time parameter of PID control output passing through the low-filter is taking second as unit.	
Selection description	
Please set the low-filter time parameter of PID control output.	
Usually, there is no need to change the factory-set value.	
For occasions of low mechanical viscous friction or rigidity or mechanical system resonance, please set time parameter longer than the resonance frequency cycle; although the response is slow, it can avoid the resonance.	
25-09 PID output characteristic	O A A A A
(Output Level Sel)	
Set value	
PID output is the positive characteristic	※[0]
PID output is the negative characteristic (PID output makes it run reversely)	[1]
The proportional gain controlled by P is set to be the rate	
Function	
Selection of positive/negative characteristic of PID output	
Selection description	
It is the parameter to adjust the gain under PID control.	

25-10 PID output gain	O	A	A	A	A
(Output Gain)					
Set value					
0.0~25.0					※[1]
Function					
Setting of PID output gain					
Selection description					
It is a parameter to adjust the PID control gain.					
25-11 Negative 0 limit	O	A	A	A	A
(Output Rev Sel)					
Set value					
0 limit when the PID output is negative					※[0]
Reverse run when the PID output is negative					[1]
Function					
Reverse run selection of PID output					
Selection description					
Description of set value					
For 21-04 parameter, if the reverse run forbidden occasion is selected, it will not run reversely.					
25-12 Feedback loss detection	O	A	A	A	A
(Fb los Det Sel)					
Set value					
There is no feedback loss detected					※[0]
There is PID feedback loss detected; it will continue to run if it is detected and the fault contact will not act					[1]
There is PID feedback detected; it will stop freely if it is detected and the fault contact will not act					[2]
25-13 Loss detection value	×	Q	Q	Q	Q
(PB los DET Lvl)					
Set value					
0~100					※[0]
Function					
PID feedback loss detection level is taking maximum output frequency as 100% and taking % as unit.					
25-14 Loss detection time	×	A	A	A	A
(PB los DET Timel)					
Set value					
0~25.5					※[1.0]
Function					
PID feedback loss time is taking second as unit.					
Selection description					

Adjustment method of PID

Please follow the following order to adjust the PID control action while observe its response waveform:

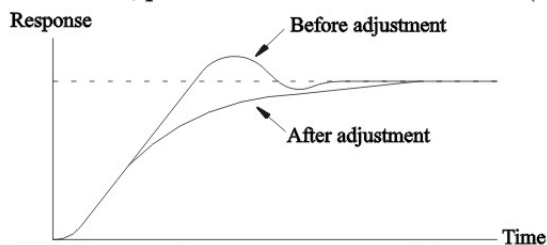
1. Please set the PID control to be available (25-01=2 or 1).
2. For proportional gain P (25-02), please increase the set value within the scope of no vibration.
3. For Integration time I (25-03), please reduce the set value within the scope of no vibration.
4. For differential time D (25-05), please increase the set value within the scope of no vibration.

Micro-adjustment method of PID

After parameters of PID control are set, the description about micro-adjustment is as follows:

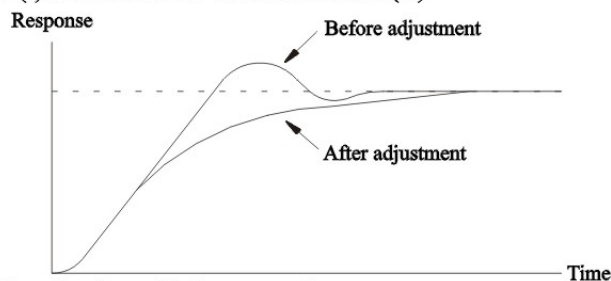
- Suppress overshoot

In case of overshoot occasion, please shorten the differential time (D) and extend the integration time(I).



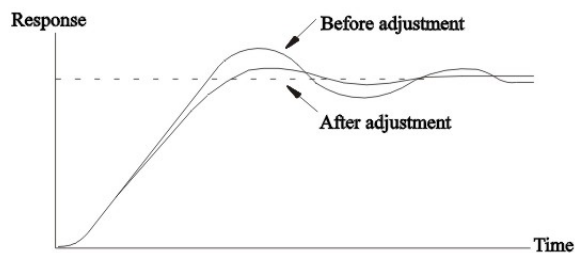
- Try to reach the stable control state as soon as possible

Even if the overshoot occurs, in order to make it stable as soon as possible, please shorten the integration time (I) and extend the differential time (D).



- Suppress the vibration with longer cycle

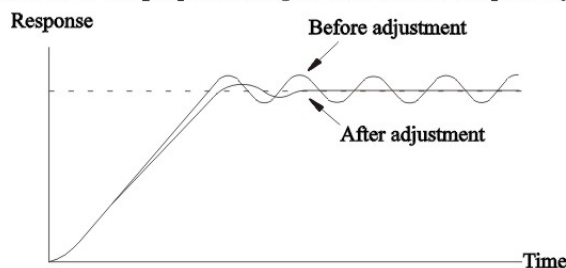
If there is a vibration cycle longer than the set value of integration time (I), it shows that the integration action is too strong; please extend the Integration time (I), then the vibration can be suppressed.



- Suppress the vibration with shorter cycle

The vibration cycle is short almost the same as the set value of vibration cycle of differential time (D); it shows that the differential action is too strong; please shorten the differential time (D), then the vibration can be suppressed.

For occasion that the differential time (D) is set to be 0.00 (no D control), but the vibration still can't be suppressed, please reduce the proportional gain and extend the primary delay time parameter of PID.



5.2.6 DWELL Function: 26

26-01 DWELL frequency at start	X	A	A	A	A
(Dwell Ref @ Start)					

Set value

0.0~400.

※[2.0]

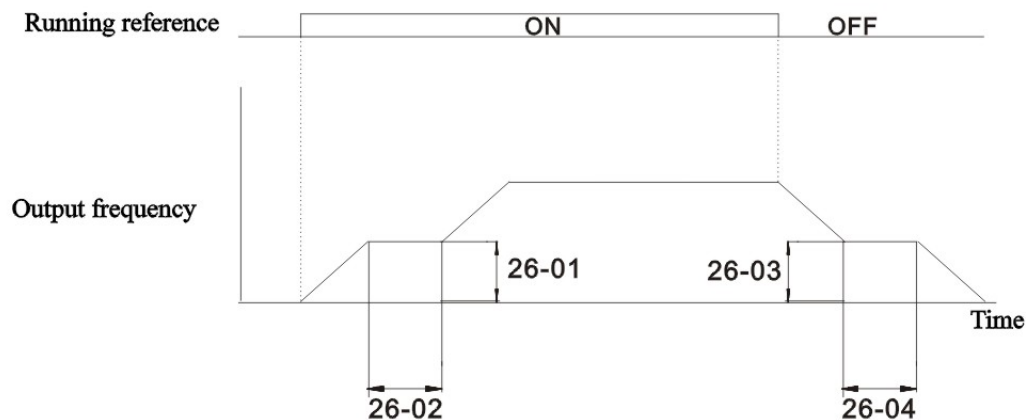
Function

Setting of DWELL function

Selection description

DWELL function is to maintain the output frequency of relatively heavy load at start or stop. The maintained frequency output can prevent the stall state.

The relationship of these parameters is shown as the figure below.



Sequence diagram of DWELL function

26-02 DWELL time at start	×	A	A	A	A
(Dwell Time @ Start)					

Set value

0.0~10.0

※ [0.0]

Function

Setting of DWELL function

Selection description

DWELL function is to maintain the output frequency of relatively heavy load at start or stop. The maintained frequency output can prevent the stall speed state.

The relationship between these parameters is shown as the Figure above.

26-03 DWELL frequency at stop	×	A	A	A	A
(Dwell Ref @ Stop)					

Set value

0.0~400. 0

※[0.0]

Function

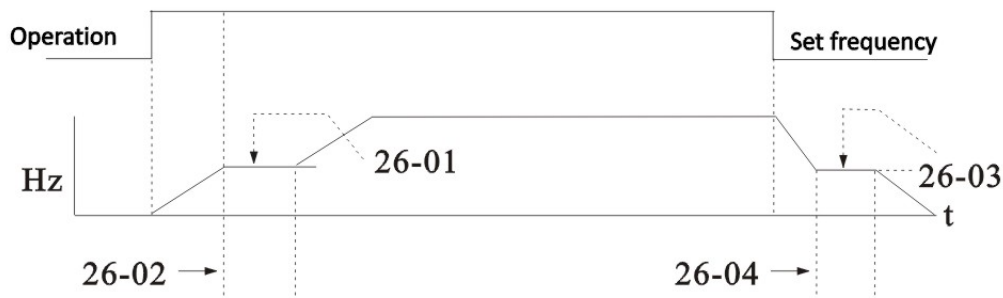
Setting of DWELL function

Selection description

DWELL function is to maintain the output frequency of relatively heavy load at start or stop. The maintained frequency output can prevent the stall state.

The relationship between these parameters is shown as the figure below.

26-04 DWELL time at stop	×	A	A	A	A
(Dwell Ref @ Stop)					
Set value					
0.0~400.0					
Function					
Setting of DWELL function					
Selection description					
Output syop time in deceleration					



5.2.7 DROOP Function: 27

27-01 Droop Gain	×	A	A	A	A
(Droop Gain)					
Set value					
0.0~100.0					
Function					
The maximum output frequency is taking the rated torque slip as 100% and taking % as unit.					
Selection description					
The slip (slip of rated torque under occasions of maximum output frequency reference) is taking % as unit.					
If it is set to be 0.0, the DROOP control will be unavailable.					

27-02 Droop delay time	×	A	A	A	A
(Droop Delay Time)					
Set value					
0.03~2.0					
Function					
Parameter for response adjustment of DROOP function					
Selection description					
It is the parameter to adjust the response of DROOP control.					
For the vibration and turbulence occasions, please increase the set value.					

5.2.8 Energy-saving control: 28

28-01 Energy-saving control gain	X	A	A	A	A
(Energy-saving Gain)					

Set value

0.0~100.0

※[80]

Function

The setting of inverter output voltage after inputting the energy-saving reference

Selection description

After the energy-saving reference is set, please set the inverter output voltage and take the set V/f curve voltage as 100% as well as take % as unit.

Please set the voltage change when the energy-saving reference is ON/OFF according to the voltage recovery time (P2-04).

28-02 Energy-saving frequency	X	A	A	A	A
(Energy-saving Freq)					

Set value

0.0~400.0

※[00]

Function

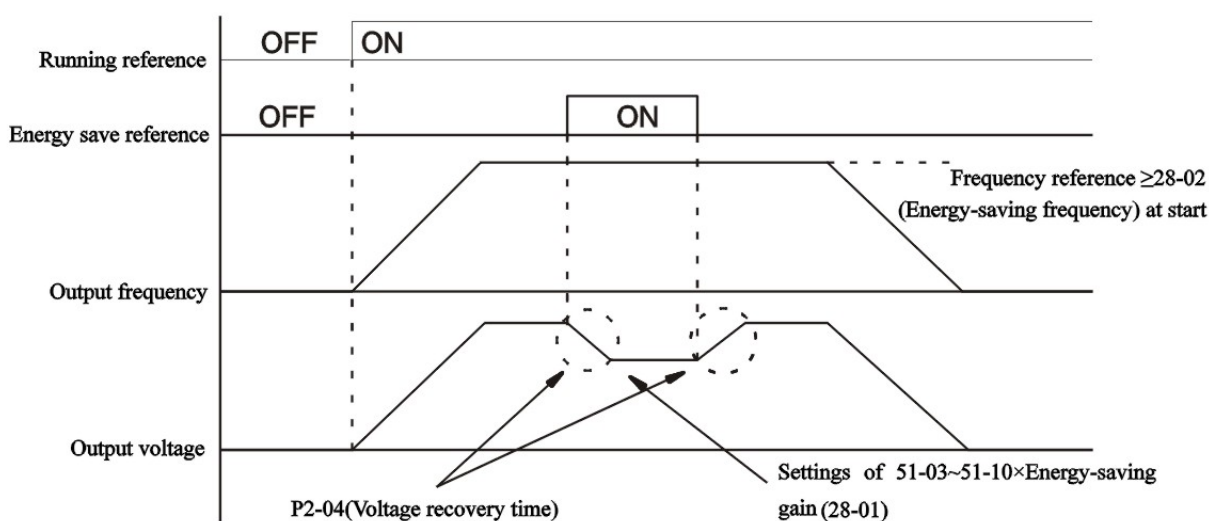
The frequency lower limit of energy-saving control is taking Hz as unit.

Selection description

Please set the frequency lower limit for the available range of energy-saving control.

Energy-saving reference starts from frequency above the starting frequency and will be available under the state of consistent speed.

The sequence diagram of energy-saving running is shown as the figure below.



5.2.9 Zero Servo: 29

29-01 Zero servo gain	x	x	x	x	A
(Zero Serve Gain)					

Set value

0~100.0

※[5]

Function

For adjustment of zero servo locking (retention)

For the multi-functional input, if the zero servo reference is input when the "Zero servo reference" is available; when the frequency is lower than zero speed level (22-01), the position control circuit output is stopped.

If the zero servo gain is set to be larger, the locking will also be relatively large; for the excessive large one, it will lead to vibration.

29-02 Zero servo complete bandwidth	x	x	x	x	A
(Zero Serve Gount)					

Set value

0~16383

※[10]

Function

Set the output bandwidth of zero servo stopping signal

For the multi-functional input, if the zero servo stopping signal is set when the "zero servo stopping" is available, the output of the current position (starting position of zero servo+stopping bandwidth of zero servo) is ON.

The delay from the starting position of zero servo to the allowable position is set by PG (pulse encoder) 4 times pulse.

Selection description

Any one from the multi-functional input (T1-01 ~ 06) is distributed to the zero servo reference (Set value: 72). When the frequency (speed) reference is lower than the zero speed level (22-01), it is under the state of zero servo. Running reference input is still at ON; if it is at OFF, the output is cut off and the locking will be cancelled. For the rotation of zero servo, please adjust 29-01 (zero servo gain); the bigger the value is, the greater the rotation will be. For the excessive large one, it will lead to vibration. For rotation adjustment, please adjust it after the speed control (ASR) gain adjustment. When the zero servo state is output externally, any one from the multi-functional output (T2-01 ~ 03) will be set as the zero servo bandwidth at stop (Set value 33). At this time, the Zero servo complete bandwidth (29-02) is set to be available. For zero servo bandwidth at stop, from the starting position of zero servo to the allowable position deflection are set by PG (pulse generator • encoder) 4 times pulse; please refer to the 600p/r encoder in the example; the 4 times pulse is 2400p/r.

If the zero servo reference is OFF, the zero servo signal at stop will also be OFF. For zero servo function, please avoid long-time servo locking under the state of 100% load, which may lead to the inverter fault.

If the current of servo locking is decreased by 50%, please increase the power capacity of inverter.

5.3 Adjustment parameter (3)

5.3.1 Accelerating and decelerating time: 31

31-01	Accelerating time 1	X	A	A	A	A
(Accel Time 1)						

Set value

0.0~60000 [※10.0]

Function

Accelerating time refers to the time from 0% to 100% of the max frequency, with the unit as second.

31-02	Decelerating time 1	X	A	A	A	A
(Decel Time 1)						

Set value

0.0~60000 ※[10.0]

Function

Decelerating time refers to the time from 100% to 0% of the max frequency, with the unit as second.

31-03	Accelerating time 2	X	A	A	A	A
(Accel Time 2)						

Set value

0.0~60000 ※[10.0]

Function

The decelerating time when the "Accelerating & decelerating time selection 1" of multi-functional input is ON

31-04	Decelerating time 2	X	A	A	A	A
(Decel Time 2)						

Set value

0.0~60000 ※[10.0]

Function

The decelerating time when the "Accelerating & decelerating time selection 1" of multi-functional input is OFF

31-05	Accelerating time 3	X	A	A	A	A
(Accel Time 3)						

Set value

0.0~60000 ※[10.0]

Function

The decelerating time when the "Accelerating & decelerating time selection 2" of multi-functional input is ON

31-06	Decelerating time 3	X	A	A	A	A
(Decel Time 3)						

Set value

0.0~60000.0 ※[10.0]

Function

The decelerating time when the "Accelerating & decelerating time selection 2" of multi-functional input is OFF

31-07	Accelerating Time 4	X	A	A	A	A
	(Accel Time 4)					
Set value	0.0~60000.0					※ [10.0]
Function	The decelerating time when the "Accelerating & decelerating time selection 1" and the "Accelerating & decelerating time selection 2" of multi-functional input is ON					
31-08	Decelerating Time 4	X	A	A	A	A
	(Deccl Time 4)					
Set value	0.0~60000.0					※ [10.0]
Function	The decelerating time when the "Accelerating & decelerating time selection 1" and the "Accelerating & decelerating time selection 2" of multi-functional input is OFF					
Selection description	Please set the accelerating time and decelerating time respectively. Accelerating time: set the time for maximum output frequency from 0% to 100%. Decelerating time: set the time for maximum output frequency from 100% to 0%. Accelerating and decelerating time: can be set as 1-4 type. For occasions with decelerating time 2-4, please set the "accelerating & decelerating time selection 1" and the "accelerating & decelerating time selection 2" for the multi-functional input (T1-01~T1-06). The setting range is changed along with the changes in set value of 31-10 (unit of accelerating & decelerating time); the above is the factory-set value. For occasion with 31-10 as "0" (taking 0.01 seconds as unit), the setting range is 0.00-600.00(seconds).					
31-09	Emergent stop time	X	B	B	B	B
	(Fast Stop Time)					
Set value	0.0~60000.0					※ [10.0]
Function	The decelerating time when multi-functional input emergent stop is ON					
Selection description	It is the decelerating time after inputting emergent stop and decelerating time upon fault detection. Please set the time of maximum output frequency from 100% to 0%. For occasion of emergent stop, please set emergent stop for multi-functional input (T1-01~T1-06); The following is fault object when the emergent stop time is set to be available; please set all kinds of stop methods. The overheating (OH) pre-pre-alarm is set in P8-03. Fault related to PG feedback is set in 61-02~04. Settings rang is changed along with 31-10 (unit of accelerating & decelerating time); the above are the set values before leaving factory. For the occasion 31-10 is set to be "0" (taking 0.01 seconds as unit), the setting range is 0.00-600.00 (seconds).					
31-10	Time unit	X	A	A	A	A
	(Acc/Dec Units)					
Set value	Unit: 0.01seconds					[0]
	Unit: 0.1 seconds					※ [1]
Function	Setting of accelerating & decelerating time unit					
Selection description	Description of set value					
	If a more precise accelerating & decelerating time should be set, please set it to be "0". But the setting range is relatively narrow.					

31-11 Switching frequency

X A A A A

(Acc/Dec SW Freq)

Set value

0.0~400.0

※[0.0]

Function

Setting of the automatic switching frequency of accelerating and decelerating time;

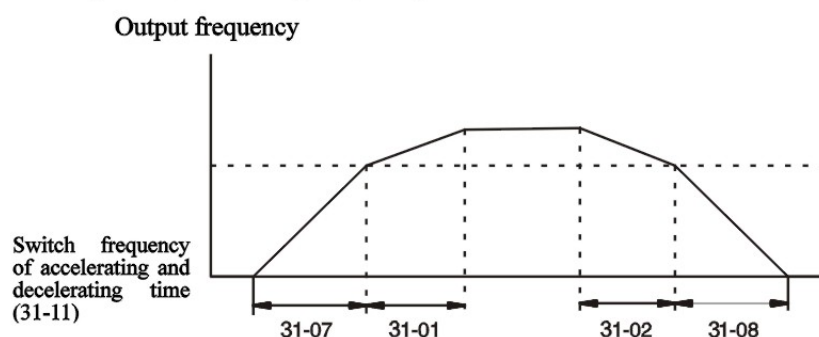
Below the set frequency: accelerating and decelerating time 4

Above the set frequency: accelerating and decelerating time 1

Selection description

For setting of the frequency point, under the occasion that the automatic accelerating & decelerating time switch should be implemented, please set the frequency point.

For the multi-functional input that the accelerating and decelerating time 1, 2 are input, the accelerating and decelerating time 1, 2 shall be given priority.



If the output frequency $\geq$ 31-11, it will run with accel/decel time 31-07, 08.

If the output frequency $<$ 31-11, it will run with accel/decel time 31-07, 08.

Switching frequency of accelerating and decelerating time

5.3.2 S curve characteristic: 32

32-01 "S" characteristic time at the beginning of acceleration

X A A A A

(SCrv Acc@Start)

Set value

0.0~2.50

※[0.20]

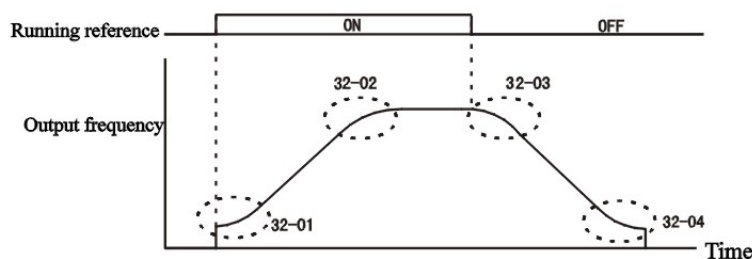
Function

The unit of S curve characteristic time is second.

Selection description

The accelerating and decelerating running based on S curve characteristic can reduce the impact on machine at start and stop. The inverter can set the S curve characteristics at the start of acceleration, the after the acceleration is completed and at the start of deceleration.

The relationship between these parameters is shown in the figure:



Setting of S curve characteristic function

If the S curve characteristic time is set, the accelerating and decelerating time shall be extended according to the following formula. Accelerating time=selected accelerating time + (S curve characteristic time at the start of acceleration + S curve characteristic time after acceleration)/2; Accelerating time=selected accelerating time + (S curve characteristic time at the start of acceleration + S curve characteristic time after deceleration)/2.

32-02 "S" characteristic time at the end of acceleration	X	A	A	A	A
(SCrv Acc@End)					

Set value

0.0~2.50

※[0.20]

Function

The unit of S curve characteristic time is second.

32-03 "S" characteristic time at the start of deceleration	X	A	A	A	A
(SCrv Des @Start)					

Set value

0.0~2.50

※[0.20]

Function

The unit of S curve characteristic time is second.

32-04 "S" characteristic time at the end of deceleration	X	A	A	A	A
(SCrv Des @ Endt)					

Set value

0.0~2.50

※[0.00]

Function

The unit of S curve characteristic time is second.

5.3.3 Slip compensation: 33

33-01 Slip compensation gain	O	B	X	B	B
(Slip Comp Gain)					

Set value

0.0~2.50

※[1.0]

Function

For improving the speed accuracy of load running;

Selection description

1. Usually, it is unnecessary to set it;
2. Vector Control With PG is used as the temperature compensation gain of motor.

If the motor temperature is increased, the parameter slip inside motor will be increased. After the parameter is set, the corresponding temperature will be increased (converted into slip amount for adjustment).

Under the torque control or after the torque limit is set, when the torque is changed along with the temperature, please make adjustment (the set value is increased and the compensation is increased). If the slip compensation is set to be "1.0", please make compensation according to the torque output state and the set slip. Vector control with PG is served as motor temperature compensation gain.

Slip compensation function is to use output torque calculated on the basis of output current to compensate for the output frequency.

Slip compensation is used for occasion of improving the speed accuracy of load action, which is available under V/F Control Without PG.

If it is necessary to change the control mode, the factory-set value will be changed as follows.

If "V/f control without PG: 0.0" "Vector control without PG: 1.0" "Vector control with PG: 1.0" are set to be "1.0", the compensation will be based on rated torque output state and the set slip. Vector control with PG is served as motor temperature compensation gain and setting of 33-01[slip compensation gain: 33-01].

1. Please set the correct motor rated slip (52-02)/motor no-load current (52-03) and motor rated slip; it can be calculated on the basis of the numbers on the motor nameplate: Motor rated slip [Hz] = Motor rated frequency [Hz] - Rated rotate speed [r/min] x Motor pole number/120. For motor no-load current, please automatically set the rated slip after the rated voltage, rated frequency, vector control and Autotuning are set.

2. For slip compensation gain (33-01), please set it to be "1.0"; if it is set to be "0.0", the slip compensation will be unavailable.

3. Measure the slip compensation gain of speed adjustment under the load running; please make the adjustment taking 0.1 as unit.

If the speed is lower than the target value, please increase the slip compensation gain.

If the speed is higher than the target value, please reduce the slip compensation gain.

33-02 Slip compensation primary delay time	X	A	X	A	X
(Slip Comp Time)					

Set value

0~10000

※[200]

Function

The primary delay time parameter of slip compensation function is taking ms as unit.

Selection description

Usually, it is unnecessary to set the slip compensation; when the response of slip compensation is too low or the speed is unstable, please make adjustment.

It is used to make adjustment if the speed is not stable or if the Velocity response is slow.

If the Velocity response is slow: increase the set value

If the speed is not stable: decrease the set value

33-03 Slip compensation limit	X	A	X	A	X
(Slip Comp Limit)					

Set value

0~250

※[200]

Function

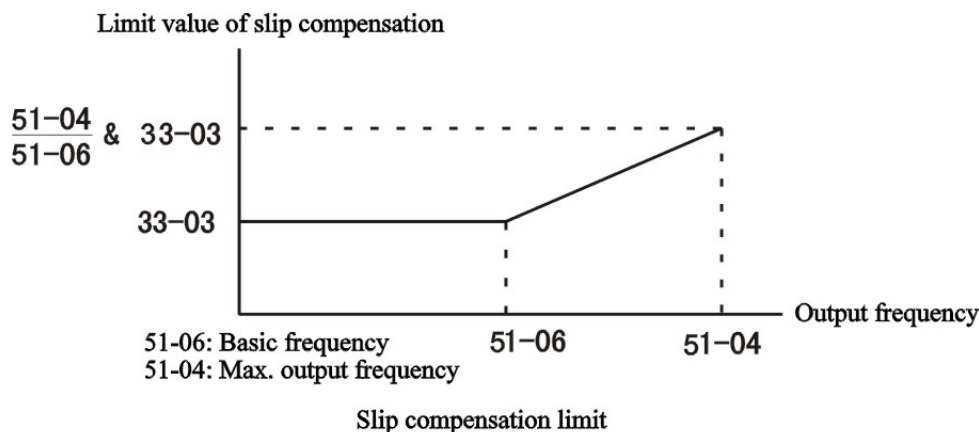
The compensation upper limit of slip compensation function is taking the motor rated slip as 100% and taking % as unit.

Selection description

Slip compensation limit is the limit for maximum compensation value of slip compensation, which is taking motor rated slip as 100% and taking % as unit.

If the speed is lower than the target value, even if the slip compensation gain is adjusted and the occasion is not changed, the slip compensation limit may be reached. If the limit value is increased, please confirm it. But for occasion that the reference frequency and slip compensation limit are enough, please make sure to set it within the permitted speed range of the machine.

Slip compensation limit in fields of Constant torque and fixed horse power are as follows:



33-04 Slip compensation in regeneration	X	A	X	A	X
(Slip Comp Regen)					

Set value

The slip compensation in regeneration motion is unavailable

※[0]

The slip compensation in regeneration motion is available

[1]

Function

Slip compensation selection in regeneration motion

Selection description

Description of set value

Please set the slip compensation function in regeneration motion to be available / unavailable.

When use this function, the regenerated energy will be increased at a moment; therefore, it should be controlled (by means of braking resistance, resistance brake modules).

33-05	Flux calculation method	X	X	X	A	X
	(Flux Select)					

Set value

Calculate according to the output frequency after slip compensation. ※[0]

Calculate according to the output frequency before slip compensation [1]

Function

Selection of calculation method for flux

33-06	Output voltage limit	X	X	X	A	
	(Output V Limit)					

Set value

Unavailable ※[0]

Available [1]

Function

Selection of output voltage limit action

Selection description

Output voltage limit action is unavailable; if the output voltage is under the saturation state and there is no change in the output current, but the torque accuracy cannot be guaranteed, for occasions that have torque accuracy requirement, please set the output voltage limit action to be available.

Output voltage limit action is available; the motor will automatically control the flux current; as the output voltage is limited, the torque accuracy is guaranteed.

Now, compared with occasions that the output voltage limit action is unavailable, the output current is increased by at most 10% (nominal load); therefore, please confirm the current surplus of inverter.

(Note)

1. Output voltage limit is only used for occasions with medium and low speed and the power voltage 10% higher than the motor rated voltage; for occasions given no consideration to the speed accuracy, the 33-06 shall not be changed.

2. For occasions that the power voltage is far lower than the motor rated voltage, even if the output voltage limit action is available, the speed accuracy still cannot be guaranteed.

5.3.4 Torque compensation: 34

34-01	Torque compensation gain	O	B	B	B	X
	(Torq Comp Gain)					

Set value

0.00~2.50 ※[1.00]

Function

Torque compensation gain is set as the rate;

Selection description

For compensation gain, it is not necessary to adjust it under flux vector control.

If the cable is too long: increase the set value;

If the motor power is less than the inverter power: increase the set value;

For motor vibration: reduce the set value;

For torque compensation gain, please make adjustment within the range that the output current at lower speed will not exceed the rated output current of inverter.

For occasions under vector control without PG, please do not make adjustment.

34-02 Torque compensation time delay	X	A	A	A	X
(Torq Comp Time)					

Set value

0~10000

※[20*]

Function

The primary delay of torque compensation function is taking ms as unit.

Selection description

Usually, it is unnecessary to adjust the time constant of torque compensation. For the following occasions, please make adjustment.

For motor vibration occasions: increase the set value.

For occasions with poor response: reduce the set value;

34-03 FWD starting torque	X	X	X	A	X
(RTorq Comp@Start)					

Set value

0.00~200.0

※[0.0]

Function

It is set taking motor rated torque as 100%.

34-04 REV starting torque	X	X	X	A	X
(F Torq Cmp@Start)					

Set value

-200.0~0.0

※[0.0]

Function

It is set taking motor rated torque as 100%.

34-05 Starting torque time	X	X	X	A	X
(Torq Comp Delay T)					

Set value

0~200

※[10]

Function

The increase time of starting torque is taking ms as unit.

Selection description

For occasion using this function, usually, the starting torque compensation is set by mechanical friction load. Travelling crane and lifter are set by the load carrying capacity.

Friction load: 34-03, 34-04 are set as friction.

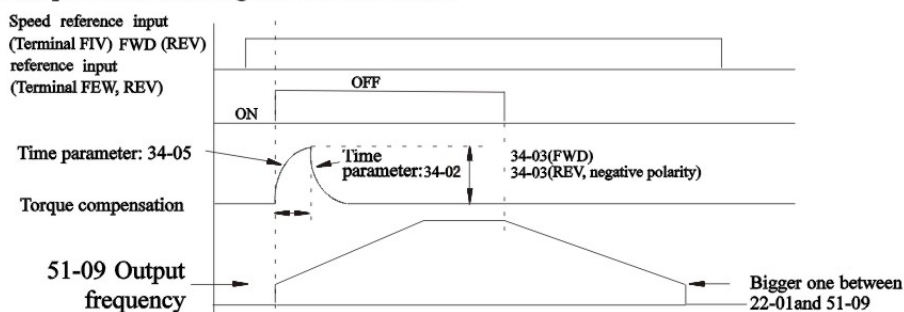
Lifter: only the electric (upward) side is set by load carrying capacity.

(For lifter with counterweight, as the impact caused by the regenerated load, please do not use this function.

FWD/REV can be set for electric side compensation. (The generated side cannot be set) For FWD/REV switch after speed search, the starting torque compensation is unavailable.

For No.2 motor, the starting torque compensation is unavailable.

For occasion of impact at start, please increase the starting torque compensation time parameter (34-05). If the DC brake at start (22-03) and braking reference of multi-functional contact input (Set value: 60) are used, please pre-establish a magnetic field for motor.



* The torque reference value of inverter will take the above torque compensation as the minimum limit.

Time sequence of starting torque compensation

5.3.5 Speed control (ASR):35

35-01	ASR proportional gain 1	O	x	B	x	B
	(Asr P Gain 1)					

Set value
0.00~300.00 ※[20.00*]

Function
Setting of the proportional gain of speed control circuit (ASR)

35-02	ASR integration time 1	O	x	B	x	B
	(Asr I Gain 1)					

Set value
0.000~10.000 ※[0.500*]

Function
The Integration time of speed control circuit (ASR) is taking second as unit.

Description of option

Please set the speed control (ASR), proportional gain (35-01) and integration time (35-02).

For occasion under V/f control with PG, please set gain parameters for the minimum output frequency and maximum output frequency.

Please set the speed control proportional gain (35-01) and Integration time (35-02) for the maximum output frequency.

35-03	ASR proportional gain 2	O	x	B	x	B
	(Asr P Gain 2)					

Set value
0.000~300.00 ※[20.00*]

Function
Setting to change the low-frequency (speed) gain

35-04	ASF integration time 2	O	x	B	x	B
	(Asr P Gain 2)					

Set value
0.000~10.00 ※[0.500*]

Function
Setting to change the low-frequency (speed) gain

Selection description

Please set the proportional gain (35-03) and integration time (35-03) for speed control (ASR) within low-speed range.

Please set the speed control proportional gain (35-03) and integration time (35-03) for maximum output frequency.

35-05	ASR speed control limit	X	X	A	X	X
	(Asr Limit)					

Set value
0.0~20.0 ※[5.0]

Function
The upper compensation frequency limit of speed control circuit is taking maximum output frequency as 100% and taking % as unit.

Selection description

35-05 parameter cannot be changed during running; if the inverter should be stopped at certain time, please reduce the set value by 0.5%. The speed control upper limit value and frequency compensation upper limit are taking % as unit (taking maximum output frequency as 100%).

If the limit value of compensation is too small, it may not reach the target speed; please confirm whether the target speed can be reached under normal running.

35-06	ASR delay time	X	X	X	A
(Asr Delay Time)					

Set value

0.000~0.500

※[0.004]

Function

The delay time parameter output from the speed control circuit torque is taking second as unit.

Selection description

Usually, it is not necessary to make adjustment;

For occasion that the motor vibration still cannot be eliminated after adjusting gain, it is used for occasions that response is decreased due to elimination; the rigidity of mechanical system is reduced.

Increase in set value may reduce the response of speed control and suppress the vibration.

35-07	ASR gain switching frequency	X	X	X	X	A
(ASR Gain SW Freq)						

Set value

0.0~400.0

※[0.0]

Function

Proportional gain 1.2, integration time 1.2 and the switching frequency are taking Hz as unit.

Selection description

Please set the switching frequency (35-07) for proportional gain/integration time of speed control (ASR).

35-08	ASR integration limit	X	X	X	X	A
(ASR I Limit)						

Set value

0~400.0

[400]

Function

The integration value upper limit of speed control circuit is taking rated load as 100% and taking % as unit.

5.3.6 Carrier frequency: 36

36-01 The upper limit of carrier frequency	X	B	B	B	B
(Carrier Freq Max)					

Set value

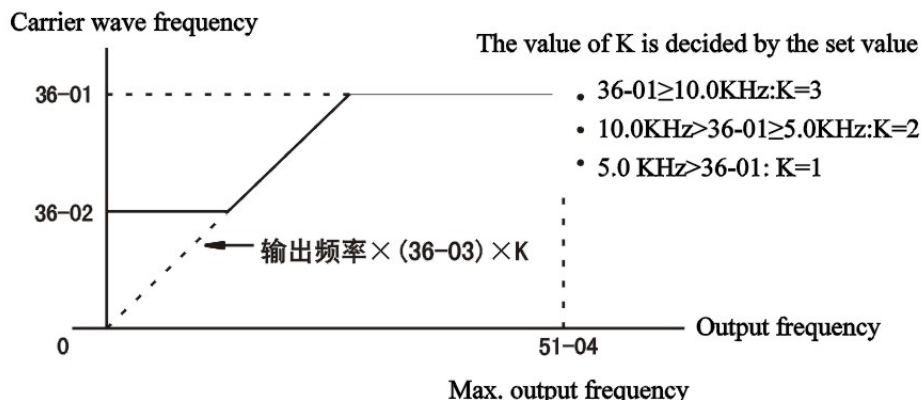
2.0~15.0*2

※[12.5]

Function

The upper limit of carrier frequency is taking Hz as unit; the carrier frequency gain is shown as the figure below.

For vector control mode, the carrier is decided by the parameter 36-01 (upper limit).



Selection description

According to the control mode, the carrier frequency has following different characteristics.

V/F control without PG, V/F control with PG: vector control without PG and vector control with PG of variable carrier can be set: usually, it is unnecessary to adjust the carrier (only the upper limit of carrier frequency is set); for the following occasions, please make adjustment.

For occasion that the wiring distance between inverter and motor is too long, please reduce the carrier frequency.

Wiring distance	Below 50m	Below 100m	Above 100m
Carrier	Below 15KHz	10KHz	Below 5KHz

For occasion of low speed and great torque vibration, please reduce the carrier.

*1. Change the control mode. The setting range is shown as follows:

V/f control (without PG/ with PG): 0.4~15.0

Vector control (without PG/ with PG): 2.0~15.0

*2. The factory-set value will be different because of the different power and size of inverter; the vector control mode and carrier frequency are fixed by 36-01 (upper limit of carrier frequency). V/f control mode (without PG, with PG) is decided by lower limit of carrier frequency (36-02), proportional gain of carrier frequency (36-03) and the variable carrier frequency of the corresponding output frequency.

If the carrier frequencies for occasions 36-01 and 36-02 are the same, please set the carrier frequency proportional gain (36-03) to be "0"; the carrier frequency is fixed at the upper limit value. The following setting is an error. (OPE11: data setting fault)

Occasion that the upper limit of carrier frequency (36-01) > 5.0 KHz and the lower limit of carrier frequency ≤ 5.0 KHz;

Occasion that the proportional gain of carrier frequency > 6 and (36-01) < (36-02);

For occasions that the lower limit value is bigger than the upper limit value, the lower limit value will be regarded as unavailable; the carrier frequency is fixed at the upper limit value.

5.3.7 Hunting prevention function: 37

37-01	Hunting prevention selection	X	X	X	X	A
(Hunt Prev Select)						

Set value

Hunting prevention function is unavailable [0]

Hunting prevention function is available ※[1]

Function

Hunting prevention function is to suppress the motor hunting for light load and the special function for V/f control mode.

For occasions that the quick response is prior to the suppressing vibration, please set the hunting prevention function to be unavailable.

37-02	Hunting prevention gain	X	X	X	X	A
(Hunt Prev Select)						

Set value

0.00~2.50 ※[1.00]

Function

Setting of the hunting prevention gain rate;

Selection description

For occasion that vibration is generated by light load, please increase the set value of 37-02.

If the vibration is too serious, the current will be suppressed, thus form a stall state.

For occasions that that quick response is priority to suppressing vibration, please set the hunting prevention function to be unavailable (37-01) = "0"

5.3.8 Parameters for factory adjustment: 38

38-08	AFR gain	X	X	X	A	X
(AFR Gain)						

Set value

0.00~10.0 ※[1.00]

Function

The control gain detected by internal speed feedback is set by rate.

Selection description

Usually, it is unnecessary to make adjustment;

When the motor rotating is unstable and the response of torque and speed is slow, please make following micro-adjustments.

For hunting occasions, please increase the set value; confirm the response, meanwhile increase the value by 0.05 for each time.

For slow response occasions, please decrease the set value; confirm the response, meanwhile decrease the value by 0.05 for each time.

38-09	AFR time	X	X	X	A	X
(AFR Time)						

Set value

0~2000 ※[50]

Function

The control gain detected by internal speed feedback is set by the rate.

38-10	Carrier frequency selection	X	X	X	A	A
(Carrier in tune)						

Set value

Carrier frequency 2 KHz [0]

Carrier frequency is the higher set value of parameter (36-01) [1]

Carrier frequency 5kHz (400V class 185~300KW inverter is 2.5 Hz) ※[2]

Function

The control gain detected by internal speed feedback is set by the rate.

5.4 Parameters for Reference Relationship (4)

5.4.1 Frequency reference: 41

41-01 Frequency reference 1	X	Q	Q	Q	Q
(Reference 1)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference

41-02 Frequency reference 2	O	Q	Q	Q	Q
(Reference 2)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 1" is ON.

41-03 Frequency reference 3	O	Q	Q	Q	Q
(Reference 3)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 2" is ON.

41-04 Frequency reference 4	O	Q	Q	Q	Q
(Reference 4)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 1, 2" is ON.

41-05 Frequency reference 5	O	B	B	B	B
(Reference 5)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 3" is ON.

41-06 Frequency reference 6	B	B	B	B	
(Reference 6)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 1, 3" is ON.

41-07 Frequency reference 7	O	B	B	B	B
(Reference 7)					

Set value
0~400.00 ※[0.00]
Function
Frequency reference when the frequency multi-functional input "multi-section reference 2, 3" is ON.

41-08 Frequency reference 8	O	B	B	B	B
(Reference 8)					

Set value

0~400.00

※[0.00]

Function

Frequency reference when the frequency multi-functional input "multi-section reference 1, 2, 3" is ON.

41-09 Frequency reference 9	O	B	B	B	B
(Reference 9)					

Set value

0~400.00

※[0.00]

Function

Frequency reference when the frequency multi-functional input "jog frequencyselection" is ON;

Selection description

The unit of set value of frequency reference is in line with the set unit of o1-03 (frequency reference setting/display unit). The initial value and set value of frequency reference will be changed along with the changes of o1-03.

For example: if the frequency reference 1 is set to be 6.00Hz, when the o1-03 is set to be "1" (0.01% unit), the set value of frequency reference 1 will be 10.00%. For occasions that frequency reference 2-8 is used, please set the multi-sectional reference 1-3 for the multi-functional input (T1-01-T1-06). For occasions that use jog frequency (41-09), please set jog frequency for multi-functional input (T1-01~T1-06).

5.4.2 Upper and lower limit of frequency: 42

42-01 Upper limit of frequency reference	X	B	B	B	B
(Ref Upper Limiet)					

Set value

0-110.0

※[100.0]

Function

The upper limit value of output frequency is taking maximum output frequency as 100% and taking % as unit.

42-02 Lower limit of frequency reference	X	B	B	B	B
(Ref Lower Limiet)					

Set value

0-109.0

※[0.00]

Function

The lower limit value of output frequency is taking maximum output frequency as 100% and taking % as unit.

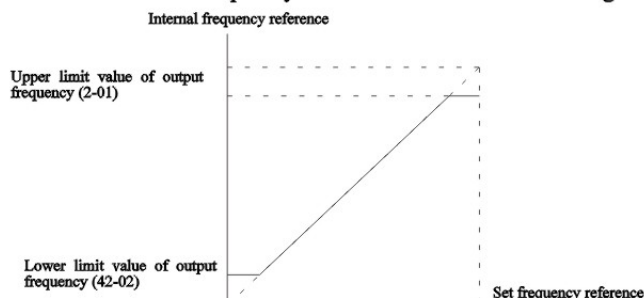
Selection description

It is the function to set the upper limit value and lower limit value of output frequency.

If the running reference is set when the frequency reference is zero, it will run according to the lower limit value of frequency reference (42-02). However, for occasions that the lower limit value is less than the minimum output frequency (51-09), it will not run.

The upper limit value and lower limit value of output frequency are taking maximum output frequency as 100% and taking % as unit.

The upper and lower limit value of frequency reference limit is shown as Figure below.



The upper and lower limit value of frequency reference limit

5.4.3 Setting of forbidden frequency: 43

43-01 Jump frequency 1	X	B	B	B	B
(Jump Freq 1)					

Set value
0.0~400.0 ※[0.0]

Function
Set the central value of frequency to be forbidden, taking Hz as unit.

43-02 Jump frequency 2	X	B	B	B	B
(Jump Freq 2)					

Set value
0.0~400.0 ※[0.0]

Function
Set the central value of frequency to be forbidden, taking Hz as unit.

43-03 Jump frequency 3	X	B	B	B	B
(Jump Freq 3)					

Set value
0.0~400.0 ※[0.0]

Function
Set the central value of frequency to be forbidden, taking Hz as unit.

43-04 Jump bandwidth	X	B	B	B	B
(Jump bandwidth)					

Set value
0.0~20.0 ※[1.0]

Function
Set the frequency range be forbidden, taking Hz as unit.
The forbidden range is set by (set forbidden frequency $\pm$ 43-04).

Selection description

There are mechanical resonance frequency occasions within the output frequency range of inverter; please avoid the running function of this frequency.

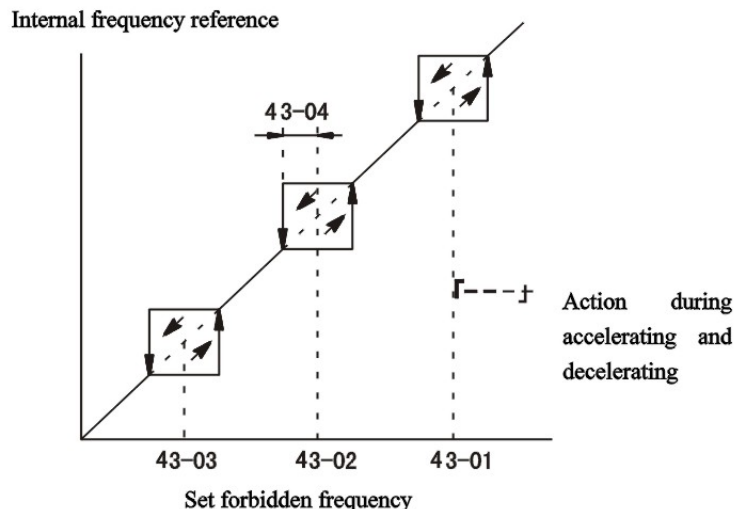
It is also available for setting the non-sensible zone of frequency reference.

If the forbidden frequency (43-01~03) is set to be 0.0Hz, the frequency jump function will not act. For 43-01~43-03, please set the central value of forbidden frequency; $43-03 \leq 43-02 \leq 43-01$.

For 43-04, please set the forbidden bandwidth [set forbidden frequency $\pm$ set width of forbidden frequency] as the range for setting forbidden frequency.

Within the range of set forbidden frequency, the running will be forbidden; while the accelerated one will not be stopped, instead it will change smoothly.

The relation between the internal frequency reference and the set frequency reference is shown as the figure below.



5.4.4 Frequency reference holding: 44

44-01 Frequency holding selection	X	A	A	A	A
(Ref Upper Limiet)					

Set value

Unavailable (the running is stopped; after the power is supplied, it will restart from 0Hz)

※[0]

Available (the running is stopped; the motor will run again with the held output frequency.)

[1]

Function

Set whether the held frequency reference should be recorded.

Selection description

44-01 is available when the multi-functional input (TI-01~T6-06) is set for the following occasions:

Maintain the accelerated and decelerated stop (Set value: A)

UP reference (set value: 10) and DOWN reference (set value: 11)

When these external signals are held, please set whether their output frequencies should be recorded.

For occasions that the holding function is set to be available, after the power is supplied, it will run according to the recorded frequency reference value again.

There is a detailed description about holding the accelerated & decelerated stop and UP/DOWN reference in [setting of multi-functional input: T1].

44-02 Reference + - limit	X	A	A	A	A
(Trim Control Lvl)					

Set value

1~100

※[25]

Function

Frequency is obtained through addition and subtraction for analog frequency reference; it is taking maximum output frequency as 100% and taking % as unit.

Selection description

For occasions that has been set + speed reference (set value: 1C) and -speed reference (set value: 1D) in multi-functional input (T1-01~ T1-06), the function is available.

When the frequency reference is input from the analog, if the +speed reference is ON, the analog frequency reference plus +speed limit (44-02) is the output frequency. If the -speed reference is ON, the analog frequency reference minus +speed limit (44-02) is the output frequency.

It is taking maximum output frequency as 100% and taking % as unit.

The negative speed reference is ON; the subtraction result is below zero; and the output frequency is zero.

For positive speed reference/negative speed reference, please see details in description of [setting of multi-functional input: T1].

5.4.5 Torque control: 45

45-01 Torque control selection	X	A	A	A	A
(Torq Control Sel)					

Set value

Speed control

※[0]

Torque control

[1]

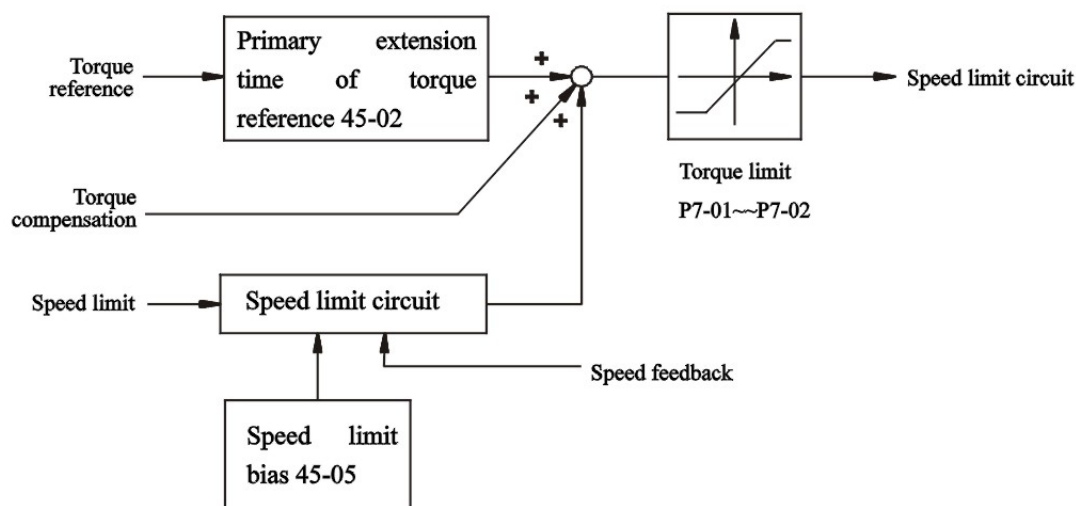
Function

Setting of torque control function

Selection description

For torque control, please set the parameter 45-01 to be "1".

The block diagram of torque control is shown as the Figure below.



Block diagram of torque control

When use speed control/torque control switch function, please set 45-0 to be "0" (speed control).

45-02 Torque reference delay time	X	X	X	X	A
(Torq Ref Filter)					

Set value

1~100

※[0]

Function

Primary delay time parameter of torque reference filter is taking ms as unit.

Selection description

The torque reference can adjust the time parameter of certain primary delay filter.

For torque reference signal, the noise elimination & adjustment and the response of upper limit controller are available.

The primary delay time parameter of torque reference filter is taking ms as unit.

Under the torque control, for vibration circumstance, please increase the set value.

45-03	Speed limit reference selection	X	X	X	X	A
	(Speed Limit Sel)					

Set value

The limit of analog frequency reference is input from the analog of (FIV or FIC terminals) ※[0]

The speed limit value is set by parameter (45-04) ※[1]

Function

Setting of speed limit reference method under torque control

Selection description

For occasion 45-03="1", the input voltage (T3-01) of frequency reference (voltage) terminal FIV is the speed limit value.

When the function of frequency reference (current) FIC terminal (T3-09) is selected to be "1F" (frequency reference), the terminal will become the speed limit input terminal. At this time, the sum of frequency reference (voltage) and frequency reference (current) will be the speed limit value.

The +- of speed limit signal and the direction of running reference are decided by the limit direction.

+Voltage input occasion: if the FWD reference is input, it will restrict the speed of FWD direction. The input REV- reference will restrict the speed of REV direction. Voltage input occasion: if the FWD reference is input, it will restrict the speed of REV direction. If the REV reference is input, it will restrict the speed of FWD direction.

For occasions whose direction is opposite to the speed limit, the zero speed will be the limit value. For example, if the+ voltage is input and the FWD reference is ON, the torque control range is from zero speed to FWD speed limit. For occasion that the speed limit bias (45-05) is set to be "0", please set it in accordance with the specification of input speed limit voltage.

45-04	Speed limit	X	X	X	X	A
	(Speed Lmt Value)					

Set value

-120~+120 ※[0]

Function

Speed limit of torque control is taking maximum output frequency as 100% and taking % as unit.

Selection description

For occasion 45-03= "1", it is taking maximum output frequency as 100% and taking % as unit.

The limit direction is decided by the +- of speed limit signal and the running reference direction.

When the set value is "+": if the FWD reference is input, it will restrict the FWD speed; if the REV reference is input, it will restrict the REV speed.

When the set value is "-": if the FWD reference is input, it will restrict the REV speed; if the REV reference is input, it will restrict the FWD speed.

For occasions whose direction is opposite to the speed limit, the zero speed will be the limit value.

For occasion that the speed limit value (45-05) is set to be "0" and "+" and the FWD reference is ON, the torque control range is from the zero speed to FWD speed limit value.

45-05	Speed limit bias	X	X	X	X	A
	(Speed Lmt Bias)					

Set value

0~120 ※[10]

Function

Speed limit bias is taking maximum output frequency as 100% and taking % as unit.

Selection description

Speed limit bias can adjust the speed limit allowance.

If the speed limit bias is used, the same speed limit value also can be set for FWD side/REV side.

The speed limit bias is taking maximum output frequency as 100% and taking % as unit.

[For example] FWD/REV sides are taking 50% of the maximum output frequency as the speed limit.

Setting of speed limit: zero (For example: 45-03= "2", 45-04= "0")

Setting of speed limit bias: 50 % (45-05= "50")

If the FWD side speed limit is set before the speed limit bias, the torque control range is as follows:

(Speed limit bias value)~ (speed limit value+speed limit bias value)

This means that, the range of speed limit value at FWD side plus the speed limit bias range at REV side will be the torque control range.

45-06	Speed switch time	X	X	X	X	A
(Ref Hold Time)						
Set value						
0~1000						※[0]
Function						
The time from start input (OFF-ON or ON-OFF) of multi-functional input "speed/torque control method switch" to the control switch is taking ms as unit.						
Selection description						
For multi-functional input (TI-01~TI-06), the speed/torque control method switch (Set value: 71) is available. The time from start input (OFF-ON or ON-OFF) of speed/torque control method switch to control switch is taking ms as unit.						
Within the set time of speed/torque control method switch, 3 changed analog inputs of speed / torque switch signal can be maintained; please prepare an external switch.						

5.5 Parameter of motor parameter (5)

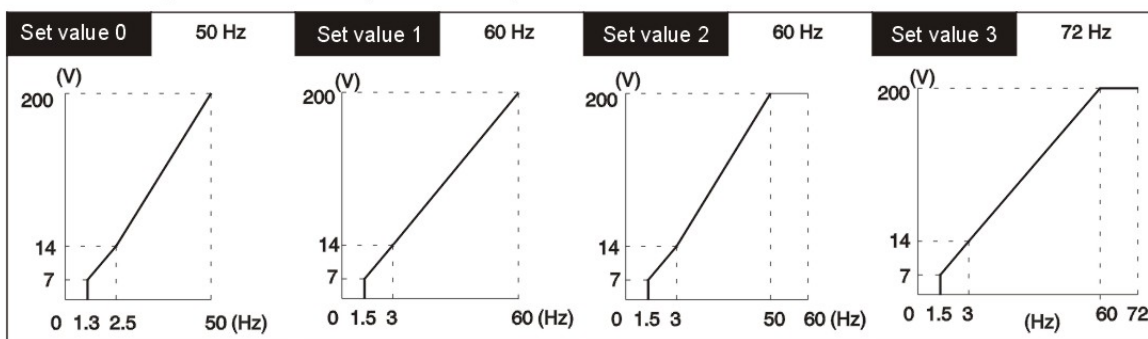
5.5.1 V/f characteristic: 51

51-01	Input voltage setting	X	Q	Q	Q	Q
(Input Voltage)						
Set value						
155~460VAC						※[400]
Function						
The input voltage of inverter is taking V as unit.						
Selection description						
Setting range and default value present the set value as 400V, which is the reference value of protection function.						
Please set the correct input voltage (51-01) in accordance with the power voltage.						
51-02	Motor selection	X	Q	Q	Q	Q
(Motor Selection)						
Set value						
Standard Motor (Universal Motor)						※[0]
Special motor (Special motor for inverter)						[1]
Special motor (Special motor for vector)						[2]
Function						
Motor selection (Motor overheating protection)						
Selection description						
For 51-02 (motor selection), please select the used motor type as the benchmark of motor overheating protection.						

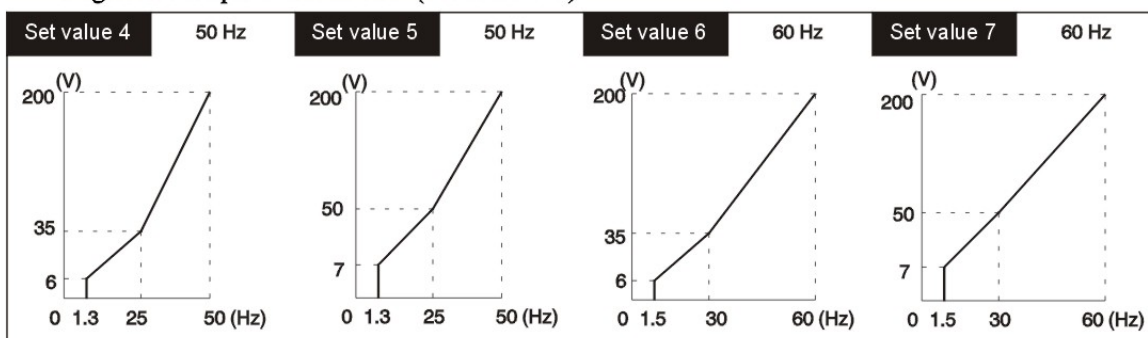
51-03	V/f curve selection	X	Q	Q	X	X
(Motor Selection)						
Set value						
15 kinds of fixed curve						[E~F]
Any V/F curve						※[F]
Function						
Set V/f curve						
Selection description						
Setting method of V/f curve generally can be divided into the following two major categories.						
Select one curve from the pre-set 15 kinds of curve (set value: 0~E).						
Set any V/f curve (set value: F).						
The Factory set value of 51-03 is "F" (any V/f curve); the content is the same as 51-03-1.						

2.2~45kW V/f Curve

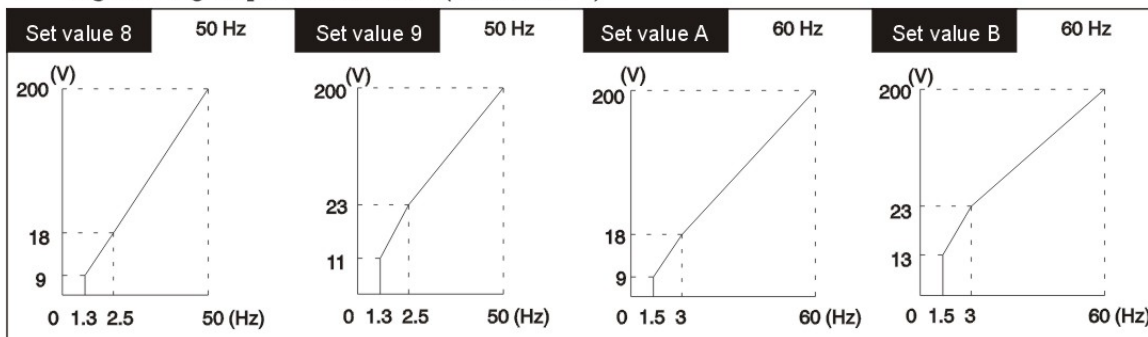
● Fixed torque characteristics (Set value 0~3)



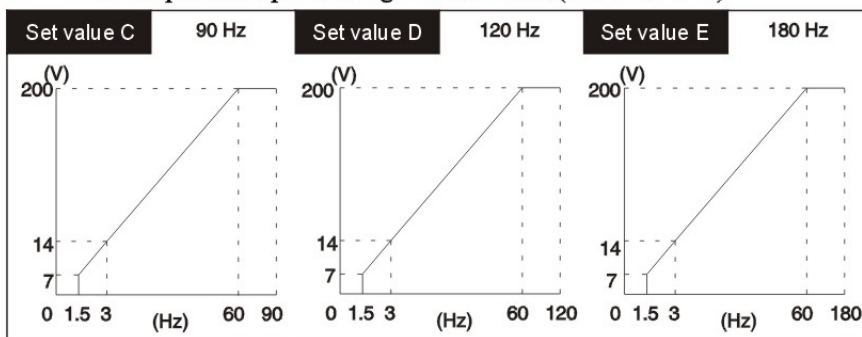
● Degressive torque characteristics (Set value 4~7)



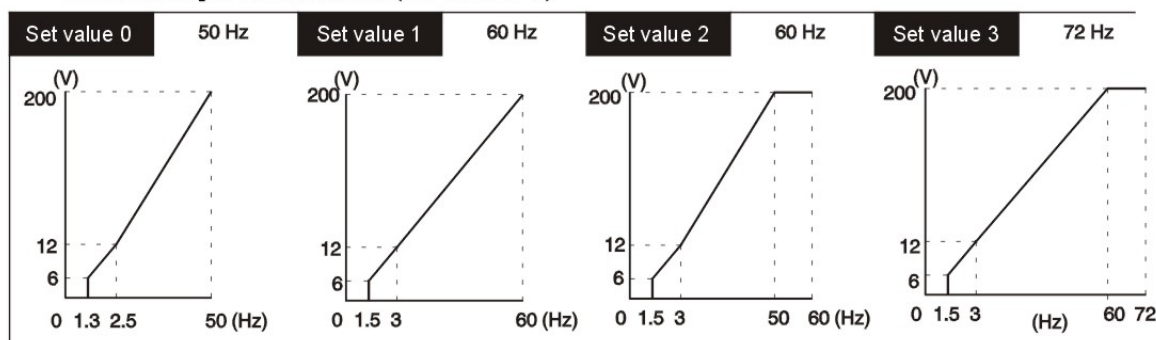
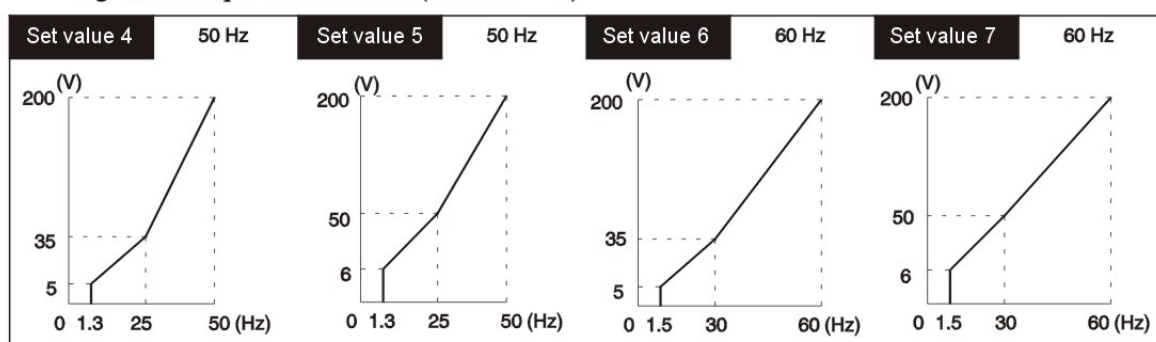
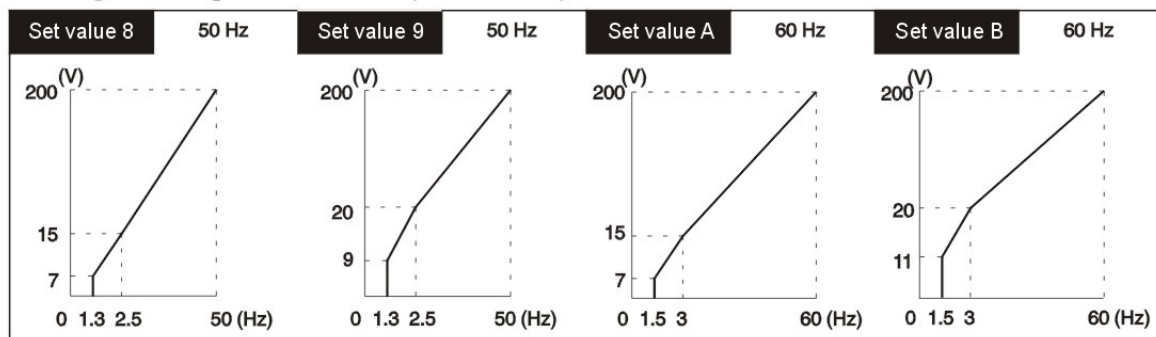
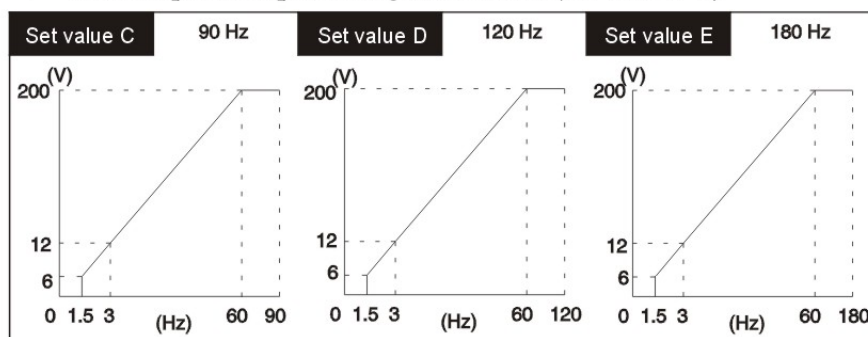
● High starting torque characteristics (Set value 8~b)



● Constant power output running characteristics (Set value C~E)



The curves mentioned above are suitable for 220 V grade, the voltage value $\times 2$ for 400V grade.

55~300kW V/f Curve
● Constant torque characteristics (Set value 0~3)

● Degressive torque characteristics (Set value 4~7)

● High start torque characteristics (Set value 8~b)

● Constant power output running characteristic (Set value C~E)


The curves mentioned above are suitable for 220 V grade, the voltage value $\times 2$ for 400V grade.

51-04 Maximum output frequency	X	Q	Q	Q	Q
(Max Frequency)					
Set value					
40.0~400.0					※[60.0]
Function					
Set V/f curve					
51-05 Maximum output voltage	X	Q	Q	Q	Q
(Max Frequency)					
Set value					
0.0~510.0					※[400]
Function					
Set V/f curve					
51-06 Base frequency (FA)	X	Q	Q	Q	Q
(Base Frequency)					
Set value					
40.0~400.0					※[60.0]
Function					
Set V/f curve					
51-07 Middle output frequency (FB)	X	Q	Q	A	X
(Mid Frequency A)					
Set value					
40.0~400.0					※[3.0]
Function					
Set V/f curve					
51-08 Middle output voltage (VC)	X	Q	Q	A	X
(Mid Voltage A)					
Set value					
0.0~510.0					※[22.0]
Function					
Set V/f curve					
51-09 Minimum output frequency (VC)	X	Q	Q	Q	A
(Min Frequency)					
Set value					
0.0~400.0					※[0.5]
Function					
Set V/f curve					
51-10 Minimum output voltage(VMIN)	X	Q	Q	Q	A
(Min Voltage)					
Set value					
0.0~510.0					※[4.0]
Function					
Set V/f curve					

51-11 Middle output frequency 2

X A A A A

(Min Frequency B)

Set value

0.0~400.0

※[0.0]

Function

The control mode of vector control with PG is only set for occasions that V/f curve should have micro-adjustment within the constant power output range; usually, it is unnecessary to set it.

51-13 Base Voltage

X A A Q Q

(Base Voltage)

Set value

0.0~510.0

※[0.0]

Function

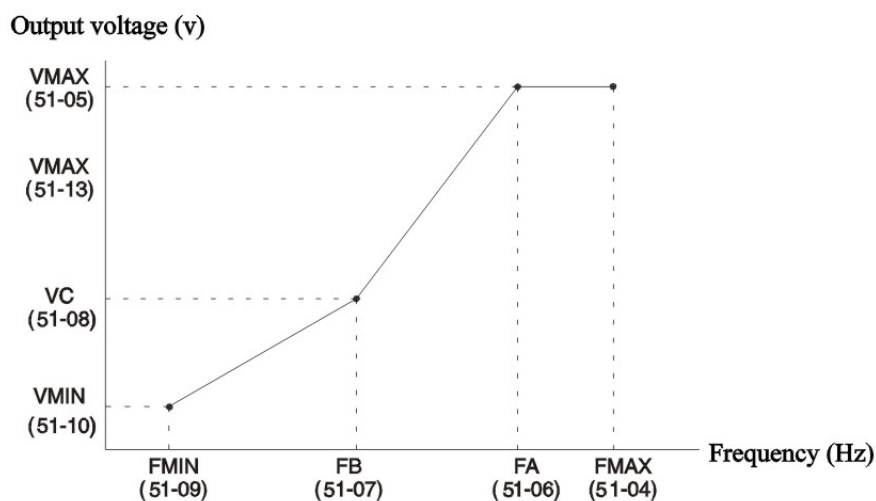
The control mode of vector control with PG is only set for occasions that V/f curve should have micro-adjustment within the constant power output range; usually, it is unnecessary to set it.

Selection description

For occasion that 51-03 = "F" is set, the 51-04~51-10 parameter can be set; settings other than "F" is only for reference.

For occasion that V/f curve is a straight line, please set the same value for 51-07 (middle output frequency) and 51-09 (minimum frequency), which has nothing to do with 51-08 (middle output voltage) at this time.

51-04(FMAX) ≥ 51-06 (FA) ≥ 51-07(FB) ≥ 51-09(FMIN)



An V/f curve

5.5.2 Motor parameter: 52

52-01	Motor rated current	X	Q	Q	Q	Q
	(Motor Rated FLA)					
Set value						
	Depending on the motor capacity					※
Function						
	Rated slip of motor is taking A as unit.					
Selection description						
	Please set it in accordance with the rated current of motor recorded on the motor nameplate.					
52-02	Motor rated slip	X	A	A	Q	Q
	(Motor Rated Slip)					
Set value						
	0.00~20.00					※
Function						
	Rated slip of motor is taking Hz as unit.					
Selection description						
	Set values before leaving factory are different depending on different inverter powers. The value in the table is from the 200V class 0.4 kW inverter.					
	Please use the value recorded on the motor nameplate to calculate the motor rated slip.					
	Motor rated slip = Motor rated frequency Hz-rated speed [r/min] × motor poles/120					
52-03	Motor no-load current	X	A	A	Q	Q
	(No-Load Current)					
Set value						
	Depending on the motor capacity					※
Function						
	Motor no-load current of is taking A as unit.					
Selection description						
	Set values before leaving factory are different depending on different inverter powers.					
	Please set the no-load current for occasion with rated voltage and rated frequency; usually, as it is not recorded on the motor nameplate, please consult to the motor manufacturer.					
52-04	Number of the poles of the motor	X	X	Q	X	Q
	(Number of Poles)					
Set value						
	2~48					※[4]
Function						
	Setting of number of the poles of the motor					
Selection description						
	Please set the number of poles of motor (pole number) recorded on the motor nameplate.					
52-05	Motor line-to-line resistance	X	A	A	A	A
	(Number of Poles)					
Set value						
	0.000~65.000					※[4]
Function						
	Interline impedance of motor is taking Ω as unit.					
Selection description						
	Line-to-line resistance is served as a reference value of motor's torque compensation function.					
	Set values before leaving factory will be different in accordance with different inverter powers.					
	Please set the interline impedance (U-V, V-W, W-U) of motor; as the motor nameplate has no record about it, please consult to the motor manufacturer.					

52-06	Motor leak inductance	X	X	X	A	A
	(Leak Inductance)					
Set value						
	0.0~40.0					※[0.5]
Function						
	The ratio of voltage drop caused by leakage reactance of motor to the rated voltage of motor is taking % as unit.					
Selection description						
	Set values before leaving factory will be different in accordance with different inverter powers. The value in the table is the value of 200V class 0.4KW inverter.					
	The ratio of voltage drop caused by leakage reactance of motor to the rated voltage of motor is taking % as unit.					
	Usually, it is unnecessary to set the automatic compensation of inverter in run. It only needs to be set when the leakage reactance of high-speed motor is relatively small.					
	As the motor nameplate has no record about leakage inductance, please consult to the motor manufacturer.					
	The loss caused by leakage inductance is also taking % as unit.					
52-07	Core saturation coefficient 1	X	X	X	A	A
	(Saturation Comp 1)					
Set value						
	0.00~0.50					※[0.50]
Function						
	Setting of core saturation coefficient when the magnetic flux is 50%;					
52-08	Core saturation coefficient 2	X	X	X	A	A
	(Saturation Comp 2)					
Set value						
	0.00~0.75					※[0.75]
Function						
	Setting of core saturation coefficient when the magnetic flux is 75%;					
Selection description						
	If the motor is used within rated frequency, it is unnecessary to set these parameters.					
	If the motor will be used within frequency range higher than the rated frequency, please set the following values (for constant power output control).					
	Core saturation coefficient 1: the core saturation coefficient when the magnetic flux is 50%.					
	Core saturation coefficient 2: the core saturation coefficient when the magnetic flux is 75%.					
	As the motor nameplate has no information about it, please consult to the motor manufacturer; it is also available to set in accordance with the initial setting.					
52-09	Mechanical loss of the motor	X	X	X	X	A
	(Mechanical Loss)					
Set value						
	0.0~10.0					※[0.0]
Function						
	The mechanical loss of motor is taking rated output power (W) of motor as 100% and taking % as unit.					
Selection description						
	Usually, it is unnecessary to make adjustment; please make adjustment for the following occasions;					
	For occasions that the torque loss of motor for fans and pumps caused by the bearing is relatively greater, it is taking motor's rated output power as 100% and taking % as unit. The set mechanical loss is compensated by the torque.					

54-05 Middle output voltage

X A A A A

(V/F2 Mid Voltage)

Set value

0.0~255.0

※[11.0]

Function

Set V/f curve

Selection description

For occasion that 51-03 = "F", 51-04~51-10 parameters can be set; settings other than "F" are only for reference.

For occasion that V/f is a straight line, please set the same value for 51-07 (middle output frequency) and 51-089 (minimum frequency); at this time, it has nothing to do with 51-08 (middle output voltage).

54-06 Minimum Output frequency

X A A A A

(V/F2 Mid Freq)

Set value

0.0~400.0

※[0.5]

Function

Set V/f curve

Selection description

For occasion that 51-03 = "F", 51-04~51-10 parameters can be set; settings other than "F" are only for reference.

For occasion that V/f is a straight line, please set the same value for 51-07 (middle output frequency) and 51-089 (minimum frequency); at this time, it has nothing to do with 51-08 (middle output voltage).

54-07 Minimum output voltage

X A A A X

(V/f2 Mid Voltage)

Set value

0.0~255.0

※[2.0]

Function

Set V/f curve

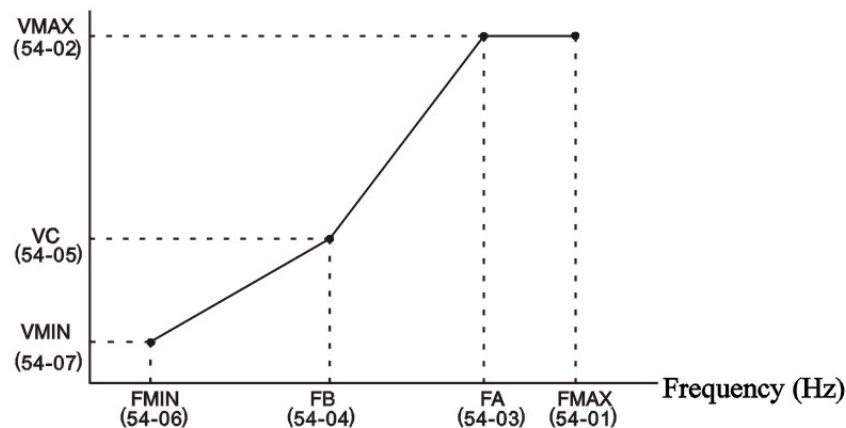
Selection description

For occasion that 51-03 = "F", 51-04~51-10 parameters can be set; settings other than "F" are only for reference.

For occasion that V/f is a straight line, please set the same value for 51-07 (middle output frequency) and 51-09 (minimum frequency); at this time, it has nothing to do with 51-08 (middle output voltage).

54-01(FMAX)≥54-03(FA)≥54-04(FB)≥54-06(FMIN)

Output voltage (v)



Any V/f curve

5.5.5 Parameters of motor 2: 55

55-01	Motor rated current	X	A	A	A	A
	(Motor 2 rated FLA)					

Set value

Depending on the different motor capacity

※

Function

Rated current of motor is taking A as unit.

Selection description

Setting range is the 10~200% of the rated current of inverter; factory-set value will be different in accordance with the inverter power; the value displayed is the value of 200V class 0.4 kW inverter.

Please set according to the rated current recorded on the motor nameplate.

55-02	Motor rated slip	X	A	A	A	A
	(Motor 2 Llip Freq)					

Set value

0.00~20.00

※[2.9]

Function

Motor rated slip is taking Hz as unit.

Selection description

Set values before leaving factory will be different in accordance with the different inverter powers; the value displayed is the value of 200V class 0.4 kW inverter.

Calculate and set the motor rated slip based on the value recorded on the motor nameplate.

Motor rated slip=motor rated frequency-rated speed × motor poles/120

55-03	Motor no-load current	X	A	A	A	A
	(Motor 2 No-Load 1)					

Set value

Depending on the different motor capacity

※

Function

The motor no-load current is taking A as unit.

Set values before leaving factory will be different in accordance with the different inverter powers.

Please set the no-load current for rated voltage and rated frequency; as there is no information recorded on the motor nameplate, please consult to the motor manufacturer.

55-04	Number of poles of motor	X	X	A	X	A
	(Motor 2# Poles)					

Set value

2~48

※[4]

Function

Setting of motor poles;

Selection description

Please set the motor poles (pole number) recorded on the motor nameplate.

55-05	Motor line-to-line resistance	X	A	A	A	A
	(Motor 2 Ohms)					
Set value						
	0.000~65.000					※[9.842]
Function						
	Motor line-to-line resistance is taking Ω as unit.					
Selection description						
	Set values before leaving factory will be different in accordance with the different inverter powers; the displayed value is the value of 200V class 0.4kW inverter.					
	Please set the motor line-to-line resistance (U-V, V-W, W-U).					
	As there is no information about line-to-line resistance recorded on the motor nameplate, please consult to the motor manufacturer. Calculate and set it according to the following formula based on the line-to-line resistance in the test report.					
	E insulation: line-to-line resistance value (Ω) under 75 °C in the test report $\times 0.92(\Omega)$					
	B insulation: line-to-line resistance value (Ω) under 75 °C in the test report $\times 0.92(\Omega)$					
	F insulation: line-to-line resistance value (Ω) under 115 °C in the test report $\times 0.87(\Omega)$					

55-06	Motor leakage inductance	X	X	X	A	A
	(Motor 2 Leak)					
Set value						
	0.0~40.0					※[18.2]
Function						
	The ratio of voltage drop caused by leakage inductance of motor to the rated voltage of motor is taking % as unit.					
Selection description						
	Set values before leaving factory will be different in accordance with the different inverter powers.					
	The % ratio of voltage drop caused by leakage reactance of motor to the rated voltage of motor is the set value.					
	Usually, the inverter in run will be automatically compensated; thus, it is unnecessary to set it.					
	As there is no information about motor leakage inductance recorded on the motor nameplate, please consult to the motor manufacturer; the loss caused by the leakage inductance is also showed in the form of % value.					

5.6 Parameter of interface card (6)

5.6.1 PG speed control card: 61

61-01	PG pulse number	X	X	Q	X	Q
	(PG Pulse/Rev)					
Set value						
	0~60000					※[600]
Function						
	Setting of encoder pulse for PG pulse generator					
Description						
	Please set the PG (pulse generator/encoder) pulse by P/r.					
	Please set the pulse for corresponding phase A or B after the motor is rotating for a circle.					
61-02	PG open-circuit running mode	X	X	B	X	B
	(PG Fdbk Loss Sel)					
Set value						
	Decelerated stop					[0]
	Free Stop					※[1]
	Emergent stop					[2]
	Continue to run					[3]
Function						
	Adopt the stop method when the PG open is detected (PGO)					
	Selection time					
	Please select the detection time of PG open (PGO) and the stop method when the PGO is detected.					

61-03 Overspeed running mode	X	X	B	X	B
(PG Overspeed Sel)					

Set value

Decelerated stop

[0]

Free Stop

※[1]

Emergent stop

[2]

Continue to run

[3]

Function

Set the stop method for over speed (OS);

Selection description

If the motor speed surpasses the above provisions, it will be detected as fault.

Please set the detection method (level/time) for over speed and stop method.

61-04 Excessive speed difference mode	X	X	B	X	B
(PG Devationd Sel)					

Set value

Decelerated stop

[0]

Free Stop

[1]

Emergent stop

[2]

Continue to run

※[3]

Function

Set the stop method when speed difference is detected at (DEV);

Selection description

If the speed difference (difference of actual motor speed) is excessively large, it will be detected as fault.

Please set the speed variation detection method (level/time) and the stop method.

61-05 PG rotation direction	X	X	B	X	B
(PG Rotation Sels)					

Set value

A phase is ahead of B phase, when the motor is forward running.

※ [0]

B phase is ahead of A phase, when the motor is forward running.

[1]

Function

The motor's line-to-line resistance of PG rotation is taking Ω as unit.

Selection description

PG Tuning Direction is the parameter to match with the rotation direction of PG and motor.

Generally, for occasion of clockwise (cw) rotation of PG from the input shaft, the phase A is in ahead.

In addition, when the FWD reference is output, the motor is rotating counter-clockwise (ccw) from the output shaft.

For motor FWD occasions, please set whether the phase A or B of PG output is in ahead.

61-06 PG output frequency-dividing ratio	X	X	B	X	B
(PG Output Ratio)					

Set value

0~132

※ [1]

Function

Set the pulse output frequency-dividing ratio of PG speed control card;

Frequency-dividing ratio = $(1+n)/m$ ($n=0, 1 \sim 32$).

Selection description

PG signal canceling rate is only available when the PG control card is used.

For other connection occasion between pulse input device and pulse monitor output, please set the frequency-dividing ratio.

The frequency-dividing ratio of set value with the first digit as n and with the latter second digit as m is as follows: frequency-dividing ratio = $(1+n)/m$ [setting range] n: 0, 1 m: 1~32, 61-06 = $\frac{\square\square}{n\ m}$ Setting of frequency-dividing ratio can be $1/32 \leq F1-06 \leq 1$; for example, for occasion that the frequency-dividing ratio is 1/2 (set value2), the 1/2 of PG pulse will be served as the monitored output.

61-07	Integration in acceleration or deceleration	X	X	B	X	X
	(PG Ramp PI/ISel)					
Set value						
	Integration act is unavailable					※ [0]
	Integration act is available					[1]
Function						
	Set whether the integration action in the acceleration & deceleration is available or unavailable.					
	Selection description					
	Under the V/f control with PG, the integration action in acceleration & deceleration can be selected to be available or unavailable.					
	Even if under the acceleration & deceleration, if the motor speed frequency reference should be consistent, please set the "1" (the integration action is available). If possible, in order to avoid impact occasion, please set it to be "0" (the Integration action is unavailable).					
61-08	Overspeed detection value	X	X	A	X	A
	(PG Overspd level)					
Set value						
	0~120					※ [115]
Function						
	Set the detection method of overspeed (OS)					
61-09	Overspeed detection time	X	X	A	X	A
	(PG Overspd Time)					
Set value						
	0.0~2.0					※[0.0]
Function						
	Set the detection method of overspeed (OS)					
	Selection description					
	For occasions that the frequency above the set value of 61-08 (taking maximum output frequency as 100% and taking % as unit) is lasted for time above 61-09 (detection time: second), the overspeed (OS) is detected.					
61-10	Speed deviation detection value	X	X	A	X	A
	(PG Deviate Level)					
Set value						
	0~50					※[1.0]
Function						
	Set detection method for excessive speed deviation (DEV)					
61-11	Speed deviation detection time	X	X	B	X	X
	(PG Deviate Time)					
Set value						
	0.0~10.0					※[0.5]
Function						
	Set detection method for excessive speed deviation (DEV)					
	Selection description					
	For occasions that the speed deviation above the set value of 61-10 (taking maximum output frequency as 100% and taking % as unit) is lasted for time above 61-11 (detection time: second), the excessive speed deviation (DEV) is detected.					
61-12	PG reduction gear teeth 1	X	X	A	X	X
	(PG# GearTeeth 1)					
Set value						
	0~1000					※[0]
Function						
	Setting of reduction gear teeth ratio of motor to PG					

61-13 PG reduction gear teeth 2	X	X	A	X	X
(PG# GearTeeth2)					
Set value					
0~1000					※[0]
Function					
Setting of reduction gear teeth ratio of motor to PG					
Selection description					
For occasion under V/f control with PG, it also can run after inserting a speed reduction puller between the motor and PG (encoder).					
For occasion that there is a speed reduction puller between the motor and PG, please set the gear teeth number of speed reduction puller.					
After setting the gear teeth number of speed reduction puller, calculate the motor speed inside the inverter in accordance with the following formula.					
Motor speed[r/min]					
= [(PG input pulse number × 60)/PG pulse number (F1-01)] × [gear teeth number of speed reduction puller 2(61-13) (gear teeth number of speed reduction puller at the load side)/ gear teeth number of speed reduction puller 1(61-12) (gear teeth number of speed reduction puller at the motor side)]					
For occasions that the 61-12 or 61-13 is set to be "0", it is the same action of gear teeth number of speed reduction puller 1 (61-12=1, 61-13=1).					

61-14 PG open-circuit-detection time	X	X	A	X	A
(PG open-cir-dettion time)					
Set value					
0.0~10.0					※[2.0]
Function					
The detection time for PG open is taking second as unit.					

5.7 Parameter of control circuit terminal (T)

5.7.1 Multi-functional input: T1

T1-01 Terminal EF function selection	X	B	B	B	B
(Terminal 3 Sel)					
Set value					
0~77					※[24]
Function					
Multi-functional input 1: Function selection of terminal EF.					
Selection description					
Refer to the following descriptions					

T1-02 Terminal RST function selection	X	B	B	B	B
(Terminal 4 Sel)					
Set value					
0~77					※[14]
Function					
Multi-functional input 2: Function selection of terminal RST.					
Selection description					
Refer to the following descriptions					

T1-03	Terminal MS1 function selection	X	B	B	B	B
	(Terminal Msl Sel)					
Set value						
0~77						※[3]
Function						
	Multi-functional input 3: Function selection of terminal MS1.					
Selection description						
	Refer to the following descriptions					
T1-04	Terminal MS2 function selection	X	B	B	B	B
	(Terminal Ms2 Sel)					
Set value						
0~77						※[4]
Function						
	Multi-functional input 4: Function selection of terminal MS2.					
Selection description						
	Refer to the following descriptions					
T1-05	Terminal JOG function selection	X	B	B	B	B
	(Terminal Jog Sel)					
Set value						
0~77						※[6]
Function						
	Multi-functional input 5: Function selection of terminal JOG.					
Selection description						
	Refer to the following descriptions					
T1-06	Terminal BX function selection	X	B	B	B	B
	(Terminal bx Sel)					
Set value						
0~77						※[8]
Function						
	Multi-functional input 6: Function selection of terminal BX.					
Selection description						
	Refer to the following descriptions					

Function of control circuit terminal: T

Setting and content of the function of control circuit terminal

5.7.1 Setting of multi-functional input: T1

Setting and content of multi-functional input are shown as follows:

List of multifunction input

Set Value	Function	Control Method			
		V/F Without PG	V/F With PG	Vector Without PG	Vector With PG
0	3-wire control method (FWD/REV reference)	○	○	○	○
1	Selection (ON: operator, OFF: parameter setting)	○	○	○	○
2	Optional card / Inverter switch (ON, optional card)	○	○	○	○
3	Multi-sectional speed reference 1 For T3-05=0, the function is available for □master/slave speed switch□	○	○	○	○
4	Multi-sectional speed reference 2	○	○	○	○
5	Multi-sectional speed reference 3	○	○	○	○
6	JOG frequency selection (prior to the multi-sectional speed)	○	○	○	○
7	Accelerating time selection 1	○	○	○	○
8	External B.B NO(Connection a: the base is blocked for ON)	○	○	○	○
9	External B.B NC(Connection b: the base is blocked for OFF)	○	○	○	○
A	Holding Accel/dec el stop (ON: stop acceleration & deceleration, holding frequency)	○	○	○	○
B	Inverter overheating pre-alarm OH2 (ON: OH2)	○	○	○	○
C	Multi-functional analog output selection (ON: multi-functional input is available)	○	○	○	○
D	V/F control with PG without speed (ON: speed feedback control is unavailable (normal V/f control)	×	○	×	×
E	Reset of speed control integration (ON: Integration control is unavailable)	×	○	×	
F	Not used (Please do not set it)	-	-	-	-
10	UP reference (Set it together with DOWN)	○	○	○	○
11	Down reference (Set it together with UP)	○	○	○	○
12	FJOG(ON: Forward run of jog frequency 41-09)	○	○	○	○
13	RJOG(ON: Reverse run of jog frequency 41-09)	○	○	○	○
14	Fault reset (ON: rising delay reset)	○	○	○	○
15	Emergent stop (Connection a ON: Emergent stop time 31-09 Decelerated stop)	○	○	○	○
16	Motor switch reference(selection of 2 motor)	○	○	○	○
17	Emergent stop (Connection b OFF: Decelerated stop at the emergent stop time 31-09)	○	○	○	○
18	Timer function input (Set the 24-01, 24-02 function together with the timer function)	○	○	○	○
19	Cancel the PID control (ON: PID control is unavailable)	○	○	○	○
1A	Accel/dec el time selection 2	○	○	○	○
1B	Parameter writing permission (ON: parameter writing permission; OFF: except for frequency monitoring, the parameter writing is forbidden)	○	○	○	○
1C	+SPEED reference (ON: 44-02 frequency plus the analog reference)	○	○	○	○
1D	- SPEED reference (ON: 44-02 frequency minus the analog reference)	○	○	○	○
1E	Sampling/maintaining of analog frequency reference	○	○	○	○
1F	Selection of frequency reference terminal FIV/FIC (ON: select terminal FIC) It is available, when the * T3-09=1F	○	○	○	○
20-2F	External fault (set arbitrarily) Input mode connection a/connection b: detection method: under normal state/In run Stop method: decelerated stop/free slip/Emergent stop/Continue to run	○	○	○	○
30	PID control integration reset (ON: Integration reset)	○	○	○	○
31	PID control integration holding (ON: Integration holding)	○	○	○	○
60	DC brake reference (ON DC brake action)	○	○	○	○
61	External speed search reference 1: maximum output frequency(ON: speed search)	○	×	○	×
62	External speed search reference 2: frequency setting (ON: speed search)	○	×	○	×
63	Energy-saving reference(ON: controlled by 28-01,28-02 energy-saving setting)	○	○	×	×
64	External speed search reference 3 (obtained from signals in the VS-656DC3 action)	○	○	○	○
65	KEB decelerating run reference at transient pause (Connection point b)	○	○	○	○
66	KEB decelerating run reference at transient pause (Connection point a)	○	○	○	○
71	Speed control/ torque control switch (ON: Torque control)	×	×	×	○
72	Zero servo reference (ON: Zero servo)	×	×	×	○
77	Speed control proportional gain switch (ASR) (ON:35-03 OFF:35-01, 35-03, 35-07 decide the gain)	×	×	×	○

- The numerical value in the Factory set value () is the initial value of three-wire system.
- There are setting and reference section for some common sections in the table below.

Function	Set value	Reference section
3-wire system (FWD/REV reference)	0	6.1.8
Multi-sectional reference1-3/ jog frequency selection	3~6	6.1.8
Accelerating & decelerating time selection 1,2	7, 1A	6.1.8
Emergent stop	15	6.1.8
FJOG reference /RJOG reference	12, 13	6.1.8
Select a frequency reference FIV/FIC terminal	1F	6.1.8
Timer function input	18	7.5.1
Energy-saving reference	63	7.2.1,7.4.1

Panel/long-distance selection (Set value: 1)

OFF	Implement frequency reference (21-01) and running reference selection (21-02)
ON	Set frequency reference/running reference with the digital operator

- Switch input method of frequency reference/running reference;
- Switch is only available when the inverter is under stop state;
- Once this function is set up, the running method of digital operator will be unavailable.

Base block reference NO (Set value: 8)

OFF	Normal running
ON	Base block

Setting of multi-functional input: T1-01~T1-06

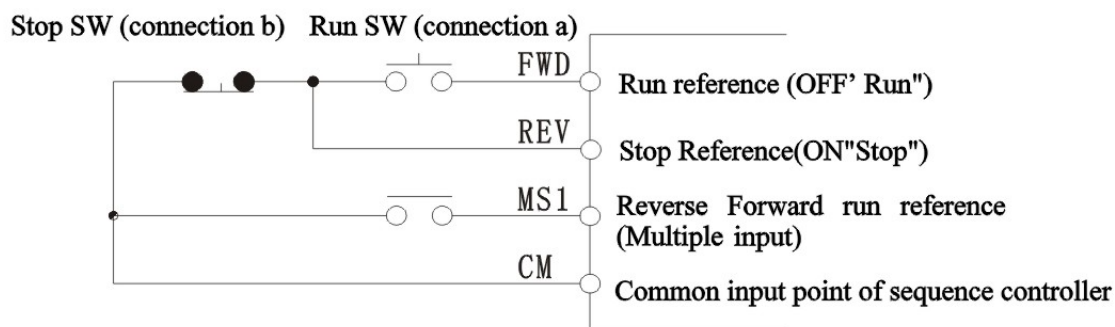
- For function selection of terminals EF, RST, MS1, MS2, JOG, BX, please cooperate with the running method of multi-functional input 1-6.

Parameter NO.	Name	Changes during running	Setting range	Unit	Factory set value	Access level			
						V/F without PG	V/F with PG	Vector without PG	Vector with PG
T1-01	Multi-functional input 1 (Function selection of terminal EF)	×	0~77	—	24	B	B	B	B
T1-02	Multi-functional input 2 (Function selection of terminal RST)	×	0~77	—	14	B	B	B	B
T1-03	Multi-functional input 3 (Function selection of terminal MS1)	×	0~77	—	3(0)	B	B	B	B
T1-04	Multi-functional input 4 (Function selection of terminal MS2)	×	0~77	—	4(3)	B	B	B	B
T1-05	Multi-functional input 5 (Function selection of terminal JOG)	×	0~77	—	6(4)	B	B	B	B
T1-06	Multi-functional input 6 (Function selection of terminal BX)	×	0~77	—	8(6)	B	B	B	B

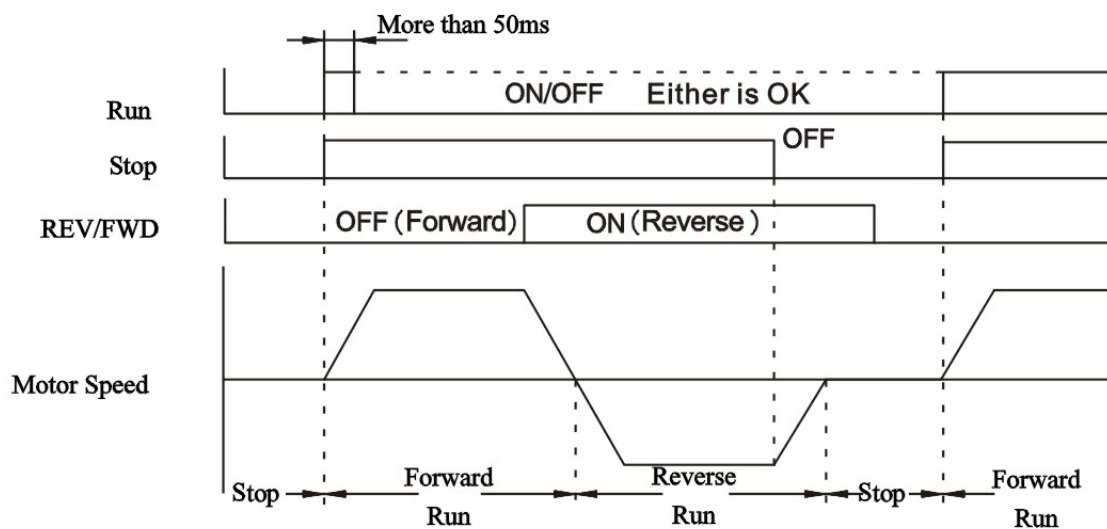
- The numerical value in the Factory set value () is the initial value of three-wire system.
- Here is the description about 6 common set values; for other set value, please refer to Chapter 7 [Application running] and the list of parameters.
- 3-wire system procedure (FWD/REV reference): set value 0
- Multi-sectional reference 1~3/jog frequency selection: set value 3~6
- Accelerating & decelerating time selection 1,2: set value 7, 1A
- Emergent stop: set value 15
- FJOG reference/RJOG reference: set value 12, 13
- Selection of frequency reference terminals FIV/FIC: set value 1F

■ **3-wire system procedure (FWD/REV reference): set value "0"**

- If anyone of the multi-functional input 1-6 (T1-01 ~ T1-06) is set to be "0", the 3-wire system procedure is established; the set multi-functional input terminal will become FWD/REV reference terminal.
- For occasions that the initial parameter (11-03) adopts the 3-wire system initialization, the multi-functional input 3 (Terminal MS1) will be the input terminals of FWD/REV reference.



Example of wiring of 3-wire system procedure



Sequence diagram of 3-wire system procedure

■ **Multi-sectional reference 1~3/jog frequency selection: set value "3" ~ "6"**

- Q9000 can use 8 frequency references and 1 jog frequency reference to realize at most 9-sectional speed.
- In order to switch among these frequency references, please set the multi-sectional reference 1~3 and jog frequency for the multi-functional input.

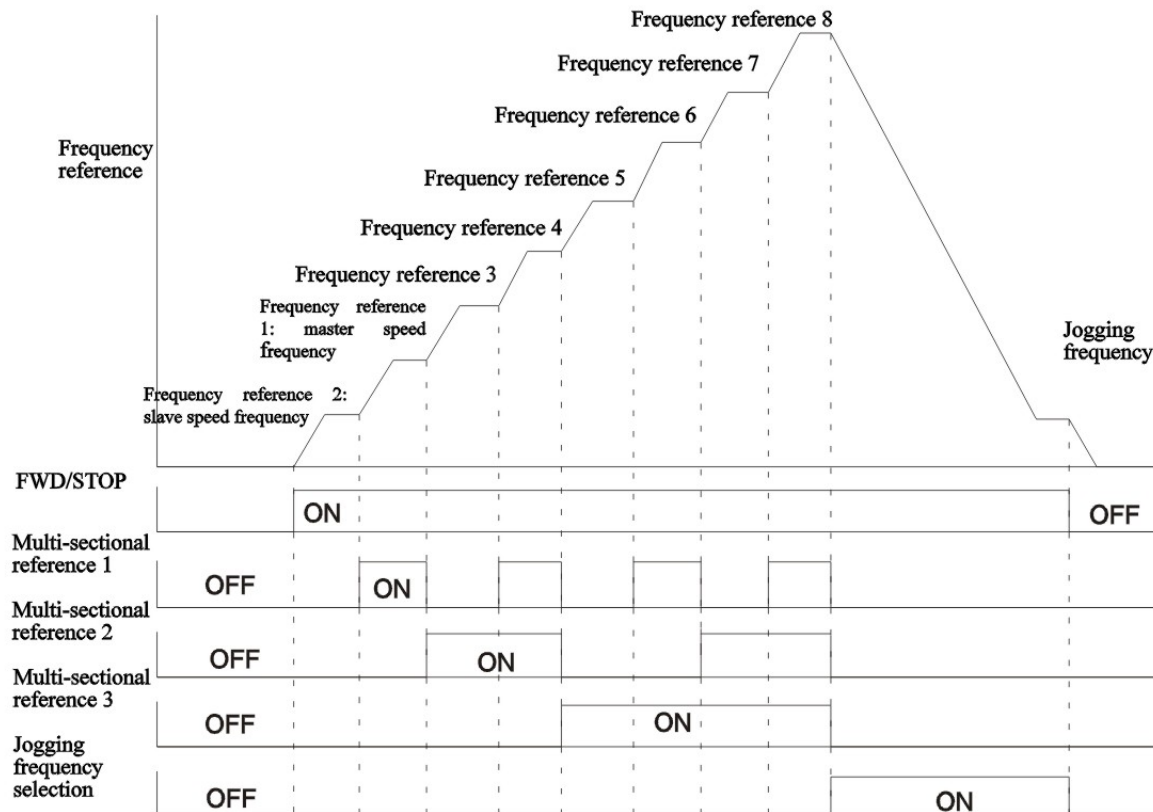
Terminal	Parameter No.	Set value	Content
MS1	T1-03	3	Multi-sectional reference 1 (used for switch of master/slave speed, besides setting the assisting frequency reference for the multi-sectional analog input H3-05,)
MS2	T1-04	4	Multi-sectional reference 2
JOG	T1-05	5	Multi-sectional reference 3
BX	T1-06	6	Jog(JOG) frequency selection (prior to the multi-sectional reference)

- Frequencies selected according to whether the multi-sectional reference 1~3 and jog frequency is ON/OFF are shown as follows.

Terminal MS1	Terminal MS2	Terminal JOG	Terminal BX	Master speed frequency
Multi-sectional reference 1	Multi-sectional reference 2	Multi-sectional reference 3	Jog frequency selection	
OFF	OFF	OFF	OFF	Frequency reference 1 41-01 Master speed frequency
ON	OFF	OFF	OFF	Frequency reference 2 41-02 Slave speed frequency
OFF	ON	OFF	OFF	Frequency reference 3 41-03
ON	ON	OFF	OFF	Frequency reference 4 41-04
OFF	OFF	ON	OFF	Frequency reference 5 41-05
ON	OFF	ON	OFF	Frequency reference 6 41-06
OFF	ON	ON	OFF	Frequency reference 7 41-07
ON	ON	ON	OFF	Frequency reference 8 41-08
-	-	-	ON	Jog frequency 41-09

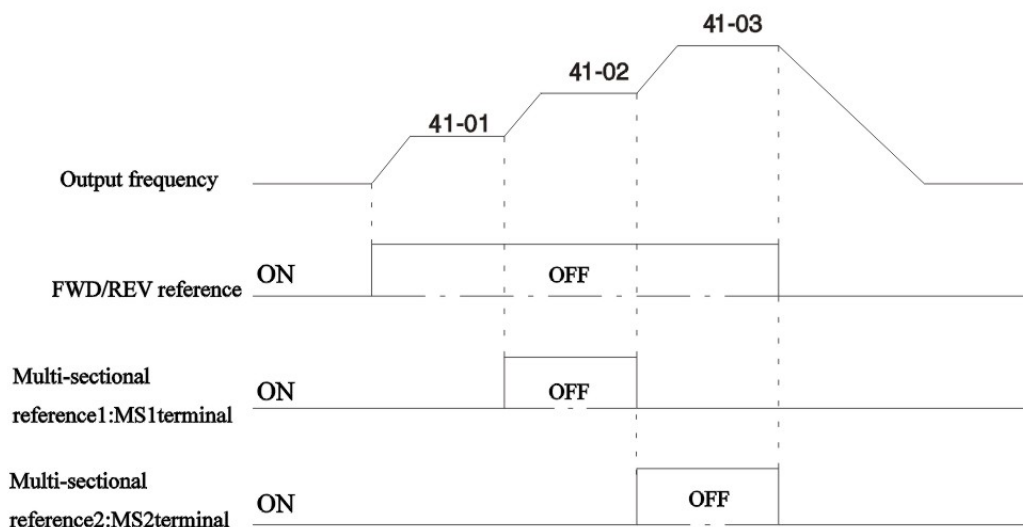
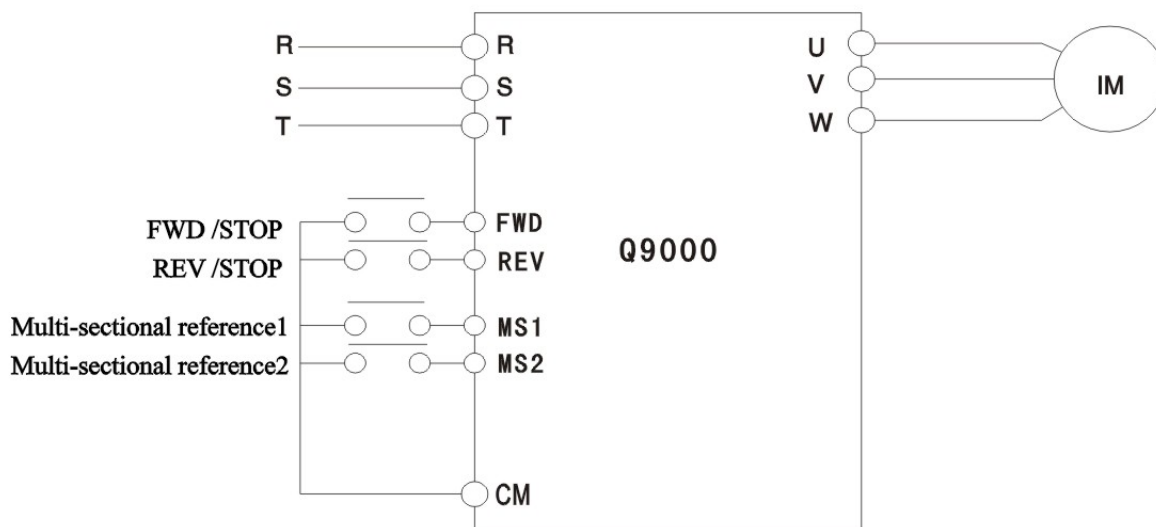
Selection method of frequency reference of [1-sectional speed] and [2-sectional speed]

- For occasions that use master speed frequency reference (analog terminal FIV or FIC), please set 21-01=1.
- For occasions that use frequency reference 1 (41-01), please set 21-01=0.
- For occasions that use slave frequency reference (analog terminal MFI), please use the initial value, without changes.
- For occasions that use frequency reference 2 (41-02), please set T3-05=1F.

**Sequence diagram of multi-sectional reference/jog frequency selection**

Example of 3-sectional speed running

The following is an example of 3-sectional running of frequency set by parameter inside the inverter.

Procedure**Wiring****Parameter setting**

Parameter No.	Name	Set value
11-01	Access level of parameter	3:BASIC(B)
21-01	Frequency reference	0: operator
41-01	Frequency reference 1	**Hz(frequency setting)
41-02	Frequency reference 2	**Hz(frequency setting)
41-03	Frequency reference 3	**Hz(frequency setting)
T1-03	Function selection of terminal MS1	3:multi-sectionnal reference 1(default setting)
T1-04	Function selection of terminal MS2	4:multi-sectionnal reference 2(default setting)
T3-05	unction selection of terminal MFI	1F:unused

For occasions of 2-sectional speed, the terminal **MS2** is not used.

■ **Accelerating & decelerating time selection 1,2: set value "7", "1A"**

- Q9000's accelerating & decelerating time can be divided into 4 kinds, which are 4 settings; in order to switch among these deceleration time, please set the accelerating & decelerating time selection 1, 2 for the multi-functional input.

Set value	Content
7	Accelerating & decelerating time selection 1
1A	Accelerating & decelerating time selection 2

- According to ON/OFF of accelerating & decelerating time selection 1, 2, the selected accelerating & decelerating time is shown as the table below. Accelerating & decelerating time also can be switched during running.

Accelerating & decelerating time selection1	Accelerating & decelerating time selection2	Accelerating time	Decelerating time
OFF or unset	OFF or unse	Accelerating time1 31-01	Decelerating time 1 31-02
ON	OFF or unse	Accelerating time2 31-03	Decelerating time 2 31-04
OFF or unset	ON	Accelerating time3 31-05	Decelerating time 3 31-06
ON	ON	Accelerating time4 31-07	Decelerating time 4 31-08

■ **Emergent stop: Set value "15", "17"**

- After setting the emergent stop, when the multi-functional input is "ON", it will be deceleratedly stopped in accordance with the set decelerating time in 31-09 (emergent stop time). Once the function occasion is set, please also set the 31-09 (emergent stop time).
- If it is necessary to cancel the emergent stop, please set the running reference and emergent stop to be "OFF".
- For occasion that emergent stop is at connection b, please set it to be "17".

Set value	Content
15	Emergent stop :(Connection a ON: decelerated stop in accordance with 31-09 Emergent stop time)
17	Emergent stop :(Connection b OFF, decelerated stop in accordance with 31-09 Emergent stop time)

■ **FJOG reference/RJOG reference: set value "12", "13"**

- Jog frequency running of REV and FWD is available.

Set value	Content
12	FJOG reference ON: FWD running in accordance with jog frequency(41-09)
13	RJOG reference ON: REV running in accordance with jog frequency(41-09)

- FJOG reference and RJOG reference are prior to other frequency references.
- If FJOG reference and RJOG reference are both "ON" above 500ms, it will be stopped in accordance with the set value of 21-03 (Stopping method).
- It is only necessary to set any one between FJOG reference and RJOG reference.
- If no FJOG reference or RJOG reference is input, it will become a separate running state.

■ Selection of frequency reference terminal FIV/FIC: set value "1F"

- If this function is set for multi-functional input, the terminal FIV/FIC running can be switched.

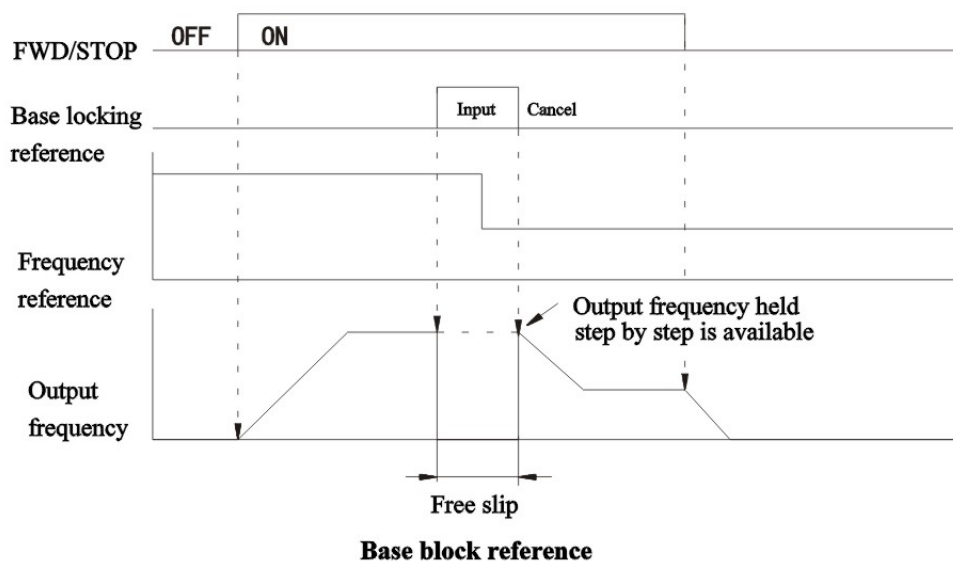
OFF	Master speed frequency reference: analog input from terminal FIV
ON	Master speed frequency reference: analog input from terminal FIC

- For occasions that terminal FIC is used as frequency reference, please set the T3-09 [Function selection of frequency reference(current)terminal FIC]to be "1F"; if T3-09 is not set to be "1F", while this function is selected, it will be a setting error (OPE03).
- If the T3-09 [Function selection of frequency reference(current)terminal FIC]is set to be "1F", while the "1F"frequency reference terminal FIV/FIC selection) is not set for multi-functional input, then the terminal FIV reference plus the terminal FIC reference will be the master speed frequency reference value.

Base block reference NC (Set value: 9)

OFF	Base block
ON	Normal running

- It is the function of the base block of external references.
- Base block is to cut off the inverter output. Once the base block reference is input, the motor will be under the free slip state.
- As the output frequency value is recorded inside. Once the base block is cancelled, the frequency will be output. At this time, as the output frequency is changed step by step for occasion that base block reference is input for especially high-speed rotating state, some safety measures should be taken; for example: setting the running reference to be "OFF". If the running reference is set to be "OFF", the output frequency value held inside will revert to be zero.
- After the base block reference is input, if it is necessary to be cancelled, the voltage will be reverted in accordance with the voltage revert time (P2-04).

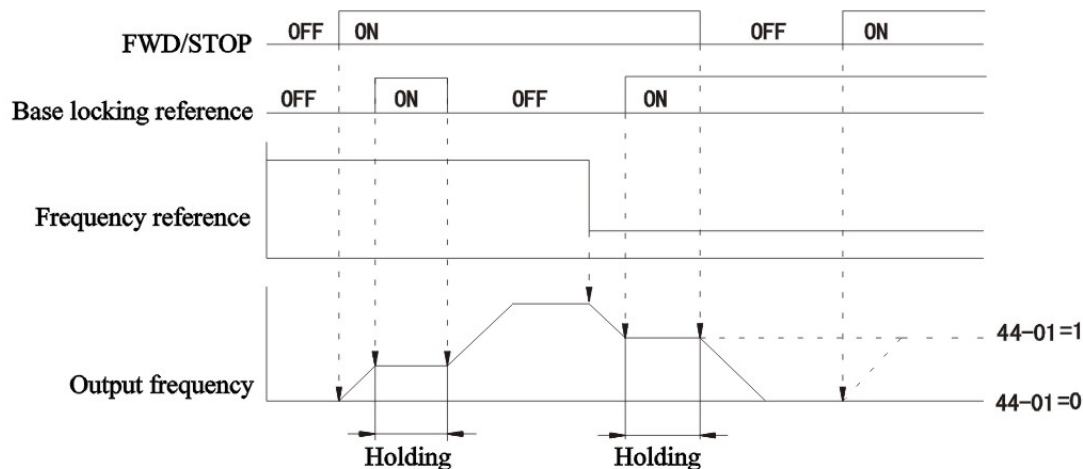


Output frequency that can hold stepping state

Holding the accelerated& decelerated stop (Set value: A)

OFF	Normal running for re-start acceleration and deceleration
ON	Stop acceleration & deceleration and hold the frequency

- During the period of inputting accelerated & decelerated stop, stop the acceleration and deceleration and hold the output frequency at that time.
- After the holding accelerated & decelerated stop is input and then cancelled, the acceleration and deceleration will be re-started.
- Under the state that the holding accelerated & decelerated stop is input, if the stop reference is input, it will enter the stop action.
- For occasion that 44-01 (Holding function selection of frequency reference) is set to be "1", the holding frequency is recorded. As this value will still be recorded after the power is cut off, when re-enter the running reference, it will re-start running in accordance with this frequency.

**Accelerated & decelerated stop**

- For occasion that 44-01="1", the held output frequency is recorded. If the inverter should be in accordance with running occasion of this frequency after stop, please enter running reference when the Holding Accelerated & Decelerated Stop is "ON".
- For occasion that 44-01="0", if the running reference is input when the accelerated & decelerated stop is ON, the "zero" output frequency will be recorded.

Inverter overheating pre-alarm OH2 (Set value: B)

OFF	Normal running
ON	Normal running (Display "OH2 inverter overheating pre-alarm" on the digital operator)

- If the inverter overheating pre-alarm is ON, it will display "OH2 inverter overheating pre-alarm". If it is changed to be OFF, it will return back; pre-alarm reset operation is not necessary.
- If the inverter continues to run without fault detection, please display the pre-alarm from the ambient temperature sensor.

Multi-functional analog input selection (Set value: C)

OFF	Multi-functional analog input is unavailable
ON	Multi-functional analog input is available

- Whether the multi-functional analog input is available /unavailable can be operated externally.
- When the signal is OFF, the action is the same as that when T3-05 (Function selection of multi-functional analog input terminal MFI) is set to be "1F".

Speed control selection when V/f control with PG is unavailable (Set value: D)

OFF	Action under V/f control with PG (speed controlled by speed feedback is available)
ON	Action under V/F control without PG (speed controlled by speed feedback is unavailable)

- Speed control method with PG or without PG can be switched externally. Inverter also can be switched during running.

Speed control integration reset (Set value: E)

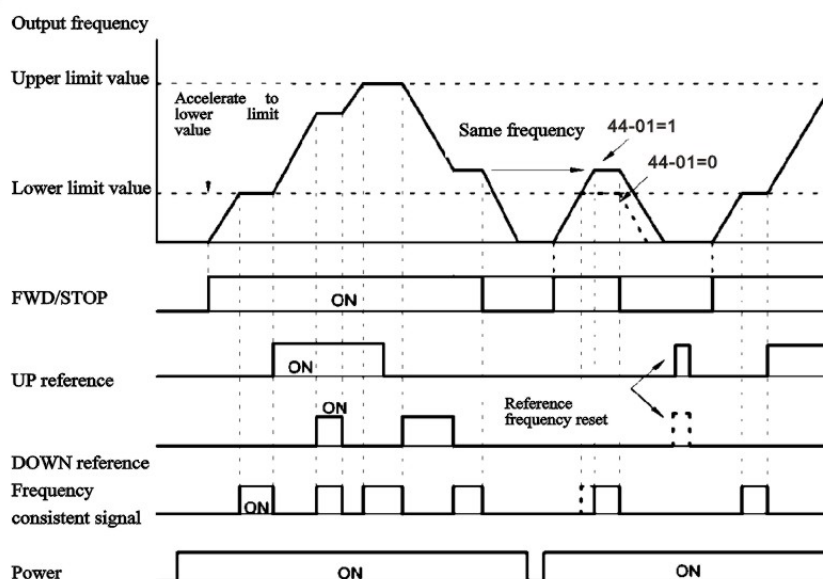
OFF	Action of speed control circuit under PI control
ON	Action of speed control circuit under P control (Integration value of speed control will be reset in accordance with the integration parameter)

- For occasion under V/f control with PG, the function is only available when the 61-07 (Integration action selection during acceleration & deceleration) is set to be "0" (unavailable: Integration is not acted during acceleration & deceleration).
- Inverter also can be switched during running.

UP reference (Set value: 10) /DOWN reference (Set value: 11)

Running state	Acceleration	Deceleration	Holding	Holding
UP reference	ON	OFF	ON	OFF
Down reference	OFF	ON	ON	OFF

- It is to use the ON/OFF of control terminal to control the output frequency function of inverter.
- For this function, please make sure to set the 2 multi-functional inputs such as the UP reference /DOWN reference; for occasion that only single one is set, it will display setting error OPE03. In addition, the occasion set with "accelerated & decelerated stop (Set value: A)" and the setting error OPE03 also will be displayed.
- For 21-02 (Running reference), please set it to be "1" (external terminal). For occasion other than "1", it will not act.
- The UP/DOWN of frequency should be in accordance with the normal accelerating & decelerating time (31-01~08).
- When UP/DOWN, the upper limit value and lower limit value of output frequency should be set as follows.
 - Upper limit value: maximum output frequency (51-04) × upper limit of output frequency (42-01) / 100
 - Lower limit value: maximum output frequency (51-04) × lower limit of output frequency (42-02) / 100
- When the frequency reference (voltage) terminal FIC and the frequency reference (current) terminal FIC are used as the frequency reference inputs, the maximum frequency value will become the lower limit value. (Except for occasions that UP and DOWN are OFF and the running reference is ON).
- When use the UP/DOWN function, once the running reference is input, the output frequency will be accelerated till reaching the lower limit value.
- For occasion that UP/ DOWN function and jog frequency are set for multi-functional input at the same time, the selection of "ON" for jog frequency is the most prior selection.
- For occasion that UP/DOWN function is set, the multi-sectional reference 1~8 will all become unavailable.
- Output frequency held by UP/DOWN function will be recorded by the set value of 44-01 (holding function selection of frequency reference) as (set value: 1). The value will also be recorded after the power is cut off; when the running reference is re-input, the inverter will run starting from this frequency. For this recorded output frequency, when the running reference is OFF, once the UP reference or DOWN reference (reference frequency reset in the figure below) is ON, it will be cancelled.



If the running reference is ON during acceleration & deceleration, the frequency consistent signal is ON.

Sequence diagram of UP/DOWN reference

Fault reset (Set value:14)

OFF	Normal running
ON	Rising: fault reset (Without fault: normal running)

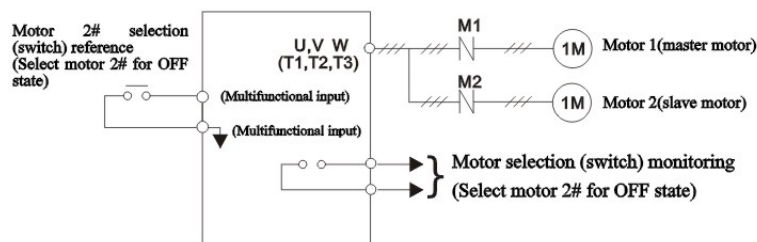
- It is a function to implement fault reset externally.
- If the fault occurs, please make sure that countermeasure is implemented for the fault before starting the inverter. If the fault reset is repeated without countermeasure, the inverter will be damaged.
- If the fault occurs, set the running reference to be OFF; set the fault reset to be ON then to be OFF; set the running reference to be ON, thus it will return to the running state. For occasion that running reference is ON, the fault reset will be unnecessary.
- For occasions without fault, the signal ON/OFF will not affect the running.

Motor switch reference (Motor 2# selection) (Set value: 16)

- OFF: run in accordance with parameter of motor 2#.

[Action Description]

(Note) Please use an external sequence controller to implement inspection for M1/M2 switch and the motor selection state.

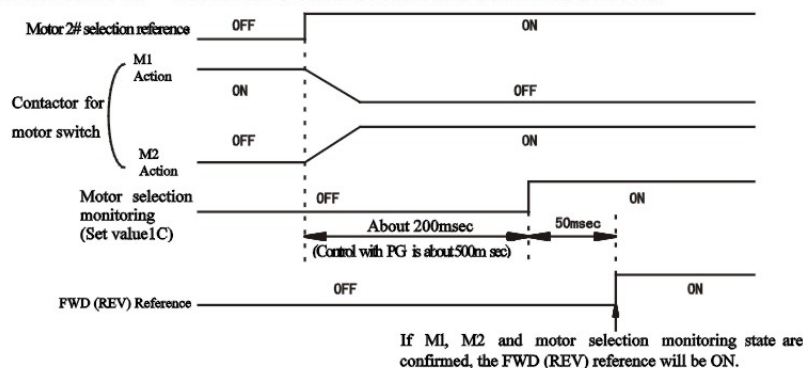


- If anyone from parameters T1-01~06 (multi-functional input) is set to be "16" (Motor 2# selection reference), the ON/OFF action of signal under stop will switch the control mode, V/f characteristic and motor parameter of memory inside inverter.
- If anyone from parameters T2-01~03 (multi-functional output) is set to be "1C" (motor selection monitoring), the multi-functional output terminal can monitor the current motor selection state.
- Please set the parameter at access level 11-01 to be "3" (BASIC) or "C" (ADVANCED).
- According to the Motor 2# selection (switch) reference, the following reference also can be replaced.

Motor 2# selection reference	ON(Motor 1#)	OFF(Motor 2#)
Control mode (Note)	11-02(Selection of control method)	53-01(Motor 2# control mode)
V/f characteristic	(Parameter for INIT-SET)	54-01~07 (Motor 2# V/f characteristic)
Motor parameter	51-04~13 (V/f characteristic)	55-01~06(Motor 2# parameter)
Motor selection monitoring	52-01~09(Motor parameter)	OFF

(Note) When 11-02 ≠ 53-01, the parameter will be initialized together with the motor switch.

Sequence diagram of Motor 1#→Motor 2# switch occasion is shown as follows.



Sequence diagram of motor 1→motor 2 switch

Cancel PID control (Set value: 19)

OFF	PND control is available
ON	PID control is unavailable (Normal inverter control)

- It is the function to switch between PID control and inverter control externally. When the normal inverter control function (open-circuit control) that is ready for running and JOG running is switched to the feedback close-circuit control (PID control) and for occasion of feedback value fault, it can be switched to the open-circuit control for use.

Parameter read-in permission (Set value: 1B)

OFF	Parameters cannot be read-in except for frequency monitoring
ON	Parameters can be read-in under INIT-SET mode

- The prohibition/permission of parameter read-in on the operator will also be cooperated externally. When the parameter read-in permission is OFF, only frequency of frequency monitoring under the driven mode can be changed.

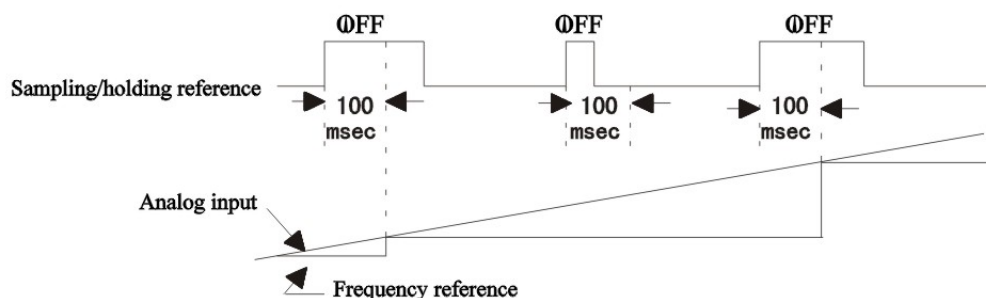
+Speed reference (Set value: 1C)/- Speed reference (Set value: 1D)

Output frequency	Reference frequency +44-02	Reference frequency -44-02	Reference frequency	Reference frequency
+ Speed reference	ON	OFF	ON	OFF
- Speed reference	OFF	ON	ON	OFF

- + Speed reference is to plus certain frequency on the analog frequency reference as output frequency.
- Speed reference is to minus certain frequency on the analog frequency reference as output frequency.
- This function is only available when the analog terminal is in the frequency reference occasions; it must be set simultaneously; or setting error OPE03 will occur. When the two signals are ON, no addition and reduction are available; if the - speed reference is ON and the reduction result is below zero, the output frequency will be zero.

Sampling/holding of analog frequency reference (Set value: 1 E)

- 100msec after the "OFF" state, the analog input value will be used as frequency reference.

**Sampling/holding of analog frequency reference**

- Sampling/holding of analog frequency reference is only available for terminals FIV, FIC, MFI or analogs from A1-14U, A1-14B.
- When the acceleration & deceleration is stopped (OA) and more than two from the UP/DOWN reference (10, 11), + speed/- speed reference (1C, 1D) and sampling/holding of analog frequency reference (1E) are set together, the setting error (OPE03) will be displayed.

External fault (Set value: 20~2F)

- In case of failure and fault of peripheral equipment, the inverter running will be stopped; the external output pre-alarm will be set.
- As the input condition of external fault, the inverter action at input can be selected. The following is the set combination of the three items, please enter the appropriate set value (20~2F).
 - Input level: connection a/connection b
 - Detection method: normal detection / detection during running
 - Action selection: Decelerated stop/Free Stop/Continue to run

Set value of external faults

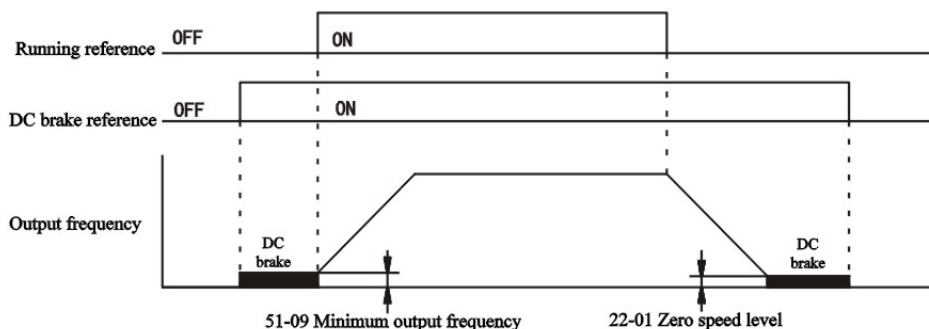
Set value	Input level		Detection method		Action selection			
	Connection a	Connection b	Detection under normal state	Detection In run	Decelerated stop (abnormal)	Free slip (abnormal)	Emergent stop (abnormal)	Continue to run (pre-alarm)
20	O		O		O			
21		O	O		O			
22	O			O	O			
23		O		O	O			
24	O		O			O		
25		O	O			O		
26	O			O		O		
27		O		O		O		
28	O		O				O	
29		O	O				O	
2A	O			O			O	
2B		O		O			O	
2C	O		O					O
2D		O	O					O
2E	O			O				O
2F		O		O				O

- For input level, please set which one from ON/OFF of signal is the fault detection (connection a: ON is external fault; connection b: OFF is external fault).
- For detection method, please set fault detection for any one from between Under Normal State/ In Run.
- Detection under normal state: it is detected when the inverter power is supplied.
- Detection in run: it is only detected when the inverter is in run.
- Action selection is the treatment method after the fault detection is set.
 - Decelerated stop: output fault; be stopped in accordance with the set decelerating time.
 - Free stop: output fault; the inverter output is cut off.
 - Emergent stop: output fault; deceleratedly stopped in accordance with parameter 31-09 (Emergent stop decelerating time).
 - Continue to run: output pre-alarm externally and continue to run.
- When the pre-alarm is output externally, please set any one from function outputs T2-01, -02, -03 to be "10".
- More than two multi-functional inputs cannot be set with the same externally abnormal function.

DC brake reference (Set value: 60)

OFF	Normal action
ON	Inverter stop: DC brake (initial excitation under vector control with PG)

- It is used for preventing motor rotation caused by inertia when the inverter is stopped.
- DC brake action is carried out when the inverter is stopped and when the DC brake reference is ON.
- When the running reference or the jogreference (jog frequencyselection, FJOG, RJOG) is input, the DC brake will be cancelled and the running will be started.

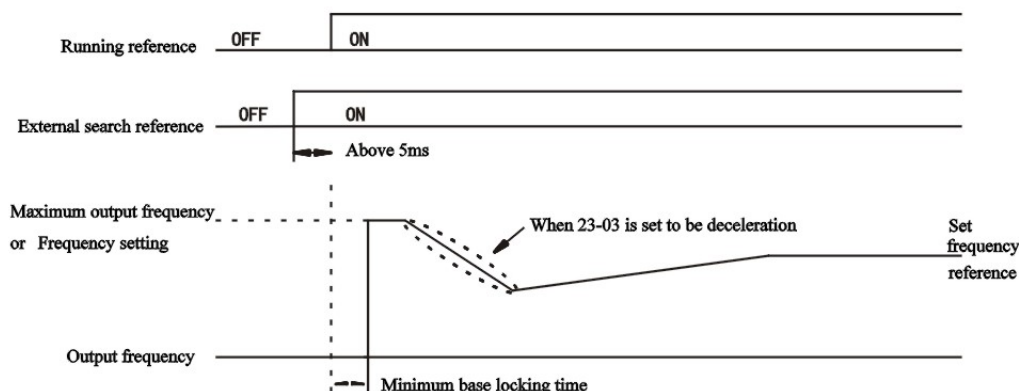
**Sequence diagram of DC brake reference****Maximum output frequency/external search reference 1 (Set value: 60)**

OFF	Normal action
ON	Start speed search from the maximum output frequency

Setting frequency /external search reference 2 (Set value: 62)

OFF	Normal action
ON	Start speed search from set frequency (Reference frequency when input reference)

- For external search reference, only one from the two types can be set.
- For occasion of switch between commercial power and inverter, when the motor under free slip is restarted, the speed search function may stop the motor vibration.
- When the external search reference is ON, if the running reference is input, after the minimum base block time (P2-03), the speed search will be started.

**Sequence diagram of external search reference****Speed/torque control method switch (Set value: 71)**

OFF	Speed control
ON	Torque control

- Switch between speed control and torque control is available; please refer to Page 51 (5.3.4).

Zero servo reference (Reference value: 72)

OFF	Normal action
ON	Reference frequency (speed) is below zero (speed) level (22-01): under zero servo state

Input of action of zero servo function (29-01 29-20);

When the zero servo is ON and the reference frequency (speed) is below the zero speed level (22-01), the position control circuit is formed and the motor rotation is completely stopped.

Speed control (ASR) proportional gain switch (Set value: 77)

OFF	Gain is decided by 35-01, 35-03 and 35-07
ON	35-03 [Proportional gain 2(P) of speed control (ASR)]

For proportional gain of speed control (ASR) switch input, the integration time is not changed.

5.7.2 Multi-functional output: T2

T2-01 Terminal RA-RC selection	X	B	B	B	B
(Terminal 9 Sel)					

Set value

0~37 ※[0]

Function

Multi-functional connection output: Terminal RA, RC function selection (contact)

Selection description

Refer to the following descriptions

T2-02 Terminal Y1 selection	X	B	B	B	B
(Terminal 25 Sel)					

Set value

0~37 ※[1]

Multi-functional output 1: terminal Y1 function selection (open-collector)

Selection description

Refer to the following descriptions

T2-03 Terminal Y2 selection	X	B	B	B	B
(Terminal 26 Sel)					

Set value

0~37 ※[2]

Multi-functional output 2: terminal Y2 function selection (open-collector)

Selection description

Refer to the following descriptions

■ Setting of multi-functional output: T2

Setting and function of multi-functional output is shown as the Table below.

List of multi-functional output function

Set value	Function	Control mode			
		V/F Without PG	V/F With PG	Vector Without PG	Vector With PG
0	In run (ON: running reference ON or voltage output)	0	0	0	0
1	Zero speed	0	0	0	0
2	Frequency (speed) arrival 1 [Detection bandwidth (P4-02)]	0	0	0	0
3	Any frequency (speed) arrival 1 (ON: output frequency=±P4-01; the detection bandwidth P4-02)	0	0	0	0
4	Frequency (FOUT) detection 1>(ON: +P4-01 ≥ output frequency ≥ -P4-01; the Detection bandwidth P4-02)	0	0	0	0
5	Frequency (FOUT) detection 2<(ON: output frequency ≥ +P4-01 or output frequency ≤ -P4-01; Detection bandwidth (P4-02)	0	0	0	0
6	Preparation for inverter running: completed. ※Preparation is completed: no abnormal state after the initial treatment.)	0	0	0	0
7	In detection of main circuit undervoltage (UV)	0	0	0	0
8	In base block (ON: in base block)	0	0	0	0
9	Frequency reference selection state (ON: operator)	0	0	0	0
A	Running reference selection state (ON: operator)	0	0	0	0
B	Overtorque detection 1 NO (Connection a: ON: overtorque detection)	0	0	0	0
C	Frequency reference loss (frequency reference loss action P4-05=1: available)	0	0	0	0
D	Non-performing raking resistor (ON: Resistance overheating or braking transistor failure)	0	0	0	0
E	Fault (ON: faults other than CPE00, CPFO1)	0	0	0	0
F	Not be used (do not set)	-	-	-	-
10	Minor fault (ON: display pre-alarm)	0	0	0	0
11	In fault reset	0	0	0	0
12	Timer function output	0	0	0	0
13	Frequency (speed) arrival 2 (Detection bandwidth P4-04)	0	0	0	0
14	Any frequency (speed) arrival 2 (ON: output frequency=P4-03; detection bandwidth P4-04)	0	0	0	0
15	Frequency (FOUT) detection 3>(ON: output frequency ≤ -P4-03, detection bandwidth P4-04)	0	0	0	0
16	Frequency (FOUT) detection 4<(ON: output frequency ≥ +P4-03; detection bandwidth P4-04)	0	0	0	0
17	Overtorque detection 1 NC (Connection b: Overtorque detection OFF)	0	0	0	0
18	Overtorque detection 2 NO (Connection: Overtorque detection ON)	0	0	0	0
19	Overtorque detection 2 NC (Connection b: Overtorque detection OFF)	0	0	0	0
1A	In reverse run (ON: under REV)	0	0	0	0
1B	In base block 2 (OFF: under base block)	0	0	0	0
1C	Motor selection (Motor switch)	0	0	0	0
1D	In regeneration action (ON: in regeneration Action)	×	×	×	0
1E	Fault restart (ON: in fault restart)	0	0	0	0
1F	Motor overload OL1 pre-alarm (ON: detection level is more than 90%)	0	0	0	0
20	Inverter overheating OH pre-alarm (Temperature is above P8-02)	0	0	0	0
30	Torque limit (current limit)(ON: in torque limit)	×	×	0	0
31	In speed limit (ON: in speed limit)	×	×	×	0
33	Zero servo is complete (ON: zero servo is complete)	×	×	×	0
37	In run 2: (ON: frequency output OFF: base block DC brake initial excitation running stop)	0	0	0	0

※=Factory-set value

Parameter setting

Parameter No.	Name	Changes during running	Setting range	Unit	Factory set value	Access level			
						V/F Without PG	V/F With PG	Vector Without PG	Vector With PG
T2-01	Multi-functional contact output: function selection of terminals RA, RC	×	0~37	-	0	B	B	B	B
T2-02	Multi-functional output 1: function selection of terminal Y1	×	0~37	-	1	B	B	B	B
T2-03	Multi-functional output 2: function selection of terminal Y2	×	0~37	-	2	B	B	B	B

- For the following functions, please refer to the relevant sections:

Function	Set value	Item
Frequency (speed) arrival 1	2	Protection function: P[Setting of frequency detection function: P4-01~P4-05]
Any frequency (speed) arrival 1	3	
Frequency (FOUT) detection 1 >	4	
Frequency (FOUT) detection 2 <	5	
Overtorque detection NO	B	Protection function:P[Setting of overtorque detection function: P6-01~P6-06]
Under frequency reference loss	C	Protection function: P[Setting of timer function: P4-01, P4-02]
Timer function output	12	
Frequency (speed) arrival 2	13	Protection function: P[Setting of frequency detection function: P4-01~P4-05]
Any frequency (speed) arrival 2	14	
Frequency (FOUT) detection 3 >	15	
Frequency (FOUT) detection 4 <	16	
Overtorque detection 1 NC	17	Protection function: P[Setting of overtorque detection function: P6-01~P6-06]
Overtorque detection 2 NO	18	
Overtorque detection 2 NC	19	

- For the following functions, please refer to the list of multi-functional output function.

Function	Set value
Completed inverter running preparation (READY)	6
In main circuit undervoltage (UV) detection	7
In base block	8
Frequency reference selection state	9
Running reference selection state	A
Non-performing braking resistance	D
Fault	E
Minor fault	10
In fault reset	11
In reverse run	1A
Base block 2	1B
In regeneration action	1D
In fault restart	1E
In torque limit (current limit)	30
In speed limit	31

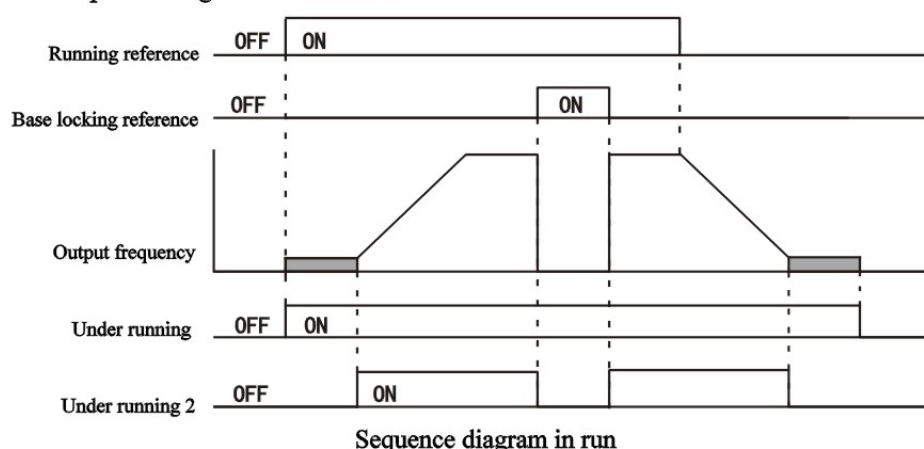
In run (Set value: 0)

OFF	Running reference OFF; no output voltage.
ON	Running reference ON / OFF; voltage output.

In run 2 (Set value: 37)

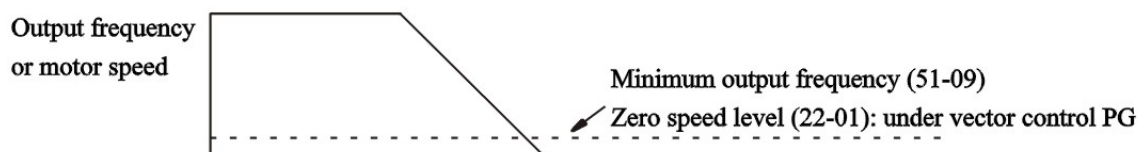
OFF	No output frequency of inverter (base block, current brake, initial excitation, running stop)
ON	Frequency output of inverter

- The output running state of inverter.



Zero speed (set value: 1)

OFF	Output frequency is greater than the minimum output frequency (51-09)"Under the vector control with PG; the motor speed is greater than zero speed level (22-01)"
ON	Output frequency is lower than the minimum output frequency (51-09)"Under the vector control with PG; the motor speed is greater than zero speed level (22-01)"



Sequence diagram of zero speed

Motor overload OL1 pre-alarm (Set value: 1F)

OFF	Electron thermal protection value: below 90% of the motor protection function
ON	Electron thermal protection value: over 90% of the motor protection function

- By making use of the electronic thermal devices, for occasion when the motor overload protection function is available (P1-01=1), this function is available.
- It can be used as the pre-alarm before the protection function action.

Inverter overheating pre-alarm (Set value=20)

OFF	Humidity of ventilating fan: below the set value in P8-02;
ON	Humidity of ventilating fan: over the set value in P8-02;

Zero servo is complete (Set value: 33)

OFF	Zero servo reference: not input; or zero servo control: not completed
ON	Zero servo reference is input: within the bandwidth of zero servo completed (29-02)

- Input signal for whether the zero servo position control is complete.
- When the zero servo reference is input and the difference (position deviation) between start position of zero servo position and the current position has reached the Zero servo complete bandwidth (29-02), it is ON.

5.7.3 Multi-functional analog input: T3

T3-01 Terminal FIV signal level	X	B	B	B	B
(Term FIV signal)					

Set value

0~+10V

※[0]

0~±10V

[1]

Function

Setting of signal level of frequency reference (voltage) (terminal FIV);

Selection Description

Selection of frequency reference (voltage) for 21-01(frequency reference)

Available when it is set to be "1";

Setting of signal level of frequency reference (voltage);

Description of set value

T3-02 Terminal FIV input gain	X	B	B	B	B
(Term FIV Gain)					

Set value

0.0~1000.0

※[100.0]

Function

The gain level setting when the frequency reference voltage is 10V input. It is taking the maximum output frequency as 100% and taking % as unit.

Selection Description

Refer to the following analog input adjustments.

T3-03 Terminal FIV input bias	X	B	B	B	B
(Term FIV Biss)					

Set value

-100.0 ~±100.0

※[0.0]

Function

It is the gain level setting when the frequency reference voltage is 10V input. It is taking maximum output frequency as 100% and taking % as unit.

Selection Description

Refer to the following analog input adjustments.

T3-04 Terminal MFI input signal	X	B	B	B	B
(Term MFI Sel Signal)					

Set value

0 ~+10V

※[0]

0 ~±10V

[1]

Function

Please set signal level for multi-functional analog input.

Selection Description

Description of set value

Set value	Description
0	0~+10V input [11 bit+polarity(positive/negative)input]
1	0~±10V input (Under the negative voltage: running reference opposite to the running direction of the current reference)

T3-05 Terminal MFI function selection

X B B B B

(Term MFI Sel)

Set value

0 ~1F

※[0]

Function

Selection of function of multi-functional analog input terminal MFI;
Please set the signal level, gain and bias of analog input for the following parameters.

Selection of signal level of multi-functional analog input terminal MFI	T3-04(0~+10V or 0~±10V)
Input gain of multi-functional analog input terminal MFI	T3-06
Input bias of multi-functional analog input terminal MFI	T3-07
Selection of signal level of frequency reference (current) terminal FIC	T3-04(0~+10V or 0~10V) 10V or 4-20mA
Input gain of frequency reference (current) terminal FIC	T3-10
Input bias of frequency reference (current) terminal FIC	T3-11

When insert the primary delay filter into analog input, please set T3-12 time parameter that is applicable to all three analog input terminals.

Set value 2 and D cannot be set at the same time, or it will be detected in OPE07.

List of multi-functional analog input / frequency reference (current) function

Set value	Function	100% content of 10V(20mA)input	Control Mode			
			V/F without PG	V/F with PG	Vector without PG	Vector with PG
0	Auxiliary frequency reference (only for 03-05)	Maximum output frequency	0	0	0	0
1	Frequency gain	Frequency reference value of frequency reference (voltage) terminal	0	0	0	0
2	Frequency bias (Zero limit when the rotation direction is changed)	Maximum output frequency (plus with the T3-03set value)	0	0	0	0
4	Output voltage bias	Motor rated voltage(51-05)	0	0	×	×
5	Accel/decel time gain (shorten coefficient)	The set acceleration & deceleration time (31-01~08)	0	0	0	0
6	DC brake (DB) current	Inverter rated output current	0	0	0	×
7	Overtorque detection level	V/f control: Motor rated current; Vector control: Motor rated torque	0	0	0	0
8	Stall prevention level in run	Inverter's rated current	0	0	×	×
9	Frequency reference lower limit level	Maximum output frequency	0	0	0	0
A	Setting forbidden frequency	Maximum output frequency	0	0	0	0
B	PID feedback	Maximum output frequency	0	0	0	0
C	PID target value	Maximum output frequency	0	0	0	0
D	Frequency bias	Maximum output frequency (plus with set value of T3-03)	0	0	0	0
10	Torque limit of forward run side	Motor rated torque	×	×	0	0
11	Torque limit of reverse run side	Motor rated torque	×	×	0	0
12	Torque limit of regeneration side	Motor rated torque	×	×	0	0
13	Torque reference/ Torque limit under speed control	Motor rated torque	×	×	×	0
14	Torque compensation	Motor rated torque	×	×	×	0
15	Positive/negative torque limit	Motor rated torque	×	×	0	0
1F	Analog input is not used (T3-05)	-	0	0	0	0
	Frequency reference (For details of T3-09, please refer to the block diagram of function)	Maximum output frequency				

T3-06 Terminal MFI input gain

O B B B B

(Term MFI Gain)

Set value

0.0~1000.0

※[100.0]

Function

When the 10V input is used, the function reference is taking % as unit.

Selection Description

Refer to the following analog input adjustments.

T3-07 Terminal MFI input bias

O B B B B

(Term 16 Gain)

Set value

-100.0~+100.0

※[0.0]

Function

When the 0V input is used, the function and reference are taking % as unit.

Selection Description

Refer to the following analog input adjustments.

T3-08 Terminal FIV input signal

X A A A A

(Term FIV Sel)

Set value

0.0~10V

[0]

0.0~±10V

[1]

4~±20mA

※[2]

Function

Selection of signal level of multi-functional analog terminal FIV

Selection Description

Frequency reference (current) is available, when 21-01(Frequency reference) is set to be "1".

Setting of signal level of frequency reference (current) signal

Description of set value

Set value	Description
0	0~+10V input [10bit input]
1	0~+10V input (Under negative voltage: running reference opposite to the running direction of the current reference)
2	4~20mA input

When the frequency reference for voltage input terminal and current input terminal are input at the same time, the sum of the two will be the final reference value.

For occasion of switching between voltage terminal and current terminal of frequency reference, please set any one from multi-functional input (T1-01 ~ T1-06) to be "1F".

For occasion that the multi-functional input is OFF, if the voltage terminal (Terminal FIV) reference is ON, the current terminal (Terminal FIC) reference will be available.

For occasion that set value is "1" (0~+10V input), it is an essential condition that T3-01 should also be set to be "1" (0~±10V input).

T3-09 Terminal FIC function selection	X	A	A	A	A
(Term FIC Sel)					

Set value

0~1F

※[1F]

Function

Selection of frequency reference (current) terminal FIC function

Selection Description

Refer to the selection description of T3-05

T3-10 Terminal FIC input gain	X	A	A	A	A
(Terminal FIC Gain)					

Set value

0.0~1000.0

※[100]

Function

When 10V (20mA) input is used, the function and reference are taking % as unit.

Selection Description

Refer to the following analog input adjustments.

T3-11 Terminal FIC input bias	O	A	A	A	A
(Terminal FIC Bias)					

Set value

-100.0~+100.0

※ [0.0]

Function

When 0V (4mA) input is used, the function and reference are taking % as unit.

Selection Description

Refer to the following analog input adjustments.

Adjustment description of analog input

As adjustment parameters for analog input, there are three types such as the gain & bias (set for individual input), the delay time and the parameter (all analog inputs are common).

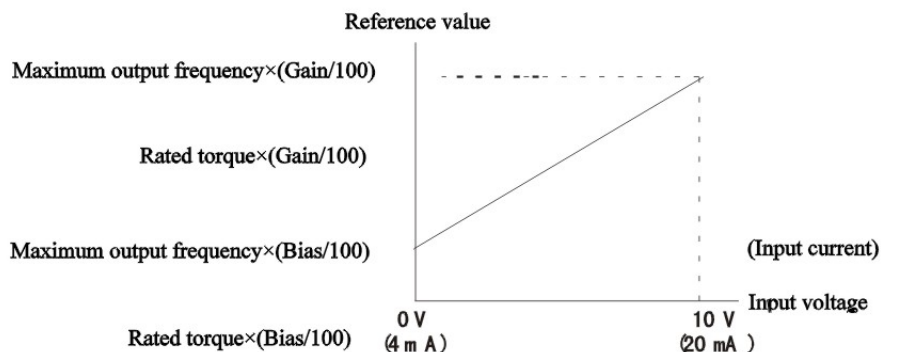
The analog input (terminal FIV, FIC, MFI) can adjust settings for the gain and bias one by one.

Gain: Please set the percentage of 10V (20mA) input to frequency (taking the maximum output frequency 51-04 as 100%);

Bias: Please set the percentage of 0V (4mA) input to frequency (taking the maximum output frequency 51-04 as 100%);

For frequency reference (voltage) terminal FIV, FIC, MFI, the settings of gain and bias are as follows:

Only when the multi-functional analog input is available, if the frequency reference occasion is selected, the gain and bias will be regarded as unavailable; please comply with the set gain and bias of terminal FIV.



Selection of current reference input is in ()

Adjustment for analog input gain and bias

T3-12 Filter average time

X A A A A

(Filter Average Time)

Set value

0.00~2.00

※[0.00]

Function

The primary delay time parameters of the three analog terminals (terminal FIV, FIC, MFI) are taking second as unit.

Selection Description

Primary delay time parameter can be set for three analog inputs [frequency reference (voltage) / frequency reference (current) / multi-functional analog input].

When the analog input signal is over-excited and noise is imposed on the signal, the setting is available.

When the set value is too large, the response will be reduced.

5.7.4 Analog output: T4

T4-01 Terminal MV+ monitoring selection

X B B B B

(Terminal 21 Sel)

Set value

1~38

※[2]

Function

Please set the multi-functional analog output 1 (the series number of monitoring item of terminal MA+ output "the numerical value of □□ in the M1-□□").

Selection Description

Please set the numerical value for multi-functional analog output, the monitoring item M1 of output inverter and the □□ part in the "M1-□□" in the list of monitored parameter.

The setting range is from "1 to 38", but "4, 10, 11, 12, 13, 14, 25, 28, 34, 35" cannot be used.

"29 to 31" are not used.

T4-02 Terminal MV+ output gain

O B B B B

(Terminal 21 Sel)

Set value

0.00~2.50

※[1.00]

Function

Set the voltage level gain of multi-functional analog output 1;

Set the times of 100% output of monitoring item to 10V;

T4-03 Terminal MV+ output bias

O B B B B

(Terminal 21 Bias)

Set value

-10.0~+10.0

※[0.00]

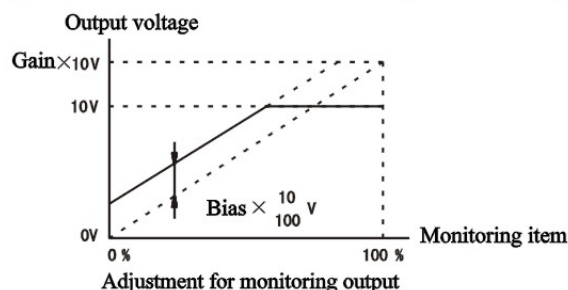
Function

Set the voltage level bias of multi-functional analog output 1 to make the output up-down moving momentum take 10V as 100% and take % as unit.

Selection Description

For multi-functional analog output gain, please set the times of 100% output of item to 10V.

The multi-functional analog output bias is to make the output up-down moving momentum take 10V as 100% and take % as unit.



T4-04 Terminal MA+ monitoring selection

O B B B B

(Terminal 23 Sel)

Set value

1~38

※[3]

Function

Please set the multi-functional analog output 2 (the series number of monitoring item of terminal MA+ output "the numerical value of □□ in the M1-□□").

Selection Description

Refer to the description of T4-01.

T4-05 Terminal MA+ output gain

O B B B B

(Terminal 23 Gain)

Set value

0.00~2.50

※[0.05]

Function

Set the voltage level gain of multi-functional analog output 2

Set the times of 100% output of monitoring item to 10V

Selection Description

Refer to the description of T4-01.

T4-06 Terminal MA+ output bias

X B B B B

(Terminal MV Bias)

Set value

-10.00~+ 10.0

※[0.0]

Function

Set the voltage level bias of multi-functional analog output 2 to make the output up-down moving momentum take 10V as 100% and take % as unit.

Selection Description

Refer to the description of T4-03.

T4-07 Output signal form

X B B B B

(Ao Level Select)

Set value

0~+10.0 Output

※ [0]

-10~+10.0 Output

[1]

Function

Set the signal output level of multi-functional analog output 1, 2 (MV+, MA+)

Selection Description

Description of the set value

This signal-level setting is applicable to multi-functional analog output 1, 2 (Terminal MV+, MA+);

For occasions that the speed (frequency reference, output frequency, motor speed) is within 0 ~ ±10V, the inverter will output the clockwise + voltage; the inverter output is under reverse running with output-voltage.

(When set value of bias is 0.0%)

When the setting is within 0~±10V, some monitored items only can output 0~+10V.

Please refer to the list of monitored parameters

Set value	Description
0	0~+10V (Absolute value output)
1	-10~+10V

5.7.5 MODBUS Communication: T5

T5-01 Serial communication address

O A A A A

(Serial Comm Adr)

Set value

0~20

※[1F]

Function

The inverter's MODBUS communication station setting.

T5-02 Serial communication selection

X A A A A

(Serial Com SeL)

Set value

1200BPS

[0]

2400BPS

※[1]

4800BPS

[2]

9600BPS

[3]

19200BPS

[4]

Function

Select the transmission time for 6CN MEMOBUS transmission

T5-03 Serial parity selection

X A A A A

(Serial Comm SeL)

Set value

No parity

[0]

Even parity

※[1]

Odd Parity

[2]

Function

Select the parity for 6CN MEMOBUS transmission

T5-04 Serial fault detection	X	A	A	A	A
(Serial Fault SeL)					
Set value					
Decelerated stop					[0]
Free stop					※[1]
Emergent stop					[2]
Continue to run					[3]
Function					
Selection of stop method for transmission error detection					
T5-05 Serial overtime detection	X	A	A	A	A
(Serial Flt Dtct)					
Set value					
Unavailable					[0]
Available					※[1]
Function					
Select whether the transmission overtime shall be detected as transmission error					

5.8 Protection function parameter (P)

5.8.1 Motor protection function: P1

P1-01 Thermal protection selection	X	B	B	B	B
(MOL Fault Select)					
Set value					
Unavailable					[0]
Available					※[1]
Function					
Set whether the electronic thermal protection is available / unavailable for the motor overload protection function.					
Selection Description					
Set whether the electronic thermal protection is available / unavailable for the motor overload protection function.					
The set value of motor rated current (52-01) is detected as the benchmark.					
For occasion that one inverter is connected to more than two motors, please set "0" to be unavailable; however, in order to protect the motor, please connect the thermal relay to the motor connection wire, in order to conduct overload protection for motors.					
It is applied for occasions that power is frequently ON/OFF, because when the power is OFF, the electronic thermal protection value will be reset. When the motor overload protection function is available and the multi-functional output ((T2-01~T2-03) has been set to be motor overload, the OL1 will make pre-alarm.					
For occasion (set value: 1F), when the electronic thermal protection value reaches more than 90% of the overload detection level, the multi-functional output is ON.					
P1-02 Protection detection time	X	B	B	B	B
(MOL Time Const)					
Set value					
0.1~5.0					※[1.0]
Function					
The detection time for electronic thermal protection is taking minute as unit.					
Selection Description					
Usually, it is unnecessary to change the setting. The factory-set value is 150% overload/1 minute tolerance. After continuous running at rated current, the motor should be set with electronic thermal protection action time against 150% overload.					
For occasion that motor overload tolerance is confirmed, please set the overload tolerance which is in accordance with the motor hot starting, with certain surplus.					
For occasion that the overload should be detected as early as possible, please reduce the set value.					

5.8.2 Treatment for transient power failure: P2

P2-01 Response selection upon transient power failure	X	B	B	B	B
(PwrL Selection)					
Set value					
Unavailable					※[0]
Available					[1]
In CPU action, it is available					[2]
Function					
Setting of treatment for transient power failure;					
Selection Description					
Please select the treatment method for transient power failure. Select occasions that the transient power failure is available (set value: 1 or 2), if the power is reverted within the allowed time, it will restart after the speed search.					
When select transient power failure (set value: 0) to be unavailable, for transient power failure for more than 15ms, the UV fault will be detected.					

P2-02 Transient compensation time	X	B	B	B	B
(PwrL Ridethrut)					
Set value					
0.0~2.0					※[0.7]
Function					
For occasion that the transient power failure selection (P2-01) is set to be "1", the compensation time is taking second as unit.					
Selection Description					
The factory-set value will be different in accordance with the inverter capacity.					
When the transient power failure action selection (P2-01)"1" is available, the guarantee time of transient power failure is taking second as unit.					

P2-03 Min. base block time	X	B	B	B	B
(PwrL Baseblockt)					
Set value					
0.1~5.0					※[0.5]
Function					
For restart after recovering from transient power failure, the inverter's minimum base block time takes second as unit.					
Selection Description					
The factory-set value will be different in accordance with the inverter capacity; it is the parameter used for speed search and DC brake.					
Set the motor's residue disappearing time; for occasion that over current occurs when speed search or DC brake, please increase the set value.					
Speed search after transient power failure and speed search under normal state are both available.					

P2-04 Voltage reset time	X	A	A	A	A
(Pwvl V/F Rampt)					
Set value					
0. 0~5.0					※[0.3]
Function					
After the speed search, the voltage reset time is taking second as unit.					
Selection Description					
After the speed search is completed, it is usually the time for voltage reset; 400V class refers to the time from 0V to 400V.					
Speed search of voltage reset time after transient power failure is available for voltage changes during common speed search, voltage change under energy-saving control and base block cancelling.					

P2-05 Low voltage detection level	X	A	A	A	A
(PUV Det Level)					
Set value					
130~420					※[380]
Function					
The detection level of main circuit low-voltage (UV) (the main circuit DC voltage) takes V as unit.					
Selection Description					
The setting range and factory-set value is 400V; usually, it is unnecessary to change the set value.					
It is used for occasion that an AC reactor should be inserted and the detected level of main circuit low-voltage should be reduced. Please set the main circuit DC voltage value (V) of main circuit low-voltage.					

P2-06 KEB decelerating frequency	X	A	A	A	A
(KEB Frequency)					
Set value					
0.0~100					※[0.0]
Function					
As inertia energy may be generated when frequency control is taken upon transient power failure; because this energy has avoided the transient power failure, it is the function to revert to the running state before transient power failure.					
Selection Description					
Inertia energy is generated when the frequency control is taken upon transient power failure; because this energy has avoided the transient power failure, it is the function to revert to the running state before transient power failure.					
The function is primarily applicable to the occasion that DC bus-bar and several inverters are used at the same time. Deceleration upon transient power failure can prevent the wire stop due to speed changes.					
KEB action is implemented through KEB reference of multi-functional input terminal.					
Applicable power range: 400V class 0.4-18.5kW					

5.8.3 Stall prevention function: P3

P3-01 Stall prevention selection in acceleration	X	B	B	B	X
(StallP Accel Sel)					
Set value					
Unavailable					※ [0]
Available					[1]
Optimal adjustment					[2]
Function					
Setting of stall prevention function					
Selection Description					
The so-called stall state is the "motor stall" or "motor stall jump" state when the load is increased on the motor or rapid acceleration and deceleration of motor.					
Inverter's stall prevention function can be set in acceleration/running/deceleration respectively; different functions may be adopted in accordance with different control modes.					
Description of set value					
Available (set value: 1) occasion: the motor acceleration will be stopped when the motor current exceed the stall prevention value during the acceleration; when the motor current is reduced below this value, the motor will accelerate again.					
According to the load, accelerating time may be longer than the set value.					
Optimum acceleration (set value: 2) occasion: motor current is accelerated, taking the stall prevention value as benchmark. At this time, the setting of accelerating time will be deemed to be unavailable.					

P3-02 Stall prevention level in acceleration	X	B	B	B	X
(Stal1P Accel Lvl)					

Set value

0~200

※[150]

Function

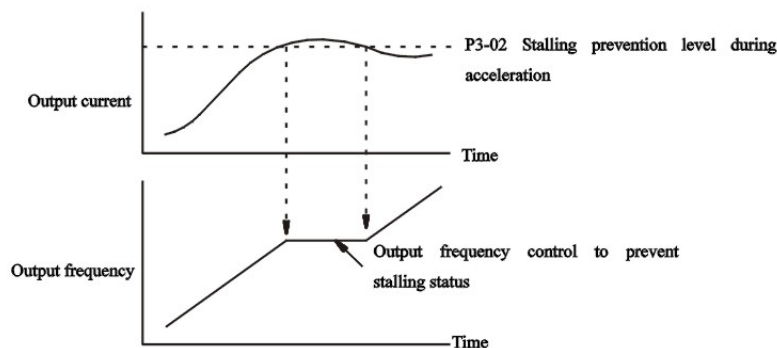
L3-01 is available when "0" or "1" is selected; it is taking inverter rated current as 100% and taking % as unit.

Selection Description

The setting is available, when the stall prevention function during acceleration (P3-01) is selected to be "1" or "2".

Usually, it is unnecessary to change the set value.

For occasion that motor power is relatively smaller than the inverter power, if stall occurs when the factory-set value is not changed, please reduce the set value, taking inverter rated current as 100% and taking % as unit.



Stalling prevention function during acceleration (P3-01=1 occasion)

P3-03 Stall prevention limit in acceleration	X	A	A	A	X
(Stal1P CHP Lvl)					

Set value

0~100

※[50]

Function

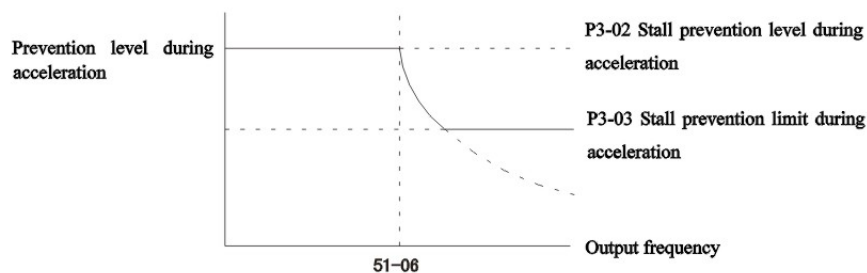
When the frequency range above maximum voltage frequency (51-06) is used, the stall prevention limit during acceleration will take inverter rated current as 100% and take % as unit.

Selection Description

Usually, it is unnecessary to change the set value.

Please set the limit of stall prevention when the high-speed motor occasion under constant power output (occasions higher than the maximum voltage frequency) is used.

The setting standard is the motor's rated current; this current value is taking inverter rated output current as 100% and taking % as unit.



51-06 Maximum voltage frequency (FA)

(Note)

For occasion that motor is running under constant power output, in order to accelerate smoothly, the stall prevention level during acceleration will be reduced automatically.

Stall prevention limit during acceleration (P3-03) is within the constant power output range. It is a limit value to avoid that stall prevention level from is reduced below the necessary value.

Stall prevention limit during acceleration

※=Factory-set value

P3-04 Stall prevention selection in deceleration	X	B	B	B	B
(StallP Decel Sel)					

Set value

Unavailable	[0]
Available	※ [1]
Optimal adjustment	[2]
Available (With brake resistor)	[3]

Function

Selection of stall prevention function during deceleration

Selection Description

Description of set value

For available (set value: "1") occasion, in order to avoid main circuit overvoltage (OV), the decelerating time will be extended automatically.

For braking selection (braking resistance, braking resistor module, brake module), please make sure to set it to be "0" or "3"; any other settings will be the unavailable braking selection, thus the decelerating time will not be shortened.

For vector control mode with PG, the P3-04 cannot be set to be "2";
(SPEC: levels below F can be set.)

For vector control mode with PG, the P3-04 cannot be set to be "3";

Selection of stall prevention function during deceleration: P3-04

Parameter No.	Name	Changes in running	Setting range	Unit	Factory-set value	Access Level			
						V/F without PG	V/F with PG	Vector without PG	Vector with PG
P3-04	Selection of stall prevention during acceleration	×	0~3	-	1	B	B	B	B

● Description of set value

Set value	Description
0	Unavailable [Deceleration based on the setting: short decelerating time; possible circuit overvoltage (OV)]
1	Available (Main circuit voltage closed to the voltage level: deceleration stop; voltage reversion: deceleration again)
2	Optimum deceleration (Minimum decelerating time: based on main circuit voltage; set decelerating time: unavailable)
3	Available (with braking resistance)

For the available (set value: "1") occasion, in order to avoid the main circuit overvoltage (OV), the decelerating time will be extended automatically.

For braking selection (braking resistance, braking resistor module, braking module), please make sure to set it to be "0" or "3"; any other settings will be the unavailable braking selection, thus the decelerating time will not be shortened.

For the vector control mode with PG, the P3-04 cannot be set to be "2";
(SPEC: levels below F can be set.)

For the vector control mode with PG, the P3-04 cannot be set to be "3";

The difference between the set value "0" and "3"; and the adjustment method of set value "3";

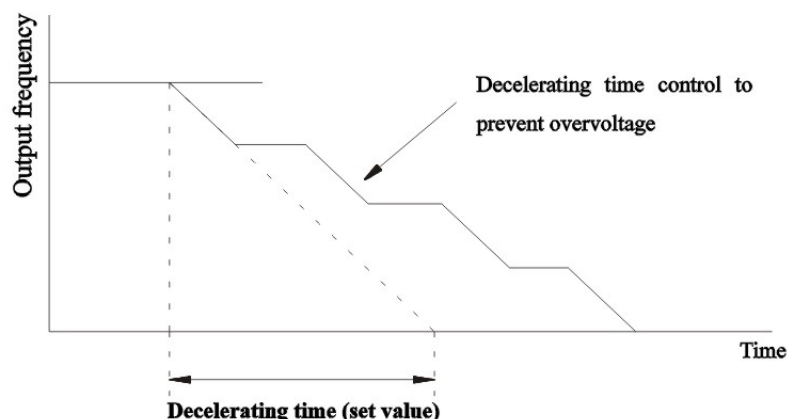
For occasion that set value is "0", the stall prevent treatment during deceleration is unavailable.

For occasion that set value is "3", if it is easy for main circuit overvoltage (OV) to be happened, the decelerating time shall be extended automatically; if it is difficult for the main circuit overvoltage (OV) to be happened, it shall be decelerated in accordance with the decelerating time. Although the actual decelerating time is longer than the set value, in order to set a shorter decelerating time than the set value "0", it is obviously that the minimum decelerating time can be realized.

When the stall prevention function during deceleration is set to be "3", please make sure to make adjustment in accordance with the following sequence.

Adjustment sequence

1. Decelerating time should be set in accordance with the braking ability and mechanical inertia.
2. For occasion that the time in the first sequence is unknown, please set the set value of P3-04 to be "0" for trail; after getting the minimum decelerating time, set the L3-04 to be "3".
3. For the range that main circuit overvoltage (OV) is unavailable, reduce the set value of decelerating time.



Stall prevention action during deceleration (P3-09=1)

P3-05 Stall prevention selection in running	X	B	B	X	X
(Sta11P Run Sel)					

Set value

Unavailable	[0]
Available- Decelerating time 1	※[1]
Available- Decelerating time 2	[2]

Function

Selection of stall prevention function in running

Selection Description

Description of set value

For available (set value: "1", "2") occasion, if the stall prevention current level lasts for more than 100ms in run, it will begin to be decelerated; after the current value is decreased below this level, it will be accelerated to run at the reference frequency.

P3-06 Stall prevention level in running	X	B	B	X	X
(Sta11P Run Sel)					

Set value

30~200	※[160]
--------	--------

Function

For available occasion that P3-05 is set to be "1" or "2", it will take the inverter rated current as 100% and take % as unit.

Selection Description

This reference is available when L3-05 is set to be "1" or "2".

Usually, it is unnecessary to change the set value.

When the motor capacity is smaller than the inverter capacity or stall is happened when the motor is running in accordance with the factory-set value, the set value should be reduced; the set value shall take the motor rated current as 100% and take % as unit.

5.8.4 Frequency detection: P4

P4-01 Frequency detection level	X	B	B	B	B
(StallP Accel Sel)					

Set value

0.0~400.0

※[0]

Function

For the multi-functional output, "any frequency (speed) arrival" is set.

Selection Description

It is the settings of signal outputs such as multi-functional output, frequency arrival, any frequency arrival and etc. The relation between parameter and output signal is as follows:

Detect the motor speed for occasion under vector control with PG.

P4-02 Frequency detection bandwidth	X	B	B	B	B
(Spd Agree Width)					

Set value

0.0~20.0

※[2.0]

Function

For the multi-functional output, the "frequency (speed) arrival 1" is set.

"Any frequency (speed) arrival 1"

P4-03 Frequency detection level (+/-)	X	B	B	B	B
(Spd Agree Lvl+-)					

Set value

-400.0~+400.0

※[2.0]

Function

For the multi-functional output, the "frequency (speed) arrival 2" is set.

P4-04 Frequency detection bandwidth +/-	X	B	B	B	B
(Spd Agree Wdth+-)					

Set value

0.0~20.0

※[0.0]

Function

For the multi-functional output, the "frequency (speed) arrival" and "any frequency (speed) arrival 2" are set.

Selection Description

Parameter NO.	Name	Changes during running	Setting range	Unit	Factory set value	Access level			
						V/F without PG	V/F with PG	Vector without PG	Vector with PG
P4-01	Frequency detection level	×	0.0~400.0	Hz	0.0	B	B	B	B
P4-02	Frequency detection bandwidth	×	0.0~20.0	Hz	2.0	B	B	B	B
P4-03	Frequency detection level (+/-)Unilateral detection	×	-400.0~+400.0	Hz	0.0	A	A	A	A
P4-04	Frequency detection bandwidth (+/-)Unilateral detection	×	0.0~20.0	Hz	2.0	A	A	A	A

P4-05 Reference loss selection	X	B	B	B	B
(Ref Loss Sel)					
Set value					
Stop					※[0]
Continue to run at the 80% speed					[1]
Function					
Frequency detection action					
Selection Description					
The so-called frequency reference loss status refers to that the frequency reference voltage is reduced to below 90% within 400ms.					

5.8.5 Fault restart: P5

P5-01 Number of restart for abnormal reset	X	B	B	B	B
(Num of Restarts)					
Set value					
0~10					※[0]
Function					
Set the number of fault restart and automatic fault restart; speed search starts from the running frequency.					
Selection Description					
If the fault restart function is used frequently, the inverter may be damaged.					
For occasion that uses fault restart, please make sure to install a breaker protector. Using the sequence controller design program, once there is fault, the periphery equipments will be stopped.					
The so-called fault restart is the function that inverter can be restarted automatically in case of internal fault in run.					
The objects of fault restart are as follows; the fault restart is unavailable for any other faults, instead the protection action will be started immediately.					
In case of following circumstances such as OC(overcurrent), PF(main circuit voltage fault), OL1 (motor overload), GF (grounding), LF (output phase-loss), OL2(inverter overload), PUF (fuse melting), RF (overheated brake resistor), OL3(overtorque), OV (main circuit over voltage), RR (brake transistor failure), OL4 (overtorque), UV1(main circuit low-voltage), the counter of number of fault restart will be cleared.					
Normal running lasts for more than 10 minutes after fault restart.					
Protection action is acting; fault restart is input after the fault is confirmed.					
Power is connected after being cut off.					
When the fault restart signal is output, set one from multi-functional output (T2-01~03) to be "1E".					

P5-02 Contact selection of restart for abnormal reset	X	B	B	B	B
(Restarts Sel)					
Set value					
Not be output					※[0]
Function					
Set the fault connection point output of fault restart					
Selection Description					
Description of set value					

5.8.6 Overtorque detection: P6

P6-01 Overtorque detection action selection 1	X	B	B	B	B
(Torq Det Set1)					

Set value

Overtorque detection is unavailable	※[0]
The overtorque detection will be performed in speed arrival / continue to run after detection	[1]
The overtorque detection will be performed in run / continue to run after detection (pre-alarm)	[2]
The overtorque detection will be performed at the speed arrival / output is cut off upon detection (protection action)	[3]
The overtorque detection will be performed in run / output is cut off upon detection (protection action)	[4]

Function

Setting of torque function
Selection Description
Refer to the following description.

P6-02 Overtorque detection level 1	X	B	B	B	B
(Torq Det 1 Lvl)					

Set value

0~300	※[150]
-------	--------

Function

Vector control method: take the rated torque of the motor as 100%.
V/F control method: take the rated current of the inverter as 100%.

Selection Description

Refer to the following description

P6-03 Overtorque detection time 1	X	B	B	B	B
(Torq Det 1 Time)					

Set value

0.0~10.0	※[0.1]
----------	--------

Function

The detection time of overtorque detection is taking second as unit.

Selection Description

Refer to the following description.

P6-04 Overtorque detection action selection 2	X	A	A	A	A
(Torq Det 2 Sel)					

Set value

0~4	※[0]
-----	------

Function

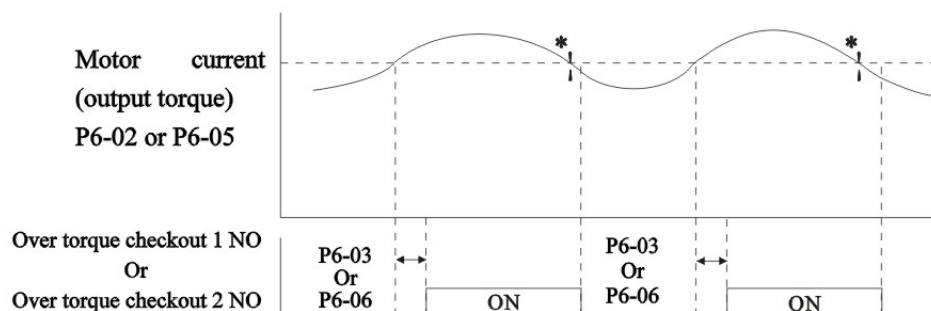
Setting method is the same as that of overtorque detection 1 (P6-03 ~ 06);
Overtorque detection 1 outputs "overtorque detection 1 NO/NC" on multi-functional output;
Overtorque detection 2 outputs "overtorque detection 1 NO/NC" on multi-functional output;

Selection Description

Refer to the following description.

P6-05 Overtorque detection level 2	X	A	A	A	A
(Torq Det 2 Lvl)					
Set value					
0~300					※[150]
Function					
Setting method is the same as that of overtorque detection 1 (P6-03 ~ 06);					
Overtorque detection 1 outputs "overtorque detection 1 NO/NC" on multi-functional output;					
Overtorque detection 2 outputs "overtorque detection 1 NO/NC" on multi-functional output;					
Selection Description					
Refer to the following description.					

P6-06 Overtorque detection time 2	X	A	A	A	A
(Torq Det 2 Time)					
Set value					
0.0~10.0					※[0.1]
Function					
Setting method is the same as that of overtorque detection 1 (P6-03 ~ 06);					
Overtorque detection 1 outputs "overtorque detection 1 NO/NC" on multi-functional output;					
Overtorque detection 2 outputs "overtorque detection 1 NO/NC" on multi-functional output;					
Selection Description					
Description of overtorque detection					
The so-called overtorque detection function refers to the function that when the machine is overloaded, the increase of output current (or output torque) will be detected.					
■ For the overtorque selection (P6-01, P6-04), please set whether there is overtorque detection and the treatment for overtorque detection.					
■ When the overtorque detection is conducted, please set the overtorque detection level (P6-02, -05) and the overtorque detection time (P6-03, -06). Overtorque will be detected when the current is surpassed the detection level and lasts for a period of time longer than the detection time. (Or the torque is detected beyond the detection level and the detection time.)					
■ Setting of overtorque detection level will be different in accordance with the control modes.					
Vector control without PG, vector control with PG: it is taking the motor's rated torque as 100%.					
V/f control without PG, V/f control with PG: it is taking the inverter's rated current as 100%.					
When the overtorque detection is output externally, please set the function for multi-functional output (T2-01 ~ T2-03).					
Overtorque detection 1 NO: set value "B"					
Overtorque detection 2 NO: set value "18"					
Overtorque detection 1 NC: set value "17"					
Overtorque detection 2 NC: set value "19"					



The cancellation width of overtorque detection is about 10% of the inverter's rated current (or the motor's rated torque).

Sequence diagram of overtorque detection

5.8.7 Torque limit: P7

P7-01 Torque limit in forward run	X	X	X	B	B
(Torq Det SetI)					

Set value

0~300

※[0]

Function

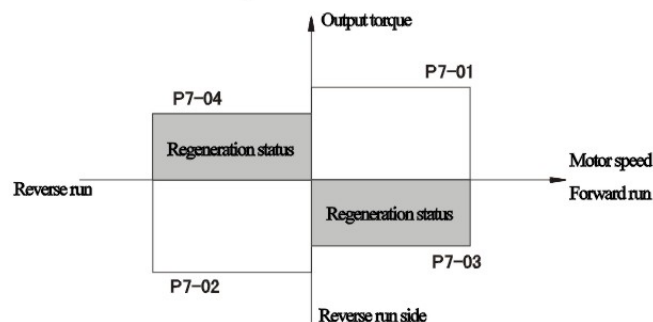
Torque limit can be set by % compared with the motor's rated torque.

Four quadrants can be set respectively.

Selection Description

Torque limit for four quadrants such as forward run/reverse run and regeneration at the forward run side/regeneration at the reverse run side can be set.

The relation of parameters is shown as Figure below.



Torque limit function

When torque limit function is acted, as the torque control is prior, the motor's speed control and compensation are unavailable; therefore, there will be situation that the acceleration & decelerating time is increased and the speed is reduced.

P7-02 Torque limit in reverse run	X	X	X	B	B
(Torq Det 1Lv1)					

Set value

0~300

※[200]

Function

Torque limit can be set by % compared with the motor's rated torque.

Four quadrants can be set respectively.

Selection Description

Refer to the description of P7-01.

P7-03 Torque regeneration limit in forward run	X	X	X	B	B
(Torq Det 1 Time)					

Set value

0~300

※[200]

Function

Torque limit can be set by % compared with the motor's rated torque.

Four quadrants can be set respectively.

Selection Description

Refer to the description of P7-01.

P7-04 Torque regeneration limit in reverse run	X	X	X	B	B
(Torq Det 1 Time)					

Set value

0~300

※[200]

Function

Torque limit can be set by % compared with the motor's rated torque.

Four quadrants can be set respectively.

Selection Description

Refer to the description of P7-01.

※=Factory-set value

5.8.8 Hardware protection: P8

P8-01 Braking resistor protection	X	B	B	B	B
(DB Resistor Prot)					

Set value

Unavailable

※[0]

Available

[1]

Function

Setting of hardware protection function

Selection Description

Set value	Description
0	Unavailable (For brake resistor module LKEB)
1	Available (Brake resistor ERF150WJ□: overheating protection)

P8-02 OH pre-alarm temperature	X	A	A	A	A
(OH Pre-Alarm Lvl)					

Set value

50-110

※[95]

Function

The detected temperature of inverter overheating (OH) pre-alarm function is taking °C as unit.

Selection Description

Refer to the following descriptions

P8-03 OH pre-alarm action	X	A	A	A	A
(OH Early-pre-alarm Lvl)					

Set value

Decelerated stop in accordance with the decelerating time 31-02

[0]

Free stop

[1]

Decelerated stop in accordance with the Emergent stop time 31-09

[2]

Continue to run

※[3]

Function

Set the action after the inverter overheating (OH) pre-alarm is detected

Selection Description

For P8-02, please set the detection temperature of inverter overheating (OH) pre-alarm, taking °C as unit. The temperature of ventilating fan will be the detection object; when the set value is reached, it will make an OH pre-alarm.

For P8-03, please set the action after the inverter overheating (OH) pre-alarm is detected. In addition, when protection action reaches 105 °C, OH1 (fin overheating) can be detected.

P8-05 Phase loss protection inside input	X	A	A	A	A
(PH Los In Sel)					

Set value

Unavailable

※[0]

Available

[1]

Function

Input phase-loss protection selection

Selection Description

Detect the power phase-loss and changes in main circuit DC voltage caused by great imbalance in power supply and main circuit capacitor deterioration.

P8-07 Phase loss protection inside output	X	A	A	A	A
(PH Los In Sel)					
Set value					
Unavailable					※[0]
Available					[1]
Function					
Input phase-loss protection selection					
Selection Description					
For occasion that motor power is smaller than the inverter power, the output phase-loss may be detected by mistake; for this situation, set it to be "0".					
P8-10 Ground protection	X	A	A	A	A
(Gnd Det Sel)					
Set value					
Unavailable					※[0]
Available					[1]
P8-17 Carrier frequency reducing selection	X	A	A	A	A
(L-Spd IGBT Prctl)					
Set value					
Not reduce the carrier frequency					[0]
Reduce the carrier frequency					※[1]
For factory adjustment					[2]
For factory adjustment					[3]
Function					
Carrier frequency reducing selection					
Selection Description					
Description of set value					
When reduce the metallic sound (carrier frequency sound) of motor (below 6Hz), please set P8-17=0 (no carrier frequency reducing) and P8-19(OL2 characteristic selection at low-speed)=1(available).					
For occasion under V/f control or vector control without PG, please do not set P8-17 and P8-19 to be "0" at the same time.					
P8-19 "OL2" Characteristic selection at low-speed	X	A	A	A	A
(O12 Cbara@L-Spd)					
Set value					
OL2 characteristic at low-speed is unavailable					※[0]
OL2 characteristic at low-speed is available					[1]
Function					
OL2 characteristic selection at low-speed					
Selection Description					
Setting description					
■ For reducing (below 6Hz) OL2 jump occasion with light load, please set P8-17=1 (with carrier frequency reducing) and P8-19(OL2 characteristic selection at low-speed) to be "0" (unavailable). But for 400V class 185kW~300kW inverter, please do not set P8-19=0.					
■ For V/f control or vector control without PG, please do not set P8-17 and P8-19 to be "0" at the same time.					
■ For occasion vector control with PG is running continuously at low-speed and high-load, please reduce the carrier frequency (36-01) to be 2 KHz.					

5.9 Parameter of operator (o)

5.9.1 Display setting/selection: o1

o1-01 Driving monitoring selection	O B B B B
(Monitor Select)	

Set value

4~38

※[6]

Function

For driving mode, set the series number of items intended to be monitored.

Selection Description

Under the driving mode of factory-set value, the frequency reference, the output frequency, the output current and the output voltage can be displayed immediately; the output voltage and other items under monitoring can be replaced. If the monitored items other than output voltage shall be displayed, please set the series number of monitoring item of this parameter.

The series number of monitoring items is the numerical value of □□ part in "M1-□□" of list of monitoring parameters.

o1-02 Power-on monitoring	O B B B B
(Power-On Monitor)	

Set value

Display frequency reference

※ [1]

Display output frequency

[2]

Display output current

[3]

Display the set by o1-01

[4]

Function

When the power is connected, the monitoring items that shall be displayed can be set.

Selection Description

When the power is connected, the data display part will display the frequency reference (default).

The monitoring items when power is connected can be selected from frequency reference, output frequency, output current or o1-01 setting.

If the monitoring item other than frequency reference shall be displayed, please change the set value of this parameter.

o1-03 Linear velocity setting	O B B B B
(Display Scaling)	

Set value

0~39999

※[0]

Function (Description of set value)

Set value	Description
0	The unit is 0.01Hz
1	0.01%
2~39	r/min(0~3999) r/min=120Xfrequency reference(Hz)/ o1-03 (motor poles)
40~39999	Radix point position: decided by the fifth digit of 01-03. The value of the fifth digit=0: Expressed as□□□□ The value of the fifth digit= 1: Expressed as□□□□. The value of the fifth digit=2: Expressed as□□□□. The value of the fifth digit= 3: Expressed as□□□□. Percentage: decided by the fourth-first digit of o1-03. (Example 1) If o1-03=12000, 100% speed =200.0 60% speed = 120.0 (Example 2) If o1-03=26500, 60% speed = 39.00.

o1-04 Display unit	O	B	B	B	B
(Display Units)					
Set value					
Hz					※ [0]
r/min					[1]
Function					
Set the setting unit for parameter of frequency relation (setting unit for 51-04, 06, 09).					
Selection Description					
Description of set value					
Setting unit of 51-04, 51-06, 51-09 can be changed.					
Frequency units except for these are unchanged.					
o1-04 is the special function for vector control mode with PG.					

o1-05 Display address	O	B	B	B	B
(Address Display)					
Set value					
Normal display (11-00)					※ [0]
Register address of MEMOBEUS communication					[1]
Function					
Select parameters No. and display method for operator					
Selection Description					

5.9.2 Multi-functional selection:o2

o2-01 PANEL/FWD key setting	O	B	B	B	B
(Oper PANEL/FWD Key)					
Set value					
Unavailable					[0]
Unavailable					※ [1]
Function					
Set the function of PANEL/FWD key					
Selection Description					
Please set whether the PANEL/FWD key of digital operator is available or unavailable.					

o2-02 STOP key setting	O	B	B	B	B
(Oper STOP Key)					
Set value					
Unavailable					※ [0]
Unavailable					[1]
Function					
Set the function of STOP key					
Selection Description					
Please set whether the STOP key of digital operator is available or unavailable.					

o2-03 Initial reset of user parameters	O	B	B	B	B
(User Defaults)					
Set value					
Record holding/not be set					※ [1]
Record start					[0]
Function					
When the user parameter initialization is used, the initial value is recorded / cleared.					
Selection Description					
It is the parameter to record / clear the initial value in the user's parameters.					
The user's set parameter can be recorded by inverter as initial value of parameter.					
After setting, the operator will return to "0".					

o2-09 Selection of initialization mode

(Lint model sel)

Set value

0~2

[0]

Selection Description

Please do not set it

5.10 Parameter of driving mode

Under the driving mode, the items that can be monitored are shown as the table below.

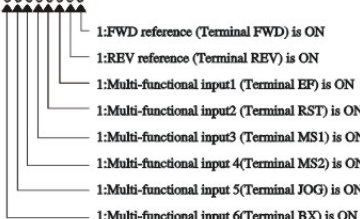
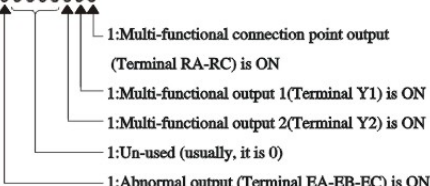
The right column of "access level/display availability" in the table has marked items that can be monitored in any access level and under any control mode; the meaning of the marks are shown as follows.

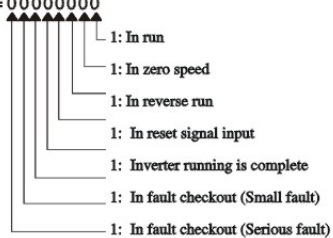
Q	Items monitored at all QUICK-START, BASIC, ADVANCED access levels
B	Items monitored at all ADVANCED and BASIC access levels
A	Items monitored at all ADVANCED access levels
X	Items monitored under such control mode

In addition, the signal level when multi-functional analog output is displayed by gain=100.0 and bias=0.0.

Parameters and their contents that can be monitored under the driving mode

Function	Parameter No.	Name	Content	Output signal level when multi-functional analog output	Min. unit	Access Level			
		Operator display				V/f without PG	V/f with PG	Vector without PG	Vector with PG
Status monitoring	M1-01	Frequency reference	Monitoring/setting of frequency reference value; Display unit: set by o1-03;	10V: Maximum frequency (0~±10V: corresponded)	0.01Hz	Q	Q	Q	Q
	M1-02	Output frequency	Monitoring output frequency; Display unit: set by o1-03;	10V: Maximum frequency (0~±10V: corresponded)	0.01Hz	Q	Q	Q	Q
	M1-03	Output current	Monitoring output current;	10V: Inverter's rated output current (0~+10V absolute value output)	0.1A	Q	Q	Q	Q
	M1-04	Control method	Confirm the set control mode	(cannot be output)	-	Q	Q	Q	Q
	M1-05	Motor speed	Monitor the detected motor speed; Display unit: set by o1-03;	10V: Maximum frequency (0~±10V: corresponded)	0.01Hz	×	Q	Q	Q
	M1-06	Output voltage reference	Monitor the inverter's internal output voltage reference value;	10V: AC200V(AC400V) (0~+10V output)	0.1V	Q	Q	Q	Q
	M1-07	Main circuit DC voltage	Monitor the main circuit DC voltage inside inverter	10V: DC400V(DC800V) (0~+10V output))	1V	Q	Q	Q	Q
	M1-08	Output power	Monitor output power (internal detection value)	10V: inverter power kW (Max. applicable motor power) (0~±10V: corresponded)	0.1kW	Q	Q	Q	Q
	M1-09	Torque reference (internal)	Monitor the internal torque reference under vector control	10V: motor rated torque (0~±10V: corresponded)	0.1%	×	×	Q	Q

Function	Parameter No.	Name	Content	Output signal level when multi-functional analog output	Min. unit	Access Level			
		Operator display				V/f without PG	V/f with PG	Vector without PG	Vector with PG
	M1-10	Input terminal status	Monitor ON/OFF of output terminal (cannot be output) M1-10=00000000 	-	Q	Q	Q	Q	
	M1-11	Output terminal status	Monitor ON/OFF of output terminal (cannot be output) M1-11=00000000 	-	Q	Q	Q	Q	

Func tion	Parameter No.	Name	Content	Output signal level when multi-functional analog output	Min. unit	Access Level			
		Operator display				V/f without FG	V/f with FG	Vector without FG	Vector with FG
Statu s monit oring	M1-12	Running status	Running status confirmation (cannot be output) M1-12= 00000000 		-	Q	Q	Q	Q
	M1-13	Elapsed running time	Monitor elapsed Time of inverter running; Initial value of operating time/power-on time: set by o2-07, -08;	(cannot be output)	1 Hour	Q	Q	Q	Q
	M1-14	Soft ware No.	(For manufacturer management)	(cannot be output)	-	Q	Q	Q	Q
	M1-15	Frequency reference (voltage): Terminal FTV input voltage	10V monitored input voltage of frequency reference (voltage): displayed as 100%;	10V: 100% (10V input) (0~±10V: corresponded)	0.1%	B	B	B	B
	M1-16	Frequency reference (current): Terminal FIC input current	20 mA input current of monitored frequency reference (current): displayed as 100%.	20mA: 100% (20mA input) (0~+10V output)	0.1%	B	B	B	B
	M1-17	Multi-functional analog terminal MFI input voltage	10V input voltage of monitored multi-functional analog input: displayed as 100%.	10V: 100%(10V input) (0~±10V: corresponded)	0.1%	B	B	B	B

M1-18	Motor secondary current (W)	Monitoring of calculation value of motor secondary current; Rated current under monitoring: displayed as 100%.	10V: Motor rated secondary current (0~+10V output)	0.1%	B	B	B	B
M1-19	Motor excitation current (W)	Monitoring of calculation value of motor excitation current; When the rated current is monitored, it is displayed as 100%.	10V: Motor rated secondary current (0~+10V output)	0.1%	×	×	B	B
M1-20	SPS output frequency	Monitoring of output frequency after soft start; For frequency without compensation of slip compensation, set in accordance with unit in o1-03.	10V:Maximum frequency (0~±10V: corresponded)	0.01Hz	A	A	A	A
M1-21	Speed control ASR input	Maximum frequency input to the speed control circuit under monitoring: display as 100%.	10V:Maximum frequency (0~±10V:corresponded)	0.01%	×	A	×	A
M1-22	Speed control ASR output	Motor rated secondary current output from speed control circuit under monitoring: display as 100%.	10V: Motor rated secondary current (0~±10V output)	0.01%	×	A	×	A
M1-23	Speed deviation	Speed deviation maximum frequency of speed control circuit under monitoring: display as 100%.	10V:Maximum frequency (0~±10V: corresponded)	0.01%	×	A	×	A
M1-24	PID feedback	Monitored feedback of PID control equal to the maximum frequency input: display as 100%.	10V:Maximum frequency (0~±10V:corresponded)	0.01%	A	A	A	A
M1-25	D1-16H2 input status	Monitoring of reference value from D1-16H2 (digital reference card); Be displayed by binary/BCD according to 63-01,	(cannot be output)	-	A	A	A	A
M1-26	Output voltage reference (Vq)	Control on motor's secondary current; monitoring of inverter's internal voltage reference value;	10V: AC200V(AC400V) (0~±10V:corresponded)	0.1V	×	×	A	A
M1-27	Output voltage reference (Vd)	Control on the motor's excitation current; monitoring of inverter's internal voltage reference value;	10V: AC200V(AC400V) (0~±10V: corresponded)	0.1V	×	×	A	A

Parameters and their contents that can be monitored under the driving mode (Continue)

Function	Parameter No.	Name	Content	Output signal level when multi-functional analog output	Min. unit	Access Level			
		Operator display				V/f without PG	V/f with PG	Vector without PG	Vector with PG
	M1-28	Software No.	(For manufacturer management)	(cannot be output)	0.1V	A	A	A	A
	M1-32	ACR output from q shaft	Monitoring of output value of current control on motor's secondary current;	10V:100%	0.1%	×	×	A	A
	M1-33	ACR output from d shaft	Monitoring of output value of current control on motor's excitation current;	10V:100%	0.1%	×	×	A	A
	M1-34	OPE abnormal parameter	The initial parameters No. after OPE abnormal is detected;	(cannot be output)	-	A	A	A	A
	M1-35	Mobile pulse of zero servo	In zero servo, the mobile bandwidth taking the stop point as center is displayed by four times of pulse;	(cannot be output)	1	×	×	×	A
	M1-36	PID input	PID reference + PID reference deviation -PID feedback is displayed by maximum frequency/100%;	10V:Maximum frequency	0.01%	A	A	A	A
	M1-37	PID Output	PID control output is displayed by maximum frequency/100%;	10V:Maximum frequency	0.01%	A	A	A	A
	M1-38	PID Reference	PID reference + PID reference deviation is displayed by maximum frequency/100%;	10V:Maximum frequency	0.01%	A	A	A	A
	M2-01	Current fault	Current fault content	(cannot be output)	-	Q	Q	Q	Q
	M2-02	Last fault	Recent fault content		-	Q	Q	Q	Q
	M2-03	Frequency reference at abnormal status	Frequency reference when "Last fault" occurred;		0.01Hz	Q	Q	Q	Q
	M2-04	Output frequency at abnormal status	Output frequency upon "Last fault";		0.01Hz	Q	Q	Q	Q
	M2-05	Output current at abnormal status	Output frequency upon "Last fault";		0.1A	Q	Q	Q	Q
	M2-06	Motor speed at abnormal status	Motor speed upon "Last fault";		0.01Hz	×	Q	Q	Q
	M2-07	Output voltage reference at abnormal status	Output voltage reference upon "Last fault";		0.1V	Q	Q	Q	Q
	M2-08	DC voltage of main circuit at abnormal status	Main circuit DC voltage upon "Last fault";		1V	Q	Q	Q	Q
	M2-09	Output power at abnormal status	Output power upon "Last fault";		0.1Kw	Q	Q	Q	Q
	M2-10	Torque reference at abnormal status	Motor's rated torque upon "Last fault" is displayed by 100%;		0.1%	×	×	Q	Q
	M2-11	Input Terminal status	Input terminal status upon "Last fault" is displayed by the same status as M1-10;		-	Q	Q	Q	Q

(Note) For faults such as CPF00, 01, 02, 03, UV1, UV2, there is no abnormal trajectory.

Function	Parameter No.	Name	Content	Output signal level when multi-functional analog output	Min. unit	Access Level			
		Operator display				V/f without PG	V/f with PG	Vector without PG	Vector with PG
(Note ¹)	M2-12	Output Terminal at abnormal status	Output terminal status upon "Last fault" is displayed by the same status as M1-11;	(cannot be output)	-	Q	Q	Q	Q
Abnormal trajectory	M2-13	Running status at abnormal status	Running status upon "Last fault" is displayed by the same status as M1-12;		-	Q	Q	Q	Q
	M2-14	Elapsed running time at abnormal status	Elapsed running time upon "Last fault";		1 Hour	Q	Q	Q	Q
(Note ²) Abnormal trajectory	M3-01	Last fault	Content of last fault	(cannot be output)	-	Q	Q	Q	Q
	M3-02	Faults of first two times	Content of faults of first two times		-	Q	Q	Q	Q
	M3-03	Faults of first three times	Content of faults of first three times		-	Q	Q	Q	Q
	M3-04	Faults of first four times	Content of faults of first four times		-	Q	Q	Q	Q
	M3-05	Elapsed running time before the last fault	Elapsed running time before the last fault		1 Hour	Q	Q	Q	Q
	M3-06	Elapsed running time before the first two times	Elapsed running time before the first two times		1 Hour	Q	Q	Q	Q
	M3-07	Elapsed running time before the first three times	Elapsed running time before the first three times		1 Hour	Q	Q	Q	Q
	M3-08	Elapsed running time before the first four times	Elapsed running time before the first four times		1 Hour	Q	Q	Q	Q

(Note)

- For faults such as CPF00, 01, 02, 03, UV1, UV2, there is no abnormal trajectory.
- No fault record of CPF00, 01, 02, 03, UV1, UV2 is saved.

■ Monitoring as power-on

Under the driving mode, the default setting such as the frequency reference, output frequency, output current and output voltage can be monitored. Only the output voltage can be replaced by any other monitored items. If the other monitored items other than the output voltage should be displayed, please set monitoring No. for o1-01 (Driving monitoring selection). Please refer to the following operating example. If the default value is set, when the power is ON, the frequency reference will be displayed. When the power is ON, the monitored item can be selected from the frequency reference, output frequency, output current and the set items in o1-01.

If the monitoring display when the power is ON should be changed, please change o1-02 (Power-on monitoring).

Display of parameters o1-01 and o1-02 only can be set when the access level is BASIC and ADVANCED.

■ Description of monitoring display

The manual adopts the following table to describe each parameter.

Parameter NO.	Name	Changes during running	Setting range	Unit	Factory set value	Access level			
						V/f without PG	V/f with PG	Vector without PG	Vector with PG
o1-01	Driving monitoring selection	O	4~38	-	6	B	B	B	B

Please set the monitored item NO. (numerical value of □□part in "M1-□□" of list of monitored parameter)that is intended to be displayed, in order to replace the output voltage display.

Changes during running	Whether the parameters can be changed when the inverter is in run	
	O	Change in run is available.
	×	Change in run is unavailable.
Setting range	Setting range of parameters	
Unit	Unit of setting value ("-" is the unit)	
Factory set value	Factory-set value (Different default settings for different control methods. In case of changes in control method, the default setting will replace the parameter.)	
Factory set value	Set control method and access level by reference.	
	Q	Reference items at all QUICK-START, BASIC, ADVANCED access levels
	B	Reference items at all ADVANCED and BASIC access levels
	A	Reference items at all ADVANCED access levels
	×	Reference items under control mode

Parameter NO.	Name	Changes during running	Setting range	Unit	Factory set value	Access level			
						V/f Without PG	V/f With PG	Vector Without PG	Vector With PG
o1-02	Power-on monitoring	O	1~4	-	1	B	B	B	B

Please select the monitoring item to be displayed as power ON. Please refer to the table below.

Displayed monitoring item as power ON

Set Value	Content
1	As power ON, display the frequency reference.
2	As power ON, display the output frequency.
3	As power ON, display the output current.
4	As power ON, display the monitoring items set by o1-01.

5.11 List of parameter setting

Take the factory-set value of 220V class 3kW inverter under control without PG (11-02=2) as an example.

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
				25-07	PID bias adjustment	0.0	42
11-01	Access level of parameters	4	33	25-08	PID primary delay time parameter	0.00	43
11-02	Selection of control method		33	25-09	PID output characteristic selection	0	43
11-03	Parameter initialization	0000	33	25-10	PID output Gain	1.0	43
11-04	Password 1	0000	33	25-11	PID REV selection of PID output	0	43
				25-12	PID feedback loss detection	0	
12-01 ~ 12-32	User's parameters	-	35	25-13	PID feedback loss detection value	0	43
21-01	Frequency reference	1	35	25-14	PID feedback loss detection time	1.0	43
21-02	Running reference	1	35	26-01	DWELL frequency at start	0.0	45
21-03	Stopping method	0	35	26-02	DWELL time at start	0.0	45
21-04	Reverse run forbidden	0	37	26-03	Dwell frequency at stop	0.0	45
21-05	Action selection below 51-09	0	37	26-04	Dwell time at stop	0.0	45
21-06	Second time selection of sequence control input	1	37	27-01	Droop control gain	0.0	45
21-07	Running mode switch ^{*2}	0	37	27-02	Droop control delay time	0.05	45
21-08	Running reference selection of PRG mode	0	37	28-01	Energy-saving level gain	80	45

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
22-01	Zero speed level (the frequency at which the DC brake starts)	0.5	37	28-02	Energy-saving frequency	0.0	45
22-02	DC brake current	50	37	29-01	Zero servo gain	5	46
22-03	DC brake time at start	0.00	38	29-02	Zero servo complete bandwidth	10	46
22-04	DC brake time at stop	0.50	38	31-01	Accelerating time 1	10.0	46
22-08	Magnetic flux compensation	0	38	31-02	Decelerating time 1	10.0	46
23-01	Selection of speed search at start	0*	38	31-03	Accelerating time 2	10.0	46
23-02	Current of speed search action	100*	38	31-04	Decelerating time 2	10.0	46
23-03	Speed search decelerating time	2.0	39	31-05	Accelerating time 3	10.0	46
24-01	TIMER function ON delay time	0.0	39	31-06	Decelerating time 3	10.0	47
24-02	TIMER function OFF delay time	0.0	39	31-07	Accelerating time 4	10.0	47
25-01	PID control method selection	0	39	31-08	Decelerating time 4	10.0	47
25-02	Proportional gain(P)	1.00	42	31-09	Emergent stop time	10.0	47
25-03	Integration time (I)	1.0	42	31-10	Acceleration/ Decelerating time unit	1	47
25-04	Integration (I) upper limit	100.0	42	31-11	Acceleration/ Decelerating time switching frequency	0.0	47
25-05	Differential (D) time	0.00	42	32-01	"S" characteristic time at the beginning of acceleration	0.20	48
25-06	PID upper limit	100.0	42	32-02	"S" characteristic time at the end of acceleration	0.20	48

* Factory-set value will be different in accordance with the control method (11-02).
(Marked by*)

List of parameter setting (continue)

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
32-03	"S" characteristic time at the beginning of deceleration	0.20	48	41-03	Frequency reference 3	0.00	53
32-04	"S" characteristic time at the end of deceleration	0.20	48	41-04	Frequency reference 4	0.00	53
33-01	Slip compensation gain	●1.0	49	41-05	Frequency reference 5	0.00	53
33-02	Slip compensation primary delay time	●200	49	41-06	Frequency reference 6	0.00	53
33-03	Slip compensation limit	200	49	41-07	Frequency reference 7	0.00	53
33-04	Slip compensation in regeneration	0	49	41-08	Frequency reference 8	0.00	53
33-05	Flux calculation method	0	49	41-09	Jog frequency reference	6.00	53
33-06	Output voltage limit	0	49	42-01	Frequency reference upper limit	100.0	54
34-01	Torque compensation gain	1.00	50	42-02	Frequency reference lower limit	0.0	
34-02	Torque compensation time parameter	●20	50	43-01	Jump frequency 1	0.0	54
34-03	FWD starting torque	0.0	50	43-02	Jump frequency 2	0.0	54
34-04	REV starting torque	0.0	50	43-03	Jump frequency 3	0.0	54
34-05	Starting torque time parameter	10	50	43-04	Jump frequency bandwidth	1.0	54
35-01	ASF proportional gain 1	●20.00	50	44-01	Holding function selection of frequency reference	0	55
35-02	ASF integration time 1	●0.500	50	44-02	+SPEED limit value	25	55

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
35-03	ASF proportional gain 2	●20.00	51	45-01	Torque control selection	0	55
35-04	ASF Integration time 2	●0.500	51	45-02	Torque reference delay time	0	56
35-05	ASF limit	5.0	51	45-03	Speed limit selection	1	56
35-06	ASF output primary delay time	0.004	51	45-04	Speed limit	0	56
35-07	ASF switch frequency	0.0	51	45-05	Speed limit bias	10	56
35-08	ASR integration limit *2	400	51	45-06	Speed/torque control switch time	0	57
36-01	Carrier frequency upper limit	15.0	51	51-01	Setting of input voltage	*200	57
				51-02	Motor selection	0	57
				51-03	V/f curve selection	0F	57
37-01	Hunting prevention function selection	1	52	51-04	Max. output frequency	60.0	60
37-02	Hunting prevention gain	1.00	52	51-05	Max. voltage	*200.0	60
38-08	Speed feedback detection control (AFR) gain	1.00	52	51-06	Base frequency	60.0	60
38-09	Speed feedback detection control (AFR) time parameter	50	53	51-07	Middle output frequency	●3.0	60
38-30	Carrier frequency selection in Autotuning	0	53	51-08	Middle output frequency voltage	●*11.0	60
41-01	Frequency reference 1	0.00	53	51-09	Min. output frequency	●0.5	60
41-02	Frequency reference 2	0.00	53	51-10	Min. output frequency voltage	●*2.0	60

1. Factory-set value will be different in accordance with the selection of control method (11-02). (Marked by ●)

2. This is the set value of 200V inverter; for occasion of 400V, the set value is twice of this. (Marked by *)

List of parameter setting (continue)

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
51-11	Middle output frequency 2	0.0	60	61-06	PG output frequency-dividing ratio (PG pulse monitoring)	1	65
51-12	Middle output frequency voltage 2	0.0	60	61-07	Integration control selection in acceleration/deceleration	0	65
51-13	Base voltage	0.0	60	61-08	Overspeed detection level	115	65
52-01	Motor rated current	*1.90	61	61-09	Overspeed detection delay time	0.0	65
52-02	Motor rated slip	*2.90	61	61-10	Speed deviation detection level	10	65
52-03	Motor no-load current	*1.20	61	61-11	Over speed deviation detection delay time	0.5	65
52-04	Motor number of poles	4	61	61-12	PG reduction gear teeth 1	0	66
52-05	Motor line-to-line resistance	*9.842	61	61-13	PG reduction gear teeth 2	0	66
52-06	Motor leak inductance	*18.2	61	61-14	PG open-circuit-detection time	2.0	66
52-07	Motor iron-core saturation coefficient 1	0.50	62	62-01	Selection of AI-14B input function	0	66
52-08	Motor iron-core saturation coefficient 2	0.75	62	63-01	Selection of frequency reference setting	0	66
52-09	Motor mechanical loss	0.0	62	64-01	Selection of output item in Channel 1	2	67
52-10	Torque compensation iron loss	*14	62	64-02	Output gain of Channel 1	1.00	67
53-01	Control mode selection of Motor 2	2	62	64-03	Selection of output item in Channel 2	3	67
54-01	Max. output frequency of Motor 2	60.0	62	64-04	Output gain of Channel 2	0.50	67
54-02	Max. voltage of motor 2	●200.0	62	64-05	Output monitoring deviation of CH1	0.0	67
54-03	Base frequency of motor 2	60.0	62	64-06	Output monitoring deviation of CH2	0.0	67

※=Factory-set value

List of parameter setting (continue)

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
51-11	Middle output frequency 2	0.0	60	61-06	PG output frequency-dividing ratio (PG pulse monitoring)	1	65
51-12	Middle output frequency voltage 2	0.0	60	61-07	Integration control selection in acceleration/deceleration	0	65
51-13	Base voltage	0.0	60	61-08	Overspeed detection level	115	65
52-01	Motor rated current	*1.90	61	61-09	Overspeed detection delay time	0.0	65
52-02	Motor rated slip	*2.90	61	61-10	Speed deviation detection level	10	65
52-03	Motor no-load current	*1.20	61	61-11	Over speed deviation detection delay time	0.5	65
52-04	Motor number of poles	4	61	61-12	PG reduction gear teeth 1	0	66
52-05	Motor line-to-line resistance	*9.842	61	61-13	PG reduction gear teeth 2	0	66
52-06	Motor leak inductance	*18.2	61	61-14	PG open-circuit-detection time	2.0	66
52-07	Motor iron-core saturation coefficient 1	0.50	62	62-01	Selection of AI-14B input function	0	66
52-08	Motor iron-core saturation coefficient 2	0.75	62	63-01	Selection of frequency reference setting	0	66
52-09	Motor mechanical loss	0.0	62	64-01	Selection of output item in Channel 1	2	67
52-10	Torque compensation iron loss	*14	62	64-02	Output gain of Channel 1	1.00	67
53-01	Control mode selection of Motor 2	2	62	64-03	Selection of output item in Channel 2	3	67
54-01	Max. output frequency of Motor 2	60.0	62	64-04	Output gain of Channel 2	0.50	67
54-02	Max. voltage of motor 2	●200.0	62	64-05	Output monitoring deviation of CH1	0.0	67
54-03	Base frequency of motor 2	60.0	62	64-06	Output monitoring deviation of CH2	0.0	67

※=Factory-set value

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
54-04	Mid. output frequency of motor 2	3.0	62	65-01	Output selection of Channel 1	0	67
54-05	Mid. frequency voltage of motor 2	●11.0	63	65-02	Output selection of Channel 2	1	67
54-06	Min. output frequency of motor 2	0.5	63	66-01	Output mode selection	0	68
54-07	Min. output frequency voltage of motor 2	●2.0	63	67-01	Output pulse selection	1	68
55-01	Rated current of motor 2	*1.9	63	68-01	Transmission option (SI-F/G)	1	68
55-02	Rated slip of motor 2	*2.90	63	69-01	Selection of external fault input level from transmission option	0	68
55-03	No-load current of motor 2	*1.20	63	69-02	Selection of external fault detection mode from transmission option	0	68
55-04	Number of poles of motor 2	4 Poles	64	69-03	Selection of external fault input action from transmission option	1	68
55-05	Line-to-line resistance of motor 2	*9.842	64	69-04	Scanning sampling time from transmission option	0	69
55-06	Leak inductance of motor 2	●18.2	64	69-05	The torque reference/torque limit from transmission card other than SI-K2	1	69
61-01	PG pulse number	600	64	69-06	Selection of error detection action not transmitted by SI-K2	1	69
61-02	PG open-circuit running mode	1	64	T1-01	Terminal EF function selection	24	69
61-03	PG overspeed running mode	1	64	T1-02	Terminal RST function selection	14	69
61-04	PG excessive speed difference mode	3	64	T1-03	Terminal MS1 function selection	3	69
61-05	PG rotation direction	0	65	T1-04	Terminal MS2 function selection	4(3)	69

1. This is the set value of 200V inverter; for occasion of 400V, the set value is twice of this. (Marked by ●)
2. Factory-set value will be different in accordance with the selection of control method (11-02). (Marked by *)

List of parameter setting (continue)

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
T1-05	Terminal JOG function selection	6	69	P2-01	Action selection in transient power failure	0	92
T1-06	Terminal BX function selection	8(6)	69	P2-02	Transient compensation time	*0.7	92
T2-01	Terminal RA-RC function selection	0	83	P2-03	Min. base block time	*0.5	92
T2-02	Terminal Y1 function selection	1	83	P2-04	Voltage reset time	*0.3	92
T2-03	Terminal Y2 function selection	2	83	P2-05	Low voltage detection level	●190	93
T3-01	Terminal FIV signal level selection	0	87	P2-06	KEB deceleration speed	0.0	93
T3-02	Terminal FIV input gain	100.0	87	P3-01	Stall prevention selection in acceleration	1	93
T3-03	Terminal FIV input bias	0.0	87	P3-02	Stall prevention level in acceleration	160	93
T3-04	Terminal MFI signal level selection	0	87	P3-03	Stall prevention level limit in acceleration	50	93
T3-05	Terminal MFI function selection	0	87	P3-04	Stall prevention selection in deceleration	1	94
T3-06	Terminal MFI input gain	100.0	89	P3-05	Stall prevention selection in running	1	95
T3-07	Terminal MFI input bias	0.0	89	P3-06	Stall prevention level in running	160	95
T3-08	Terminal MFC signal level selection	2	89	P4-01	Frequency detection level	0.0	95
T3-09	Terminal MFC function selection	1F	89	P4-02	Frequency detection bandwidth	2.0	95
T3-10	Terminal MFC input gain	100.0	89	P4-03	Frequency detection level	0.0	95
T3-11	Terminal MFC input bias	0.0	89	P4-04	Frequency detection bandwidth (+/-)	2.0	95
T3-12	Analog input delay parameter	0.00	90	P4-05	Action selection in reference loss	0	95

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
T4-01	Terminal MV+ input monitor selection	2	90	P5-01	Number of restart for abnormal reset	0	96
T4-02	Terminal MV+ output gain	1.00	90	P5-02	Contact action selection in restart for fault reset	0	96
T4-03	Terminal MV+ output bias	0.0	90	P6-01	Overtorque detection action selection 1	0	96
T4-04	Terminal MA+ output monitor selection	3	90	P6-02	Overtorque detection level 1	150	96
T4-05	Terminal MA+ output gain	0.50	90	P6-03	Overtorque detection time 1	0.1	96
T4-06	Terminal MA+ output bias	0.0	91	P6-04	Overtorque detection action selection 2	0	96
T4-07	Analog output signal level selection	0	91	P6-05	Overtorque detection level 2	150	97
T5-01	Serial communication address	1F	91	P6-06	Overtorque detection time 2	0.1	97
T5-02	Transmission speed selection	3	91	P7-01	Torque limit in forward rotation	200	97
T5-03	Transmission parity selection	0	91	P7-02	Torque limit in reverse running	200	97
T5-04	Transmission fault detection selection	3	91	P7-03	Torque limit in forward running regeneration	200	97
T5-05	Transmission fault detection	1	91	P7-04	Torque limit in reverse running regeneration	200	98
P1-01	Motor protection selection	1	91	P8-01	Concealed brake resistor protection	0	98
P1-02	Motor protection time	1.0	92	P8-02	"OH" pre-alarm level	95	98

1. Factory-set value will be different in accordance with the selection of control method (11-02). (Marked by *)
2. This is the set value of 200V inverter; for occasion of 400V, the set value is twice of this. (Marked by ●)

Table 12.1 List of parameter setting (continue)

Parameter No.	Name (Display on the LCD screen)	Default setting	Set value	Parameter No.	Name (Display on the LCD screen)	Default setting	Set value
P8-03	Action selection after OH pre-alarm level	3	98	o1-05	Selection of parameter No. display	0	99
P8-05	Phase loss protection inside input	0	98	o2-01	LOCAL/REMOTE Key function selection	1	100
P8-07	Phase loss protection inside output	0	98	o2-02	"STOP" Key function selection	1	100
P8-10	Ground protection selection	1	98	o2-03	Initial reset of user parameters	0	100
P8-17	Reducing carrier frequency selection	1	98	o2-04	Inverter power selection	*0	100
P8-19	"OL2" Characteristic selection at low-speed	1	99	o2-05	Setting method selection of frequency reference *1	0	100
o1-01	Driving monitoring selection	6	99	o2-06	Action selection as operating apparatus power-off	0	100
o1-02	Power-on monitoring	1	99	o2-07	Elapsed running time setting	-	100
o1-03	Frequency reference/monitor setting/display unit	0	99	o2-08	Elapsed running time selection	0	100
o1-04	Unit setting for frequency reference	0	99	o2-09	Selection of initialization mode *1	0	100

Factory-set value will be different in accordance with the selection of control method (11-02). (Marked by*)

Chapter VI Description of fault and countermeasures

6.1 Fault reference and countermeasures

6.1.1 Fault inspection

When the inverter fault is detected, the fault content will be displayed on the digital operator; the fault contact will cut off the output, then the motor will be stopped freely. (For fault that stop method selection is available, it will be in accordance with the set stop method).

- In case of fault, please refer to the table below and take corrective measures.
- For restart, please comply with the following any method to make fault reset.
- Abnormal reset signal is ON.

[For multi-functional input (TI-01~T1-06), Please set it to be abnormal reset (set value: 14)]

- Press the reset key on the digital operator.
- Cut off the main circuit power for a while; then connect it again.

Fault	Content	Cause	Countermeasure
PUF DC Bus Fuse Open	Fuse broken Fuse of main circuit is broken.	As the short-circuit of inverter output, the output transistor is damaged by grounding (confirm whether the following terminal is short-circuit; for short-circuit, the transistor is damaged): B1(Φ3) ↔ U, V, W; ⊙ ↔ U, V, W)	Replace the inverter after cause investigation and countermeasure implementation
GF Ground Fault	Ground current of inverter output is 150% of the inverter's rated output current.	Ground short-circuit occurred in inverter output (contact, grounding and etc. caused by motor burning, insulation deterioration and wire damage)	Reset the inverter after cause investigation and countermeasure implementation
OC Overcurrent	Overcurrent Inverter's output current is over the overcurrent detection value. (About 200% of the rated current)	● Ground short-circuit occurred in inverter output (contact, grounding and etc. caused by motor burning, insulation deterioration and wire damage) ● Load is too large and accelerating time is too short; ● Special motor or motor above the applicable maximum power is used; Electromagnetic switch of inverter output is acted	Reset the inverter after cause investigation and countermeasure implementation

Fault	Content	Cause	Countermeasure
UV1 DC Bus Undervolt	Main circuit low-voltage Main circuit DC voltage is lower than the low-voltage detection level (L2-05); 200V: about 190V 400V: about 380V	● Input power has phase loss. ● Transient power failure occurs. ● Wiring terminal of input power is loosened. ● Input power voltage changes too much.	Reset the inverter after cause investigation and countermeasure implementation
OV Overvoltage	Main circuit overvoltage Main circuit DC voltage is over the voltage detection value; 200V: about 190V 400V: about 380V	Decelerating time is too short; the motor regeneration energy is too much.	Extend the decelerating time or connect the braking resistance (braking resistor module)
		Power voltage is too high.	Reduce the voltage to a range within the power specification.
SC Short Circuit	Load short-circuit Inverter's output or load is shortened;	Ground short-circuit occurred in inverter output (contact, grounding and etc. caused by motor burning, insulation deterioration and wire damage)	Reset the inverter after cause investigation and countermeasure implementation
UV2 CTL PS Undervolt	Control power is abnormal The voltage of control current is too low;	—	● Try to make the power ON/OFF; ● Replace the inverter upon continuous abnormal situation.
UV3 MC Answerback	Surge circuit fault prevention Surge circuit fault prevention is non-performing;		● Try to make the power ON/OFF; ● Replace the inverter upon continuous abnormal situation.
PF Input Pha Loss	Main circuit voltage is abnormal Main circuit DC voltage has abnormal vibration under status other than regeneration. (Be detected if L8-05 is "available")	Input power has phase loss. Transient power failure occurred. Wiring terminal of input power is Loosened. Input power voltage changes too much. The balance of line voltage is bad.	Reset the inverter after cause investigation and countermeasure implementation

Fault	Content	Cause	Countermeasure
OH (OH1) Heatsink Over tmp	Heatsink overheating Inverter's heatsink temperature is over the set value of P8-02 or 105 °C;	Too high ambient temperature	Install a cooling device.
		Heating elements	Remove the heat source.
	Inverter's internal ventilating fan is stopped (over 18.5 kW)	The inverter's ventilating fan is stopped.	Install cooling device.
		The inverter's ventilating fan is stopped (over 18.5kW).	
LF Output Pha Loss	Output phase loss Inverter output has phase loss; (Be detected if P8-07 is available)	● Disconnected output cable; ● Disconnected motor coil; ● Loosened output terminal.	After cause investigation and countermeasure implementation, please reset the inverter.
		The power of used motor is below 1/20 of the inverter's maximum applicable motor power.	
RH Dyn Brk Resistor	Installation-type braking resistor overheating The braking resistor protection set by P8-01 is acted;	Decelerating time is too short; the motor regeneration energy is too much.	● Reduce the load; extend the decelerating time; and reduce the speed. ● Replace a new braking resistor module.
RR Dyn Brk Transistor	Built-in braking transistor is abnormal; Braking transistor action is abnormal;	—	● Try to make the power ON/OFF; ● In case of continuous abnormal situation, please replace the inverter.
OL3 Overtorque Det 1	Overtorque 1 Current is over (P6-02) and lasts for time over (P6-03);	—	● Confirm whether the set value of P6-02 and P6-03 is appropriate. ● Confirm the use condition of mechanical system; find out and solve the fault cause.

Fault	Content	Cause	Countermeasure
OL4 Overtorque det 2	Overtorque 2 Current is over (P6-05) and lasts for time over (P6-06);	—	- Confirm whether the set value of P6-05 and P6-06 is appropriate. - Confirm the use condition of mechanical system; find out and solve the fault cause.
OL1 Motor Overloaded	Motor overload Motor overload protection action caused by electronic thermal protection;	The load is too large; the accelerating & decelerating time and cycle time are too short.	Adjust the load size, accelerating & decelerating time and cycle time.
		The voltage with V/f characteristic is too high.	Adjust the V/f characteristic.
		The set value of motor's rated current (52-01) is inappropriate.	Confirm the motor's rated current value (52-01).
OL2 Inv Overloaded	Inverter overload Inverter overload protection action caused by electronic thermal protection;	The load is too large; the acceleration & decelerating time and cycle time are too short.	Adjust the load size, acceleration & decelerating time and cycle time.
		The voltage with V/f characteristic is too high.	Adjust the V/f characteristic.
		Inverter power is too small.	Please use an inverter with large capacity.
OS Over speed	Over speed Speed is over the set value (61-08) and lasts for time over (61-09);	Overshoot/shortage occurred.	Re-adjust the gain.
		The reference speed is too fast.	Adjust the reference circuit and reference gain.
		The set value of 61-08 and 61-09 is inappropriate.	Confirm the set value of 61-08 and 61-09.

Fault	Content	Cause	Countermeasure
PGO PG open	PG open detection Under the following conditions, the status without PG pulse input is over the time in 61-14; Vector Control With PG: Soft start output $\geq 2\%$ V/F Control With PG: Soft start output $\geq 61-09$	PG connection is broken.	Repair the broken circuit.
		PG connection has errors.	Correct the wiring.
		There is no PG power supply.	Correct power supply.
		—	Confirm whether the contracting brake (motor) is opened in use.
DEV Speed Deviation	Excessive speed deviation Speed deviation is over the set value (61-10) and lasts for time over (61-11);	The load is too large.	Reduce the load.
		The acceleration & decelerating time is too short.	Extend the acceleration & decelerating time.
		The load is locked.	Confirm the mechanical system.
		Setting of 61-10 and 61-11 is appropriate	Confirm the set value of 61-10 and 61-11.
		—	Confirm whether the contracting brake (motor) is opened in use.

Fault	Content	Cause	Countermeasure
OPR Oper Disconnect	Operator connection is not good In the running of operator control running reference, the operator is disconnected;	—	Confirm the operator connection
SVE Zero Servo Fault	Zero servo fault In the running of zero servo, the rotation position is deviated;	Torque limit is too small.	Increase it
		Load torque is too large.	Decrease it
		—	Check the PG signal interference
EFO Opt External Flt	External abnormal input from communication option card;	—	Check the communication card and communication signal

Fault	Content	Cause	Countermeasure
EF3 External Fault 3	External fault (Input terminal EF)	[External abnormal] is input outside the multi-functional input.	● Cancel the external abnormal input from multi-functional input ● Remove causes for external abnormal
EF4	External fault (Input terminal RST)		
EF5	External fault (Input terminal MS1)		
EF6	External fault (Input terminal MS2)		
EF7	External fault (Input terminal JOG)		
EF8	External fault (Input terminal BX)		
CPF00 COM-ERR (OP&INV)	Operator transmission fault 1 Operator communication is unavailable 5 seconds after power-on;	Terminal connection of digital operator is not good.	Remove the digital operator and re-install it.
		Inverter's control circuit is not good.	Replace the inverter
CPF01 COM-ERR (OP&INV)	Operator transmission fault 2 Transmission fault occurs 2 seconds later than the operator communication;	Terminal connection of digital operator is not good.	Remove the digital operator and re-install it.
		Inverter's control circuit is not good.	Replace the inverter
CPF02 BB Circuit Err	Base block circuit is not good; EEPROM is not good;	—	Try to make the power ON/OFF;
		Control circuit damage	Replace the inverter
CPF03 EEPROM Error	CPU internal A/D inverter is not good;	—	Try to make the power ON/OFF;
		Control circuit damage	Replace the inverter
CPF04 Internal A/D Err	Base block circuit is not good; EEPROM is not good;	—	Try to make the power ON/OFF;
		Control circuit damage	Replace the inverter
CPF05 External A/D Err	CPU internal A/D inverter is not good;	—	Try to make the power ON/OFF;
		Control circuit damage	Replace the inverter

6.1.2 Pre-alarm (alarm) inspection

Pre-alarm is the inverter's protection action; but the fault contact is not acted. After the fault cause is removed, the inverter will return to the original state.

The flashing of digital operator means the (pre-alarm) output of multi-functional output. If the alarm is happened, find out causes according to the table and take measures.

Alarm display	Content	Cause	Countermeasure
EF(blinking) External Fault	FWD and REV reference are input simultaneously; REV and FWD are input simultaneously for more than 0.5 seconds;	—	The sequence controller to adjust the FWD, REV reference; ※When such alarm is happened, the motor will be deceleratedly stopped (due to the unknown rotation direction).
OH2 (blinking) Overtorque Det 1	Inverter overheating pre-alarm Multi-functional inverter [inverter overheating pre-alarm OH2] is input.	—	Cancel the inverter's overheating pre-alarm of function input.
OL3(blinking) Overtorque Det 1	Overtorque 1 Current is over (P6-02) and lasts for time over (P6-03);	—	● Confirm whether the set value of P6-02 and P6-03 is appropriate. ● Confirm the mechanical use condition and remove the fault.
OL4(blinking) Overtorque Det 1	Overtorque 2 Current is over (P6-05) and lasts for time over (P6-06);	—	● Confirm whether the set value of P6-05 and P6-06 is appropriate. ● Confirm the mechanical use condition and remove the fault.
UV(blinking) DC Bus Undervol	Main circuit low-voltage When the running signal is not input, it is already under the following states: ● Main circuit DC voltage is below (P2-05) low-voltage detection level. ● The contactor for restraining surge current is disconnected. ● Control power is below the (CUV level) low-voltage.	Refer to the causes for fault display UV1, UV2 and UV3.	Refer to the countermeasures for fault display UV1, UV2 and UV3.

Alarm display	Content	Cause	Countermeasure
OV(blinking) Overvoltage	Main circuit overvoltage Main circuit DC voltage detection value is over the overvoltage; 200V: about 400V 400V: about 800V	Power voltage is too high.	Reduce the voltage to a range within the power specification.
OH (blinking) Heatsink Over tmp	Heatsink overheating The temperature of inverter's heatsink is over the set value of P8-02.	The ambient temperature is too high.	Install cooling device.
		There is heating elements around.	Remove heat source.
		The running of inverter's ventilating fan is stopped	Change a new ventilating fan (please contact our Company).
OS(blinking) Over speed	Over speed Speed is over the set value (61-08) and lasts for time over (61-09);	Overshoot/shortage occurred.	Re-adjust the gain.
		The reference speed is too fast.	Adjust the reference circuit and reference gain.
		The set value of 61-08 and 61-09 is inappropriate.	Confirm the set value of 61-08 and 61-09.
PGO (blinking) PG open	PG open detection Inverter has frequency output, but no PG pulse.	PG connection is broken.	Repair the broken circuit.
		PG connection has errors.	Correct the wiring.
		There is no PG power supply.	Correct power supply.
DEV(blinking) Speed Deviation	Excessive speed deviation Speed deviation is over the set value (61-10) and lasts for time over (61-11);	The load is too large.	Reduce the load.
		The acceleration & decelerating time is too short.	Extend the accelerating & decelerating time.
		The load is locked.	Confirm the mechanical system.
		Setting of 61-10 and 61-11 is appropriate	Confirm the set value of 61-10 and 61-11.

Alarm display	Content	Cause	Countermeasure
CALL SERIAL Com Call	SI-B transmission error When the power is input, the control information cannot be received normally.	—	Check the transmission equipment and the transmission signal
BUS Option Com Err	Selection of the transmission error Errors occur in the setting of running reference or frequency reference from the selection card.	—	Check the transmission card and the transmission signal
CE MEMOBUS Com Err	Transmission error After receiving the first control signal, no signal can be received normally within 2 seconds.	—	Check the transmission equipment and the transmission signal
EF3(blinking) External Fault 3	External abnormal (Input terminal EF)	[External abnormal] is input outside the multi-functional input.	● Cancel the external abnormal input from the multi-functional input ● Remove causes for the external abnormal
EF4(blinking)	External abnormal (Input terminal RST)		
EF5(blinking)	External abnormal (Input terminal MS1)		
EF6(blinking)	External abnormal (Input terminal MS2)		
EF7(blinking)	External abnormal (Input terminal JOG)		
EF8(blinking)	External abnormal (Input terminal BX)		

6.1.3 Operation Error

After the parameter is set, in case of the conflict situation between set value and each parameter, the operation error will be happened.

Before the parameter is set correctly, the inverter cannot be started. (Abnormal contact output of alarm output is not acted.)

In case of the operation error, based on the causes listed in the table below, please carry out the investigation and change the parameters.

Display	Content	Setting of abnormal content
OPE01 KVA Selection	Setting of inverter power is abnormal	If the set inverter power is not in accordance with the machine, please contact our company.
OPE02 Limit	Setting range of parameters is not good	Value beyond the setting range is set.
OPE03 Terminal	Selection of the multi-functional input is not good	Setting of multi-functional input (TI-01 ~ T1-06): ● More than 2 same values are set for multi-functional input. ● UP reference and DOWN reference are set not simultaneously. ● UP/DOWN reference and acceleration & deceleration holding reference are set simultaneously. ● External search reference (maximum output frequency) and external search reference (setting frequency) are set simultaneously. ● Base block reference NO/NC are set simultaneously. ● UP/DOWN reference are set when PID control (25-01) is available. ● T3-09 [Frequency reference (current) terminal FTC function selection] is (frequency reference) other than "1F"; the "Frequency reference" terminal FTV/FNT terminal selection is also set. ● +speed reference and -speed reference are not set simultaneously. ● Emergent stop references NO/NC are set simultaneously.
OPE05 Sequence Select	Selection of optional reference is not good	Parameter 21-01 (Frequency reference) =3 (optional card); optional card (option C): disconnected.
OPE06 PG Opt Missing	Selection of control method is not good	● Parameter 11-02 (Selection of control method)=1 (V/f control with PG); PG speed control card: disconnected. ● Parameter (Control method selection)=3 (Vector control with PG); PG speed control card: disconnected.

Display	Content	Setting of abnormal content
OPE07 Analog Selection	Selection of multi-functional analog input is not good	- T3-05 and T3-09 are different(except for "1F") - Analog reference card A1-14B, 62-01=0; Multi-functional input (T1-01 ~ T1-06)=2" (selection/inverter switch). - Parameters T3-05,T3-09 = "2" and "D" respectively ("2" and "D" cannot be setsimultaneously)
OPF08 Elevator Table	Parameter selection is not good	Set parameter not used under the current control mode. (For example)Function of vector control with PG is used; while parameter of vector control without PG is selected.
OPE10 V/f Ptrn Setting	V/f data setting is not good	51-04, 06,07,09 do not meet the following condition: 51-04(FMAX)≥51-06(FA) > 51-07(FB)≥51-09(FMIN)
OPE11 CarrFrg/On/Delay	Parameter setting is not good	The following any one setting is non-performing. - Carrier frequency upper limit (36-01)>5kHz and Carrier frequency lower limit (36-02)≤5kHz - Carrier frequency proportional gain (36-03) > 6;while (36-02)>(36-01) is set. - An error in the upper and lower limit of 36-01~03, 38-15.
ERR EEPROM R/W Err	EEPROW read-in is not good	EEPROM read-in is not matched - Try to make the power ON/OFF; - Adjust the setting parameter once again.

6.2 Common Failure Analysis

When the system is started, as there are errors in the parameter setting and wiring, the inverter and motor cannot be acted as imagined. For such occasions, please refer to this section to implement appropriate countermeasures.

6.2.1 Parameters cannot be set

■The display will not be changed after pressing the increase key and decrease key

1. Parameter read-in permission is input

●It will be happened when the parameter read-in permission (set value: 1B) is set for the multi-functional input. When the parameter read-in permission input is OFF, the parameter cannot be changed; only when the parameter read-in permission input is ON, the parameter can be set.

2. Inverter is started (driving mode)

When the inverter is started, there will be parameters that cannot be set; please stop the inverter and then set the parameters.

■OPE01~11 is displayed

●Parameter setting is abnormal: if the parameter setting value is abnormal, please refer to the section 6.1.3 Operation Error to make adjustment.

■CPF00, 01 is displayed

If the communication of digital operator is abnormal and the connection between digital operator and inverter is abnormal, please remove the operator and re-install it again.

6.2.2 Motor does not run

■After pressing the running key of operator, the motor will not run

1. There is an error in the setting of running method

●For occasion that the 21-02(Running reference) is set to be "1" (control circuit terminal), if the RUN key is pressed, the motor will still not run. Please set the parameter 21-02 to be "0" (digital operator).

2. Not under the driving mode

●If not under the driving mode, the inverter cannot be started under the preparation status. Please press the PRG/ESC key for 2 seconds, the driving mode will be displayed; then press the ENTER key, it will enter the driving mode.

3. Frequency reference is too low

●If the frequency reference is lower than the set frequency of the minimum output frequency (51-09), the inverter will not run. Please change the frequency reference, making it larger than the minimum output frequency (relevant parameters: 21-19-05, 51-09).

4. Setting of multi-functional analog input is abnormal

●If the multi-functional analog input (T3-05, T3-09) is set to be "1" (frequency gain), the voltage (current) is not input and the frequency reference is zero, please confirm whether the set value and analog input value are appropriate.

5. Under the multi-sectional speed running status, the frequency reference 2 is set; the auxiliary frequency reference is not input.

●For occasion that the multi-functional analog input (T3-05) is set to be "0" (auxiliary frequency reference) and the multi-sectional speed reference is used, the auxiliary frequency reference will be used as frequency reference 2. Please confirm whether the set value and multi-functional input value (Terminal MFI) are appropriate.

6. Under the multi-sectional speed running status, the numerical value of frequency reference 2 is set, but the multi-functional analog input (T3-05) is not set to be "1F".

●For occasion that the multi-functional analog input (T3-05) is set to be "0" (auxiliary frequency reference) and the multi-sectional speed reference is used, the auxiliary Frequency reference is used as frequency reference 2.

●Please confirm whether the multi-functional analog input (T3-05) is "1F" and whether the set value of frequency reference 2 is appropriate.

■After the external running signal is input, the motor still does not run.

1. There is an error in the selection of running method.

●If the 21-02 (Running reference) is set to be "0" (digital operator), after the external running signal is input, the motor still does not run; Please set the 21-02 to be "1" (control circuit terminal).

2. 3-wire system program status

●The input mode of FWD/STOP, REV/STOP running occasion (2-wire system) is different from that of the 3-wire system; even if the FWD/STOP, REV/STOP input terminal is ON, the motor will not run.

●For occasion that the motor is running under the 3-wire system, please input the correct signal after confirming the 3-wire system sequence diagram.

●For occasion that the motor is acted under the 2-wire status, please set the multi-functional input (T1-01 ~ T1-06) to be numerical value other than "0".

3. Not under the driving mode

●If not under driving mode, the inverter cannot be started under the preparation status. Please press the PRG/ESC key for 2 seconds, the driving mode will be displayed; then press the ENTER key, it will enter the driving mode.

4. Frequency reference is too low

●If the frequency reference is lower than the set frequency of minimum output frequency (51-09), the inverter will not run. Please change the frequency reference, making it larger than the minimum output frequency (relevant parameters: 21-19-05, 51-09).

5. The setting of multi-functional analog input is abnormal

●If the multi-functional analog input (T3-05, T3-09) is set to be "1" (frequency gain), the voltage (current) is not input and the frequency reference is zero, please confirm whether the set value and analog input value is appropriate.

6. Under the multi-sectional speed running status, the frequency reference 2 is set; the auxiliary frequency reference is not input.

●For occasion that the multi-functional analog input (T3-05) is set to be "0" (auxiliary frequency reference) and the multi-sectional speed reference is used, the auxiliary frequency reference will be used as frequency reference 2. Please confirm whether the set value and multi-functional input value (Terminal MFI) are appropriate.

7. Under the multi-sectional speed running status, the numerical value of frequency reference 2 is set, but the multi-functional analog input (T3-05) is set to be "1F".

●For occasion that the multi-functional analog input (T3-05) is set to be "0" (auxiliary frequency reference) and the multi-sectional speed reference is used, the auxiliary frequency reference is used as frequency reference 2.

●Please confirm whether the multi-functional analog input (T3-05) is "1F" and whether the set value of frequency reference 2 is appropriate.

■The motor is stopped during acceleration or when the load is connected

●Load is too large. Although the inverter has stall prevention function and automatic torque lifting function, for occasion that the acceleration is large and the load is too large, the motor will be beyond the response range. Please extend the accelerating time, reduce the load or increase the motor power.

■Motor can only rotate in one direction

●If the REV prohibition is selected, when the reverse run forbidden (21-04) is set to be "1", the inverter will not accept the REV reference. If both FWD and REV directions should be used, please set the parameter 21-04 to be "0".

6.2.3 Motor's rotating direction is reversed

●It is the reason for wiring error of motor output wire. If the inverter U, V, W and motor U, V, W are connected correctly, the motor will run reversely upon FWD reference. As the motor FWD direction is decided by manufacturer and motor model, please confirm the specification. If two wires from U, V, W are connected across, the rotation direction will be reversed.

6.2.4 Motor's torque output is unavailable/the accelerating time is too long

■Under the status of torque limit

●If the torque limit (P7-01~P7-04) parameters are set, because the torque above set value is set, the torque will be insufficient, or the accelerating time will be extended; please confirm whether the torque limit setting is appropriate.

When the torque limit (set value: 10~13) is set for multi-functional analog input (T3-05, T3-09) parameter, please confirm whether the multi-functional input value is appropriate.

■Stall prevention level in acceleration is too low

●If the set value of stall prevention level in acceleration (P3-02) is too small, the accelerating time will be extended. Please confirm whether the set value is appropriate.

■Stall prevention level in running is too low

●If the set value of stall prevention level in running is too low, the speed before torque output will be reduced. Please confirm whether the set value is appropriate.

■Under the vector control status, the Autotuning has not been implemented yet

●If the Autotuning is not implemented, the vector control capability is unavailable. Please run the Autotuning for the motor, set the motor parameter through computer, or change the control mode selection (11-02) to be under V/f control.

6.2.5 Motor overheating**■Motor load is too large**

●If the motor load is too large; the actual torque is over the motor's rated torque and the motor will be used for a long time, the motor heating will be within the motor's rated torque table. Besides the continuous rated torque, there is also a short-term rated torque. Please reduce the load, extend the accelerating & decelerating time or increase the motor power.

■The ambient temperature is too high

●Motor's rated value is decided by the ambient temperature. If the motor is running at the rated torque continuously in the ultra-temperature environment, it will be burned; please lower the motor's ambient temperature to make it within the allowable range.

■Motor's interphase withstand voltage is insufficient

●If the inverter output is connected to the motor, the inverter's switch action will make shock wave generate in the motor's winding coil. Usually, the maximum impulse voltage will reach 3 times of the inverter input power (For 400V, it is 1200V); please use the 400V inverter with motor's interphase impulse withstand voltage higher than the maximum impulse voltage. Please use special motor for inverter.

■Under the vector control method, the Autotuning is not implemented

●For occasion that the Autotuning is not implemented, the vector control function is not available. Please implement Autotuning for the motor, set the motor parameter through computer, or change the control mode selection (11-02) to be V/f control.

Chapter VII Specification

7.1 Standard specification of inverter

Standard specification of 440V

Series			Q-9000																											
Type	(HP)		3	5	5.5	7.5	10	15	20	25	30	40	50	60	75	100	120	150	180	200	250	300	340	400						
Rated Output	Motor power	KW	2.2	3.7	4	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	185	220	250	315						
	Rated power	KVA	4.7	6.1	8	11	14	21	26	31	37	50	61	73	98	130	150	170	202	230	260	340	370	460						
	Rated current	A	6.2	8	9	14	18	27	34	41	48	65	80	96	128	165	183	224	264	302	340	450	510	630						
	Output voltage	V	Three-phase 380/415/440/460V(Proportional to input voltage)																											
Power Supply	Max. output frequency				Up to 400Hz available by programming																									
	Rated voltage and Frequency				Three-phase 380~460V, 50Hz/60Hz																									
	Allowable voltage fluctuation				+10%~-15%																									
	Allowable frequency fluctuation				±5%																									
Control Feature	Control method				Sine wave PWM dynamic current vector control (with V/F control , torque vector control, PG feedback vector control)																									
	Speed control accuracy				±0.2%												[±0.02% with PG]													
	Speed control range				1:100												[1:1000 with PG]													
	Speed control response				10Hz												[30Hz with PG]													
	Starting torque				150%/0.5Hz												[200%/0Hz with PG]													
Protective Function	Torque response				20Hz, 50ms												[40Hz, 25ms with PG]													
	Torque accuracy				±5%																									
	Torque limit				4 kinds of vector control methods by parameter setting																									
	Frequency controlling range				0.01~400 Hz																									
	Frequency accuracy				Digital signal reference: ±0.01% (-10℃~ +40℃), analogue reference: ±0.1% (25℃±10℃)																									
	Frequency setting resolution				Digital signal reference: ±0.01Hz (Below 100Hz), analogue reference: ±0.03Hz/60Hz (12bit)																									
	Output frequency resolution				0.001 Hz																									
	Frequency setting signal				Analogue reference DC-10~+10V(20KΩ),4~20Ma(250Ω)																									
	Braking torque				±20 % (approximately 150% with braking resistor option)																									
	Accelerating/decelerating time				0.01-6000.0s (Accelerating/Decelerating time setting independently, 4 kinds of time controlling modes available)																									
	Overload capability				150% of Rated torque current for 60s, 200% of rated torque current for 10s																									
	Communication				RS-485																									
	Running/stopping setting				Operator, RS-485, Control circuit terminal (frequency setting and parameter access control available by computer)																									
	Affiliated control function				Parameter save operator, RS-485, torque control, speed control, PID control, multiple-speed control, couple control, etc.																									
	Instantaneous Overcurrent				Motor coasts to stop at approx. 200% rated output current.																									
	Motor overload protection				Electronic thermodynamic electric protection																									
	Fuse protection				Motor coasts to stop																									
	Momentary power loss				Continue to run during power loss less than 2s (standard)																									
	Overload				150% of rated output current for 60s, 200% of rated output current for 10s, motor coasts to stop																									
	Overvoltage				Motor coasts to stop if the main circuit voltage exceeds 820 V																									
	Undervoltage				Motor coasts to stop if the main circuit voltage drops to 380V																									
	Fin Overheat				Thermocouple temperature switch protection																									
	Stall prevention				Stall prevention during acceleration/deceleration and constant speed operation																									
	Ground fault				Protected by electronic circuit																									
	Power charge protection				Indicates until the main circuit voltage reaches 50 V																									
Environment	Ambient temperature				-10℃~+50℃(internal type)																									
	Ambient humidity				Below 90%RH (non-condensing)																									
	Vibration				9.8 m/s2 (1G) at a vibration frequency below 20 Hz, 2 m/s2 (0.2G) at a vibration frequency above20 Hz																									
	Applicable places				Indoor (Protected from corrosive gasses and dust)																									
	Storage temperature				-20℃~+65℃ (for short period during shipping)																									
Altitude environment				1000 meters or lower																										

※=Factory-set value

Standard specification of 220V

Series		Q-9000														
Type	(HP)	3HP	5HP	7.5HP	10HP	15HP	20HP	25HP	30HP	40HP	50HP	60HP	75HP	100HP	150HP	
Rated Output	Motor power	KW	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75	110
	Rated power	KVA	4.2	6.7	9.5	13	19	24	30	37	50	61	70	85	110	160
	Rated current	A	11	17.5	25	33	49	64	80	96	130	160	183	224	300	450
	Output voltage	V	Three-phase 200/220/230/240V (Proportional to input voltage)													
	Max. output frequency			Up to 400Hz available by programming												
Power	Rated voltage and Frequency			Three-phase 220~2400V, 50Hz/60Hz												
	Allowable voltage fluctuation			+10%~-15%												
	Allowable frequency fluctuation			±5%												
Control Feature	Control method			Sine wave PWM dynamic current vector control (with V/F control , torque vector control, PG feedback vector control)												
	Speed control accuracy			±0.2%					[±0.02% with PG]							
	Speed control range			1:100					[1:1000 with PG]							
	Speed control response			10Hz					[30Hz with PG]							
	Starting torque			150%/0.5Hz					[200%/0Hz with PG]							
	Torque response			20Hz, 50ms					[40Hz, 25ms with PG]							
	Torque accuracy			±5%												
	Torque limit			4 kinds of vector control methods by parameter setting												
	Frequency controlling range			0.01~400 Hz												
	Frequency accuracy			Digital signal reference: ±0.01% (-10℃~ +40℃), analogue reference: ±0.1% (25℃±10℃)												
	Frequency setting resolution			Digital signal reference: ±0.01Hz (Below 100Hz), analogue reference: ±0.03Hz/60Hz (12bit)												
	Output frequency resolution			0.001 Hz												
	Frequency setting signal			Analogue reference DC-10~-+10V(20KΩ),4~20Ma(250Ω)												
	Braking torque			±20 % (approximately 150% with braking resistor option)												
	Accelerating/decelerating time			0.01-6000.0s (Accelerating/Decelerating time setting independently, 4 kinds of time controlling modes available)												
	Overload capability			150% of Rated torque current for 60s, 200% of rated torque current for 10s												
	Communication			RS-485												
	Running/stopping setting			Operator, RS-485, Control circuit terminal (frequency setting and parameter access control available by computer)												
	Affiliated control function			Parameter save operator, RS-485, torque control, speed control, PID control, multiple-speed control, couple control, etc.												
	Protective Function	Instantaneous Overcurrent			Motor coasts to stop at approx. 200% rated output current.											
Motor overload protection			Electronic thermodynamic electric protection													
Fuse protection			Motor coasts to stop													
Momentary power loss			Continue to run during power loss less than 2s (standard)													
Overload			150% of rated output current for 60s, 200% of rated output current for 5s, motor coasts to stop													
Overvoltage			Motor coasts to stop if the main circuit voltage exceeds 820 V													
Undervoltage			Motor coasts to stop if the main circuit voltage drops to 380V													
Fin Overheat			Thermocouple temperature switch protection													
Stall prevention			Stall prevention during acceleration/deceleration and constant speed operation													
Ground fault			Protected by electronic circuit													
Power charge protection			Indicates until the main circuit voltage reaches 50 V													
Environment	Ambient temperature			-10℃~+50℃(internal type)												
	Ambient humidity			Below 90%RH (non-condensing)												
	Vibration			9.8 m/s2 (1G) at a vibration frequency below 20 Hz, 2 m/s2 (0.2G) at a vibration frequency above20 Hz												
	Applicable places			Indoor (Protected from corrosive gasses and dust)												
	Storage temperature			-20℃~+65℃ (for short period during shipping)												
	Altitude environment			1000 meters or lower												

※=Factory-set value

Chapter VIII Appendix

8.1 Maintenance and inspection

In the warranty period, the inverter should be in accordance with the following provisions.

■ Daily inspection

When the system is under normal running status, please confirm the following items.

- Whether the motor has abnormal noise and vibration
- Whether there is abnormal heating
- Whether the ambient temperature is too high
- Whether the difference between the monitoring display of output current and the normal value is great
- Whether the running of ventilating fan installed on the bottom of inverter is normal

■ Periodic inspection

During the routine maintenance, please confirm the following items.

The inspection only can be implemented one minute (for inverter over 30kW, it is more than 3 minutes) after the power is cut off and all LED lights on the surface are off. There will be the risk of electric shock if touching terminals immediately after the power is cut off.

Table 10.1 Periodic inspection item

Item	Content	Fault countermeasure
Install external terminals, module screws, connectors	Loosened screw	Tightening
	Loosened connector	Tightening and reassembly
Cooling fin	Accumulated garbage and dust	Blow by $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa (4-6kgcm ²) dry compressed air
Printing substrate	Conductive dust and grease	Blow by $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa (4-6kgcm ²) dry compressed air to blow it off
Ventilating fan	Abnormal noise and vibration Elapsed running time below 20,000 hours	Replace the cooling fan
Power component	Garbage and dust	Blow by $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa (4-6kgcm ²) dry compressed air to blow it off
Filtering dielectric capacitance	Abnormities such as: discoloration, strange smell and etc.	Replace the printing substrate, for stubborn abnormities

■ Routine maintenance for components

An inverter is composed of many components; the normal motion of all these components can make the inverter play the original function.

According to the application condition, some electronic parts and components should be maintained. In order to ensure the long-term normal motion, the parts and components should be inspected regularly and changed if necessary, in accordance with the service life. Quoted from "Introduction of regular inspection of general inverter" issued by JEMA.

The periodic inspection interval will be different according to the setting environment and application status of inverter. The inverter maintenance period is shown as the table below; please refer to the following table.

Table 10.2 Predetermined replacing time for components (For reference)

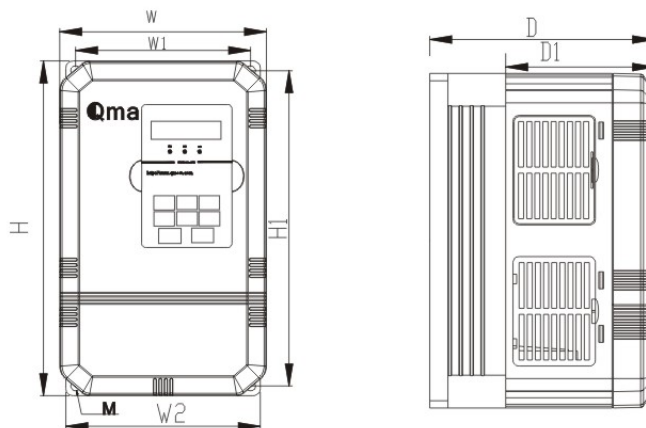
Component Name	Standard replacing frequency	Replacing method and others
Cooling fin	2~3 Years	Replace a new one
Filtering dielectric capacitance	5 Years	Replace a new one (Decision after investigation)
Braking Relay	-	Decision after inspection
Fuse	10 Years	Decision after inspection
Aluminum medium capacitance on the printing substrate	5 Years	Replace a new substrate (Decision after inspection)

(Note) Application condition

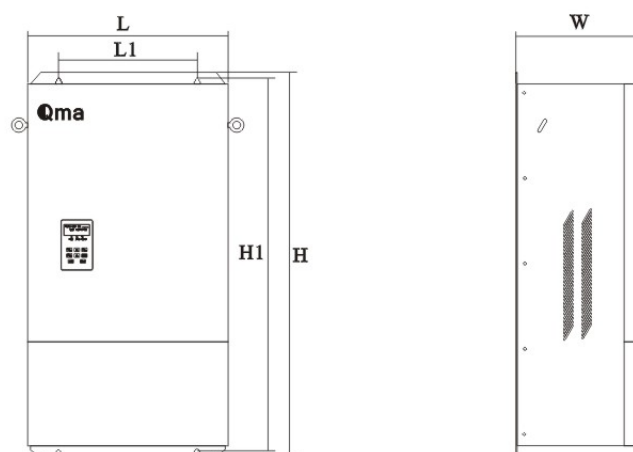
- Ambient temperature: annual average temperature is 30℃
- Load coefficient: below 80%
- Working time: below 12 hours per day

8.2 Installation dimension

External physical dimension of 1.5kw-30kw (mm)

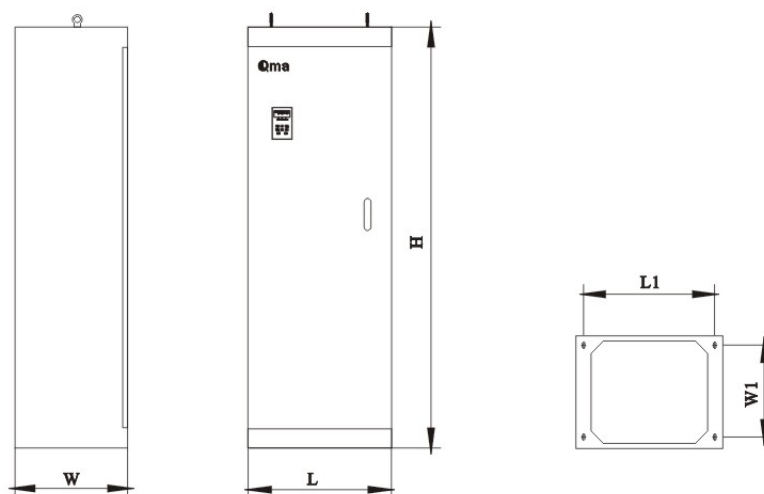


Voltage	Machine Model		H	H1	W	W1	W2	D	D1	M
AC220V	Q9000-A/B/C-0222(L3HP)	Q9000-A/B/C-0322(L5HP)	275	259	170	144	160	185	122	M4
AC440V	Q9000-A/B/C-0244(H3HP)	Q9000-A/B/C-0344(H5HP)								
AC220V	Q9000-A/B/C-0522(L7.5HP)	Q9000-A/B/C-0722(L10HP)	330	314	230	206	222	226	141	M8
AC440V	Q9000-A/B/C-1122(L15HP)									
AC220V	Q9000-A/B/C-0544(H7.5HP)	Q9000-A/B/C-0744(H10HP)								
	Q9000-A/B/C-1144(H15HP)	Q9000-A/B/C-1544(H20HP)	465	450	275	249	265	272	247	M8
AC220V	Q9000-A/B/C-1522(L20HP)	Q9000-A/B/C-1822(L25HP)								
AC440V	Q9000-A/B/C-2222(L30HP)	Q9000-A/B/C-3022(L40HP)								
AC220V	Q9000-A/B/C-1844(H25HP)	Q9000-A/B/C-2244(H30HP)								
	Q9000-A/B/C-3044(H40HP)									

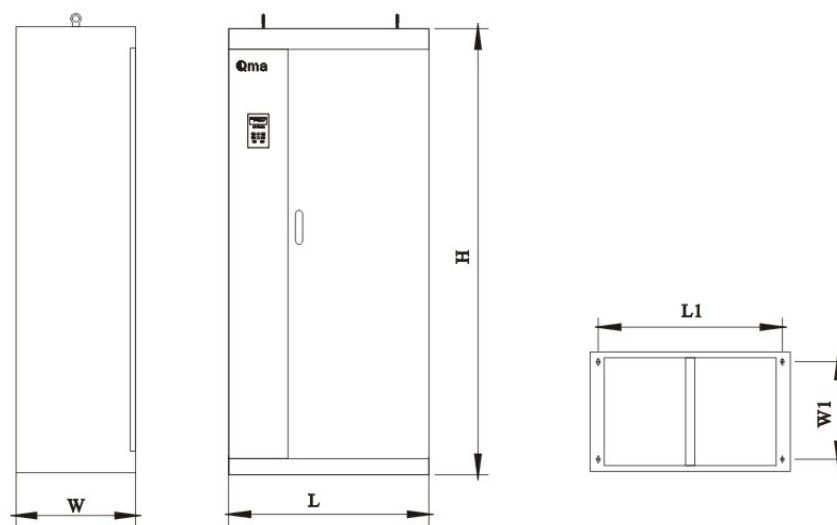
External physical dimension of 37kw-110kw (mm)


Voltage	Power (KW)	H	H1	W	L	L1	Installation aperture
220V	37	770	745	301.5	480	350	10
220V	37-55	1002	975	325.5	525	350	10
440V	37-45	594	571	260	346	240	8
440V	55-75	770	745	301.5	480	350	8
440V	90-110	1002	975	325.5	525	350	10

★ The size of product model A/B/C is the same, but the internal PCB is different.

External physical dimension of 132kw-185kw (mm)


Voltage	Power (KW)	H	L	L1	W	W1	Installation aperture
440V	132-185	1455	490	440	390	310	12

External physical dimension of 200kw-315kw (mm)


Voltage	Power(KW)	H	L	L1	W	W1	Installation aperture
440V	200-300	1640	750	710	400	340	12

8.3 Operation steps of parameter storage

Operation steps of parameter storage of QMA inverter series

Step display	*MAIN MENU* RUN/STATUS
Press PRG/ESC for 3 seconds	INIT-SET
Press ↓ key	Select language Reserve
Press the ENTER key	Factory ID***** Batch number of leaving factory
Press the ENTER key	Copy password 0000
Press the ENTER key Then press ↑↓ key	Save to the keyboard: save the inverter parameters in the operator Write to inverter: Write the parameters stored within the operator in the inverter Copy select verify data: Data comparison
Press the ENTER key	Run: Comparison: Storage: Read-in function

※Parameter reset is only applicable for inverter with the same specification, with the same horsepower and under the same control mode (11-02)※

8.4 Matching list of braking unit and braking resistor

Q9000 series 400V Class inverter under 15KW has the built-in braking unit. The braking torque can be increased through increasing the external resistance; the necessary braking torque depends on the specific demand of use. Please select the suitable resistance from the following table, according to the purpose and capacity of inverter.

Inverter			Braking unit		Braking resistor	
Voltage	Max. applicable motor capacity	Inverter Model	Model CDBR	Number of unit	Resistor Specification	Number of resistor
400V Class	0.4	0P44	Built-In		70W 750Ω	1
	0.75	0P74			70W 750Ω	1
	1.5	0144			260W 400Ω	1
	2.2	0244			260W 250Ω	1
	3.7	0344			500W 150Ω	1
	5.5	0544			1000W 100Ω	1
	7.5	0744			1000W 75Ω	1
	11	1144			1000W 100Ω	2
	15	1544			1000W 80Ω	2
	18.5	1844	4022B	1	2500W 64Ω	2
	22	2244	4030B	1	2500W 54.4Ω	2
	30	3044	4030B	1	1500W 80Ω	4
	37	3744	4045B	1	2500W 64Ω	4
	45	4544	4045B	1	2500W 54.4Ω	4
	55	5544	4055B	1	3000W 50Ω	5
	75	7544	4075B	1	2500W 48Ω	8
	90	9044	4110B	1	2500W 40Ω	10
	110	1104	4110B	1	2500W 40Ω	10
	132	1324	4160B	1	2500W 42Ω	12
	160	1604	4160B	1	2500W 48Ω	16
	185	1854	4220B	1	2500W 60Ω	20
	220	2204	4220B	1	2500W 40Ω	20
	315	3154	4220B	1	2500W 48Ω	32

Memo

This image shows a full page of a worksheet designed for handwriting practice. It features approximately 20 horizontal dashed lines spaced evenly across the page, providing a guide for letter height and placement. The background is plain white, and there are no other markings or text present.

***ATTENTION:** any type of connection not reflected in this manual, before testing it should be notified to our Technical Department*

Tecnolama declines all responsibility in the case of damages produced in the operator and installation, if the instructions given have not been followed.

***TECNOLAMA** reserves the rights In modifying the products specifications of this technical brochure without any previous advise.*