# Content

# 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

Q9000        A        11        44

Q9000 Series

| Mark | Voltage grade |
|---|---|
| 44 | Three-phase 440V |
| 22 | Three-phase 220V |

| Mark | Type |
|---|---|
| A | Synchronous vector type |
| B | Engineering vector type |
| C | High-performance vector type |

Power Grade
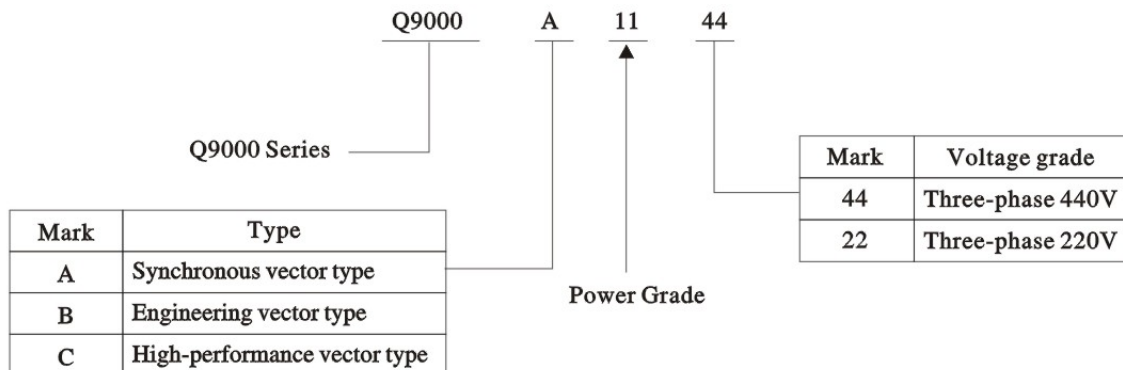
**For wiring diagram, refer to page 9-11**

## 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℉)
                                                Locking wall-mounted type: (-10~40℃/+14~104℉).
- 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 librations 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℃.



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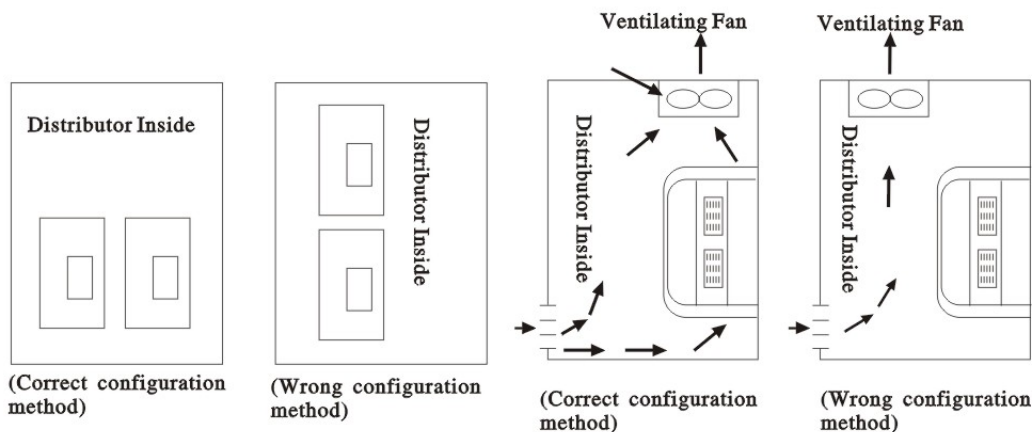
- The front surface of the inverter should face front for better heat emission.
- The installation space must comply with the following regulation: If the inverter is installed in the control board or the environment that is permitted, the upper dust cover can be taken down for better heat emission).



More than 30mm      More than 30mm

(Front view)

More than 150mm      Air

The maximum external temperature is 45 ℃

(Side view)

Popularity temperature

- Panel inner opening type -10-45℃

More than 150mm      Air

- locking wall-mounted type -10-40℃
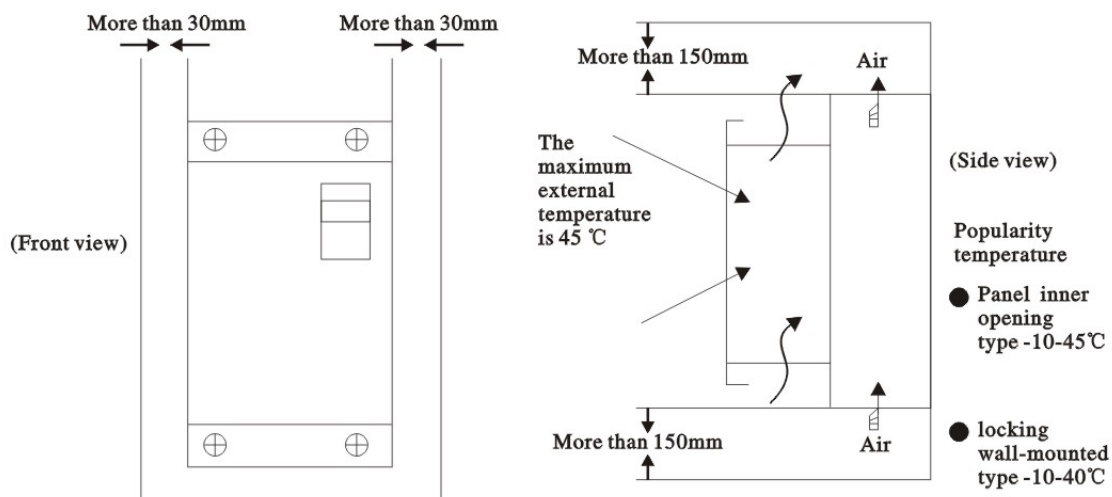
## 1.6 Summary of Control Methods

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 Mutiple motors 2.Motor parameters unknown 3.Autotuning is unavailable | PG is attached at mechinical 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 though 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

Braking resistance (optional)

B1    ⊖    B2

3-phase input power
200-300V or
380-440V
50/60Hz

MCCB

R
S
T

Q-9000A

U
V
W
E

Motor
IM

The third type grounding

ENCODER

Factory preset functions:
FWD
REV
EF
RST
MS1
MS2
JOG
BX
CM

TA1
① Power +12V
② Power 0V
③ Power +5V
④ Phase A pulse Input (+)
⑤ Phase A pulse input (-)
⑥ Phase B pulse input (+)
⑦ Phase B pulse input (-)
⑧ Phase Z pulse Input (+)
⑨ Phase Z pulse input (-)
⑩

TA2
① Phase A pulse monitor input (+)
② Phase A pulse monitor input (-)
③ Phase B pulse monitor input (+)
④ Phase B pulse monitor input (-)
⑤ Phase Z pulse monitor input (+)
⑥ Phase Z pulse monitor input (-)
⑦ Monitor Output Common Terminal

Shielding lead terminal

E

MA+
AM
Multifunctional analogue output:-10~+10V (5V:I.R.C) (Factor preset output current)

MV+
MOC
FM
Multifunctional analogue output: -10~+10V (10V:100%) (Factor preset output current)

E

2KΩ
Power for Fre setting

External frequency order:
+15(20mA)
Main speed    FIV   0 ~ +10V
Main speed    FIC   4 ~20mA
Multi function analog input   MFI   0 ~ 10V
Analog signal common terminal   0V

EA
EB
EC
Abnormal joint output: AC 250V 5A max/DC 30V 5A max

RA
RC
Multifunctional joint output: AC 250V 5A max/DC30V 5A max (Factory preset running signal)

Power for setting frequency
-15(20mA)

RS485
R+
R-
GND

Y1
Multifunctional open collector output 1: DC 48V 50mA max (Factory preset zero speed signal)

Y2
Multifunctional open collector output 2: DC 48V 50 mA max (Factory preset consistent speed signal)

YC
Common terminal of the multifunctional open collector output

Note I: ⌁ separating harness

Note 2: terminal blocks +15, +12, -15, 20mA

Note 3: ⬚⬚⬚ refers to wiring display cables or doublet cord and twisted pair cables

Note 4: a. Only shield twist pair cable is used as signal cable.
   b. Max length of PG is 100m.
   c. The turning direction of PG maybe selected by parameter 61-02 and the Factory- set value is the phase advancer during the motor is running forward.

Note 5: The corresponding ABZ phase pulse input; complement output.

(Take Q9000-A-1144 as an example)

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

Braking resistance (optional)

B1  ⊖  B2

MCCB

Three-phase input power
200-300V or
380-440V
50/60Hz

R
S
T

Q-9000B

U
V
W
E

Motor
IM

The third type grounding

ENCODER

**Factory preset functions**

FWD/Stop — FWD
REV/stop — REV
EF — EF
RST — RST
MS1 — MS1
MS2 — MS2
JOG — JOG
BX — BX
CM — CM

TA1
① Power +12V
② Power 0V
③ Phase A pulse Input (+)
④ Phase A pulse input (-)
⑤ Phase B pulse input (+)
⑥ Phase B pulse input (-)

TA2
⑦ Phase A pulse monitor input (+)
⑧ Phase A pulse monitor input (-)
⑨ Phase B pulse monitor input (+)
⑩ Phase B pulse monitor input (-)

Shielding lead terminal

E

MA+
AM   Multifunctional analogue output:
-10~+10V (5V:I.R.C)
(Factor preset output current)

MV+
FM   Multifunctional analogue output:
-10~+10V (10V:100%)
(Factor preset output current)

MOC

E

**External frequency order**

2KΩ

Power for setting frequency

+15(20mA)

FIV — FIV   0 ~ +10V
FIC — FIC   4 ~20mA
MFI — MFI   0 ~ 10V
0V — 0V

EA
EB
EC
} Abnormal joint output:
AC 250V 5A max/DC 30V 5A max

RA
RC
} Multifunctional joint output:
AC 250V 5A max/DC30V 5A max
(Factory preset running signal)

Power for setting frequency

-15(20mA)

RS485
R+
R-
GND

Y1   Multifunctional open collector output 1:
DC 48V 50mA max (Factory preset zero speed signal)

Y2   Multifunctional open collector output 2:
DC 48V 50mA max (Factory preset consistent speed signal)

YC   The common terminal of the multifunctional open collector output

(Take Q9000-B-1144 as an example)

Note l:  ⇌ separating harness

Note 2: terminal blocks +15, +12, -15, 20mA

Note 3: ⌁⌁⌁   refers to wiring display cables
or doublet cord and twisted pair cables

Note 4: a. Only shield twist pair cable is used as signal cable.
b. Max length of PG is 100m.
c. The turning direction of PG maybe selected by
parameter 61-02 and the Factory-set value is the phase
advancer during the motor is running forward.

Note 5: The corresponding ABZ phase pulse input;
complement output.

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.



\* For 400V class, please connect to the 400/200V transformer
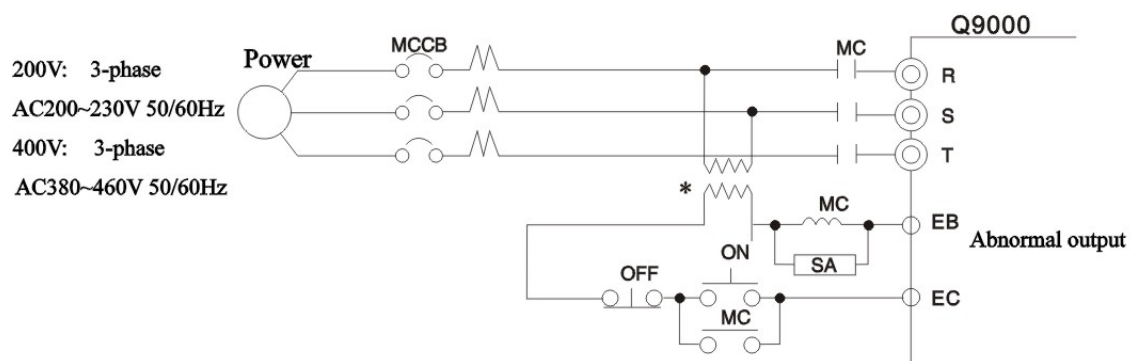
**Setup of breaker for wiring**

■ **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, ⊕ | 4055~4300 |
| For the connection of braking unit | ⊕,⊖ | 4055~4300 |
| For grounding | ⏚ | 41 P5~4300 |
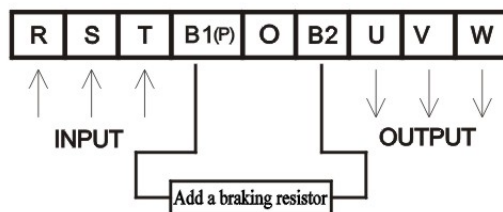


Take Q9000-A-1144 as an example

■ **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 ) |
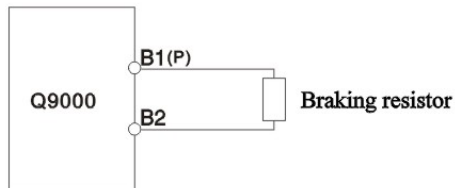


B1, B2 are terminals to be connected with the braking resistor. Please do not connect breaking resistor to other terminals, or it will be abnormal, heated and burned.

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 breaking 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

Contact of thermal protection relay
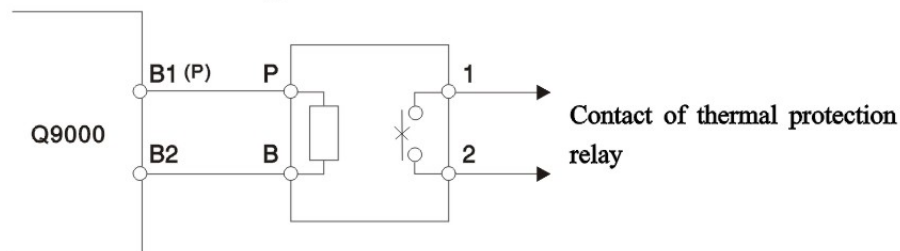
**200V 37kW and 400V 55kW above Inverter**
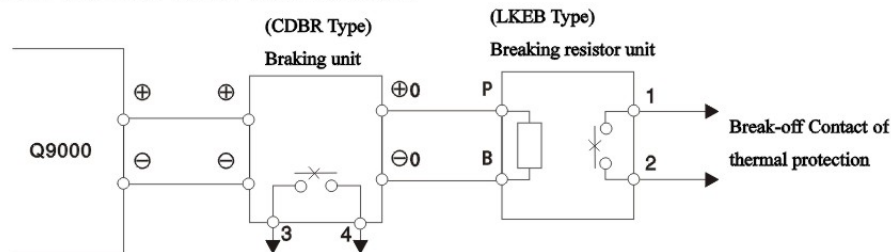


Contact of thermal protection relay

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.
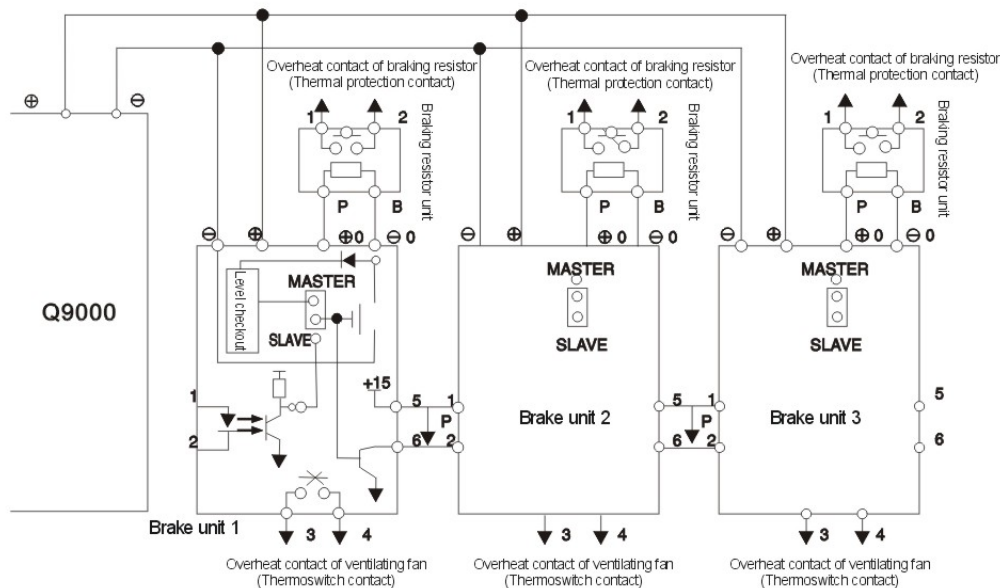


Parallel connection of braking unit

## Power sequence controller



Breaker for wiring

Three-phase power:
200~230V 50/60Hz or
380~460V 50/60Hz

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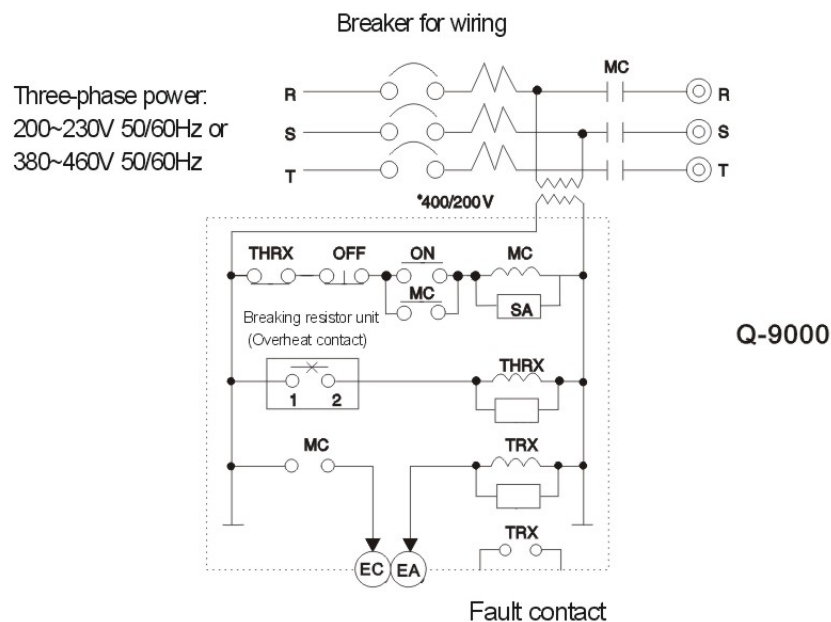
*For occasion of 400V class, please connect to the 400/200V inverter.

Power Sequence Controller

**Wiring distance between inviter 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)
400VClass: 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.

Grounding connection

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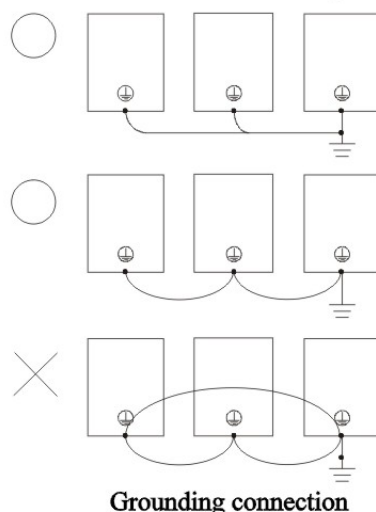For occasion of external input frequency reference, please use shielded twisted pair wire.

### 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) |
| | | | -10~+10V/-100%~+100% frequency | | -10+1(20K) |
| | FIC | | 4-20Ma/100% frequency | | 4-20mA,(20) |
| | MFI | Auxiliary frequency reference | 0-10V/100% frequency | Auxiliary analog input T3-01-03 | 0-10V,(20) |
| | | | -10~+10V/-100%~+100% frequency | | 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, below 48V 50mA |
| | Y2 | Speed arrival detection | LOW level is within ±1% of the settling frequency | | |
| | YC | Common terminal of terminal Y1,Y2 | | | |
| | EA | Abnormal output signal | If abnormal, | | Grounding capacity AC250V 5A DC30V 5A |
| | EB | EA-EC, A connection point | terminal EA-EC is off | | |
| | EC | EB-EC, B connection point | terminal EB-EC is on | | |
| 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) | | Below 20mA |
| | MA+ | Output current monitoring | 5V/inverter rated current | Multi-functional analog output 2 (T4-04, T4-06) | |

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

Bypass diode

External power below 48V

Coil

Below 50mA
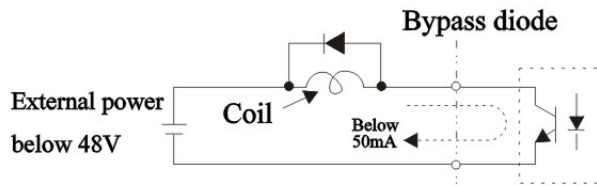
Please select a bypass diode with rated current larger than circuit current

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.

Shielding mesh cable          Outer sheath

Connect the shielded network cable to the connection terminal (grounding terminal) of shielding mesh cable for Q9000

Do not connect

Wrapped by insulation tape
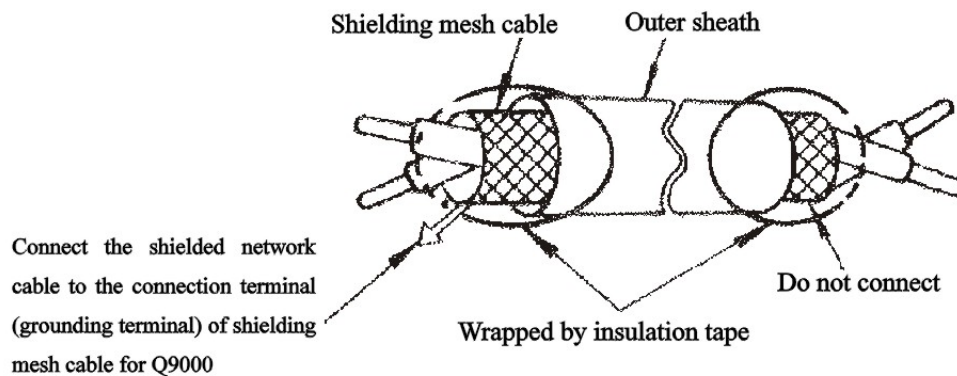
Wrapped end of shielded twisted pair cable

## 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:
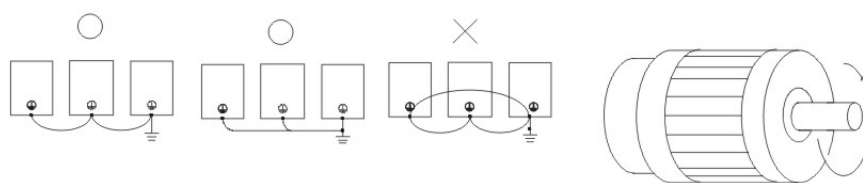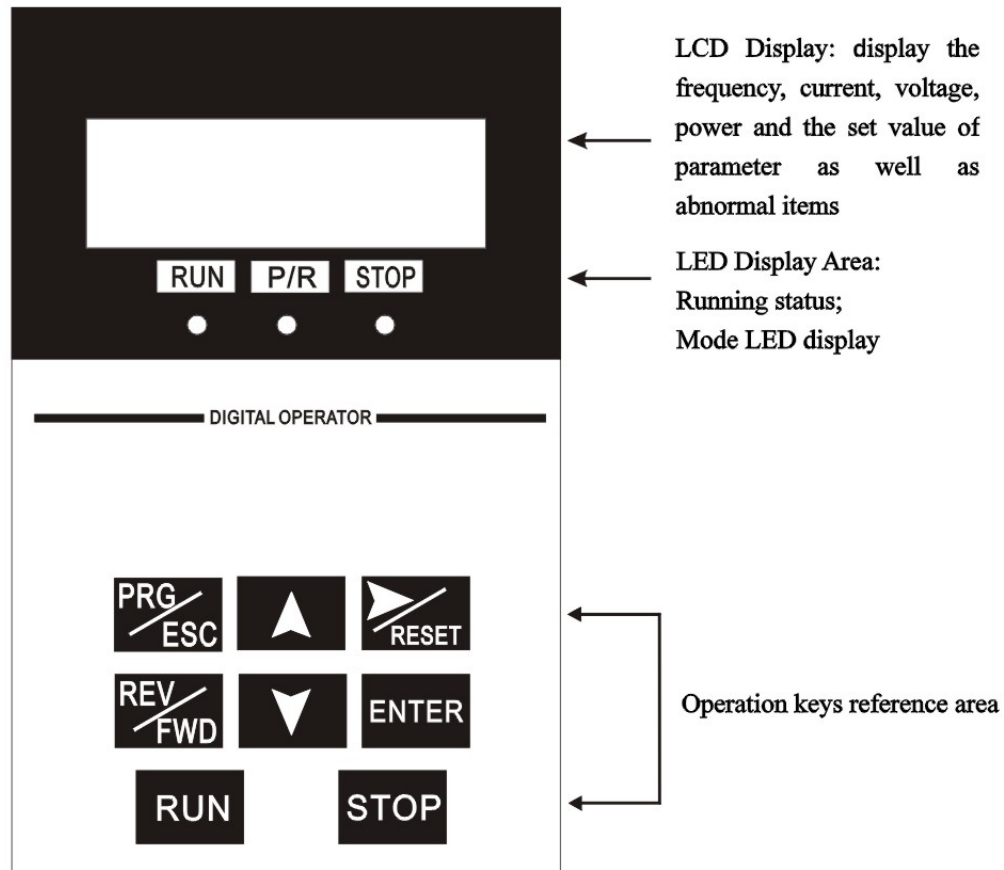


Inversion

◆ 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).

LCD Display: display the frequency, current, voltage, power and the set value of parameter as well as abnormal items

LED Display Area:
Running status;
Mode LED display

Operation keys reference area

**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<br>ESC=Return to the previous screen | (1)PRG: Press once to enter the PRG mode; press for 2 seconds to return to Main menu<br>(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 ruining on the operator. RUN indicator light is on. |
| STOP | STOP(Stop) | Stop: Stop running on the operator. STOP indicator light is off. |

Output frequency of inverter

STOP    RUN    STOP

Frequency setting
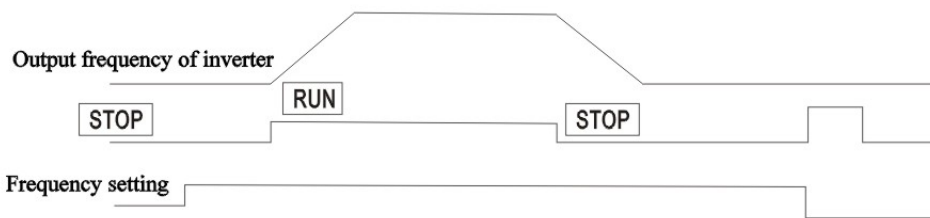
| RUN<br>Indicator Light | ● | ☼ | ☼ | ● | ☼ |
|---|---|---|---|---|---|
| STOP<br>Indicator Light | ☼ | ● | ☼ | ☼ | ☼ |

☼: 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.<br>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);<br>The selection of control mode and parameter initialization. |
| PROGRAM-SET | The necessary parameter reading and programming can be divided by functional group as follows.<br>● Application: running mode selection, DC braking, speed search and etc.<br>● Adjustment: accelerating and decelerating time, S curve characteristic, carrier frequency and etc.<br>● Reference: setting of relevant frequency reference;<br>● Motor parameter: V/f characteristic and motor parameter;<br>● Option parameter: setting of interface card;<br>● External terminal function: input and output PLC and setting of analog input & output;<br>● 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 [∨] 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!
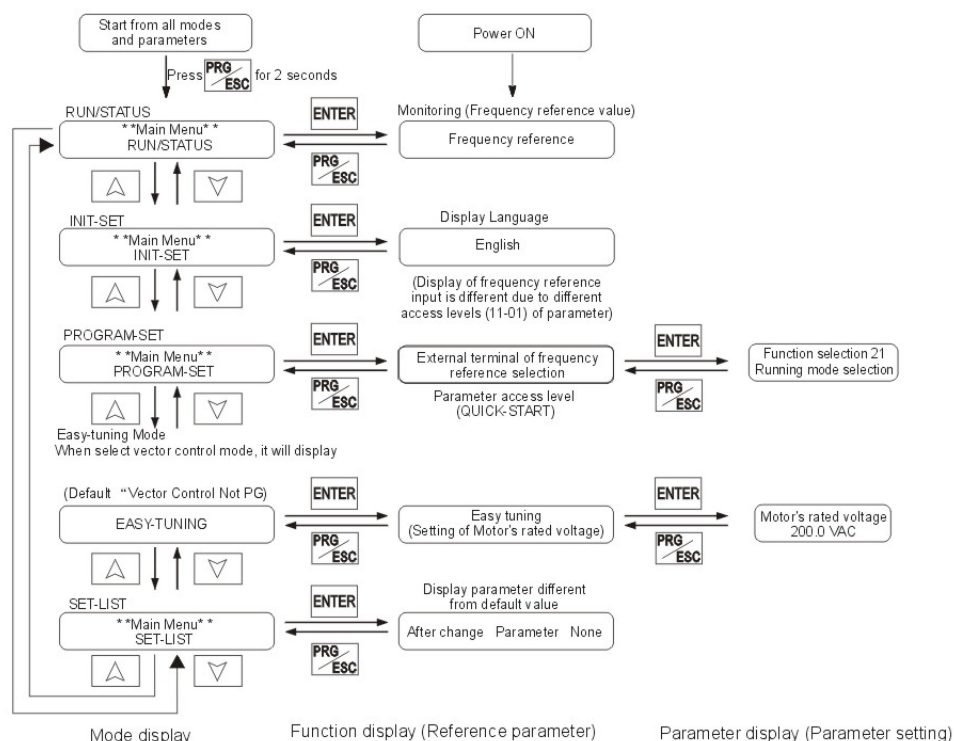


Mode Switch

## 3.4 Access level of parameters
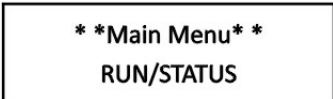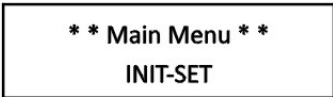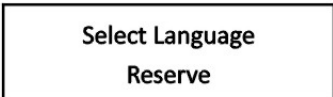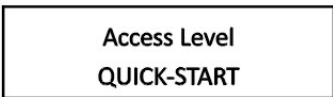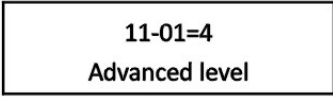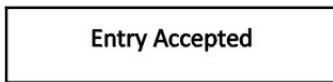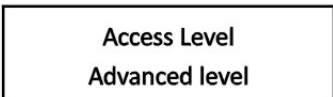
Q9000 has the following three access levels for corresponding different purposes.

| 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 | Dsiplay Menu | Description |
|---|---|---|---|
| 1 | Press PRG/ESC for 2 seconds | * *Main Menu* *<br>RUN/STATUS | |
| 2 | △ | * * Main Menu * *<br>INIT-SET | |
| 3 | ENTER | Select Language<br>Reserve | |
| 4 | △ | Access Level<br>QUICK-START | |
| 5 | ENTER | 11-01=2***<br>QICK-START | |
| 6 | Press △ twice | 11-01=4<br>Advanced level | |
| 7 | ENTER | Entry Accepted | |
| | | Access Level<br>Advanced level | About three seconds later, the display menu of the operator will be shown as left. |

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

Press PRG/ESC for 2 seconds

```
**  Main Menu  **
   RUN/STATUS
       ↑↓
**  Main Menu  **     ENTER →    Select Language
   INIT-SET                         RESERVE
                                       ↑↓
                                   Access Level      ENTER →    11 - 01 =  2 * * *
                                   QUICK-START                     QUICK-START
                                                               Press ↑↓ twice
                                                                   11 - 01 =  4
                                                                      Basic
                                                                      ENTER ↓
                         Access Level        ←        Entry Accepted
                         ADVANCED LEVEL
```
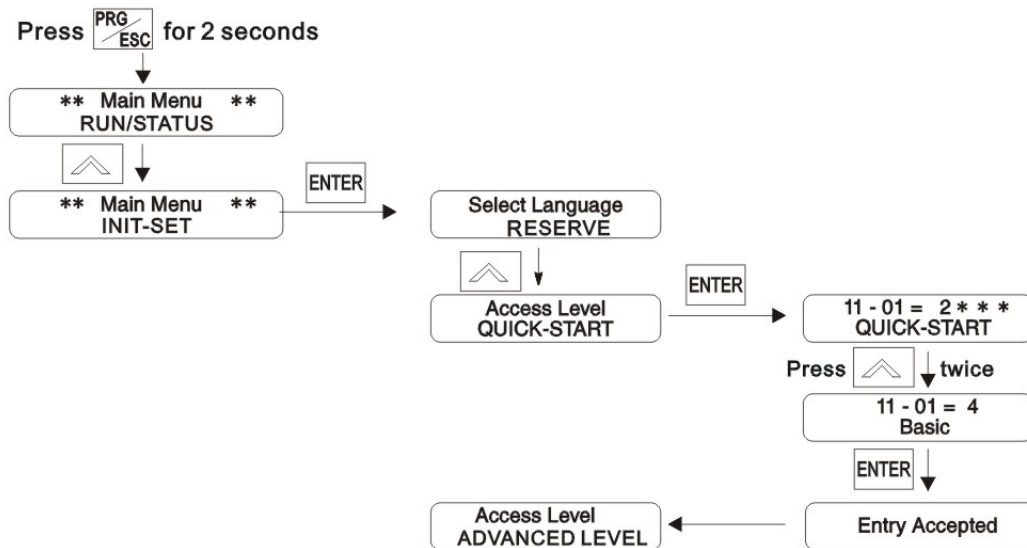
Method for switching from QUICK-START to ADVANCED

■   **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  ENTER  key is not pressed within 1 minute, it will return to the previous set value.

Now, please operate from this figure.
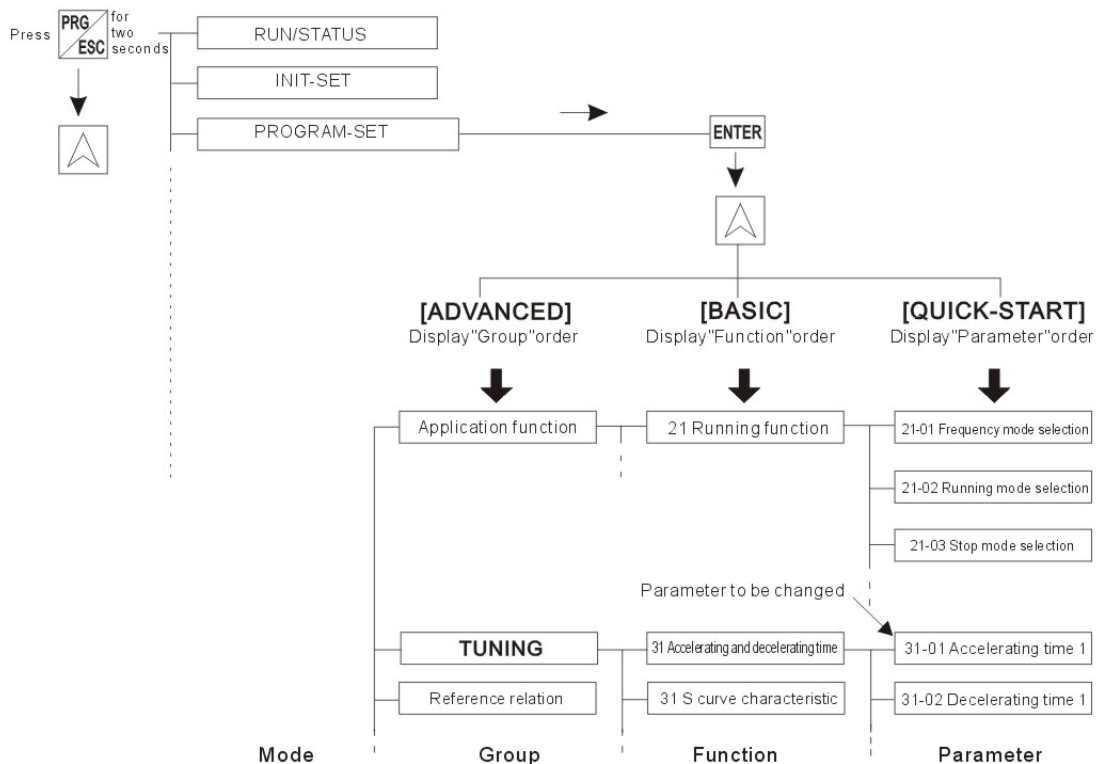


Parameter Level (Part)

# 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.<br>● Please confirm whether it satisfied the set conditions. |
| Wiring ↓ | Please connect wire to the power and peripheral equipments.<br>● Select the appropriate peripheral equipments and connect wires correctly. |
| Power input ↓ | Please input power after confirmation before power input<br>● Please make sure the power voltage and the connection of power input terminals (R.S.T).<br>200v Class Three-phase AC200~230V 50/60Hz<br>400v Class Three-phase AC380~460V 50/60Hz<br>● Please make sure the connection between motor output terminal and motor.<br>● Please make sure the connection between control circuit terminal and control device and whether the control circuit terminals are at OFF position.<br>● Please make sure the connection of PG speed control card, for occasions with the PG speed control card.<br>● Please keep the motor away from idling condition (not connected to any mechanical load).<br>● Please input power after confirming the above items. |
| Display status confirmation ↓ | Please confirm whether the inverter is under normal state<br>● In case of the normal power input, it will display as follows.<br>Data display: [Frequeney Ref]<br>● 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<br>● 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.<br>● If run the Autotuning, the motor parameters will be set automatically.<br>● Please adopt V/f control and set V/f cure for non-autotuning occasions.<br>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<br>M1-01 = 0.00Hz | Monitoring of frequency reference is shown on the data disply 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<br>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) =o2-04. 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 | Dsiplay Menu | Description |
|---|---|---|---|
|  |  | Frequency Ref 1<br>M1-01=0.00Hz | Display driven mode |
| 1 | Press PRG/ESC for 2 seconds | * *Main Menu* *<br>RUN/STATUS | Display environment setting mode |
| 2 | △ | * Main Menu *<br>INIT-SET | Enter into the environment mode<br>Select the initialization |
| 3 | Press ENTER for 3 times | Select Language<br>Reserve | Display initialization parameters (11-03) Set 2-wire process initialization as (2220); Set value of "Frequency input" is displayed for about 0.5 seconds; Back to initialization display |
| 4 | △ | Init parameters<br>NO. Initialize |  |
| 5 | ENTER | 11-03= 0***<br>No. Initialize |  |
| 6 | Press △ for 2 seconds | A1-03=2220<br>2-Wire Initial |  |
| 7 | ENTER | Entry Accepted |  |
|  |  | Init parameters<br>NO. Initialize |  |
| 8 | PRG/ESC | **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 | Dsiplay Menu | Description |
|-------|-----|--------------|-------------|
| 1 | Press △ for 2 times | *Main Menu*<br>INIT-SET<br><br>*Main Menu*<br>Easy-Tuning | Display program mode<br><br>Display autotuning mode |
| 2 | ENTER | Rated Voltage<br>200.0VAC | Display rated voltage of motor |
| 3 | △ | Rated Current<br>1.90A | Display rated current of motor |
| 4 | △ | Rated Frequency<br>60.0Hz | Display rated frequency of motor |
| 5 | △ | Rated Speed<br>1750RPM | Display rated rotate speed of motor |
| 6 | △ | Number of Poles<br>4 | Display pole number of motor |
| 7 | △ | Select Motor<br>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?<br>Press RUN key | Start autotuning |
| 10 | RUN | □Hz□□□□A<br><br>Tune Successful | ("Autotuning process" flash) The autotuning is completed. |
| 11 | Press PRG/ESC for 2 times | ** Main Menu**<br>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 Frequeney | Rated frequeney 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 | Countmeasure |
|---|---|---|---|
| Data Invalid | Motor data is abnormal | Motor data input for Autotuning is not correct. | ● Verify the input information.<br>● 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<br>● 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<br>● If lower the torque limit value (P7-01, -02), it will be increased.<br>● 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<br>● Verify wring of the motor<br>● 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<br>● 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.<br>● Accelerating time (31-01) is too long<br>● Verify the input information, especially the number of PG pulse wave. |
| V/f Over Setting | V/f setting is to large | Torque reference during Autotuning is over 100% and with no-load.<br>Current is 70% more than the motor's rated current. | ● Please confirm the set value and make amendment.<br>● 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 ⬚PRG/ESC 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:

```
11-02   Control Mode Selection   0   Q   Q   Q   Q
```

Vector Control with PG mode: all access levels can be used for setting/reference

Vector Control without PG mode: all access levels can be used for setting/reference

V/F control with PG mode: all access levels can be used for setting/reference

V/F control without PG mode: all access levels can be used for setting/reference

Change is available during running

Name: control mode selection

Parameter NO: 11-02parameter

**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…ADUANCED, 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

# MAIN MENU

## SET-LIST · EASY-TUNING · PROGRAM-SET · INIT-SET · RUN/STATUS

### PROGRAM-SET

**O — Operating apparatus**
- 01 Display choice
- 02 Operating key function

**P — Protection**
- P1 Motor electronic kinetic heat
- P2 Momentary power loss compensation
- P3 Stalling prevention
- P4 Frequency checkout
- P5 Abnormal RETRY
- P6 Over torque checkout
- P7 Torque limit
- P8 Hardware protection

**T — Duct Pilot terminal**
- T1 Sequential control input
- T2 Sequential control output
- T3 Analogue input
- T4 Analogue output
- T5 MODBUS communication

**6 — Interface Card**
- 61 PG speed card

**5 — motor parameters**
- 51 V/F Feature No 1
- 52 Motor No.1 parameters

**4 — Instruction relationship**
- 41 Frequency instruction
- 42 Upper/Lower limit
- 43 Inhibit frequency setting
- 44 Sequence control
- 45 Torque instruction

**3 — TUNING**
- 31 Acceleration/Deceleration time
- 32 "S" Feature
- 33 Slip compensation
- 34 Torque compensation
- 35 ASR
- 36 Carrier frequency
- 37 Hunting prevention gain
- 38 Parameters for factory regulation

**2 — Applied function**
- 21 Running mode
- 22 DC braking
- 23 Speed search
- 24 TIMER control
- 25 PID Control
- 26 DWELL function
- 27 DROOP control
- 28 Energy save control
- 29 Zero servo

### INIT-SET

**1 — Initial Setting**
- 11 Environmental setting
- 12 User parameters setting

### RUN/STATUS

**M — Monitoring**
- M1 State monitoring
- M2 Abnormal tracking
- M3 Abnormal resume

## 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 | × | × | × | o |
| | | 28 | Energy saving control | | Multi-functional input implements energy-saving function according to the energy-saving reference | o | o | × | × |
| | | 29 | Zero servo | | Setting of zero servo function | × | × | × | 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 | × |
| | | 35 | Speed control | | Speed control/adjustment | × | o | × | o |
| | | 36 | Carrier frequency | | ★Setting of Carrier frequency | o | o | o | o |
| | | 37 | Hunting prevention function | | Setting of Hunting function | o | o | × | × |
| | | 38 | Parameters for factory adjustment | | Speed reverse adjustment (Only for Vector Control Without PG) | × | × | o | × |
| 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 | × | × | × | 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 | × | o | × | 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 | × | × | o | o |
| | | P8 | Hardware protection | | ★Setting of overheating/phase loss protection function of hardware | o | o | o | o |
| O | Operator | 01 | Display/Setting selection | | ★Selection/Setting of display and setting method of operator | o | o | o | o |
| | | 02 | 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)
V/F Control with PG (V/F control with PG speed card)                              [0]
Vector Control without PG (Vector control with internal speed information of inverter)   [1]
Vector Control with PG (Vector control with PG speed card)                     ※[2]
Function                                                                          [3]
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

```
                              ___  ___         FWD
        o----------------------o    o-----------|o    FWD/STOP
        |                                        |
        |                     ___  ___    REV    |
        |   o------------------o    o------------|o    REV/STOP
        |   |                                    |
        |   |                              CM    |
        o---o---------------------------------- |o    Input public end
```
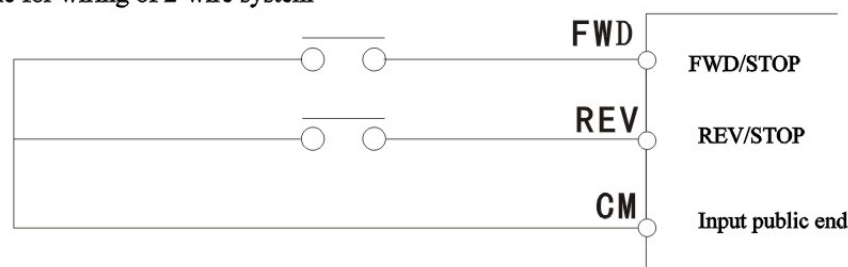
Example   for   wiring   of   2-wire

- 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.

```
  Stop SW (Connection b)     Run aw (Connection a)
                                             FWD
    o---o--o---o-----.------o--o---------------|o    Running reference ("OFF" Run)
    |                |                          |
    |                |                   REV    |
    |                |                          |o    Stop reference ("ON" Stop)
    |                |                          |
    |                |    ___  ___     MS1      |
    |                o-----o    o--------------|o    FWD/REV reference
    |                                           |      (Multi-functional input=3)
    |                                    CM      |
    o------------------------------------------ |o    Input public end
```
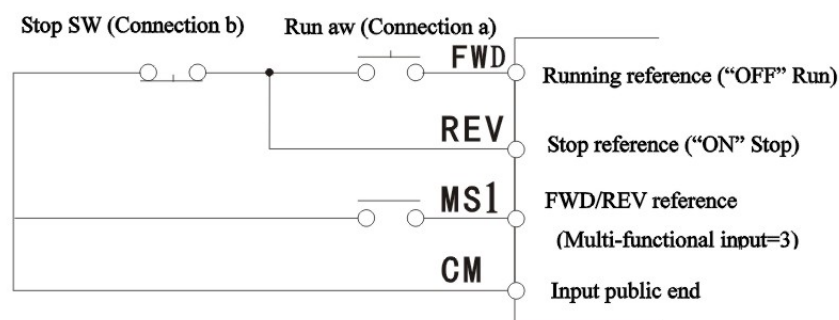
Example for wiring of 3-wire system

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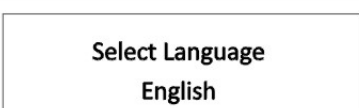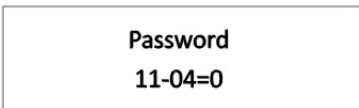
Please follow the following sequence of initialization. This is the operation to return to the factory default.

| Order | Key | Dsiplay Menu | Description |
|---|---|---|---|
| 1 | Press PRG/ESC for 2 seconds | **Main Menu**<br>Monitoring Mode | |
| 2 | ⌃ | * * Main Menu * *<br>INIT-SET | |
| 3 | ENTER | Select Language<br>English | |
| 4 | Press ⌃ for 3 times | Reset primary value<br>NO. Initialize | |
| 5 | ENTER | 11-03=0***<br>NO. Initialize | |
| 6 | ⌃ | 11-03=2220<br>2-Wire Initial | |
| 7 | ENTER | Entry Accepted | Set value is input.<br><br>About few seconds later, the display menu of the operator will be shown as left. |
| 8 | | Reset primary value<br>No. Initialize | |

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 | Dsiplay Menu | Description |
|:---:|:---:|:---:|:---|
| 1 | Press [PRG/ESC] for 2 seconds | **Main Menu**<br>Monitoring Mode | |
| 2 | [△] | **Main Menu**<br>INIT-SET | |
| 3 | [ENTER] | Select Language<br>English | |
| 4 | Press [△] for 4 times | Password<br>11-04=0 | |
| 5 | [ENTER] | Password<br>0000 | The left column is flashing. Figure in the flashing column can be changed.<br>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.<br><br>Set value is input. |
| 6 | [△] | Password<br>1000 | |
| 7 | [ENTER] | Entry Accepted | |
| 8 | | Password<br>11-04=1000 | About few seconds later, the display menu of the operator will be shown as left. |
| 9 | [PRG/ESC] | INIT-SET | |

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)



Decelerated stop in accordance with the selected decelerating time

Decelerated stop
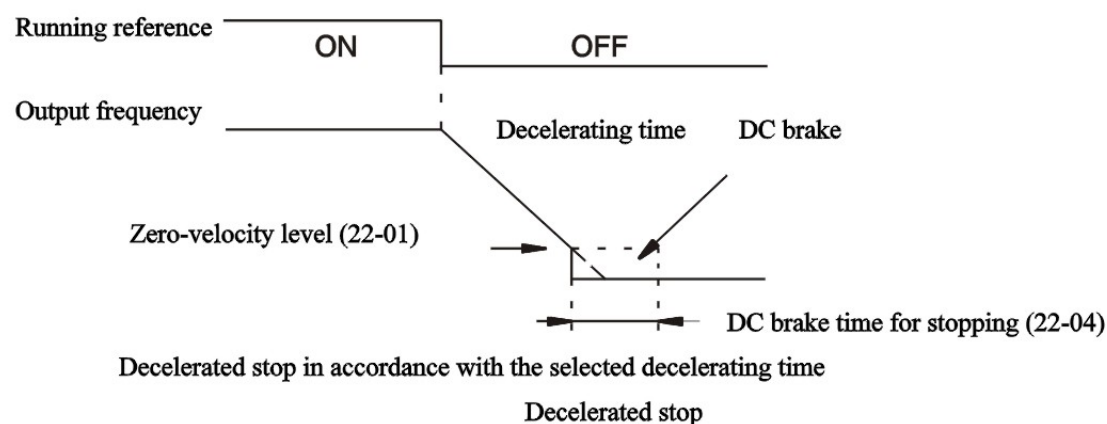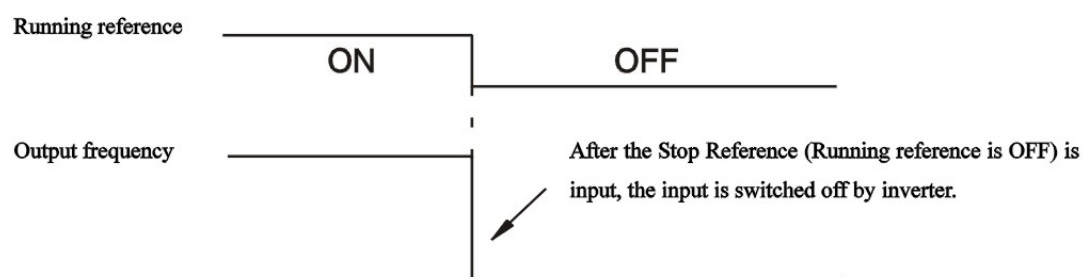
Free Stop (21-03=1)



    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)
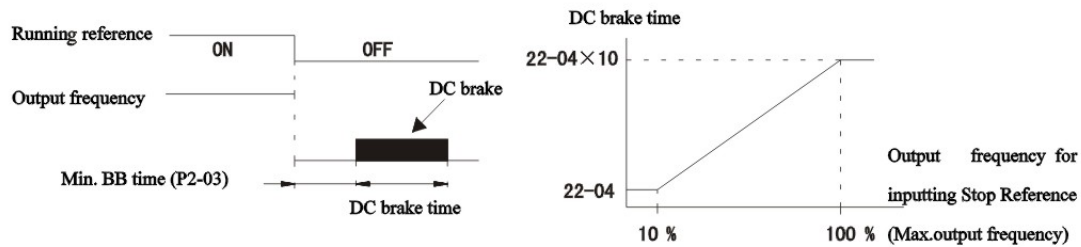


If the Stop Reference is input and after the minimum base blocking (BB) time (P2-03), it will be stopped due to DC brake.

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)
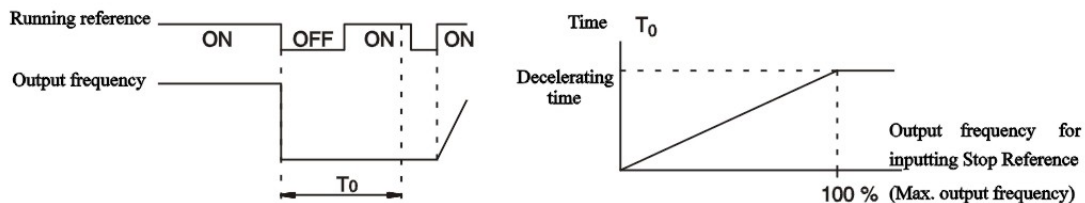


After the Stop Reference is input, before the "time $T_0$", the Running Reference will be neglected. The "time $T_0$" will be decided by the output frequency and decelerating time.

Free Stop with time limit

---

※=Factory-set value                        37

| 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 Ferq) | | | | | |

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)**
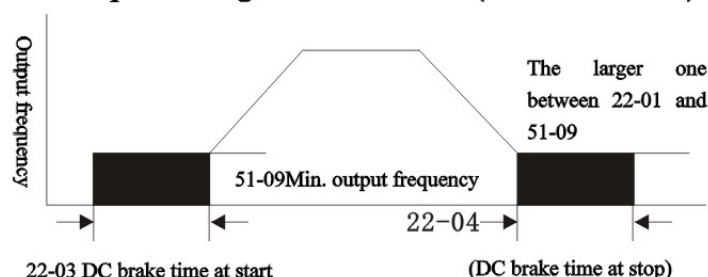


※=Factory-set value            39

| 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 $T2= [(52\text{-}01^2\text{-}52\text{-}03^2)/ (2\pi \times 52\text{-}02 \times 52\text{-}03]\ 1/2$ (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.
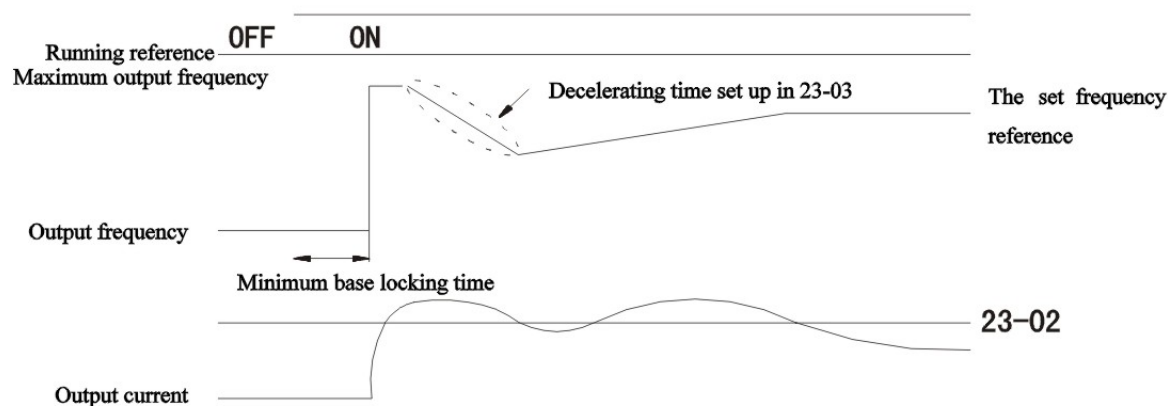


### 5.2.4 TIMER function: 24

| 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. <br> ● 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 <br> ● 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.
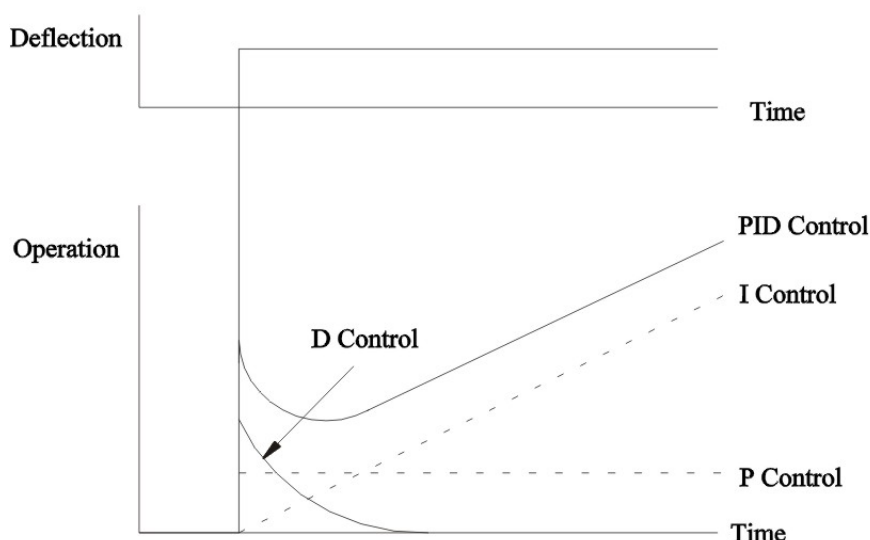


Action of PID control

- 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.
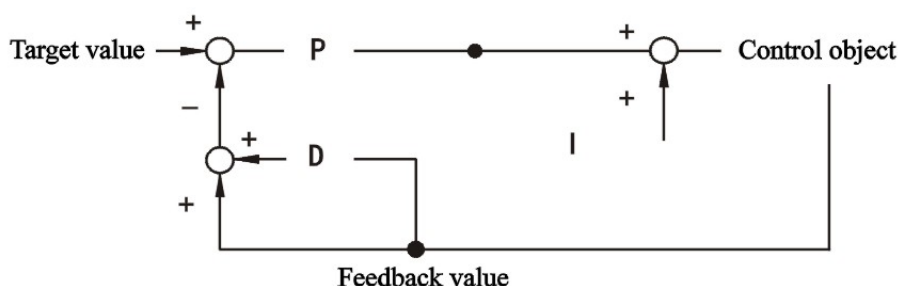


- Basic PID control: is the basic shape of PID control. If the response of D control is adjusted to track the changes in control object, when the target value is changed, there may be shortage or overshoot phenomenon.



Feedback value
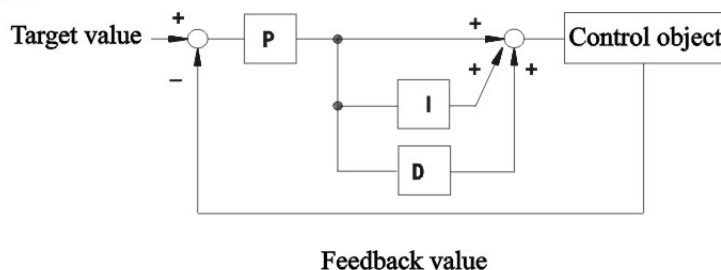
### PID control function of inverter

PID control inside the inverter is show as the figure below:
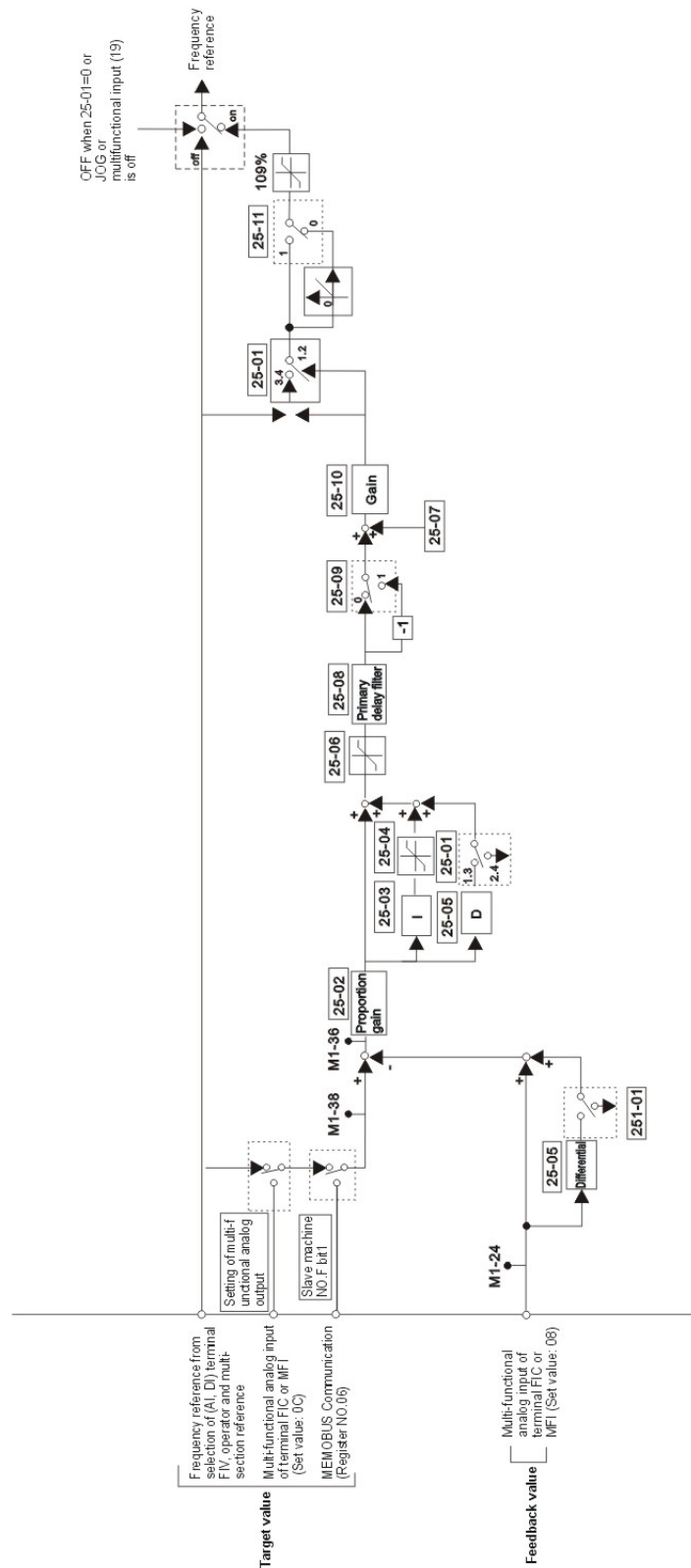
Block diagram of PID control inside the inverter

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.
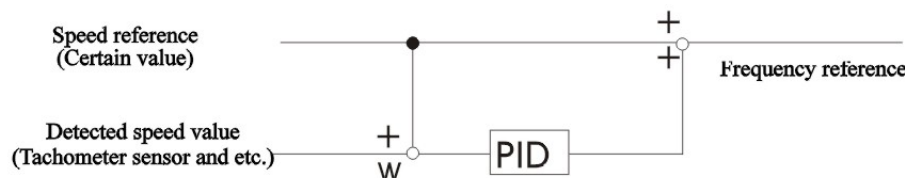


| 25-02  Proportional gain | O   A   A   A   A |
| --- | --- |
| (PID Gain) | |

**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).
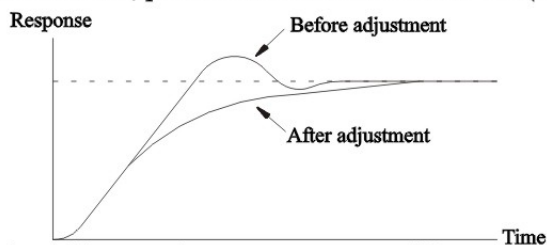
● Try to reach the stable control state as soon as possible

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).
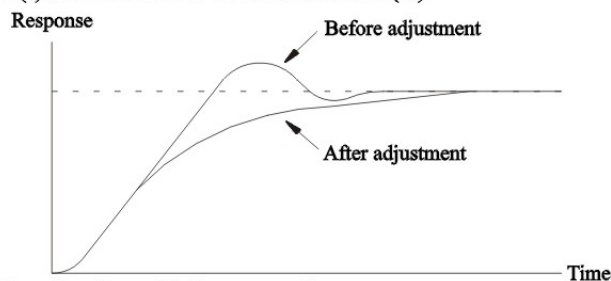
● Suppress the vibration with longer cycle

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.
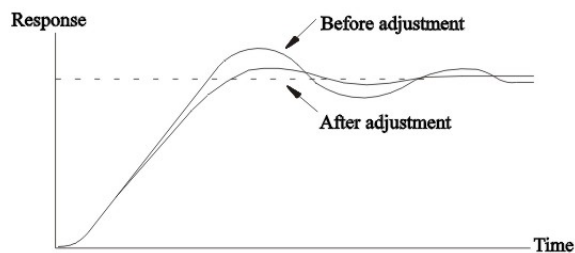
● Suppress the vibration with shorter cycle

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.
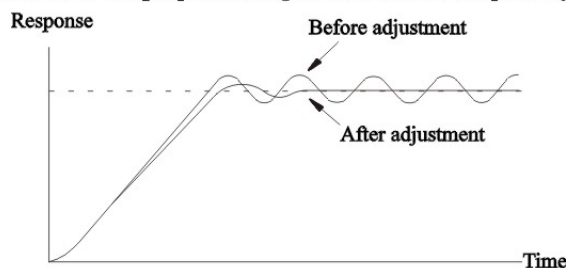
### 5.2.6 DWELL Function: 26

| 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.
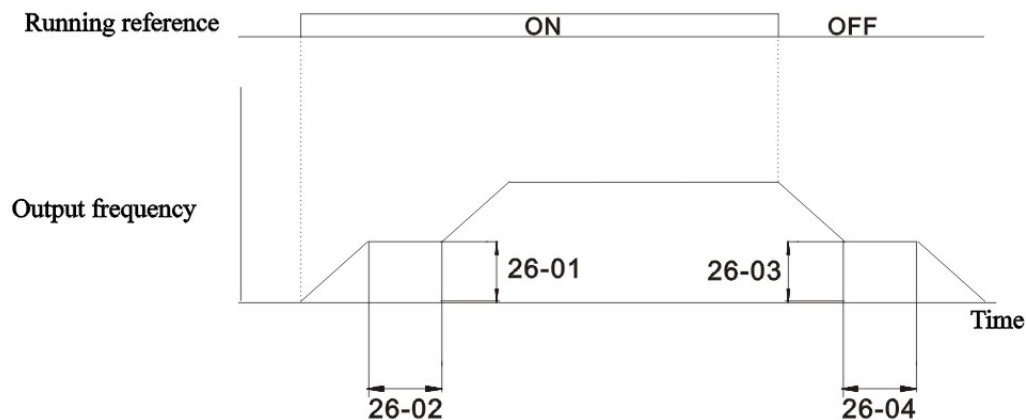


Sequence diagram of DWELL function

| 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                                               [0.0]

Function

    Setting of DWELL function

Selection description

    Output syop time in deceleration
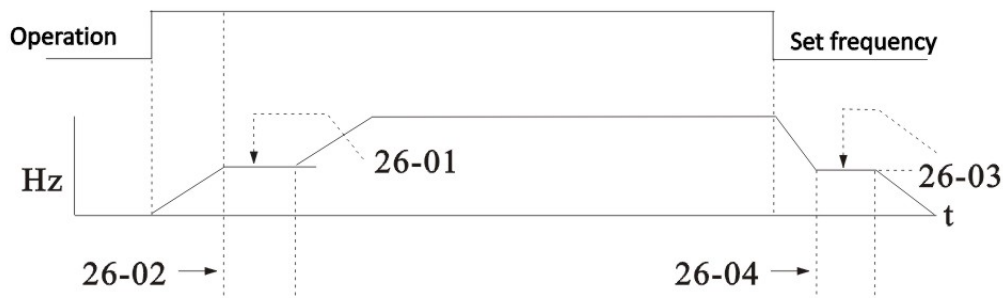


### 5.2.7 DROOP Function: 27

| 27-01 Droop Gain | × A A A A |
| --- | --- |
| (Droop Gain) | |

Set value

    0.0~100.0                                                 ※[0.0]

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                                                 ※[0.05]

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.
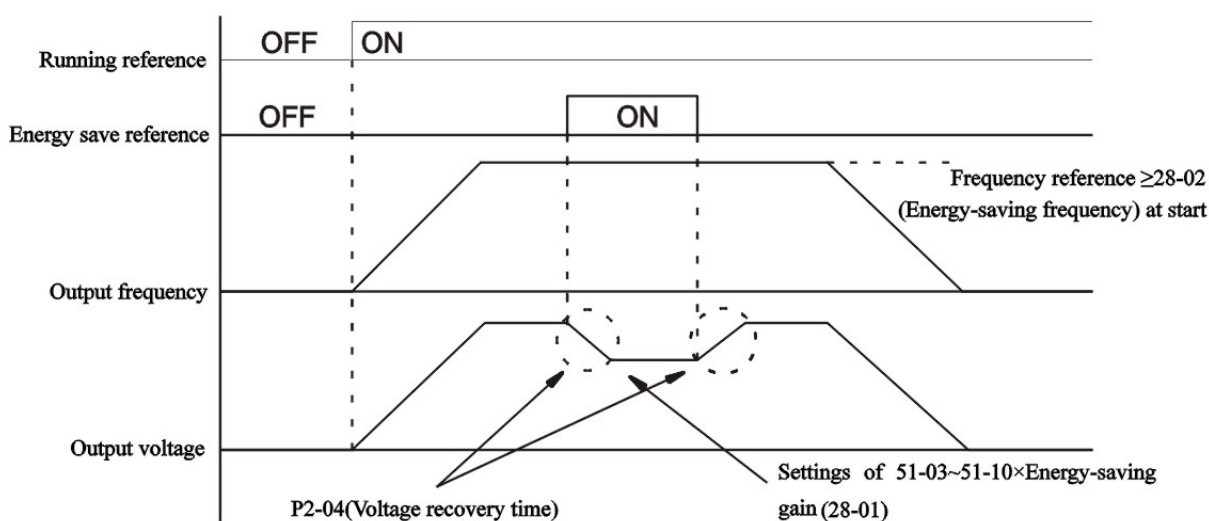
### 5.2.9 Zero Servo: 29

| 29-01 Zero servo gain | × × × × 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 | × × × × 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.

## 5.3Adjustment 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 thee "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% to100%.
    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~TI-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~TI-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.
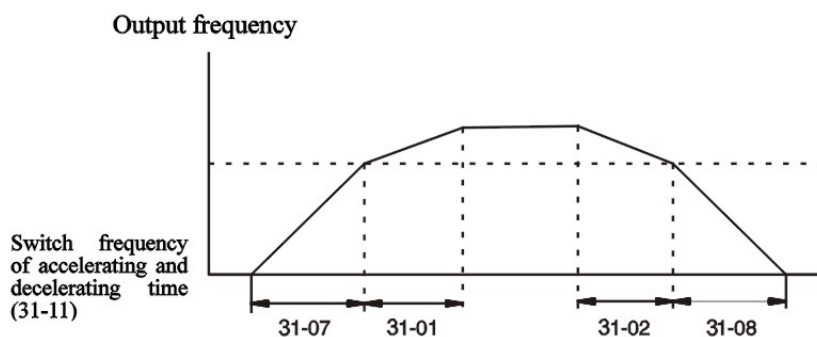


If the output frequency ≥31-11, it will run with accel/decel time 31-07, 08.
If the output frequency ＜31-11, it will run with accel/decel time 31-07, 08.
Switching frequency of accelerating and decelerating time

### 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:
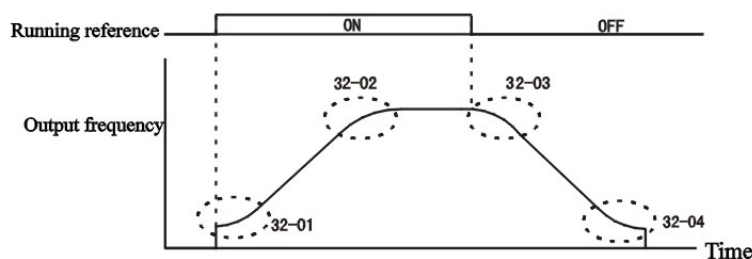


Setting of S curve characteristic function

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:



51-06: Basic frequency
51-04: Max. output frequency

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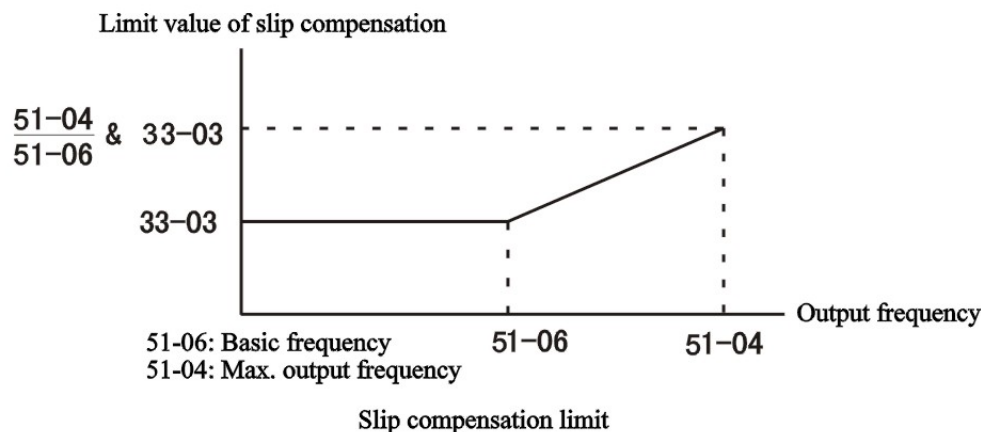
| 33-04 | Slip compensation in regeneration | X | A | X | A | X |
|---|---|---|---|---|---|---|
| | (Slip Comp Regen) | | | | | |

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 |
|---|---|---|---|---|---|---|
| | (Flus 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 staring torque compensation is unavailable.
  For No.2 motor, the staring 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.
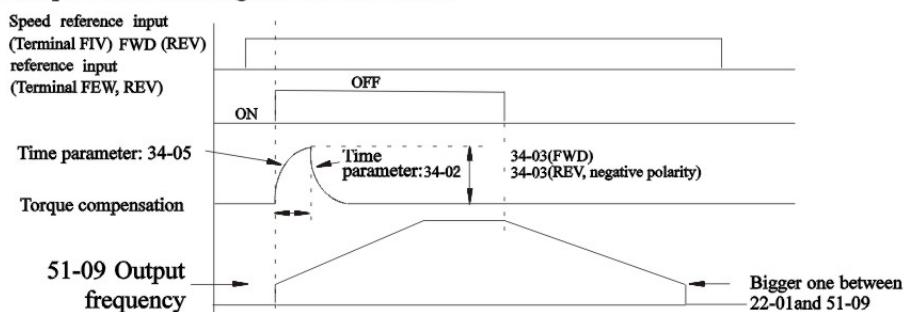


* The torque reference value of inverter will take the above torque compensation as the minimum limit.

Time sequence of starting torque compensation

---

### 5.3.5 Speed control (ASR):35

| 35-01 | ASR proportional gain 1 | O | × | B | × | 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 | × | B | × | 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 | × | B | × | 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 | × | B | × | 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.

---

※=Factory-set value                    60

| 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).

Carrier wave frequency

The value of K is decided by the set value

- 36-01≥10.0KHz:K=3
- 10.0KHz>36-01≥5.0KHz:K=2
- 5.0 KHz>36-01: K=1

36−01

36−02

输出频率×（36−03）×K

0                                           51−04       Output frequency

Max. output frequency
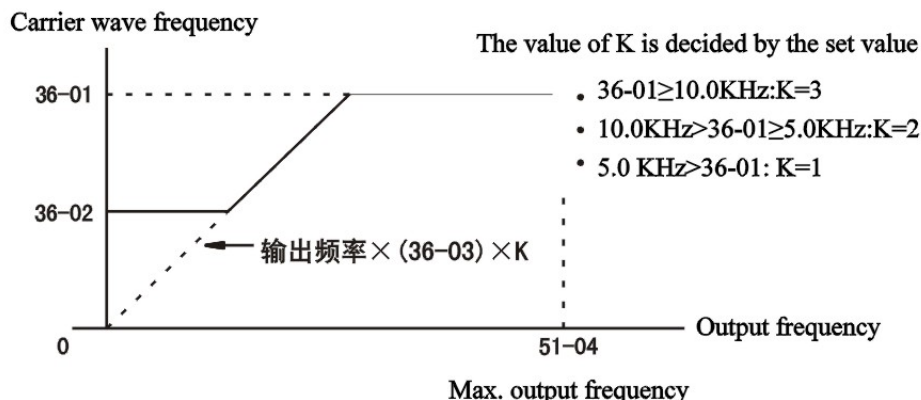
Selection description

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.

---

※=Factory-set value                 63

## 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 |
|---|---|---|---|---|---|---|
| | (Reference6) | | | | | |

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.

---

※=Factory-set value                

| 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.
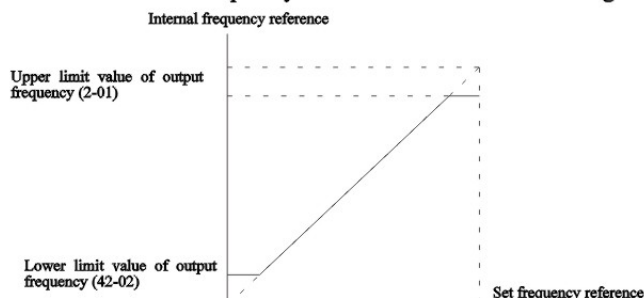


The upper and lower limit value of frequency reference limit

### 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 ±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 ≤ 43-02 ≤ 43-01.
  For 43-04, please set the forbidden bandwidth [set forbidden frequency±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.



※=Factory-set value  66
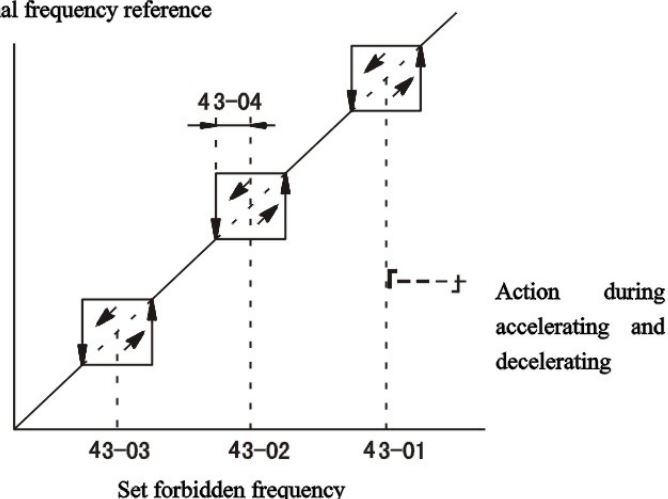
### 5.4.4 Frequency reference holding: 44

| 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.
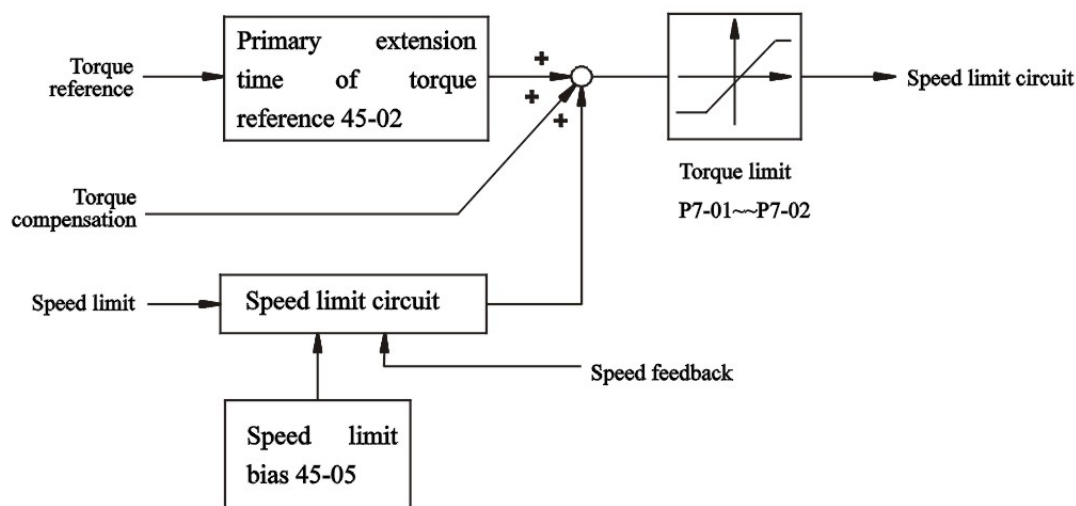


Block diagram of torque control

   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 | 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)

| Set value 0 | 50 Hz | Set value 1 | 60 Hz | Set value 2 | 60 Hz | Set value 3 | 72 Hz |

- Degressive torque characteristics (Set value 4~7)

| Set value 4 | 50 Hz | Set value 5 | 50 Hz | Set value 6 | 60 Hz | Set value 7 | 60 Hz |
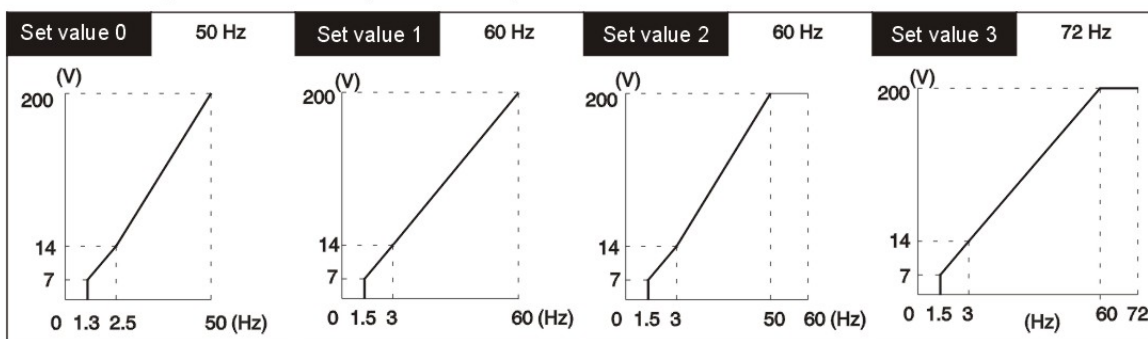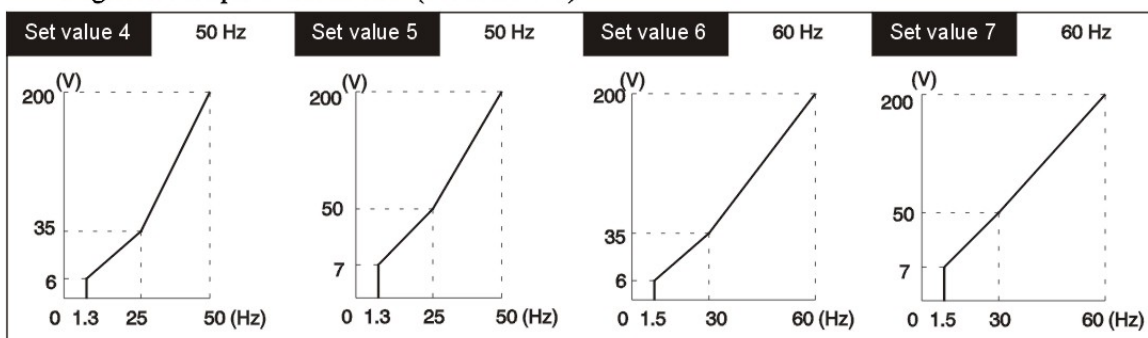
- High starting torque characteristics (Set value 8~b)
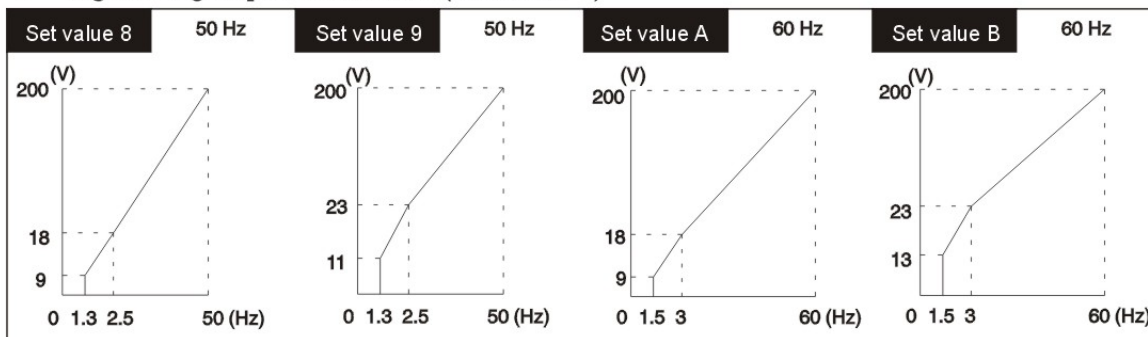
| Set value 8 | 50 Hz | Set value 9 | 50 Hz | Set value A | 60 Hz | Set value B | 60 Hz |

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

| Set value C | 90 Hz | Set value D | 120 Hz | Set value E | 180 Hz |
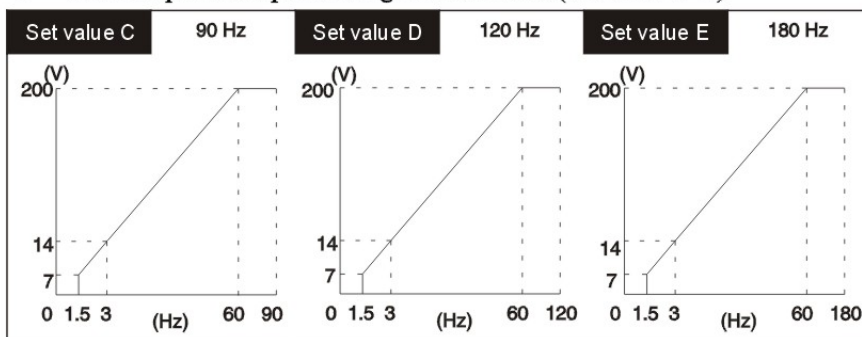
The curves mentioned above are suitable for 220 V grade, the voltage value ×2 for 400V grade.

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

| Set value 0 50 Hz | Set value 1 60 Hz | Set value 2 60 Hz | Set value 3 72 Hz |
|---|---|---|---|

(V) 200, 12, 6 — 0 1.3 2.5 50 (Hz)
(V) 200, 12, 6 — 0 1.5 3 60 (Hz)
(V) 200, 12, 6 — 0 1.5 3 50 60 (Hz)
(V) 200, 12, 6 — 0 1.5 3 60 72 (Hz)

- Degressive torque characteristics (Set value 4~7)

| Set value 4 50 Hz | Set value 5 50 Hz | Set value 6 60 Hz | Set value 7 60 Hz |
|---|---|---|---|

(V) 200, 35, 5 — 0 1.3 25 50 (Hz)
(V) 200, 50, 6 — 0 1.3 25 50 (Hz)
(V) 200, 35, 5 — 0 1.5 30 60 (Hz)
(V) 200, 50, 6 — 0 1.5 30 60 (Hz)
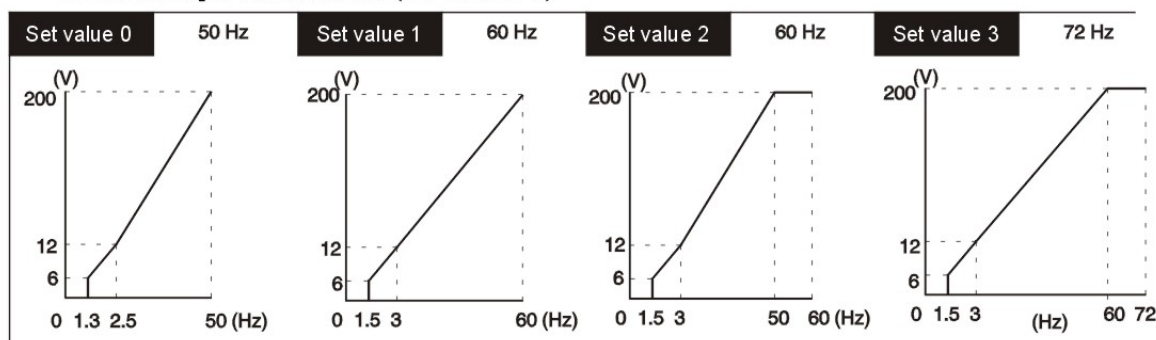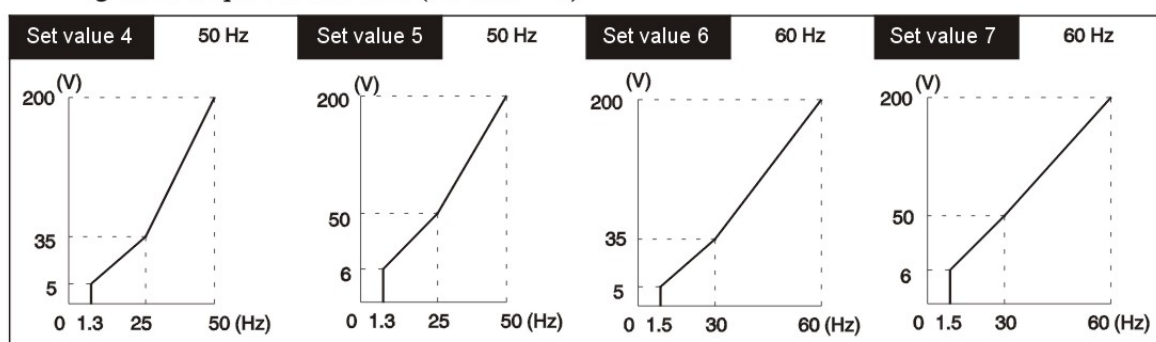
- High start torque characteristics (Set value 8~b)

| Set value 8 50 Hz | Set value 9 50 Hz | Set value A 60 Hz | Set value B 60 Hz |
|---|---|---|---|

(V) 200, 15, 7 — 0 1.3 2.5 50 (Hz)
(V) 200, 20, 9 — 0 1.3 2.5 50 (Hz)
(V) 200, 15, 7 — 0 1.5 3 60 (Hz)
(V) 200, 20, 11 — 0 1.5 3 60 (Hz)
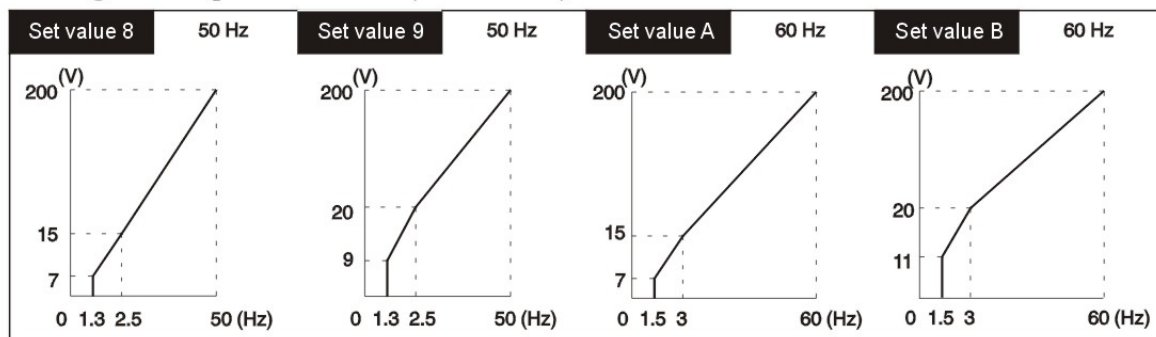
- Constant power output running characteristic (Set value C~E)

| Set value C 90 Hz | Set value D 120 Hz | Set value E 180 Hz |
|---|---|---|

(V) 200, 12, 6 — 0 1.5 3 60 90 (Hz)
(V) 200, 12, 6 — 0 1.5 3 60 120 (Hz)
(V) 200, 12, 6 — 0 1.5 3 60 180 (Hz)
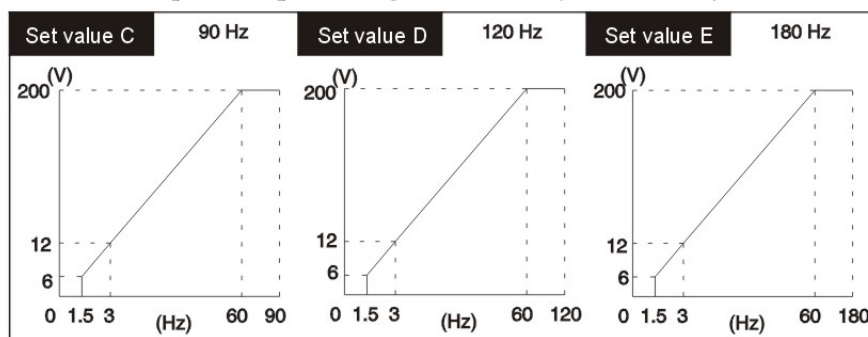
The curves mentioned above are suitable for 220 V grade, the voltage value ×2 for 400V grade.

| 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

---

※=Factory-set value

| 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)

Output voltage (v)

VMAX
(51-05)

VMAX
(51-13)

VC
(51-08)

VMIN
(51-10)

FMIN          FB            FA         FMAX        Frequency (Hz)
(51-09)      (51-07)      (51-06)     (51-04)
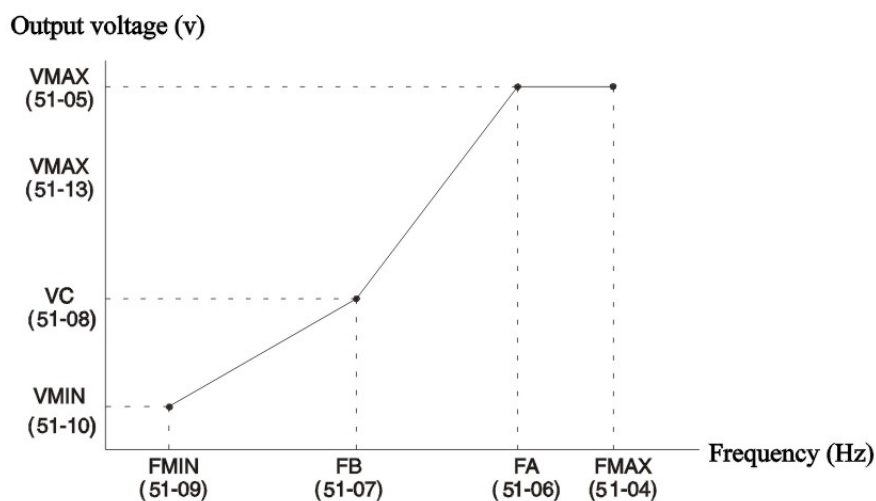
An   V/f curve

### 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.

---

※=Factory-set value                        75

| 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.

| 52-10 | Torque compensation iron loss | X | A | A | X | A |
| | (Tcomp Iron Loses) | | | | | |

Set value
   0~6553.5                                    ※Depending on different powers
Function
   Motor iron loss is taking w as unit.
Selection description
   Set values before leaving factory will be different in accordance with different inverter powers.
   Usually, it is unnecessary to make changes; for the following occasions, please adjust the motor iron loss, taking w as unit.
   Usually, it is unnecessary to set it; however, if there is a great difference between the inverter power and motor power, please set the same value for the motor power and inverter power.

### 5.5.3 Control mode of motor 2: 53

| 53-01 | Mode of Motor 2 | X | A | A | A | A |
| | (Control Method) | | | | | |

Set value
   V/f control                                                [0]
   V/f vector control with PG                                 [1]
   V/f vector control without PG                            ※[2]
   V/f vector control with PG                                 [3]

### 5.5.4 V/f characteristic of motor 2: 54

| 54-01 | Maximum output frequency | X | A | A | A |
| | (V/F2 Max Freq) | | | | |

Set value
   40.0~400.0                                          ※ [60.0]
Function
   Set V/f curve

| 54-02 | Maximum voltage | X | A | A | A |
| | (V/F2 Max Voltage) | | | | |

Set value
   0.0~255.0                                           ※[200]
Function
   Set V/f curve

| 54-03 | Base frequency | X | A | A | A |
| | (V/F2 Base Freq) | | | | |

Set value
   0.0~400.0                                           ※[60]
Function
   Set V/f curve

| 54-04 | Middle output frequency | X | A | A | X |
| | (V/F2 Mid Freq) | | | | |

Set value
   0.0~400.0                                           ※[3.0]
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).

| 54-05 | 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 Freeq)**

**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)

VMAX
(54-02)

VC
(54-05)

VMIN
(54-07)

FMIN       FB       FA    FMAX    Frequency (Hz)
(54-06)  (54-04)  (54-03)  (54-01)
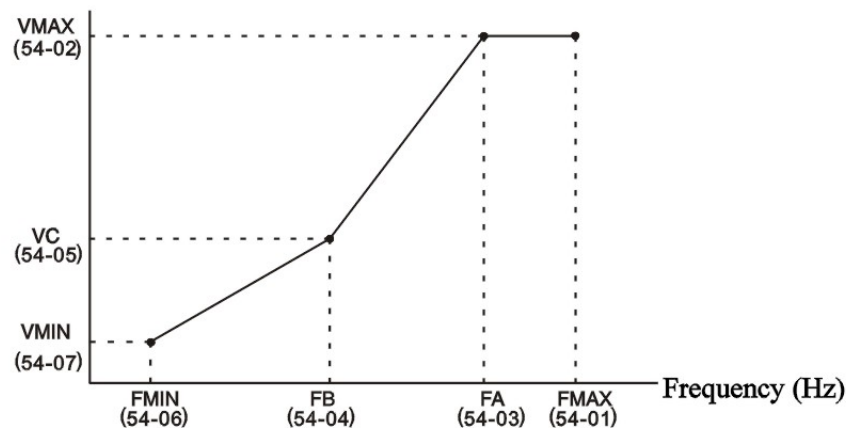
**Any V/f curve**

### 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.

---

※=Factory-set value                           79

| 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 $\Omega$ 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 ($\Omega$) under 75 ℃ in the test report ×0.92($\Omega$)
  B insulation: line-to-line resistance value ($\Omega$) under 75 ℃ in the test report ×0.92($\Omega$)
  F insulation: line-to-line resistance value ($\Omega$) under 115 ℃ in the test report ×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 $\Omega$ 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=1-32).

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= $\underline{\square\square\square}$
$\underline{n\ m}$

Setting of frequency-dividing ratio can be $1/32 \leq F1\text{-}06 \leq 1$; 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/ISeI)**

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 gearteeth 1 | X | X | A | X | X |

**(PG# GearTeeth 1)**

Set value
0~1000　※[0]
Function
Setting of reduction gearteeth ratio of motor to PG

※=Factory-set value

| 61-13 | PG reduction gearteeth 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 gearteeth number of speed reduction puller.
After setting the gearteeth 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)] × [gearteeth number of speed reduction puller 2(61-13) (gearteeth number of speed reduction puller at the load side)/ gearteeth number of speed reduction puller 1(61-12) (gearteeth 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 gearteeth 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

---

※=Factory-set value                    83

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

※=Factory-set value                                      85

- 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 value7, 1A
- Emergent stop: set value15
- FJOG reference/RJOG reference: set value12, 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.

Stop SW (connection b)    Run SW (connection a)

FWD — Run reference (OFF' Run")

REV — Stop Reference(ON"Stop")

MS1 — Reverse Forward run reference (Multiple input)

CM — Common input point of sequence controller
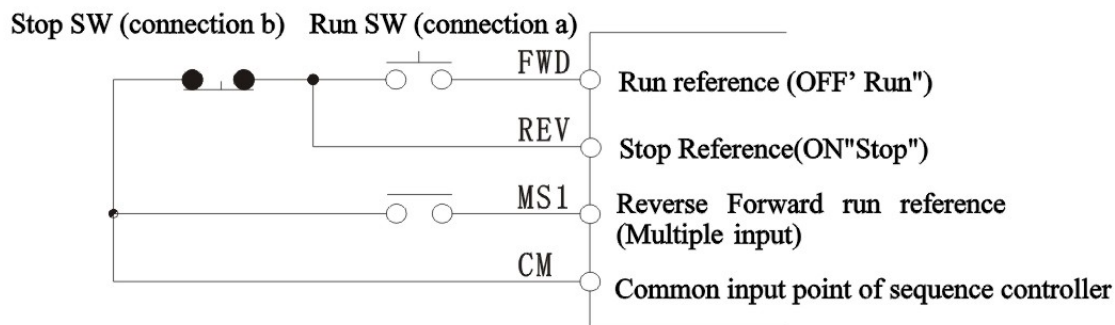
**Example of wiring of 3-wire system procedure**

More than 50ms

Run — ON/OFF    Either is OK

Stop — OFF

REV/FWD — OFF (Forward)    ON (Reverse)

Motor Speed

Stop — Forward Run — Reverse Run — Stop — Forward Run
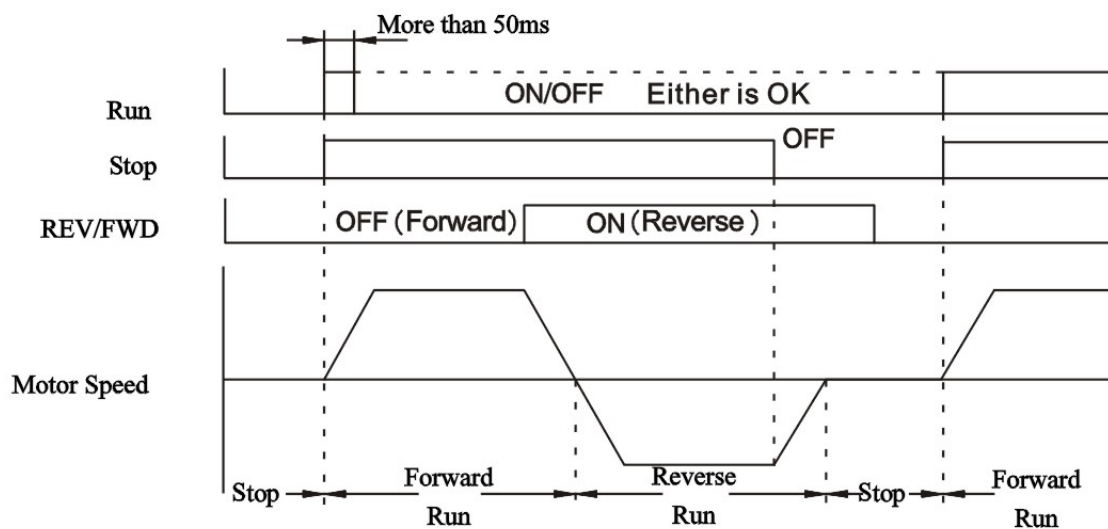
**Sequence diagram of 3-wire system procedure**

■ **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 |
|---|---|---|---|
| MSI | 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 frequencyis 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 frequencyselection | |
| 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 frequencydl-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.
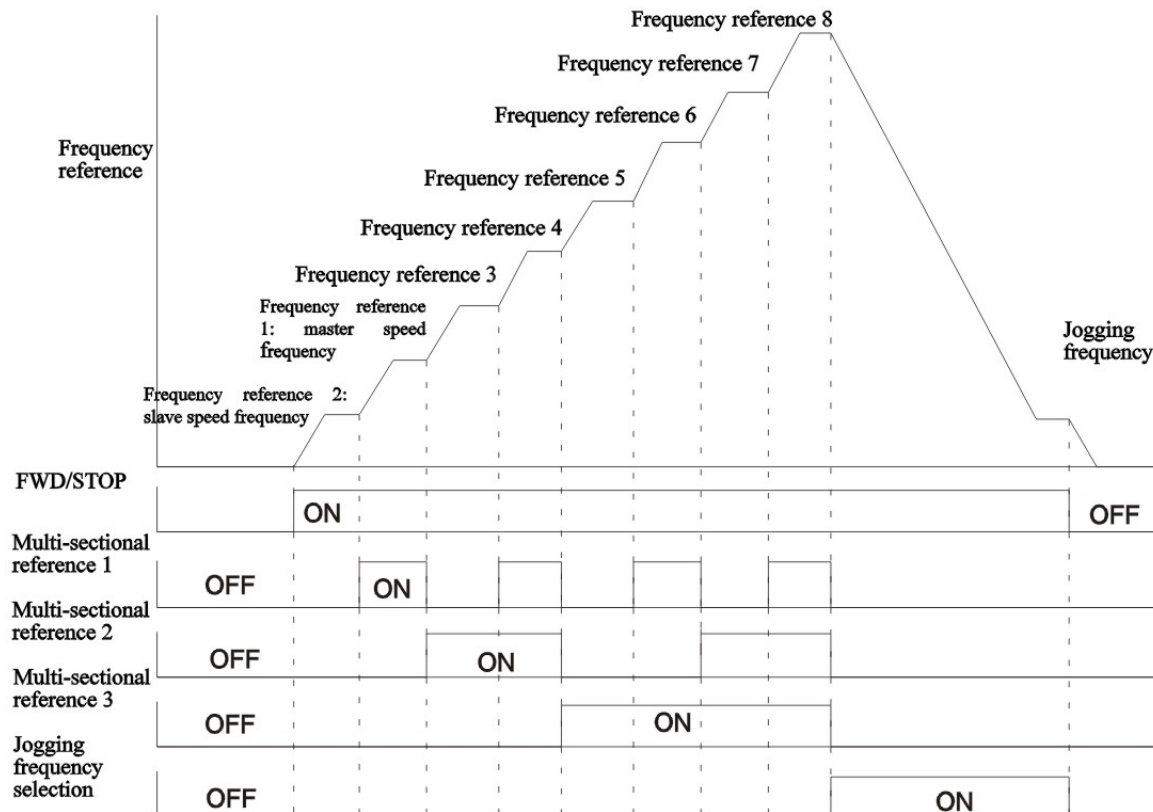


**Sequence diagram of multi-sectional reference/jog frequencyselection**

### Example of 3-sectional speed running

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

**Procedure**
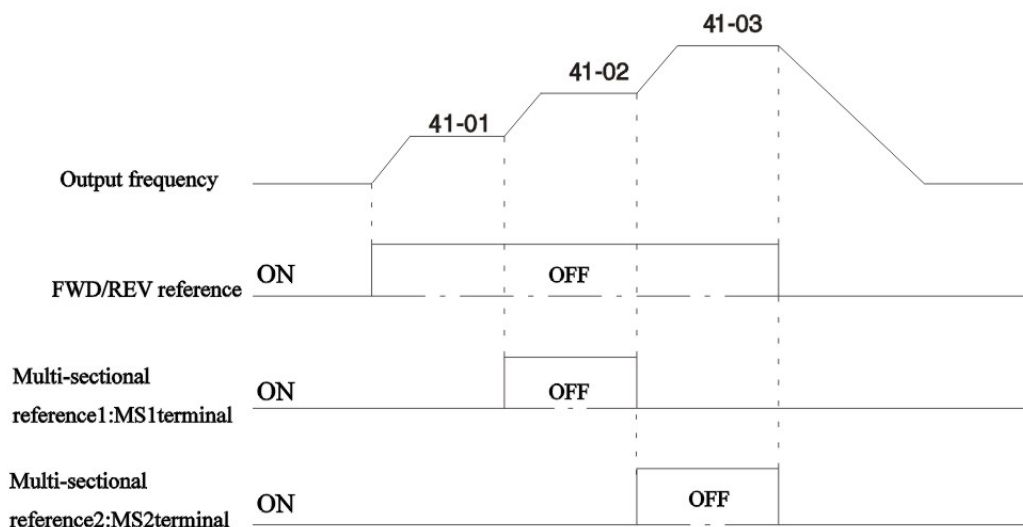


**Wiring**
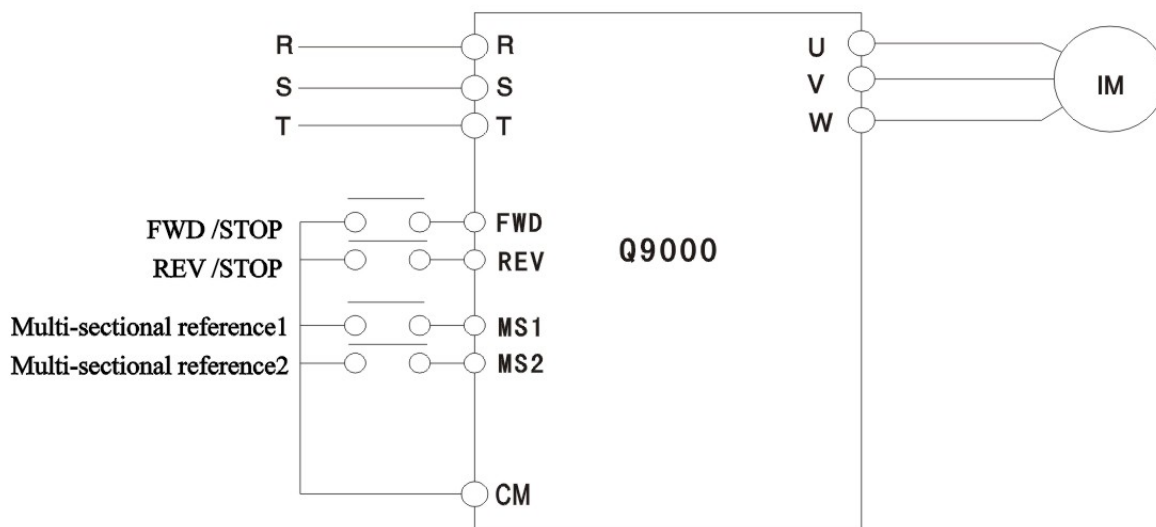


**Parameter setting**

| Parameter No. | Name | Set value |
|---|---|---|
| 11-01 | Access level of parameter | 3:BACIC(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 | lF:unused |

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

※=Factory-set value                        91

■ **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 frequencyrunning 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).



**Base block reference**
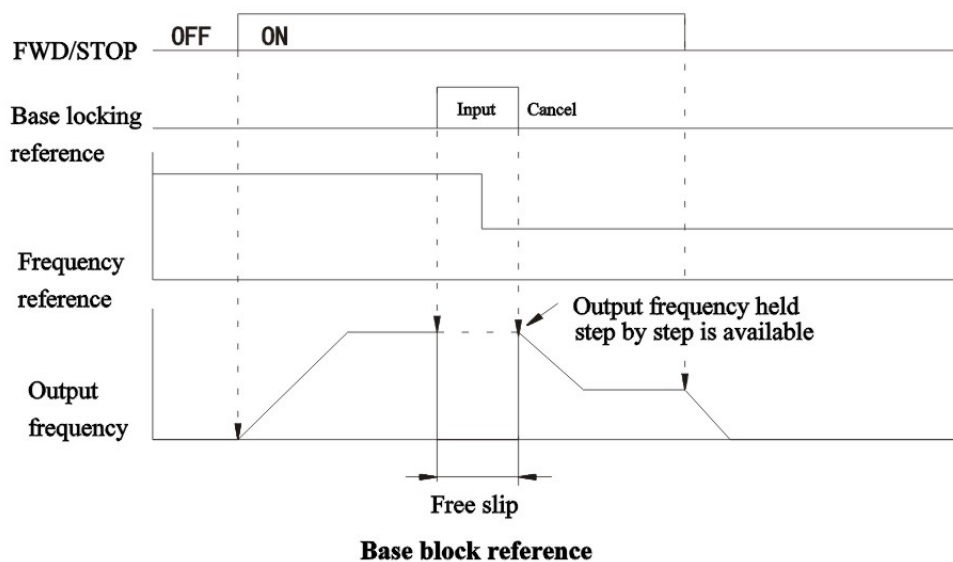
Output frequency that can hold stepping state

**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.
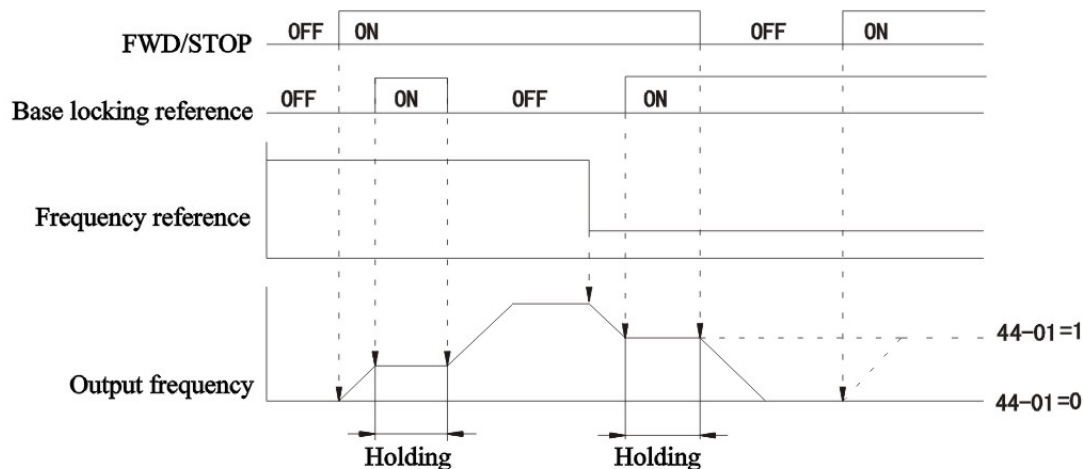


**Accelerated & decelerated stop**

- 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 Holing 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 frequencyare set for multi-functional input at the same time, the selection of "ON" for jog frequencyis 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.
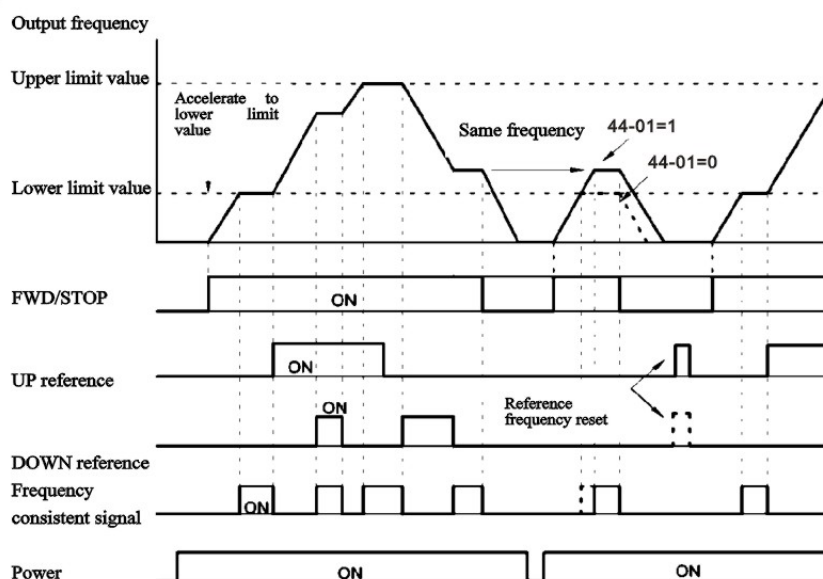


If the running reference is ON during acceleration & deceleration, the frequency consistent signal is ON.

**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.
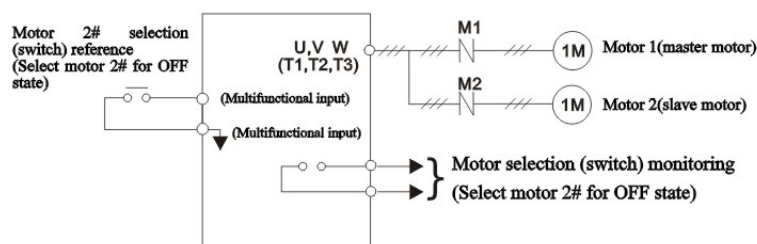


- If anyone from parameters T1-01~06 (multi-functional input) is set to be "16" (Motor 2# selection reference), the ON/OFF action of signal under stop will switch the control mode, V/f characteristic and motor parameter of memory inside inverter.
- If anyone from parameters T2-01~03 (multi-functional 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 arameter | 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.
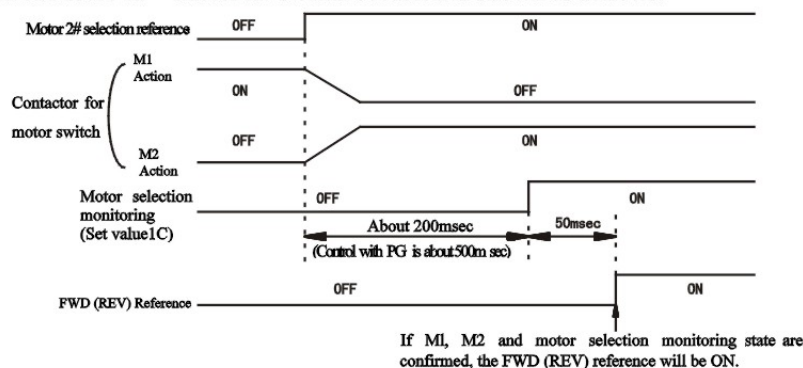


**Sequence diagram of motor 1→motor 2 switch**

**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.
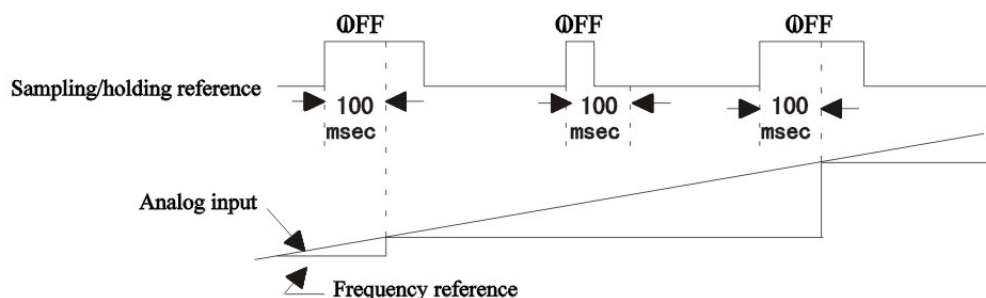


**Sampling/holding of analog frequency reference**

- 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.
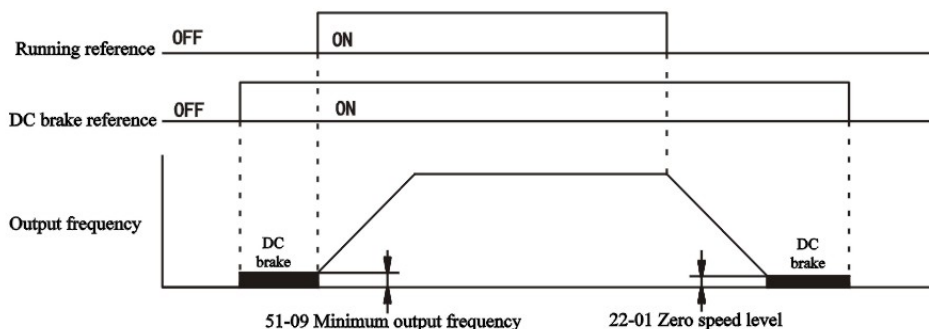


**Sequence diagram of DC brake reference**

**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.
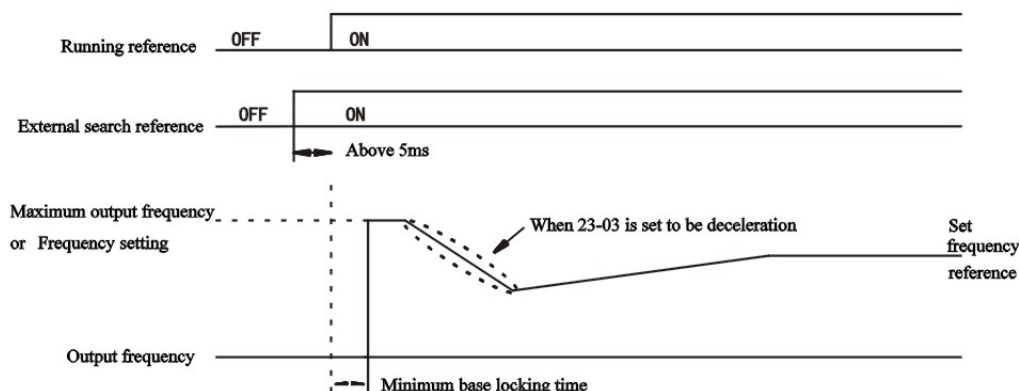


**Sequence diagram of external search reference**

**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) | O | O | O | O |
| 1 | Zero speed | O | O | O | O |
| 2 | Frequency (speed) arrival 1 [Detection bandwidth (P4-02)] | O | O | O | O |
| 3 | Any frequency (speed) arrival 1 (ON: output frequency=±P4-01; the detection bandwidth P4-02) | O | O | O | O |
| 4 | Frequency (FOUT) detection 1>(ON:+P4-01≥output frequency≥-P4-01;the Detection bandwidth P4-02) | O | O | O | O |
| 5 | Frequency (FOUT) detection 2<(ON: output frequency≥+P4-01 or output frequency≤-P4-01; Detection bandwidth (P4-02) | O | O | O | O |
| 6 | Preparation for inverter running: completed. ※Preparation is completed: no abnormal state after the initial treatment,) | O | O | O | O |
| 7 | In detection of main circuit undervoltage (UV) | O | O | O | O |
| 8 | In base block (ON: in base block) | O | O | O | O |
| 9 | Frequency reference selection state (ON: operator) | O | O | O | O |
| A | Running reference selection state (ON: operator) | O | O | O | O |
| B | Overtorque detection 1NO(Connection a:ON: overtorque detection) | O | O | O | O |
| C | Frequency reference loss (frequency reference loss action P4-05=1: available) | O | O | O | O |
| D | Non-performing raking resistor (ON: Resistance overheating or braking transistor failure) | O | O | O | O |
| E | Fault (ON: faults other than CPE00, CPFO1) | O | O | O | O |
| F | Not be used (do not set) | - | - | - | - |
| 10 | Minor fault (ON: display pre-alarm) | O | O | O | O |
| 11 | In fault reset | O | O | O | O |
| 12 | Timer function output | O | O | O | O |
| 13 | Frequency (speed) arrival 2 (Detection bandwidth P4-04) | O | O | O | O |
| 14 | Any frequency (speed) arrival 2 (ON: output frequency=P4-03; detection bandwidth P4-04) | O | O | O | O |
| 15 | Frequency (FOUT) detection 3>(ON: output frequency≤-P4-03, detection bandwidth P4-04) | O | O | O | O |
| 16 | Frequency (FOUT) detection 4<(ON: output frequency≥-P4-03; detection bandwidth P4-04) | O | O | O | O |
| 17 | Overtorque detection 1 NC (Connection b: Overtorque detection OFF) | O | O | O | O |
| 18 | Overtorque detection 2 NO (Connection: Overtorque detection ON) | O | O | O | O |
| 19 | Overtorque detection 2 NC (Connection b: Overtorque detection OFF) | O | O | O | O |
| 1A | In reverse run (ON: under REV) | O | O | O | O |
| 1B | In base block 2 (OFF: under base block) | O | O | O | O |
| 1C | Motor selection (Motor switch) | O | O | O | O |
| 1D | In regeneration action (ON: in regeneration Action) | × | × | × | O |
| 1E | Fault restart (ON: in fault restart) | O | O | O | O |
| 1F | Motor overload OL1 pre-alarm (ON: detection level is more than 90%) | O | O | O | O |
| 20 | Inverter overheating OH pre-alarm (Temperature is above P8-02) | O | O | O | O |
| 30 | Torque limit (current limit)(ON: in torque limit) | × | × | O | O |
| 31 | In speed limit (ON: in speed limit) | × | × | × | O |
| 33 | Zero servo is complete (ON: zero servo is complete) | × | × | × | O |
| 37 | In run 2: (ON: frequency output OFF: base block  DC brake  initial excitation  running stop) | O | O | O | O |

※=Factory-set value                              102

## 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 | |
| Any frequency (speed) arrival 1 | 3 | Protection function: |
| Frequency (FOUT) detection 1＞ | 4 | P[Setting of frequency detection function: P4-01~P4-05] |
| 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: |
| Timer function output | 12 | P[Setting of timer function: P4-01, P4-02] |
| Frequency (speed) arrival 2 | 13 | |
| Any frequency (speed) arrival 2 | 14 | Protection function: |
| Frequency (FOUT) detection 3＞ | 15 | P[Setting of frequency detection function: P4-01~P4-05] |
| Frequency (FOUT) detection 4＜ | 16 | |
| Overtorque detection 1 NC | 17 | Protection function: |
| Overtorque detection 2 NO | 18 | P[Setting of overtorque detection function: P6-01~P6-06] |
| 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.



Sequence diagram in run
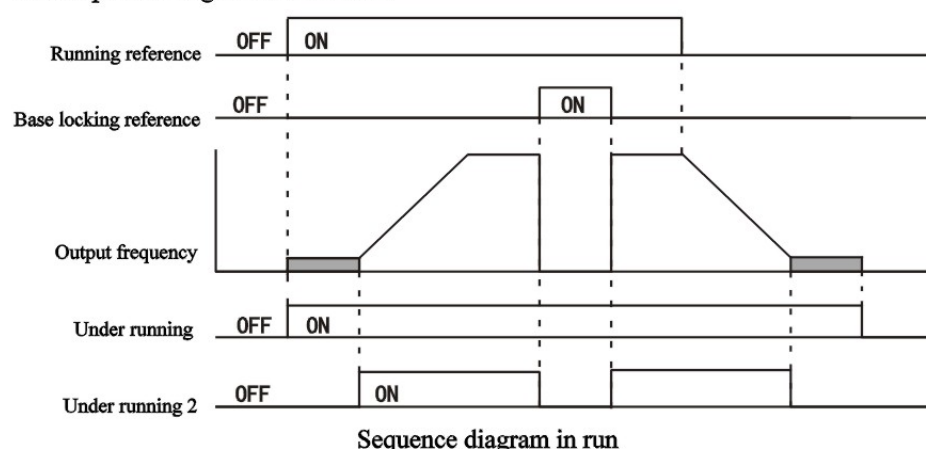
Zero speed (set value: 1)

| 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)" |
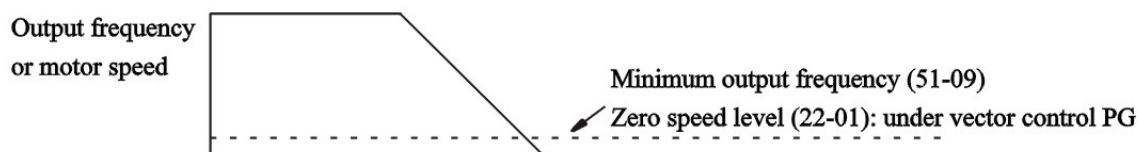


Sequence diagram of zero speed

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 |
|---|---|---|---|---|---|

(Terml 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 |
|---|---|---|---|---|---|

(Terml 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 |
|---|---|---|---|---|---|

(Terml 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~+10Vinput [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.

---

※=Factory-set value

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 | O | O | O | O |
| 1 | Frequency gain | Frequency reference value of frequency reference (voltage) terminal | O | O | O | O |
| 2 | Frequency bias (Zero limit when the rotation direction is changed) | Maximum output frequency (plus with the T3-03set value) | O | O | O | O |
| 4 | Output voltage bias | Motor rated voltage(51-05) | O | O | × | × |
| 5 | Accel/decel time gain (shorten coefficient) | The set acceleration & deceleration time (31-01~08) | O | O | O | O |
| 6 | DC brake (DB) current | Inverter rated output current | O | O | O | × |
| 7 | Overtorque detection level | V/f control: Motor rated current;<br>Vector control: Motor rated torque | O | O | O | O |
| 8 | Stall prevention level in run | Inverter's rated current | O | O | × | × |
| 9 | Frequency reference lower limit level | Maximum output frequency | O | O | O | O |
| A | Setting forbidden frequency | Maximum output frequency | O | O | O | O |
| B | PID feedback | Maximum output frequency | O | O | O | O |
| C | PID target value | Maximum output frequency | O | O | O | O |
| D | Frequency bias | Maximum output frequency (plus with set value of T3-03) | O | O | O | O |
| 10 | Torque limit of forward run side | Motor rated torque | × | × | O | O |
| 11 | Torque limit of reverse run side | Motor rated torque | × | × | O | O |
| 12 | Torque limit of regeneration side | Motor rated torque | × | × | O | O |
| 13 | Torque reference/<br>Torque limit under speed control | Motor rated torque | × | × | × | O |
| 14 | Torque compensation | Motor rated torque | × | × | × | O |
| 15 | Positive/negative torque limit | Motor rated torque | × | × | O | O |
| 1F | Analog input is not used (T3-05) | - | O | O | O | O |
| | 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 Blas) | | | | | |

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.
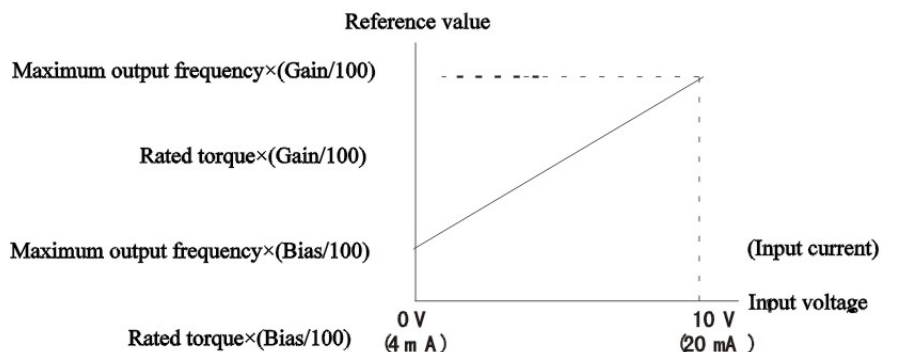
Adjustment for analog input gain and bias

| 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.



Adjustment for monitoring output
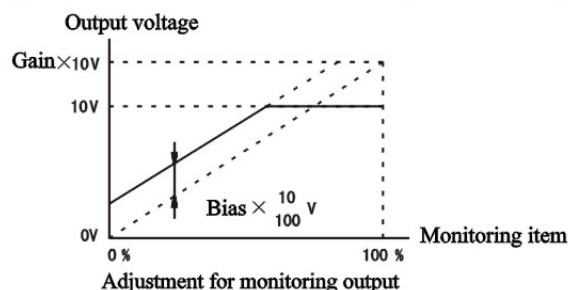
| T4-04 Terminal MA+ monitoring selection | O | B | B | B | B |
| (Terminal 23 Sel) | | | | | |

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.
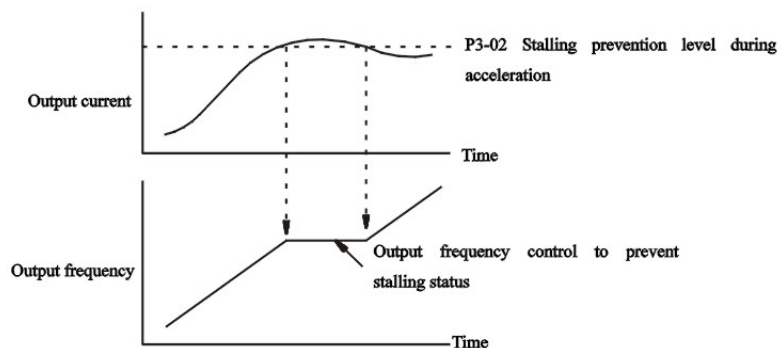


Stalling prevention function during acceleration (P3-01=1 occasion)

| P3-03 Stall prevention limit in acceleration | X | A | A | A | X |
| --- | --- | --- | --- | --- | --- |
| (StallP 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.
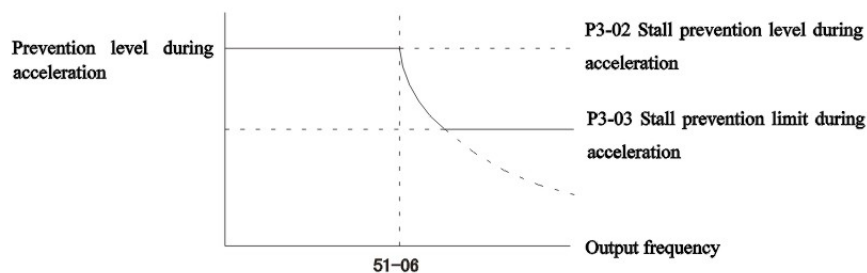


51-06 Maximum voltage frequency (FA)

(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                          116

| 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 [Decelerateion based on the setting: short decelerating time; possible circuit vervoltage (OV) |
| 1 | Available (Main circuit voltage closed to the voltage level: deceleration stop; voltage revertion: 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.
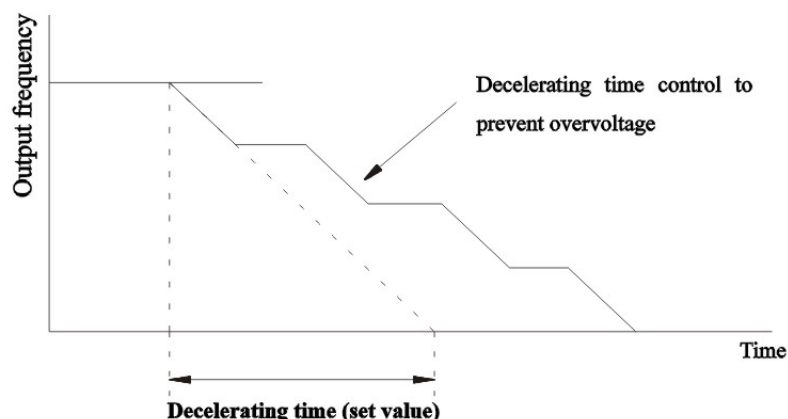


Stall prevention action during deceleration (P3-09=1)

| 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 |
|---|---|---|---|---|---|

| (StaIIP 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 Setl) | | | | | |

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"
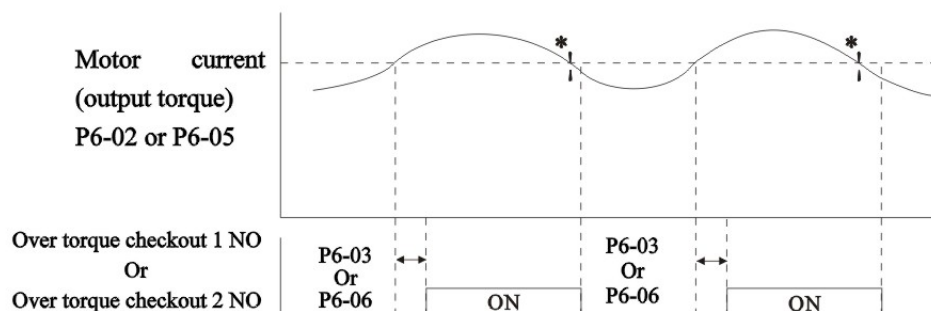


The cancellation width of overtorque detection is about 10% of the inverter's rated current (or the motor's rated torque).

**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 Setl) | | | | | |

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
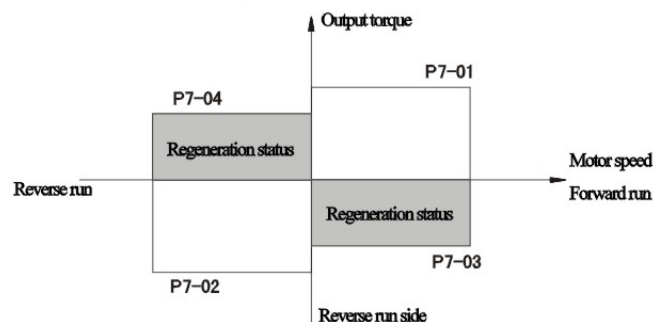   Torque limit can be set by % compared with the motor's rated torque.
   Four quadrants can be set respectively.

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 | Desription |
|-----------|------------|
| 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 ℃ 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 ℃ 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 ℃, 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 Prtctl) | | | | | |

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)<br><br>r/min=120Xfrequency reference(Hz)/ o1-03 (motor poles) |
| 40~39999 | Radix point position: decided by the fifth digit of 01-03.<br>The value of the fifth digit=0: Expressed as□□□□<br>The value of the fifth digit= 1: Expressed as□□□.□<br>The value of the fifth digit=2: Expressed as□□.□□<br>The value of the fifth digit= 3: Expressed as□.□□□<br>Percentage: decided by the fourth-first digit of o1-03.<br> (Example 1)<br>If o1-03=12000,100% speed =200.0<br>60% speed = 120.0<br>(Example 2 )<br>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".

※=Factory-set value

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.
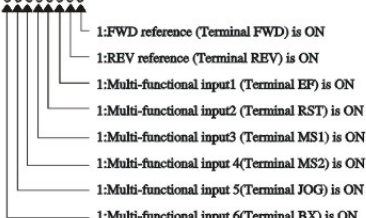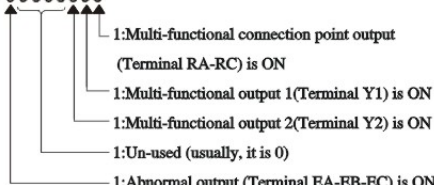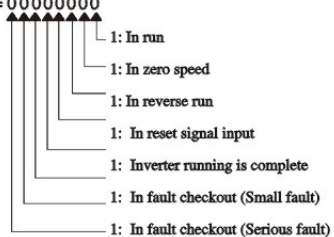
| Q | Items monitored at all QUICK-START, BASIC, ADVANCED access levels |
|---|---|
| B | Items monitored at all ADVANCED and BASIC access levels |
| A | Items monitored at all ADVANCED access levels |
| X | Items monitored under such control mode |

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 / Operator display | Content | Output signal level when multi-functional analog output | Min. unit | 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 | l0V: motor rated torque (0~±10V: corresponded) | 0.1% | × | × | Q | Q |

| Function | Parameter No. | Name — Operator display | Content | Output signal level when multi-functional analog output | Min. unit | 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)<br>M1-10=00000000<br>1:FWD reference (Terminal FWD) is ON<br>1:REV reference (Terminal REV) is ON<br>1:Multi-functional input1 (Terminal EF) is ON<br>1:Multi-functional input2 (Terminal RST) is ON<br>1:Multi-functional input3 (Terminal MS1) is ON<br>1:Multi-functional input 4(Terminal MS2) is ON<br>1:Multi-functional input 5(Terminal JOG) is ON<br>1:Multi-functional input 6(Terminal BX) is ON | (cannot be output) | - | Q | Q | Q | Q |
| | M1-11 | Output terminal status | Monitor ON/OFF of output terminal (cannot be output)<br>M1-11=00000000<br>1:Multi-functional connection point output (Terminal RA-RC) is ON<br>1:Multi-functional output 1(Terminal Y1) is ON<br>1:Multi-functional output 2(Terminal Y2) is ON<br>1:Un-used (usually, it is 0)<br>1:Abnormal output (Terminal EA-EB-EC) is ON | (cannot be output) | - | Q | Q | Q | Q |

| Function | Parameter No. | Name — Operator display | Content | Output signal level when multi-functional analog output | Min. unit | V/f without PG | V/f with PG | Vector without PG | Vector with PG |
|---|---|---|---|---|---|---|---|---|---|
| Status monitoring | M1-12 | Running status | Running status confirmation (cannot be output)<br>M1-12=00000000<br>1: In run<br>1: In zero speed<br>1: In reverse run<br>1: In reset signal input<br>1: Inverter running is complete<br>1: In fault checkout (Small fault)<br>1: In fault checkout (Serious fault) | (cannot be output) | - | 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 FIV input voltage | 10V monitored input voltage of frequency reference (voltage): displayed as 100%; | 10V: 100% (10V input)<br>(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)<br>(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)<br>(0~±10V: corresponded) | 0.1% | B | B | B | B |

※=Factory-set value

| | | 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 | D1-16H 2 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 |

※=Factory-set value                           131

**Parameters and their contents that can be monitored under the driving mode (Continue)**

| Func tion | Parameter No. | Name / Operator display | Content | Output signal level when multi-functional analog output | Min. unit | Access Level 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 | | - | 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"; | (cannot be output) | 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 |

※=Factory-set value

(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 | 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 |
| trajectory | M2-14 | Elapsed running time at abnormal status | | Elapsed running time upon "Last fault"; | | 1 Hour | Q | Q | Q | Q |
| | M3-01 | Last fault | | Content of last fault | | - | 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 |
| (Note[2]) | M3-04 | Faults of first four times | | Content of faults of first four times | | - | Q | Q | Q | Q |
| Abnormal | M3-05 | Elapsed running time before the last fault | | Elapsed running time before the last fault | (cannot be output) | 1 Hour | Q | Q | Q | Q |
| trajectory | 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)
1. For faults such as CPF00, 01, 02, 03, UV1, UV2, there is no abnormal trajectory.
2. 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

* 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 gearteeth 1 | 0 | 66 |
| 52-05 | Motor line-to-line resistance | *9.842 | 61 | 61-13 | PG reduction gearteeth 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 gearteeth 1 | 0 | 66 |
| 52-05 | Motor line-to-line resistance | *9.842 | 61 | 61-13 | PG reduction gearteeth 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 *)

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※=Factory-set value　　　　　　　140

**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 |

※=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 |
|---|---|---|---|---|---|---|---|
| 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<br>DC Bus Fuse Open | Fuse broken<br>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(⊕3)←→U, V, W;⊝ ←→U, V, W) | Replace the inverter after cause investigation and countermeasure implementation |
| GF<br>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<br>Overcurrent | Overcurrent<br>Inverter's output current is over the overcurrent detection value.<br>(About 200% of the rated current) | ●Ground short-circuit occurred in inverter output (contact, grounding and etc. cause d by motor burning, insulation deterioration and wire damage)<br>●Load is too large and accelerating time is too short;<br>●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<br>DC Bus Undervolt | Main circuit low-voltage<br>Main circuit DC voltage is lower than the low-voltage detection level (L2-05);<br>200V: about 190V<br>400V: about 380V | • Input power has phase loss.<br>• Transient power failure occurs.<br>• Wiring terminal of input power is loosened.<br>• Input power voltage changes too much. | Reset the inverter after cause investigation and countermeasure implementation |
| OV<br>Overvoltage | Main circuit overvoltage<br>Main circuit DC voltage is over the voltage detection value;<br>200V: about 190V<br>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<br>Short Circuit | Load short-circuit<br>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<br>CTL PS Undervolt | Control power is abnormal<br>The voltage of control current is too low; | — | • Try to make the power ON/OFF;<br>• Replace the inverter upon continuous abnormal situation. |
| UV3<br>MC Answerback | Surge circuit fault prevention<br>Surge circuit fault prevention is non-performing; |   | • Try to make the power ON/OFF;<br>• Replace the inverter upon continuous abnormal situation. |
| PF<br>Input Pha Loss | Main circuit voltage is abnormal<br>Main circuit DC voltage has abnormal vibration under status other than regeneration.<br>(Be detected if L8-05 is "available") | Input power has phase loss.<br>Transient power failure occurred.<br>Wiring terminal of input power is Loosened.<br>Input power voltage changes too much.<br>The balance of line voltage is bad. | Reset the inverter after cause investigation and countermeasure implementation |

※=Factory-set value                      145

| 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 ℃; | Too high ambient temperature | Install a cooling device. |
| | | Heating elements | Remove the heat source. |
| | | The inverter's ventilating fan is stopped. | Install cooling device. |
| | Inverter's internal ventilating fan is stopped (over 18.5 kW) | 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<br>Overtorque det 2 | Overtorque 2<br>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.<br>• Confirm the use condition of mechanical system; find out and solve the fault cause. |
| OL1<br>Motor Overloaded | Motor overload<br>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<br>Inv Overloaded | Inverter overload<br>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<br>Over speed | Over speed<br>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<br>PG open | PG open detection<br>Under the following conditions, the status without PG pulse input is over the time in 61-14;<br>Vector Control With PG: Soft start output≥2%<br>V/F Control With PG: Soft start output≥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<br>Speed Deviation | Excessive speed deviation<br>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<br>Oper Disconnect | Operator connection is not good<br>In the running of operator control running reference, the operator is disconnected; | — | Confirm the operator connection |
| SVE<br>Zero Servo Fault | Zero servo fault<br>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<br>Opt External Flt | External abnormal input from communication option card; | — | Check the communication card and communication signal |

| Fault | Content | Cause | Countermeasure |
|---|---|---|---|
| EF3<br>External Fault 3 | External fault<br>(Input terminal EF) | [External abnormal] is input outside the multi-functional input. | ● Cancel the external abnormal input from multi-functional input<br><br>● Remove causes for external abnormal |
| EF4 | External fault<br>(Input terminal RST) | | |
| EF5 | External fault<br>(Input terminal MS1) | | |
| EF6 | External fault<br>(Input terminal MS2) | | |
| EF7 | External fault<br>(Input terminal JOG) | | |
| EF8 | External fault<br>(Input terminal BX) | | |
| CPF00<br>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<br>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<br>BB Circuit Err | Base block circuit is not good;<br>EEPROM is not good; | — | Try to make the power ON/OFF; |
| | | Control circuit damage | Replace the inverter |
| CPF03<br>EEPROM Error | CPU internal A/D inverter is not good; | — | Try to make the power ON/OFF; |
| | | Control circuit damage | Replace the inverter |
| CPF04<br>Internal A/D Err | Base block circuit is not good;<br>EEPROM is not good; | — | Try to make the power ON/OFF; |
| | | Control circuit damage | Replace the inverter |
| CPF05<br>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.

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※=Factory-set value                                    149

| Alarm display | Content | Cause | Countermeasure |
|---|---|---|---|
| EF(blinking)<br>External Fault | FWD and REV reference are input simultaneously;<br>REV and FWD are input simultaneously for more than 0.5 seconds; | — | The sequence controller to adjust the FWD, REV reference;<br>※When such alarm is happened, the motor will be deceleratedly stopped (due to the unknown rotation direction). |
| OH2 (blinking)<br>Overtorque Det 1 | Inverter overheating pre-alarm<br>Multi-functional inverter [inverter overheating pre-alarm OH2] is input. | — | Cancel the inverter's overheating pre-alarm of function input. |
| OL3(blinking)<br>Overtorque Det 1 | Overtorque 1<br>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.<br>• Confirm the mechanical use condition and remove the fault. |
| OL4(blinking)<br>Overtorque Det 1 | Overtorque 2<br>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.<br>• Confirm the mechanical use condition and remove the fault. |
| UV(blinking)<br>DC Bus Undervol | Main circuit low-voltage<br>When the running signal is not input, it is already under the following states:<br>• Main circuit DC voltage is below (P2-05) low-voltage detection level.<br>• The contactor for restraining surge current is disconnected.<br>• 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<br>SERIAL Com Call | SI-B transmission error<br>When the power is input, the control information cannot be received normally. | — | Check the transmission equipment and the transmission signal |
| BUS<br>Option Com Err | Selection of the transmission error<br>Errors occur in the setting of running reference or frequency reference from the selection card. | — | Check the transmission card and the transmission signal |
| CE<br>MEMOBUS Com Err | Transmission error<br>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)<br>External Fault 3 | External abnormal<br>(Input terminal EF) | [External abnormal] is input outside the multi-functional input. | • Cancel the external abnormal input from the multi-functional input<br>• Remove causes for the external abnormal |
| EF4(blinking) | External abnormal<br>(Input terminal RST) | | |
| EF5(blinking) | External abnormal<br>(Input terminal MS1) | | |
| EF6(blinking) | External abnormal<br>(Input terminal MS2) | | |
| EF7(blinking) | External abnormal<br>(Input terminal JOG) | | |
| EF8(blinking) | External abnormal<br>(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): <br>● More than 2 same values are set for multi-functional input. <br>● UP reference and DOWN reference are set not simultaneously. <br>● UP/DOWN reference and acceleration & deceleration holding reference are set simultaneously. <br>● External search reference (maximum output frequency) and external search reference (setting frequency) are set simultaneously. <br>● Base block reference NO/NC are set simultaneously. <br>● UP/DOWN reference are set when PID control (25-01) is available. <br>● 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. <br>● +speed reference and -speed reference are not set simultaneously. <br>● 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. <br>● 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") <br>• Analog reference card Al-14B, 62-01=0; Multi-functional input (T1-01 ~ T1-06)-=2" (selection/inverter switch). <br>• 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: <br>• $51\text{-}04(FMAX) \geq 51\text{-}06(FA) > 51\text{-}07(FB) \geq 51\text{-}09(FMIN)$ |
| OPE11 CarrFrg/On/Delay | Parameter setting is not good | The following any one setting is non-performing. <br>• Carrier frequency upper limit (36-01)＞5kHz and Carrier frequency lower limit (36-02)≤5kHz <br>• Carrier frequency proportional gain (36-03) ＞ 6;while (36-02)＞(36-01) is set. <br>• 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 <br>• Try to make the power ON/OFF; <br>• 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".

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※=Factory-set value                    155

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.

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※=Factory-set value

### 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 Output — 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 Output — 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 |
| Rated Output — Output voltage | V | Three-phase 380/415/440/460V(Proportional to input voltage ) | | | | | | | | | | | | | | | | | | | | | |
| Rated Output — Max. output frequency | | Up to 400Hz available by programming | | | | | | | | | | | | | | | | | | | | | |
| Power Supply — Rated voltage and Frequency | | Three-phase 380~460V, 50Hz/60Hz | | | | | | | | | | | | | | | | | | | | | |
| Power Supply — Allowable voltage fluctuation | | +10%~-15% | | | | | | | | | | | | | | | | | | | | | |
| Power Supply — 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 ) | | | | | | | | | | | | | | | | | | | | | |
| Control Feature — Speed control accuracy | | ±0.2% | | | | | | | | | [±0.02% with PG] | | | | | | | | | | | | |
| Control Feature — Speed control range | | 1:100 | | | | | | | | | [1:1000 with PG] | | | | | | | | | | | | |
| Control Feature — Speed control response | | 10Hz | | | | | | | | | [30Hz with PG] | | | | | | | | | | | | |
| Control Feature — Starting torque | | 150%/0.5Hz | | | | | | | | | [200%/0Hz with PG] | | | | | | | | | | | | |
| Protective Function — Torque response | | 20Hz, 50ms | | | | | | | | | [40Hz, 25ms with PG] | | | | | | | | | | | | |
| Protective Function — Torque accuracy | | ±5% | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Torque limit | | 4 kinds of vector control methods by parameter setting | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Frequency controlling range | | 0.01~400 Hz | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Frequency accuracy | | Digital signal reference: ±0.01% (-10℃~ +40℃), analogue reference: ±0.1% (25℃±10℃) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Frequency setting resolution | | Digital signal reference: ±0.01Hz (Below 100Hz), analogue reference: ±0.03Hz/60Hz (12bit) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Output frequency resolution | | 0.001 Hz | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Frequency setting signal | | Analogue reference DC-10~+10V(20KΩ),4~20Ma(250Ω) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Braking torque | | ±20 % ( approximately 150% with braking resistor option) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Accelerating/decelerating time | | 0.01-6000.0s (Accelerating/Decelerating time setting independently, 4 kinds of time controlling modes available) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Overload capability | | 150% of Rated torque current for 60s, 200% of rated torque current for 10s | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Communication | | RS-485 | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Running/stopping setting | | Operator, RS-485, Control circuit terminal (frequency setting and parameter access control available by computer) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — 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. | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Motor overload protection | | Electronic thermodynamic electric protection | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Fuse protection | | Motor coasts to stop | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Momentary power loss | | Continue to run during power loss less than 2s (standard) | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Overload | | 150% of rated output current for 60s, 200% of rated output current for 10s, motor coasts to stop | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Overvoltage | | Motor coasts to stop if the main circuit voltage exceeds 820 V | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Undervoltage | | Motor coasts to stop if the main circuit voltage drops to 380V | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Fin Overheat | | Thermocouple temperature switch protection | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Stall prevention | | Stall prevention during acceleration/deceleration and constant speed operation | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Ground fault | | Protected by electronic circuit | | | | | | | | | | | | | | | | | | | | | |
| Protective Function — Power charge protection | | Indicates until the main circuit voltage reaches 50 V | | | | | | | | | | | | | | | | | | | | | |
| Environment — Ambient temperature | | -10℃~+50℃(internal type) | | | | | | | | | | | | | | | | | | | | | |
| Environment — Ambient humidity | | Below 90%RH (non-condensing) | | | | | | | | | | | | | | | | | | | | | |
| Environment — Vibration | | 9.8 m/s2 (1G) at a vibration frequency below 20 Hz, 2 m/s2 (0.2G) at a vibration frequency above20 Hz | | | | | | | | | | | | | | | | | | | | | |
| Environment — Applicable places | | Indoor (Protected from corrosive gasses and dust) | | | | | | | | | | | | | | | | | | | | | |
| Environment — Storage temperature | | -20℃~+65℃ (for short period during shipping) | | | | | | | | | | | | | | | | | | | | | |
| Environment — 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 $39.2\times10^4 \sim 58.8\times10^4$ Pa (4-6kgcm$^2$) dry compressed air |
| Printing substrate | Conductive dust and grease | Blow by $39.2\times10^4 \sim 58.8\times10^4$ 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 $39.2\times10^4 \sim 58.8\times10^4$ 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 abonormities |

■ **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 | 2~3Years | 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

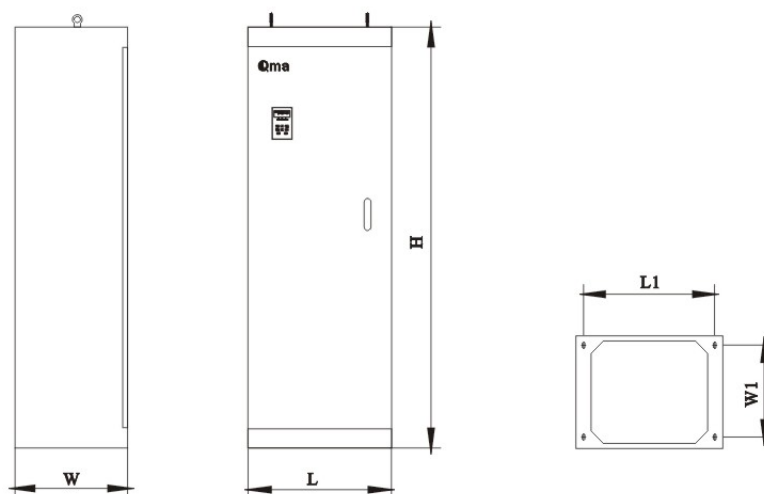**External physical dimension of 1.5kw-30kw (mm)**
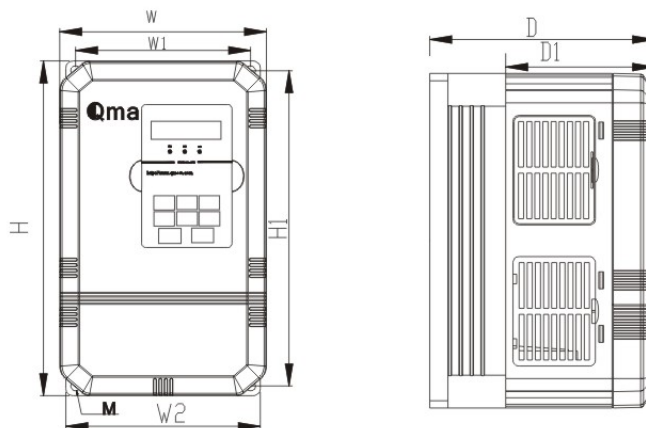


| Voltage | Machine Model | | H | H1 | W | W1 | W2 | D | D1 | M |
|---|---|---|---|---|---|---|---|---|---|---|
| AC220V | Q9000-A/B/C-0222(L3HP) | Q9000-A/B/C-0322(L5HP) | 275 | 259 | 170 | 144 | 160 | 185 | 122 | M4 |
| AC440V | Q9000-A/B/C-0244(H3HP) | Q9000-A/B/C-0344(H5HP) | | | | | | | | |
| AC220V | 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(H1OHP) | | | | | | | | |
| | Q9000-A/B/C-1144(H15HP) | Q9000-A/B/C-1544(H2OHP) | | | | | | | | |
| AC220V | Q9000-A/B/C-1522(L20HP) | Q9000-A/B/C-1822(L25HP) | 465 | 450 | 275 | 249 | 265 | 272 | 247 | M8 |
| 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)**
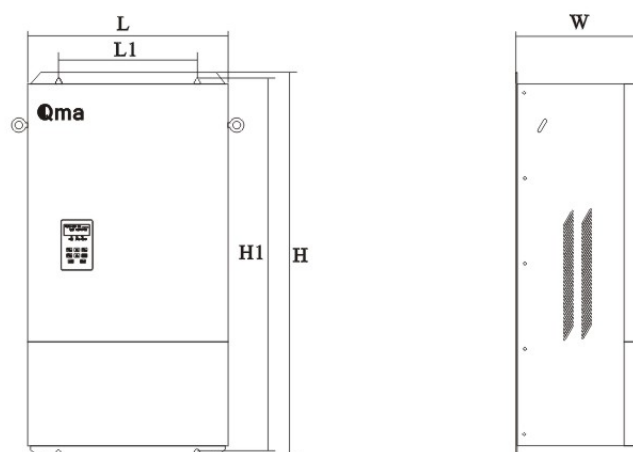


| Voltage | Power (KW) | H | H1 | W | L | L1 | Installation aperture |
|---|---|---|---|---|---|---|---|
| 220V | 37 | 770 | 745 | 301.5 | 480 | 350 | l0 |
| 220V | 37-55 | 1002 | 975 | 325.5 | 525 | 350 | l0 |
| 440V | 37-45 | 594 | 571 | 260 | 346 | 240 | 8 |
| 440V | 55-75 | 770 | 745 | 301.5 | 480 | 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 | Ll | W | W1 | Installation aperture |
|---|---|---|---|---|---|---|---|
| 440V | 132-185 | 1455 | 490 | 440 | 390 | 310 | 12 |

**External physical dimension of 200kw-315kw (mm)**
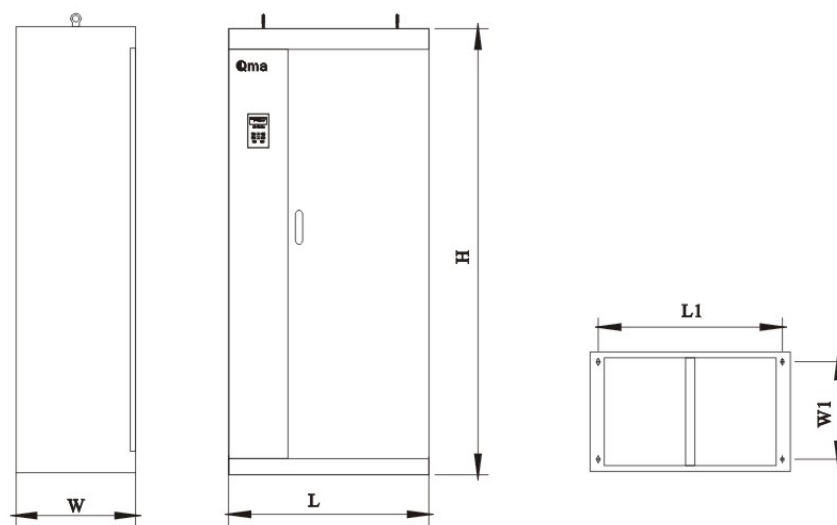


| Voltage | Power(KW) | H | L | L1 | W | Wl | Installation aperture |
|---|---|---|---|---|---|---|---|
| 440V | 200-300 | 1640 | 750 | 710 | 400 | 340 | l2 |

## 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

*ATENTION*: *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.*