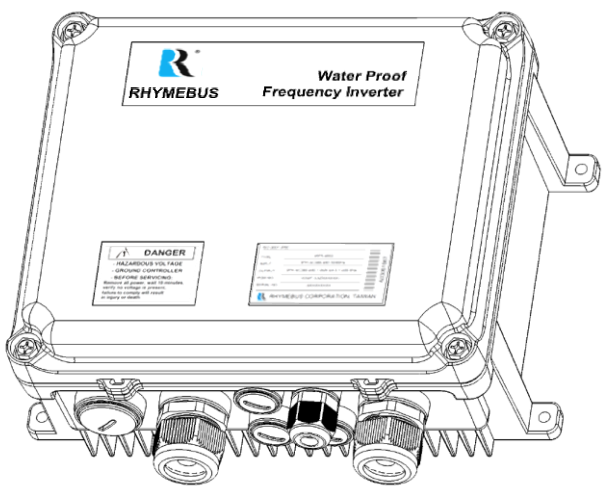
VARIABLE FREQUENCY DRIVE

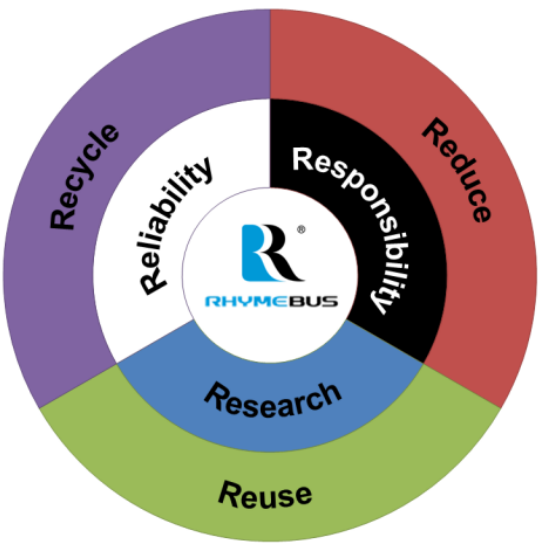
Operation Manual



ISO 9001:2008

WP5 series

Quality • Satisfaction • Improvement • Innovation



Rhymebus Corporation

http://www.rhymebus.com.tw

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PREFACE

Thank you for using RHYMEBUS WP5 series drive. For proper operations and safety purposes, please do read and follow specific instructions contained in this manual before using the product. The manual shall be placed on the top of the machine, and all the setup parameters and reference numbers must be properly recorded in Attachment 2 to facilitate future maintenance and repairs.

SAFETY PRECAUTION

Please read this manual thoroughly and pay attention to the safety precautions marked with " **DANGER** " or " **CAUTION** " before the installation, wiring, maintenance, or troubleshooting.

Only the qualified personnel may proceed with the installation, wiring, testing, troubleshooting, or other tasks.

※Qualified Personnel: Must be familiar with the fundamentals, structures, characteristics, operating procedures, and installation, and this personnel must read the manual in details and follow the steps of security measures to prevent possible dangers.

DANGER	User may cause the casualty or serious damages if user does not abide by the instructions of the manual to execute the tasks.
CAUTION	User may cause injuries to the people or damage the equipment if user does not abide by the instructions of the manual to execute the tasks.

※Although the " ⚠ " mark may indicate minor damages, serious damages or injuries may be possibly incurred if the caution is not under user's attention.

Installation

CAUTION
a. The installation shall take place only on top of the metal surface or any material with the fire resistant. Any place or location of high temperature, moist, oil and gas, cotton fiber, metal powder and erosive gas shall be avoided.
b. Please note the surrounding temperature shall not exceed 40°C when the installation needs to be placed inside the control panel.
c. For the environment of storage and installation, please follow the instructions of the environmental conditions illustrated in the sections of the common specification of WP5.

Wiring

⚠ DANGER

a. Do Not conduct any wiring during the system power ON to avoid the electric shock.
b. R/L1,S/L2,T/L3 are power inputs (electric source terminals) and U/T1,V/T2,W/T3 are drive's outputs connecting to a motor. Please Do Not connect these input and output terminals to P, P_R, and N terminals.
c. Once the wiring is completed, the cover of the drive must be put back and must seal the drive to avoid other's accidental contact.
d. 200V series drives must not be connected to the electric source of 346/380/415/440/460/480V.
e. The main circuit and multi-function terminals cannot connect to ground terminal PE(⏚).
f. PE terminal must be exactly grounded. Ground the drive in compliance with the NEC standard or local electrical code.
g. Please refer to the "**section 2-3-4 Description of Terminals"** for the screwing torque of the wiring terminal.
h. Please refer to the national or local electric code for the appropriate spec. of the cords and wires.
i. Please install an appropriate Molded Case Circuit Breaker (MCCB) or Fuse at each path of power lines to a drive.
j. Please install the thermal relay between the individual motor and the drive when using one drive to propel several motors.
k. Do Not connect power factor leading capacitor, surge absorber, or non-three-phase motor to drive's U/T1,V/T2,W/T3 side.
l. AC reactor (ACL) installation is required when the power capacity exceeds 500kVA or 10 times or more than the drive rated capacity.
m. After power off, the use must wait at least 5 minutes. Do Not touch the drive or perform any unwiring actions before drive indicator light (CHARGE) turns off. Use a multimeter with the DC voltage stage to measure the cross voltage between P(+) and N(-) ports (DC bus voltage must be less than 25V).
n. When the motor do the voltage-proof, insulation testing, unwiring the U/T1,V/T2,W/T3 terminal of drive at first.

⚠ CAUTION

a. The WP5 series are designed to drive a three-phase induction motor. Do Not use for single-phase motor or other purposes.
b. The main circuit and control circuit must be wired separately; control circuit must use a shielded or twisted-pair shielded wires to avoid possible interferences.

Operation

⚠ DANGER

a. Do Not open or remove the cover while power is on or during the operation. Do close up the cover before powering on the drive. Do Not remove the cover except for wiring or periodic inspection when power off.

b. At the function F_078=1 or 3, the drive will automatically restart when the power is restored. Stay away from the motor and machine.

c. At the function F_003=0 and F_001=0 or 1, the"STOP RESET" key on keypad is ineffective. Please use an emergency stop switch separately for safe operations.

d. The drive can produce high frequency outputs. Before adjusting the frequency, please check the specifications of motor carefully to prevent the motor from unexpected damages.

e. If any of the protective functions have been activated, and the start command is set to terminal control (F_001=0 or 1). First remove the case and check if the all running commands set to OFF. Then press the"STOP RESET" key to release the alarm.

⚠ CAUTION

a. Do Not touch the heat sink or brake resistors due to the high heat.

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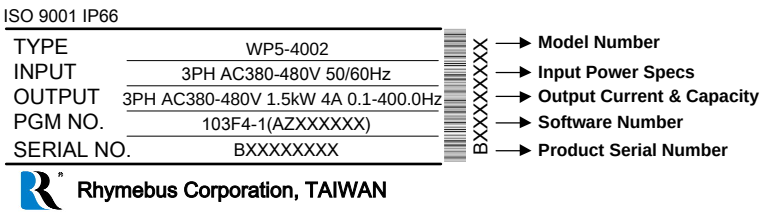
Chapter 1 Cautions Before Installation

1-1 Product Verification

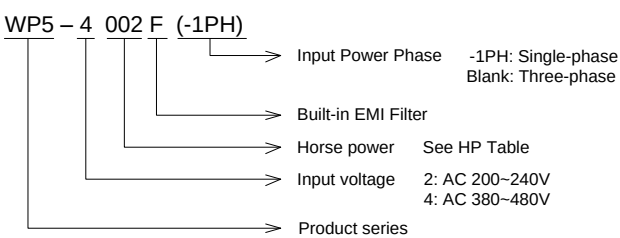
The product has passed the strictest quality test before shipped out from the factory. However, the product might possibly sustain minor damages due to the impact, shaking, vibration, and other factors during the transportation. Please make sure to verify the following items after receiving this product. If the product verification finds anything abnormal, please contact the agent immediately for the further assistance.

1-1-1 Confirmation of Appearance

1. Check up the specifications at shipping label on the carton is identical with the nameplate of drive.
2. Check up the appearance of drive for any paint chipped off, smearing, deformation of shape, etc.
3. Check up the nameplate (as below example by WP5-4002) of the drive to verify the product descriptions with the order specification.



1-1-2 The Description of Nomenclature:



HP (Horse Power) Table for Drive Horse Power Code Conversion

Horse power code	Horse power
001/2	0.5
001	1
002	2
003	3

1-1-3 Confirmation of Accessories

One operation manual is inclusive. Please verify other accessories inclusively such as braking resistor, AC reactor, etc..

※Please refer to the standard specifications to verify the product specifications with your requirements.

1-2 WP5 Standard Specifications

1-2-1 AC 200V and 400V Series

Model name (WP5-□□□□)	2001/2	2001	2002	4001	4002	4003
Maximum applicable motor (HP / kW)	0.5/0.4	1/0.75	2/1.5	1/0.75	2/1.5	3/2.2
Rated output capability (kVA)	1.1	1.5	2.7	1.9	3	3.8
Rated output current (A)	3	4	7	2.5	4	5
Rated output voltage (V)	Three-phase 200~240V			Three-phase 380~480V		
Range of output frequency (Hz)	0.1~400.00Hz					
Power source (ϕ , V, Hz)	Three-phase/Single-phase			Three-phase		
	200~240V 50/60Hz			380~480V 50/60Hz		
Permissible AC power source fluctuation	176~264V 50/60Hz / ±5%			332~528V 50/60Hz / ±5%		
Overload protection	150% of drive rated output current for 1 min.					
Cooling method	Nature cooling					
Protective structure	IP66					
Weight / Mass(kg)	3.96	4.04	4.16	3.95	4.13	4.20

1-2-2 Single-phase 200V Series(Built-in EMC Filter Type)

Model name (WP5-□□□□F-1PH)	2001/2	2001	2002
Maximum applicable motor (HP / kW)	0.5/0.4	1/0.75	2/1.5
Rated output capability (kVA)	1.1	1.5	2.7
Rated output current (A)	3	4	7
Rated output voltage (V)	Three-phase 200~240V		
Range of output frequency (Hz)	0.1~400.00Hz		
Power source (ϕ , V, Hz)	Single-phase 200~240V 50/60Hz		
Permissible AC power source fluctuation	176~264V 50/60Hz / ±5%		
Overload protection	150% of drive rated output current for 1 min.		
Cooling method	Nature cooling		
Protective structure	IP66		
Weight / Mass(kg)	4.26	4.34	4.46

1-2-3 Three-phase 200V and 400V Series(Built-in EMC Filter Type)

Model name (WP5-□□□□F)	2001/2	2001	2002	4001	4002	4003
Maximum applicable motor (HP / kW)	0.5/0.4	1/0.75	2/1.5	1/0.75	2/1.5	3/2.2
Rated output capability (kVA)	1.1	1.5	2.7	1.9	3	3.8
Rated output current (A)	3	4	7	2.5	4	5
Rated output voltage (V)	Three-phase 200~240V			Three-phase 380~480V		
Range of output frequency (Hz)	0.1~400.00Hz					
Power source (ϕ , V, Hz)	Three-phase					
	200~240V 50/60Hz			380~480V 50/60Hz		
Permissible AC power source fluctuation	176~264V 50/60Hz / ±5%			332~528V 50/60Hz / ±5%		
Overload protection	150% of drive rated output current for 1 min.					
Cooling method	Nature cooling					
Protective structure	IP66					
Weight / Mass(kg)	4.26	4.34	4.46	4.25	4.43	4.5

1-3 The Features of Control and Operation

Control Characteristics	Control method	• Voltage vector sinusoidal PWM control (V/F control). • Switching frequency: 800Hz~15kHz.
	Range of frequency setting	0.1~400.00Hz
	Resolution of frequency setting	• Digital Keypad (KP-201C): 0.01Hz • Analog signal: 0.06Hz / 60Hz
	Resolution of output frequency	0.01Hz
	Frequency setting signal	DC 0~10V, 4~20mA
	Overload protection	150% of drive rated output current for 1 minute.
	DC braking	• Time of DC braking after stop / before start: 0~60.0sec • DC braking frequency at stop: 0.1~60Hz • DC braking level: 0~150% of rated current
	Braking torque	Approximately 20%.(built-in brake transistor series drives are 100% above)
	Acceleration/ deceleration time	• 0sec (coast to stop), 0.0~3200.0sec (independent setting of the acceleration / deceleration). • The setting of acceleration time from 0Hz to 60Hz is 0.015sec ~ 19,200,000sec (222days). • The setting of deceleration time from 60Hz to 0Hz is 0.015sec ~ 19,200,000sec (222days).
	V/F pattern	• Linear, Energy-saving mode (auto-adjust V/F pattern according to the load condition), Square curve, 1.7^{th} power curve, 1.5^{th} power curve. • V/F pattern (2 V/F points). • Output voltage adjustment of V/F pattern(Variable voltage (V) adjustment of V/F pattern for acceleration / deceleration).
	Other functions	slip compensation, auto-torque compensation, auto-adjustment for output voltage stability, auto-operation for energy-saving, auto-adjustment of switching frequency, restart after instantaneous power failure, speed tracing, overload detection, acceleration/deceleration switch, parameters copy

Operation Characteristics	Input	Start method	Forward (FWD) / reverse (REV) rotation, 3-wire self-holding FWD/REV control, or 9-speed control can be selected
		Multi-function inputs	6 sets programmable input terminals: X1~X6
			Refer to the function setting description of F_052~F_057
		Analog inputs	• Vin – GND: DC 0~10V • Iin – GND: DC 4~20mA / 2~10V or DC 0~20mA / 0~10V
			Refer to the function setting description of F_040, F_041, and F_126 ~ F_128
	Output	Multi-function outputs	4 sets programmable output detection: Ta2–Tc2, Ta1–Tb1–Tc1, Y1–CME, Y2–CME
			Refer to the function setting description of F_058~F_060, and F_131
		Analog outputs	• “FM+” – “M-“：DC 0~10V • “AM+” – “M-“：DC 0~10V
			Refer to the function setting description of F_044, F_045, F_129, F_130
Display	Keypad (KP-201C)		output frequency, frequency command, output voltage, DC bus voltage, output current, motor speed (RPM), machine speed (MPM), terminal status.
Protections	Fault protection	Error trip messages of drive	EEPROM error(EEr), A/D converter error(AdEr), Fuse open(SC), Under voltage during operation(LE1), Drive over current(OC), Grounding fault (GF), Over voltage(OE), Drive overheating(OH), Motor overload(OL), Drive overload(OL1), System overload(OLO), External fault(thr), KP-201 Keypad interruption during copy(PAdF)
		Warning messages of drive	Power source under voltage(LE), Drive output interruption (bb), Coast to stop(Fr), Dynamic brake transistor over voltage(db), Keypad cable trip before connecting(Err_00), Keypad cable trip during operation(Err_01)
	Cooling method		Nature cooling
Environment	Atmosphere		Non-corrosive or non-conductive, or non-explosive gas
	Surrounding temperature		-10°C (14°F) ~ +40°C (104°F)
	Storage temperature		-20°C (-4°F) ~ +60°C (149°F)
	Vibration		Less than 5.9m/sec² (0.6G)
	Altitude		Less than 1000m (3280 ft.)

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Chapter 2 Installation and Confirmation

2-1 Basic Equipment

The drive needs the several components for the conjunctive operation. These components are called “basic equipment”, listed in the following:

2-1-1 Power Source: The voltage with three-phase or single-phase of the power source must meet the drive specifications.

2-1-2 MCCB or NFB: MCCB (Molded Case Circuit Breaker) or NFB (No Fuse Breaker) can withstand the inrush current at instant power ON and providing the overload and over-current protection to the drive.

2-1-3 Drive: The main device of motor control must be chosen in accordance with the rated voltage and current specifications of motor (please refer to the lists of standard specifications of drives).

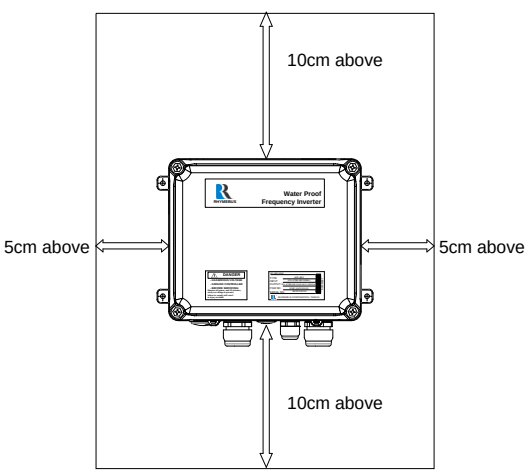
2-1-4 Motor: The specifications of motor are determined from the requirement. Please be cautious to the motor rated current that must not exceed the drive current.

2-2 Installing the Drive

For the safe operation of the drive, please be cautious to the environmental conditions where the drive is going to be installed.

2-2-1 AC Power: AC power input must be complied with the AC power input specification of the drive.(see WP5 standard specifications)

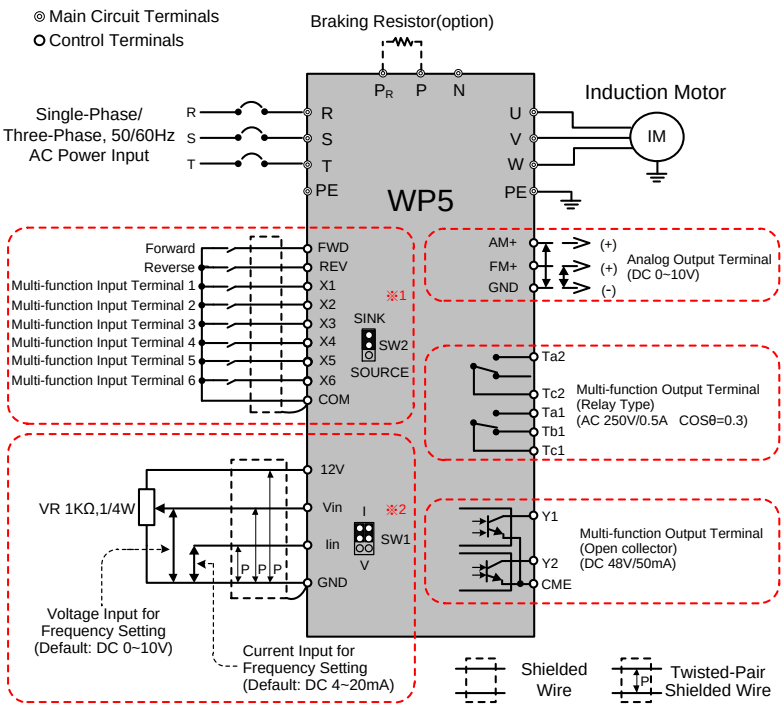
2-2-2 Location: Due to the heat dissipating requirement during the drive operation, please install the drive with the least clearance space (shown as below figure) around the drive. Therefore, the location of installation shall be arranged as follows:



2-3 Descriptions of Terminal and Wiring Diagram

2-3-1 Wiring Diagram

Model: WP5-2001/2 ~ WP5-2002;
WP5-4001 ~ WP5-4003



※1.SW2: SINK / SOURCE selection;
The input signal mode selection of multi-function input terminal(X1~X6), FWD and REV terminals, please see the section **2-3-2 SINK / SOURCE Definition**.

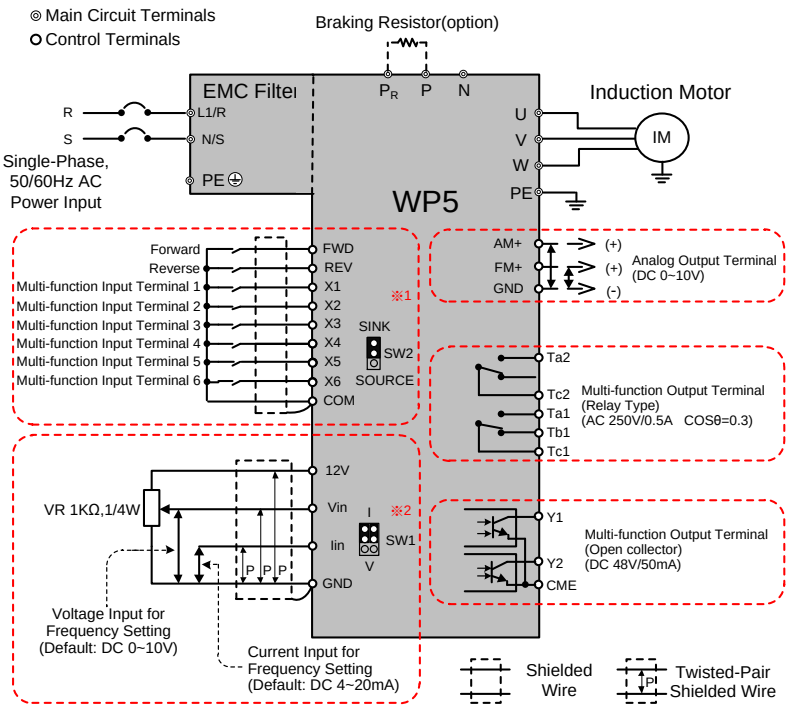
※2.SW1: I / V selection;
I position: Iin-GND terminal is inputted with the current signal.(default)
V position: Iin-GND terminal is inputted with the voltage signal.

※3.The analog input selection is set by F_126 (default: DC 2~10V(4~20mA))

※4.The tightening torque of control terminal is 5 lb-in(5.7 kgf-cm).

※5.R,S,T(L1,L2,L3); U,V,W(T1,T2,T3)

Model: WP5-2001/2F-1PH ~ WP5-2002F-1PH



※1.SW2: SINK / SOURCE selection;

The input signal mode selection of multi-function input terminal(X1~X6), FWD and REV terminals, please see the section **2-3-2 SINK / SOURCE Definition**.

※2.SW1: I / V selection;

I position: Iin-GND terminal is inputted with the current signal.(default)

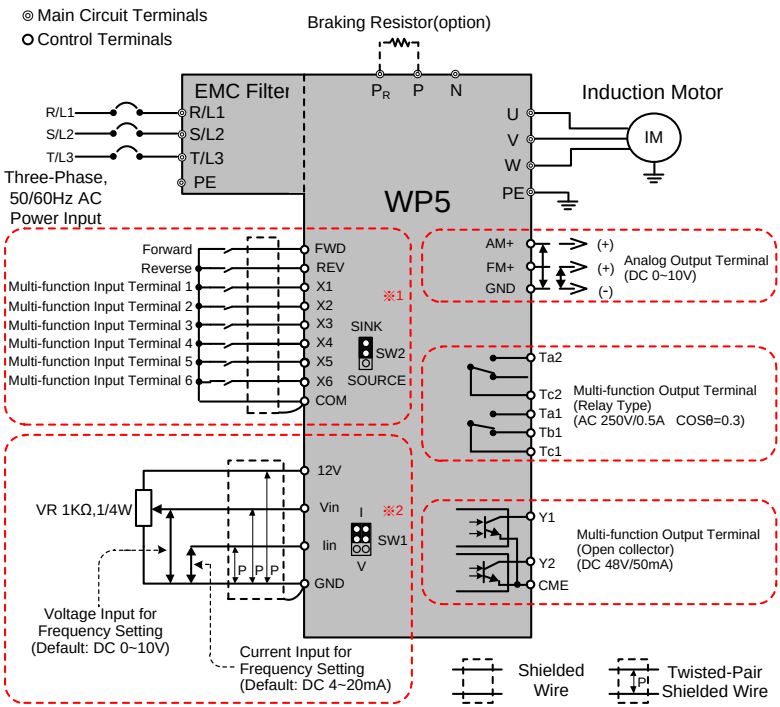
V position: Iin-GND terminal is inputted with the voltage signal.

※3.The analog input selection is set by F_126 (default: DC 2~10V(4~20mA))

※4.The tightening torque of control terminal is 5 lb-in(5.7 kgf-cm).

※5.R,S(L1,L2); U,V,W(T1,T2,T3)

Model: WP5-2001/2F ~ WP5-2002F;
WP5-4001F ~ WP5-4003F



※1.SW2: SINK / SOURCE selection;
The input signal mode selection of multi-function input terminal(X1~X6), FWD and REV terminals, please see the section **2-3-2 SINK / SOURCE Definition**.

※2.SW1: I / V selection;
I position: Iin-GND terminal is inputted with the current signal.(default)
V position: Iin-GND terminal is inputted with the voltage signal.

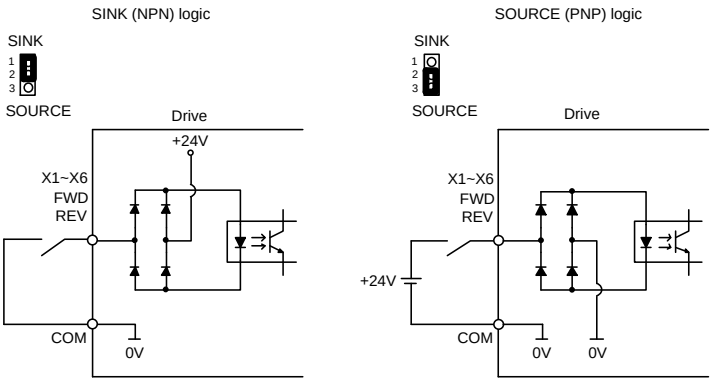
※3.The analog input selection is set by F_126 (default: DC 2~10V(4~20mA))

※4.The tightening torque of control terminal is 5 lb-in(5.7 kgf-cm).

※5.U,V,W(T1,T2,T3)

2-3-2 SINK / SOURCE Definition

There are two ways of connection for multi-function input terminals:



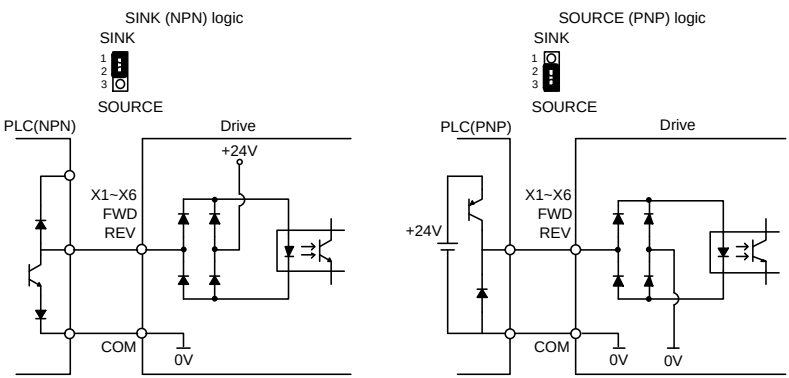
(a) Jumper at 1,2 position; SINK mode

(b) Jumper at 2,3 position; SOURCE mode

Figure(a) and (b) show two examples by using a switch to control X1 to X6, FWD, or REV terminals with sink or source mode.

2-3-3 Using a PLC Circuit

There are two ways of connection for multi-function input terminals by PLC circuit:



(a) Jumper at 1,2 position; SINK mode

(b) Jumper at 2,3 position; SOURCE mode

Figure(a) and (b) show two examples by using PLC to control X1 to X6, FWD, or REV terminals with sink or source mode.

2-3-4 Description of Terminals

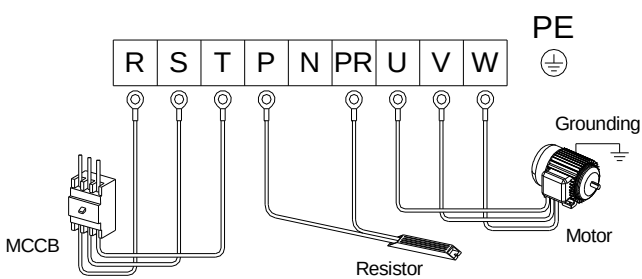
a. Main Circuit Terminals

Type	Symbol	Function	Description
Power Source	R,S (L1,L2)	AC power source input terminals	Single-phase; sinusoidal power source input terminals.
	R,S,T (L1,L2,L3)		Three-phase; sinusoidal power source input terminals.
Motor	U,V,W (T1,T2,T3)	Drive outputs to motor terminals	Output three-phase variable frequency and voltage to motor.
Brake	P, P_R	External braking resistor terminal	The terminals can connect to external brake resistor (option).
Grounding	PE(⏚)	Grounding terminal	Ground the drive in compliance with the NEC standard or local electrical code.

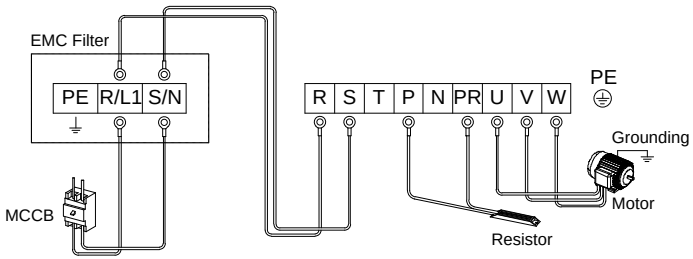
b. Main Circuit Connection

Model number	Terminal screw size	Tightening torque lb-in (kgf-cm)
WP5-_____: 2001/2, 2001, 2002; 4001, 4002, 4003 WP5-_____F-1PH: 2001/2, 2001, 2002 WP5-_____F: 2001/2, 2001, 2002; 4001, 4002, 4003	M4	13.8 (15)

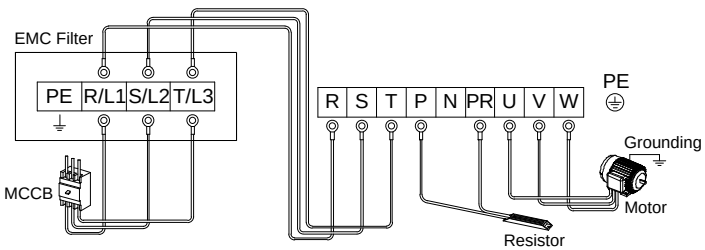
1)AC 200V and 400V Series



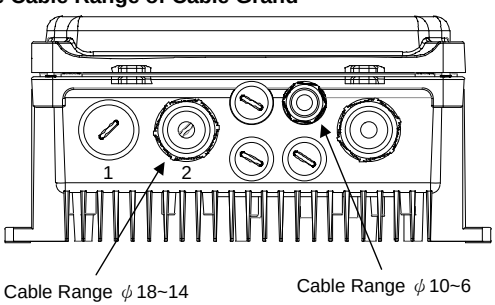
2)Single-phase 200V Series(Built-in EMC Filter Type)



3)Three-phase 200V and 400V Series(Built-in EMC Filter Type)



c. Suitable Cable Range of Cable Grand



Note: Cable grand locks in position 1 or position 2 depending on the model number.

Series	Position
AC 200V and 400V Series	2
Single-phase 200V Series(Built-in EMC Filter Type)	1
Three-phase 200V and 400V Series(Built-in EMC Filter Type)	1

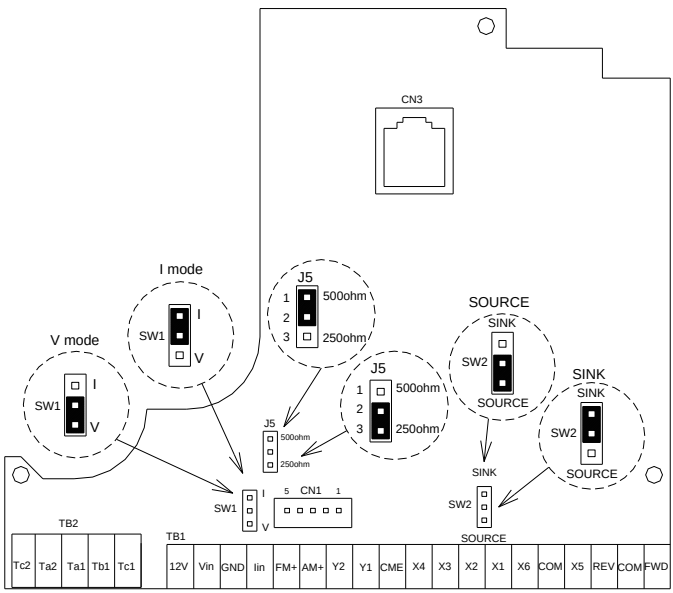
d. Control Terminals

Type		Symbol	Function	Description
Control circuit terminal	Control power	12V	Power terminal; Control device usage	Output DC+12V; Maximum supplied current is 20mA.
		GND	Common of analog input control terminals	Common of analog input control terminals (Vin, Iin).
	Input terminals	FWD	Forward command terminal	Connect the FWD and COM terminals for forward operation. (F_001=0,1,2)
		REV	Reverse command terminal	Connect the REV and COM terminals for reverse operation. (F_001=0,1,2)
		X1	Multi-function input terminal 1	• Connect the X1 and COM terminals and set the function F_052. • Default setting: Multi-speed level 1 command
		X2	Multi-function input terminal 2	• Connect the X2 and COM terminals and set the function F_053. • Default setting: Multi-speed level 2 command
		X3	Multi-function input terminal 3	• Connect the X3 and COM terminals and set the function F_054. • Default setting: Jog command
		X4	Multi-function input terminal 4	• Connect the X4 and COM terminals and set the function F_055. • Default setting: Secondary accel/decel time command
		X5	Multi-function input terminal 5	• Connect the X5 and COM terminals and set the function F_056. • Default setting: External fault command (thr)
		X6	Multi-function input terminal 6	• Connect the X6 and COM terminals and set the function F_057. • Default setting: Reset command
		COM	Common of digital input control terminals	Common of digital input control signal terminals. (FWD, REV and X1 ~ X6)
		Vin	Analog input terminal	Input range: DC 0~10V。
		Iin	Analog input terminal	• Input signal selection SW1: I position (current signal) SW1: V position (voltage signal) • Input range: DC 4~20mA (2~10V) or DC 0~20mA (0~10V) • The function is set by F_126.

Type		Symbol	Function	Description
Control circuit terminal	Output terminals	FM+ AM+	Analog output terminal	• Voltage meter with 10V full scale spec. (meter impedance: 10KΩ above) • Maximum output current: 1mA
		GND	Common of analog output terminals	Common of analog output terminals.
		Ta1	Multi-function output terminals (relay type)	• N.O (contact a); The function is set by F_060 (default setting: Error detection). • Capacity: AC250V, 0.5AMax, cosθ=0.3
		Tb1		• N.C (contact b); The function is set by F_060 (default setting: Error detection). • Capacity: AC250V, 0.5AMax, cosθ=0.3
		Tc1		Common terminal for Ta1, Tb1.
		Ta2		• N.O (contact a); The function is set by F_131 (default setting: Operation detection). • Capacity: AC250V, 0.5AMax, cosθ=0.3
		Tc2		Common terminal for Ta2.
		Y1	Multi-function output terminals (open collector type)	• The function is set by F_058, F_059. • Capacity: DC48V, 50mAMax
		Y2		
		CME		Common terminal of Y1, Y2.

2-3-5 Control Board

(1) WP5-2001/2 ~ WP5-2002;
WP5-4001 ~ WP5-4003;
WP5-2001/2F-1PH ~ WP5-2002F-1PH;
WP5-2001/2F ~ WP5-2002F;
WP5-4001F ~ WP5-4003F



CN3:RJ-45 socket for keypad (KP-201C).

TB1:Input/Output terminals.

TB2:Multi-function output terminals (relay type).

J5:Input impedance selection of Iin (pin1, 2: 500Ω ; pin2, 3: 250Ω); Default: pin2, 3

SW1:Input signal type selection of Iin (voltage/current). Default: current

SW2:SINK/SOURCE mode selection of X1 to X6, FWD or REV (refer to page 11). Default: SINK

2-3-6 Wiring Cautions and Specifications

a. Wiring connection between drive and motor due to the variance of the rated power causes the variance of current leakage. The setting of the switching frequency, rated power, and cable length is listed in the below table.

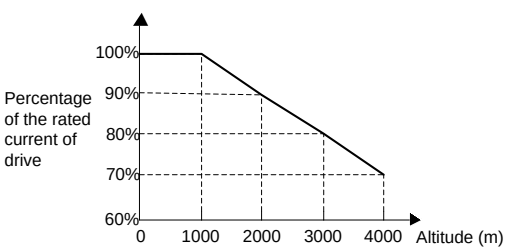
Cable length	10m	20m	30m	50m	100m	100m above
Switching frequency	10kHz	7.5kHz	5kHz	2.5kHz	800Hz	800Hz

The setting of switching frequency is determined by F_081

F_081	=0	Switching frequency	800Hz	Note: When the setting value of F_081 exceeds 4 (10kHz) in WP5 drive, recommending decrease the output current or selecting the higher rated output capacity.
	=1		2.5kHz	
	=2		5kHz	
	=3		7.5kHz	
	=4		10kHz	
	=5		12.5kHz	
	=6		15kHz	

b. The wiring length between the drive and motor must keep as short as possible. The parasitic capacitance effect is minor within 10 meters. The drive shall connect an AC reactor (ACL) on the side of drive output terminals U/T1,V/T2,W/T3 and decrease the switching frequency if the wiring length is over 30m.

c. If the drive is used at the altitude over than 1000m, the relationship of drive's rated current and altitude is shown as below figure.



d.Recommending wire size and Molded Case Circuit Breaker (MCCB)

AC 200V and 400V Series

Model number WP5-	MCCB (A)		Main circuit wire size (R/L1,S/L2,T/L3) (mm^2)	Control circuit wire size (mm^2)	Grounding wire size (mm^2)
2001/2	Single-phase	10	2.0	0.75~1.25	2.0
	Three-phase	5			
2001	Single-phase	20			
	Three-phase	10			
2002	Single-phase	30			
	Three-phase	15			
4001	Three-phase	5			
4002	Three-phase	10			
4003	Three-phase	15			

Single-phase 200V Series(Built-in EMC Filter Type)

Model number WP5-____F-1PH	MCCB (A)	Main circuit wire size (R/L1,S/L2,T/L3) (mm^2)	Control circuit wire size (mm^2)	Grounding wire size (mm^2)
2001/2	10	2.0	0.75~1.25	2.0
2001	20	2.0		2.0
2002	30	2.0		2.0

Three-phase 200V and 400V Series(Built-in EMC Filter Type)

Model number WP5-____F	MCCB (A)	Main circuit wire size (R/L1,S/L2,T/L3) (mm^2)	Control circuit wire size (mm^2)	Grounding wire size (mm^2)
2001/2	5	2.0	0.75~1.25	2.0
2001	10	2.0		2.0
2002	15	2.0		2.0
4001	5	2.0		2.0
4002	10	2.0		2.0
4003	15	2.0		2.0

Notes:

i. Please refer to the local electrical code with respect to the wiring(the loading and continuity, the wire capability for the current and temperature, the length of wiring, and the surrounding temperature must be all considered in order to add or reduce the size of the wire).

ii. Please use the cable that is suitable for 600V, 75℃ above.

iii. This table is only for reference.

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Chapter 3 The Setting of Keypad

3-1 Digital Keypad (KP-201C) for WP5

1. ON: Primary frequency command is set by keypad or UP/DOWN terminal
2. OFF: Primary frequency command is set by multi-function input terminals

1. T.S: Indicate the status of terminals
2. Unit indicator

Blinking: Under acceleration or deceleration
ON: Constant speed
OFF: Stop

Drive start key

1. Enter function setting mode
2. Back to monitor mode

Up/down key of changing functions and parameters

1. Enter parameter setting mode
2. Back to function setting mode
3. Switch monitor mode

1. Drive stops(cut off output frequency of drive)
2. Fault reset

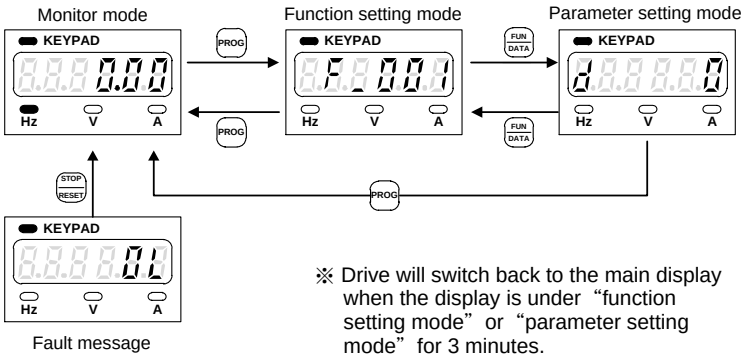
Note:

- KP-201C transmission cable can select 8-pin telephone cable (flat) or network cable (AMP)
- 8-pin telephone cable: The length must be within 5 meters.
- Network cable (AMP): The length can be over 5 meters (the longest length is 25 meters)

3-2 The Operation of Keypad (KP-201C) and Monitor Mode

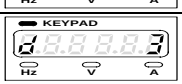
3-2-1 Operation of Keypad

The operation of the digital keypad includes fault messages and three modes. The switching methods are shown as below figure:



※ Drive will switch back to the main display when the display is under "function setting mode" or "parameter setting mode" for 3 minutes.

The operation steps are shown as below table (by default setting)

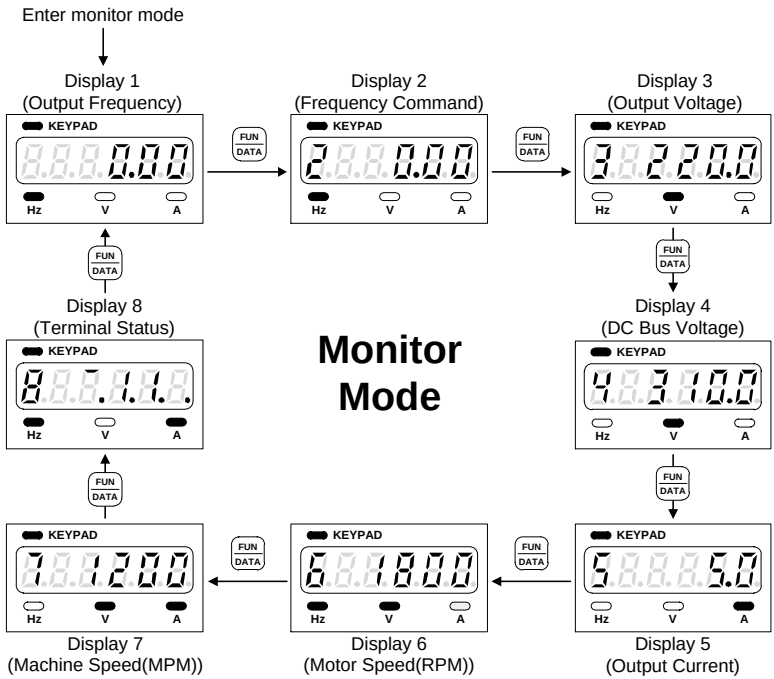
Operation Steps	Display
1.Start the drive and enter the monitor mode.	
2.Press PROG key and enter the function setting mode.	
3.Press FUN DATA key and enter the parameter setting mode.	
4.Press FUN DATA key and return to the function setting mode.	
5.Press PROG key and return to the monitor mode.	

Error message display:

Operation Steps	Display
The fault message displayed during the drive operation	
1.After the error is troubleshooted, press STOP RESET key to clear the fault and return to the monitor mode.	

3-2-2 Description of Monitor Mode

There are eight displays can be selected in the monitor mode. Press "FUN DATA" to switch the display in accordance with below sequence under monitor mode. User can determine one of eight displays as the main display from function F_006 (Selection of Main Display). Please refer to the following illustrations:



a. Select one of eight displays as the main display from function F_006 (Selection of Main Display).

b. Determine one of eight displays as the main display according to the application. When the parameter of function is completed without pressing "PROG" key, the drive will automatically switch back to the main display after 3 minute.

3-2-3 Description of Function Setting Mode

In function setting mode, there are 135 functions (F_000 ~ F_134) can be selected for WP5 series drive, and the setting steps are as below:

Operation Steps	Display
1.In the monitor mode, press PROG key to enter function setting mode.	
2.Press ▲ key to increase the function number.	
3.Press ▼ key to decrease the function number.	

3-2-4 Description of Parameter Setting Mode

In parameter setting mode, the setting range for every function is shown in Chapter 4 - Parameter List.

Operation Steps	Display
1.Select F_001 (Start Command Selection) as the example.	
2.Press FUN DATA key to enter parameter setting mode.	
3.Press ▼ key to decrease the value of F_001 from 3 (default value) to 2.	
4.Press FUN DATA key to save the setting value and return to function setting mode.	

3-2-5 Operation at Monitor Mode

In the monitor mode, the frequency command can be changed. Please refer to below example of changing frequency from 60Hz to 50Hz.

Operation Steps	Display
1.In “display 6” of monitor mode, the keypad will display motor speed(RPM).	
2.Press ▲ or ▼ key, the display will switch to the frequency value.	
3.Press ▼ key to decrease the frequency command from 60Hz to 50Hz.	
4.After selecting the demanding speed, press FUN DATA key to save the setting value within 5 seconds (the setting value is blanking) or waiting the drive automatically save the value.	

3-2-6 Start / Stop Operation of Drive

To start / stop the drive, the display must switch to monitor mode.

Operation Steps	Display
1.In monitor mode, press RUN key to start the drive. (default: output frequency)	
2.Drive will display the output frequency value on keypad.	
3.Press STOP RESET key can cut off the output frequency of drive.	

3-2-7 Parameter Copy; Restore Default Value; Save/Restore Setting Value

a. Parameter Copy:

Including writing and readout setting value of functions. Parameter settings of two drives can be copied by "rd.EE" and "UR.EE" functions via keypad (KP-201C).

(Parameter Read Out: Drive parameter → Keypad)

Operation steps	Display
1.In the monitor mode, press [PROG] key to enter function setting mode.	
2.Press [▼] or [▲] key to select the function to F_134 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	
3.Press [▲] key and then select rd.EE parameter and then press [FUN DATA] key to execute the parameter readout.	
4.Drive will start to copy the parameters to keypad, and then display the copy process on keypad.	
5.After completing the copy, the keypad will display End message and automatically back to function setting mode.	

• **Hot key of rd.EE:**

Before connecting the transmission cable to digital keypad (KP-201C), keep pressing [▲] key until the keypad is connected to drive. The drive will execute the function of rd.EE.

(Parameter Write In : Keypad parameters → Drive)

Operation steps	Display
1.In the monitor mode, press [PROG] key to enter function setting mode.	
2.Press [▼] or [▲] key to select the function to F_134 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	
3.Press [▲] key and then select UWr.EE parameter and then press [FUN DATA] key to execute the writing.	
4.Keypad will start to copy the parameters to drive, and then display the copy process on keypad.	
5.After completing the copy, the keypad will display End message and automatically back to function setting mode.	

- **Hot key of UWr.EE :**

Before connecting the transmission cable to digital keypad (KP-201C), keep pressing [▼] key until the keypad is connected to drive. The drive will execute the function of UWr.EE.

※Do Not execute the copy function for different software version, otherwise the parameters will occur error and the keypad will display UWr.oF message.

b. Restore Default Value:

WP5 series drive provide two default values for using. User can according to the demand to restore default values.

rEF60 (Restore the default value of drive for 60Hz.)

rEF50 (Restore the default value of drive for 50Hz.)

※Be caution of the usage of this parameter! This parameter will clear the saved setting value via SAv parameter.

Select the dEF50 parameter as an example, and the operation steps as below:

Operation Steps	Display
1.Press ▼ or ▲ key selecting the function to F_134 (Default Setting) and then press FUN DATA key to enter parameter setting mode.	
2.Press ▲ key to select dEF50 parameter, and then press FUN DATA key to execute the restoring.	
3.After completing the restoring, the keypad will display End message and back to the function setting mode.	

c. Save / Restore Setting Value:

(Save the setting value)

Operation Steps	Display
1.Press ▼ or ▲ key to select the function to F_134 (Default Setting) and then press FUN DATA key to enter parameter setting mode.	
2.Press ▲ key to select SAv parameter, and then press FUN DATA key to execute the saving.	
3.After completing the saving, the keypad will display End message and back to the function setting mode.	

(Restore the setting value)

Operation Steps	Display
1.Press ▼ or ▲ key to select the function to F_134 (Default Setting) and then press FUN DATA key to enter parameter setting mode.	
2.Press ▲ key to select rES parameter, and then press FUN DATA key to execute the restoring.	
3.After completing the restoring, the keypad will display End message and back to function setting mode.	

Note: “Restore” parameter is activation when the setting value is saved by “Save” parameter.

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Chapter 4 Parameter List

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_000	Drive Information	0: Software version (P5103F) 1: Drive model number 2: Drive running hours 3: Drive supply power time 4: Software checksum code 5: Reserved	—	—	—	40
F_001	Start Command Selection	**Start command** / **Rotation direction command** 0: FWD or REV terminal / FWD or REV terminal 1: FWD terminal / REV terminal 2: Keypad "RUN" key / FWD, REV terminal 3: Keypad "RUN" key / Forward direction 4: Keypad "RUN" key / Reverse direction	0~4	—	3	40
F_002	Primary Frequency Command Selection	0: Frequency command by analog signal via terminal. 1: Frequency command by keypad. 2: Motor speed (RPM) command by keypad. 3: Machine speed (MPM) command by keypad. 4: Frequency command by UP/DOWN terminal.	0~4	—	1	43
F_003	Selection of "STOP" Key Validity	0: Start command by terminal, "STOP" key disabled. 1: Start command by terminal, "STOP" key enabled.	0,1	—	1	44
F_004	Frequency Command Selection	0: In the monitor mode, frequency command cannot be changed. 1: In the monitor mode, frequency command is changeable.	0,1	—	1	44
F_005	Selection of Frequency Command Auto-Storing	0: In the monitor mode, frequency command auto-storing disable. 1: In the monitor mode, frequency command auto-storing after 3 minutes.	0,1	—	1	44
F_006	Selection of Main Display	Select 1 of 8 "monitor modes" as the main display. *Refer to section 3-2-2	1~8	—	1	45
F_007	Machine Speed Ratio	Set the ratio of machine speed. This function determines MPM display value.	0.00~ 500.00	0.01	20.00	45
F_008	Digits of Decimal Value (Machine Speed)	Select the digits of decimal values displaying the machine speed.	0~3	—	0	45

The color as [ ] means the functions can be set during operation.

Func.	Name	Description				Range of Setting	Unit	dEF60	Page
F_009	Primary Speed	Jog speed command	Multi-speed level 3 command	Multi-speed level 2 command	Multi-speed level 1 command	0.00~ 400.00	0.01 Hz	50.00 (Note1)	46
		OFF	OFF	OFF	OFF			60.00 (Note2)	
F_010	Preset Speed 1	OFF	OFF	OFF	ON			10.00	46
F_011	Preset Speed 2	OFF	OFF	ON	OFF			20.00	46
F_012	Preset Speed 3	OFF	OFF	ON	ON			30.00	46
F_013	Preset Speed 4	OFF	ON	OFF	OFF			0.00	46
F_014	Preset Speed 5	OFF	ON	OFF	ON			0.00	46
F_015	Preset Speed 6	OFF	ON	ON	OFF			0.00	46
F_016	Preset Speed 7	OFF	ON	ON	ON			0.00	46
F_017	Jog Speed	ON	X	X	X			6.00	46
F_018	Reference Frequency of Accel/Decel Time	The frequency corresponding to accel/decel time.				0.01~ 400.00	0.01 Hz	50.00 (Note1) / 60.00 (Note2)	48
F_019	Primary Acceleration Time	The acceleration time of primary speed, preset speed 4~7, and jog speed.				0.0~ 3200.0	0.1 sec	5.0	48
F_020	Primary Deceleration Time	The deceleration time of primary speed, preset speed 4~7, and jog speed.							
F_021	Acceleration Time of Preset Speed 1	Acceleration time of preset speed 1.							
F_022	Deceleration Time of Preset Speed 1	Deceleration time of preset speed 1.							
F_023	Acceleration Time of Preset Speed 2	Acceleration time of preset speed 2.							
F_024	Deceleration Time of Preset Speed 2	Deceleration time of preset speed 2.							
F_025	Acceleration Time of Preset Speed 3	Acceleration time of preset speed 3.							
F_026	Deceleration Time of Preset Speed 3	Deceleration time of preset speed 3.							
F_027	Secondary Acceleration Time	Switch to secondary acceleration time by multi-function input terminal.							
F_028	Secondary Deceleration Time	Switch to secondary deceleration time by multi-function input terminal.							

X: Don't care The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_029	Set S-curve for Accel/Decel Time	Set S-curve to slow the acceleration and deceleration time at start and stop.	0.0~5.0	0.1 sec	0.0	48
F_030	Limitation of Output Voltage	0: Output voltage of V/F pattern is not limited. 1: Output voltage of V/F pattern is limited.	0, 1	—	0	50
F_031	Maximum Output Frequency	Maximum output frequency of drive.	0.1~400.0	0.1Hz	50.0 (Note1) 60.0 (Note2)	50
F_032	Starting Frequency	Starting frequency of drive's output.	0.1~10.0	0.1Hz	0.5	50
F_033	Starting Voltage	The voltage corresponds to the output starting frequency.	0.1~50.0 0.1~100.0	0.1V	8.0 (Note3) 12.0 (Note4)	50
F_034	Base Frequency	The frequency corresponds to the base voltage in V/F pattern.	0.1~400.0	0.1Hz	50.0 (Note1) 60.0 (Note2)	50
F_035	Base Voltage	The voltage corresponds to the base frequency in V/F pattern.	0.1~255.0 0.1~510.0	0.1V	220.0 (Note3) 380.0 (Note4)	50
F_036	V/F Frequency 1	Frequency at the first point of V/F pattern.	0.0~399.9	0.1Hz	0.0	51
F_037	V/F Voltage 1	Voltage at the first point of V/F pattern.	0.0~255.0 0.0~510.0	0.1V	0.0	51
F_038	V/F Frequency 2	Frequency at the second point of V/F pattern.	0.0~399.9	0.1Hz	0.0	51
F_039	V/F Voltage 2	Voltage at the second point of V/F pattern.	0.0~255.0 0.0~510.0	0.1V	0.0	51
F_040	Vin Gain	Analog input "Vin" gain ratio adjustment.	0.00~2.00	0.01	1.00	52
F_041	Vin Bias	Analog input "Vin" bias ratio adjustment.	-1.00~ 1.00	0.01	0.00	52
F_042	Frequency Upper Limit	The upper limit of output frequency= F_031(Maximum Output Frequency)*F_042	0.00~1.00	0.01	1.00	57
F_043	Frequency Lower Limit	The lower limit of output frequency= F_031(Maximum Output Frequency)*F_043	0.00~1.00	0.01	0.00	57
F_044	Analog Output Signal Selection (FM+)	0: Output frequency 1: Frequency command 2: Output current 3: "Vin" analog input signal. 4: "Iin" analog input signal.	0~4	—	0	58
F_045	Analog Output Gain (FM+)	Analog output gain ratio adjustment.	0.00~2.00	0.01	1.00	58
F_046	Motor Overload Protection (OL)	0: Disable 1: Overload protection for **dependent cooling fan** type motor: Enabled (OL) 2: Overload protection for **independent cooling fan** type motor: Enabled (OL)	0~2	—	1	59
F_047	Filter Setting of Analog Input Signal	Filter the analog input signal when the frequency command is controlled by analog input terminal. (F_002=0).	0~255	—	20	57

The color as [ ] means the functions can be set during operation.

Func.	Name	Description		Range of Setting	Unit	dEF60	Page
F_048	Motor Rated Current	Set the value according to the motor rated current.		10%~150% of drive rated current	0.1A	According to the rated current of motor	59
F_049	Motor No-Load Current	Current setting according to the motor's no-load condition.		0~motor rated current	0.1A	1/3 motor rated current	59
F_050	Motor Slip Compensation	According to the load condition, set the motor slip compensation for motor running at constant speed. (0.0: off)		-9.9~10.0	0.1Hz	0.0	60
F_051	Number of Motor Poles	Determinate the RPM display value of monitor mode.		2~10	2P	4P	60
F_052	Multi-function Input Terminal (X1)	=0: UP/DOWN frequency command enter key	±1: Jog command ±2: Secondary accel/decel time command ±3: Multi-speed level 1 command ±4: Multi-speed level 2 command ±5: Multi-speed level 3 command ±6: Reset command ±7: External fault command (thr) ±8: Interruption of output command (bb) ±9: Coast to stop command (Fr) ±10: Speed tracing from the maximum frequency ±11: Speed tracing from the setting frequency ±12: Holding command ±13: UP command ±14: DOWN command ±15: Clear UP/DOWN frequency command ±16: Analog input source selection	-16 ~ +16 (Note 6)	—	3	61
F_053	Multi-function Input Terminal (X2)	=0: DC braking enable (at stop)				4	
F_054	Multi-function Input Terminal (X3)	=0: Current limit enable				1	
F_055	Multi-function Input Terminal (X4)	=0: Selection of primary or secondary frequency command **(ON: secondary frequency command)**				2	
F_056	Multi-function Input Terminal (X5)	=0: Stop command with 3-wire start/stop circuit (N.O; contact a)				7	
F_057	Multi-function Input Terminal (X6)	=0: Stop command with 3-wire start/stop circuit (N.C; contact b)				6	

The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_058	Multi-function Output Terminal (Y1)	0: Disable ±1: Operation command detection ±2: Constant speed detection ±3: Zero speed detection ±4: Frequency detection ±5: Overload detection (OLO) ±6: Stall prevention detection ±7: Low voltage detection (LE) ±8: Braking detection ±9: Restart after instantaneous power failure detection ±10: Restart after error condition detection ±11: Error detection	-11 ~ +11 (Note 6)	—	3	68
F_059	Multi-function Output Terminal (Y2)				2	
F_060	Multi-function Output Terminal (Ta1,Tb1)				11	
F_061	Constant Speed Detection Range	Set the bandwidth of constant speed detection range.	0.0~10.0	0.1Hz	2.0	73
F_062	Frequency Detection Range	Set the bandwidth of frequency detection range.	0.0~10.0	0.1Hz	2.0	73
F_063	Frequency Detection Level	Set the frequency detection level of multi-function output terminal.	0.0~400.0	0.1Hz	0.0	73
F_064	Automatic Torque Compensa-tion Range	According to the load condition, adjust the output voltage of the V/F pattern. (0.0: off)	0.0~25.5	0.1	1.0	73
F_065	System Overload Detection (OLO)	0: Disable 1: Enable	0,1	—	0	73
F_066	System Overload Detecting Selection	0: Detection during constant speed only 1: Detection during operation only	0,1	—	0	73
F_067	Output Setting after System Overload	0: Drive keeps operation when the overload is detected 1: Drive trips to protection when the overload is detected	0,1	—	0	73
F_068	System Overload Detection Level	When the output current of drive is larger than the level with the duration of F_069, the drive will trip to protection.	30%~200% of drive rated current	1%	160	73
F_069	System Overload Detection Time	When the output current of drive is larger than the level (F_068 * drive's rated current) with the duration, the drive will trip to protection.	0.1~10.0	0.1 sec	0.1	73
F_070	Stall Prevention Level at Acceleration	If stall is occurred during acceleration, the motor keeps running at constant speed. (200%: off)	30%~200% of drive rated current	1%	170	75

The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_071	Stall Prevention Level at Constant Speed	While the stall is occurred during constant speed running condition, the prevention of stall is to decrease the speed of motor. (200%: off)	30%~200% of drive rated current	1%	160	75
F_072	Acceleration Time Setting after Stall Prevention under Constant Speed	Set the acceleration time after stall prevention under the constant speed.	0.1~ 3200.0	0.1 sec	5.0	75
F_073	Deceleration Time Setting for Stall Prevention under Constant Speed	Set the deceleration time at the stall prevention under the constant speed.	0.1~ 3200.0	0.1 sec	5.0	75
F_074	Stall Prevention Setting at Deceleration	0: Disable 1: Enable	0, 1	—	1	75
F_075	DC Braking Level	Set the current level of DC braking.	0~150% of drive rated current	1%	50	76
F_076	Time of DC Braking after Stop	Set the time for DC braking after drive stopped.	0.0~20.0	0.1 sec	0.5	76
F_077	Time of DC Braking before Start	Set the time for DC braking before drive started.	0.0~20.0	0.1 sec	0.0	76
F_078	Operation Selection at Instantane-ous Power Failure	0: Drive cannot be restarted 1: Drive can be restarted 2: Ramp to stop 3: Drive will re-accelerate again during ramp to stop interval, when the power is restored.	0~3	—	0	77
F_079	Voltage Level of Ramp to Stop by Power Failure	Set the voltage of power source for ramp to stop.	150.0~ 192.0 300.0~ 384.0	0.1V	175.0 (Note3) 320.0 (Note4)	77
F_080	Auto-restart Times Setting of Error Trip	When the auto-restart times of error conditions (OC,OE,GF only) reach the setting value, the drive must be restarted manually. 0: disable	0~16	1	0	80
F_081	Switching Frequency	The setting value is higher and the motor noise is lower.	0~6	—	6 (Note5)	80
F_082	Stop Mode	0: Ramp to stop 1: Coast to stop 2: Coast to stop + DC braking	0~2	—	0	81
F_083	Reverse Prohibition	0: Reverse rotation allowed. 1: Reverse rotation NOT allowed.	0, 1	—	0	81

The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_084	Jump Frequency 1	Avoid mechanical resonance point 1.	0.0~400.0	0.1Hz	0.0	79
F_085	Jump Frequency 2	Avoid mechanical resonance point 2.	0.0~400.0	0.1Hz	0.0	79
F_086	Jump Frequency 3	Avoid mechanical resonance point 3.	0.0~400.0	0.1Hz	0.0	79
F_087	Jump Frequency Range	Set the range of the jump frequency 1, 2, 3.	0.0~25.5	0.1Hz	0.0	79
F_088	The Current Level of Speed Tracing	When the current is higher than the “speed tracing current level”, the output frequency will trace downward.	0~200% of drive rated current	1%	150	79
F_089	Delay Time before Speed Tracing	Set the output delay time before the speed tracing.	0.1~5.0	0.1 sec	0.5	79
F_090	The V/F Pattern of Speed Tracing	Set the percentage of V/F output voltage at the speed tracing.	0~100%	1%	100	79
F_091	Error Record	Display the latest 5 error records.	—	—	—	81
F_092	Parameter Setting Lock	0: Parameters are changeable. Maximum frequency cannot exceed 120.0Hz. 1: Parameters are locked. Maximum frequency cannot exceed 120.0Hz. 2: Parameters are changeable. Maximum frequency can exceed 120.0Hz. 3: Parameters are locked. Maximum frequency can exceed 120.0Hz.	0~3	—	0	81
F_093	Automatic Voltage Regulation (AVR)	0: Disable 1: Enable	0,1	—	1	81
F_094	Drive Overload (OL1)	0: Disable 1: Thermal protection 2: Current limit overload protection 3: Both 1 and 2 enable	0~3	—	3	82
F_095	Power Source	The value of setting according to the actual power source.	190.0~240.0 340.0~480.0	0.1V	220.0 (Note3) 380.0 (Note4)	82
F_096	Holding Frequency	The drive accelerates to the holding frequency and running at constant speed.	0.0~400.0	0.1Hz	0.5	80
F_097	Holding Time Interval	The drive runs at holding frequency by constant speed and running the time interval.	0.0~25.5	0.1 sec	0.0	80
F_098	Grounding Fault Protection (GF)	0: Disable 1: Enable (GF)	0, 1	—	1	82

The color as ▭ means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_099 ~ F_101	Reserved					
F_102	V/F Pattern Selection	0: Linear. 1: Energy-saving mode (auto-adjust V/F pattern according to the load condition). 2: Square curve. 3: 1.7th power curve. 4: 1.5th power curve.	0~4	—	0	82
F_103	Subtracted Frequency of Deceleration at Power Failure	When the power failure, drive will reduce the frequency level before ramp to stop. **(F_078 Operation Selection at Instantaneous Power Failure)=2 or 3**	0.0~20.0	0.1Hz	3.0	77
F_104	Deceleration Time 1 of Ramp to Stop by Power Failure	Set a deceleration time down to the turning frequency set in F_106.	0.0~ 3200.0	0.1 sec	5.0	78
F_105	Deceleration Time 2 of Ramp to Stop by Power Failure	Set a deceleration slope below the frequency set in F_106	0.0~ 3200.0	0.1 sec	5.0	78
F_106	Turning Frequency of Ramp to Stop	Set the turning frequency level of ramp to stop when the deceleration time is switched from F_104 setting value to F_105 setting value.	0.0~400.0	0.1Hz	0.0	78
F_107	Analog Frequency Dead Band	When the noise of analog input signal is large, appropriately increase the dead band to stabilize the frequency command. But adjusting this function will reduce the tuning linearity of input signal.	0.00~2.55	0.01 Hz	0.00	57
F_108	Digital Input Response Time	When the pulse width of digital signal is lower than setting time, the signal disabled.	5~16	1ms	10	68
F_109 ~ F117	Reserved					
F_118	UP/DOWN Memory Selection	0: Clear the UP/DOWN frequency command when power failure. 1: Save the UP/DOWN frequency command at F_121 when power failure.	0, 1	—	0	67
F_119	UP/DOWN Frequency Resolution	0: 0.01Hz 1~8: x0.05Hz 9: 0.5Hz 10~250: x0.1Hz	0~250	—	0	67

The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_120	UP/DOWN Trigger Mode	1~5: Continuous accel./decel. when the terminal is activated with the duration (1 ~ 5 sec). 6: Edge trigger.	1~6	—	1	67
F_121	UP/DOWN Frequency Adjustment	Adjust UP/DOWN frequency by KP-201C keypad.	0.00~ 400.00	0.01 Hz	0.00	68
F_122	Secondary Frequency Command Selection	0: Frequency command by analog signal via terminal. 1: Frequency command by keypad. 2: Frequency command by UP/DOWN terminal.	0~2	—	0	66
F_123	Analog Input Selection	0: Vin+Iin 1: Vin-Iin 2: Iin-Vin 3: Vin or Iin (switch by multi-function input terminal X1 ~ X6).	0~3	—	0	53
F_124	Analog Input Selection (Vin)	0: Analog input gain. 1: Frequency command. 2: Current limit level. 3: Output voltage adjustment of V/F pattern.	0~3	—	1	53
F_125	Analog Input Selection (Iin)	0: Analog input gain. 1: Frequency command. 2: Current limit level. 3: Output voltage adjustment of V/F pattern.	0~3	—	1	54
F_126	Iin Range Selection	0: 4~20mA (2~10V). 1: 0~20mA (0~10V).	0,1	—	0	54
F_127	Analog Input Gain (Iin)	The gain ratio of analog input terminal Iin.	0.00~2.00	0.01	1.00	52
F_128	Analog Input Bias (Iin)	The bias ratio of analog input terminal Iin.	-1.00~ 1.00	0.01	0.00	52
F_129	Analog Output Signal Selection (AM+)	0: Output frequency. 1: Frequency command. 2: Output current. 3: Vin frequency command. 4: Iin frequency command.	0~4	—	2	58
F_130	Analog Output Gain (AM+)	AM+ analog output adjustment ratio.	0.00~2.00	0.01	1.00	58
F_131	Multi-function Output Terminal (Ta2/Tc2)	The way of settings are same as multi-function output terminals setting. (F_058 ~ F_060)	-11~+11 (Note 6)	—	1	68
F_132	DC Braking Frequency at Stop	Active frequency level of DC braking at stop.	0.1~60.0	0.1Hz	0.5	76

The color as [ ] means the functions can be set during operation.

Func.	Name	Description	Range of Setting	Unit	dEF60	Page
F_133	Current Limit Level	Monitor the setting value of current limit level percentage.	—	—	—	65
F_134	Default Setting	0: Disable CLF: Clear fault records dEF60: Restore the default value of drive for 60Hz. dEF50: Restore the default value of drive for 50Hz. SAv: Save the setting value. rES: Restore the setting value. rd_EE: Read the parameters from drive to digital keypad Wr_EE: Write the parameters from digital keypad to drive	—	—	0	45

The color as [ ] means the functions can be set during operation.

Note:
1. Default value of 50Hz.
2. Default value of 60Hz.
3. Specification of 200V series.
4. Specification of 400V series.
5. WP5 series: When switching frequency setting exceeds 4, the drive must be de-rating or selecting higher capacity.
6. + : Represents a contact (N.O)
   — : Represents b contact (N.C)

No Text on This Page

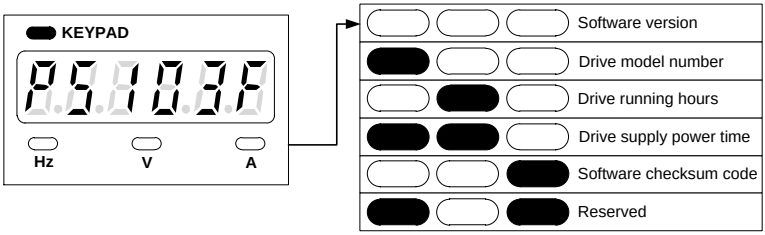
Chapter 5 Parameter Setting Description

A. The Keypad Setup

F_000	Drive Information

a. The drives with different software versions cannot execute readout or writing, otherwise, the parameters will occur error and the keypad will display  message.

b. Three LED indicators (Hz, V, A) replace the corresponding information of drive as below table.



c. Pressing the ▲ or ▼ key can switch display status.

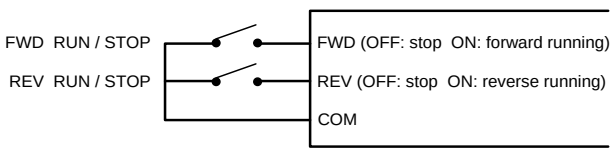
F_001	Start Command Selection

a. F_001=0

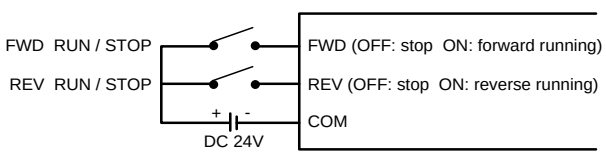
(I). **FWD and REV terminals both control the start command and rotation direction.**

(II). Drive stops operation when FWD and REV terminals are simultaneously open-circuit or short-circuit.

SINK (NPN) mode:



SOURCE (PNP) mode:

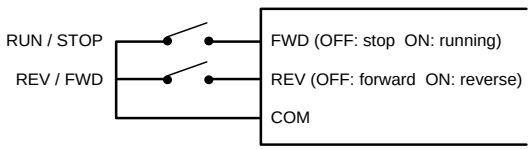


b. F_001=1

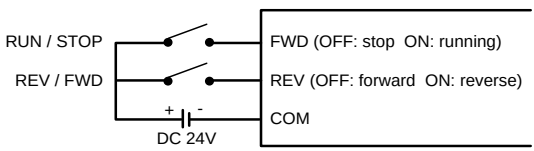
Start command by FWD terminal.

Rotation direction command by REV terminal.

SINK (NPN) mode:



SOURCE (PNP) mode:

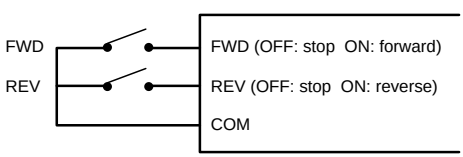


c. F_001=2

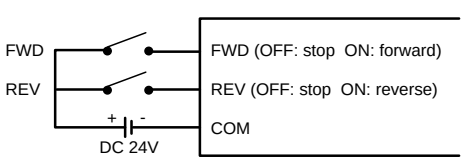
(I). **Start command by keypad "RUN" key.**
Rotation direction command by FWD or REV terminal.

(II). Drive stops operation when FWD and REV terminals are simultaneously open-circuit or short-circuit.

SINK (NPN) mode:



SOURCE (PNP) mode:



d. F_001=3

Start command by the keypad "RUN" key.
Motor rotates at the forward direction (clockwise).

e. F_001=4

(I). **Start command by keypad "RUN" key.**
Motor rotates at the reverse direction (counterclockwise).

(II). The most left digit of output frequency will show "–".

Note:

1.When F_001 set to 0 or 2 and FWD-COM and REV-COM are simultaneously open-circuit, the monitor mode will display blanking " " (except "Display 8-terminal status"). If FWD-COM and REV-COM are simultaneously short-circuit, the monitor mode will display blanking " " (except "Display 8-terminal status").

2.The definition of rotation direction is according to IEC (International Electrotechnical Commission) standard. Observing the motor from axle center side, not the fan side. The standard rotation direction (Forward) is clockwise

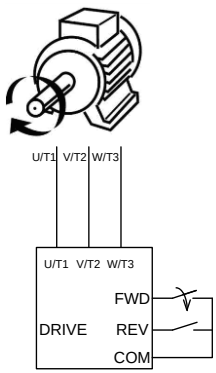


Figure A

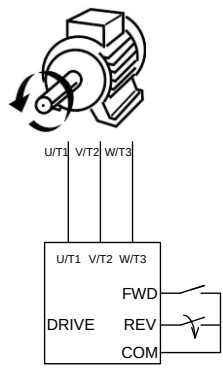


Figure B

EX: F_001=0,
Forward (FWD) rotation is clockwise (Figure A).
Reverse (REV) rotation is counter-clockwise (Figure B).

F_002	Primary Frequency Command Selection

a. F_002=0

Frequency command by "Vin" or "Iin" analog input terminal (select Vin or Iin analog input sources by F_123).

(I). Vin-GND: Input range DC 0~10V。

※ The gain or bias of frequency command can be set by function F_040 and F_041.

(II). Iin-GND: Select the input signal mode via "SW1" switch.
SW1→I position (current signal); Range: 4~20mA or 0~20mA (set by F_126).
SW1→V position (voltage signal); Range: 2~10V or 0~10V (set by F_126).

※ The gain or bias of frequency command can be set by function F_127 and F_128.

b. F_002=1

Frequency command by keypad.

(I). In keypad KP-201C, the primary speed, jog speed and preset speeds (F_009 ~ F_017) can be set during operation and the frequency command can be set under monitor mode.

c. F_002=2

Motor speed (RPM) command by keypad (KP-201C).

d. F_002=3

Machine speed (MPM) command by keypad (KP-201C).

e. F_002=4

Frequency command by UP/DOWN terminal.

Multi-function input terminals can be set UP command, DOWN command, UP/DOWN frequency clear and enter commands.

Note: In monitor mode, when F_002 sets 1, 2 or 3, pressing [▲] or [▼] key one time and the frequency command will be blink but not changing. Press the [▲] or [▼] key again to change the frequency command.

F_003	Selection of "STOP" Key Validity

a. F_003=0

When the start command by terminal, the "STOP RESET" key of keypad disabled.

b. F_003=1

When the start command by terminal, the "STOP RESET" key of keypad enabled.

c. The applications of "STOP" key.

(I). Emergency stop:

When the start and frequency command are both controlled by multi-function input terminal (F_001=0 or 1), the output frequency will be decreased to 0Hz and displaying 0.00 on keypad by pressing "STOP RESET" key during operation.

If the drive needs to be restarted, cut off the wire between the terminals of the start command (FWD or REV) and COM and restart the drive again.

(II). Normal stop:

F_001=2 or 3, the start command by "RUN" key of keypad KP-201C and the stop is controlled by "STOP RESET" key.

F_004	Frequency Command Selection

a. F_004=0

In the monitor mode, the frequency command cannot be changed by KP-201C keypad to avoid possible mistakes and errors.

b. F_004=1

In the monitor mode, the frequency command can be changed by KP-201C keypad.

F_005	Selection of Frequency Command Auto-Storing

a. F_005=0

In the monitor mode, the frequency command will not be saved automatically.

b. F_005=1

In the monitor mode, the frequency command will be saved automatically after 3 minutes.

F_006	Selection of Main Display

The function of F_006 (Main Display Selections) is corresponding setting of KP-201C. In the monitor mode, there are 8 monitor modes can be selected. The corresponding value and monitor modes are shown as below table:

1. Output Frequency	5. Output Current
2. Frequency Command	6. Motor Speed (RPM)
3. Output Voltage	7. Machine speed (MPM)
4. DC bus Voltage	8. Terminals Status

Note: One of above 8 monitor modes can be selected as the “main display”, and others can be as the “auxiliary display”. When the display is under “auxiliary display” mode (including the setting mode and other monitor modes), the display will switch to “main display” automatically after 3 minutes by idling the keypad.

F_007	Machine Speed Ratio

Set the displaying ratio for “display 7-machine speed” under monitor mode.

Machine speed = machine speed ratio (F_007) x output frequency

F_008	Digits of Decimal Value (Machine Speed)

Set the digits of decimal values for machine speed to provide the better resolution for observing. (the max. accuracy is the thousandth digit)

F_134	Default Setting

Drive can restore the default setting values and restoring the parameter setting values. The parameter of F_134 are described as below table:

0 (0): Disable
CLr (CLF): Clear error records
dEF60 (dEF60): Restore the default value of drive for 60Hz.
dEF50 (dEF50): Restore the default value of drive for 50Hz.
SAv (SAv): Save the setting value.
rES (rES): Restore the setting value.
rd_EE (rd_EE): Read the parameters from drive to digital keypad
Wr_EE (Wr_EE): Write the parameters from digital keypad to drive

Note: rd_EE and Wr_EE are used to copy functions to several drives with the same setting value. (Please refer to page 25)

B. Preset Speed Setup

F_009	Primary Speed
F_010	Preset Speed 1
F_011	Preset Speed 2
F_012	Preset Speed 3
F_013	Preset Speed 4
F_014	Preset Speed 5
F_015	Preset Speed 6
F_016	Preset Speed 7
F_017	Jog Speed

a. Related functions:

(I) The setting of acceleration and deceleration time (F_018 ~ F_029).

(II) The setting of multi-function input terminals (F_052 ~ F_057).

b. Switch of jog speed, primary speed and preset speeds.

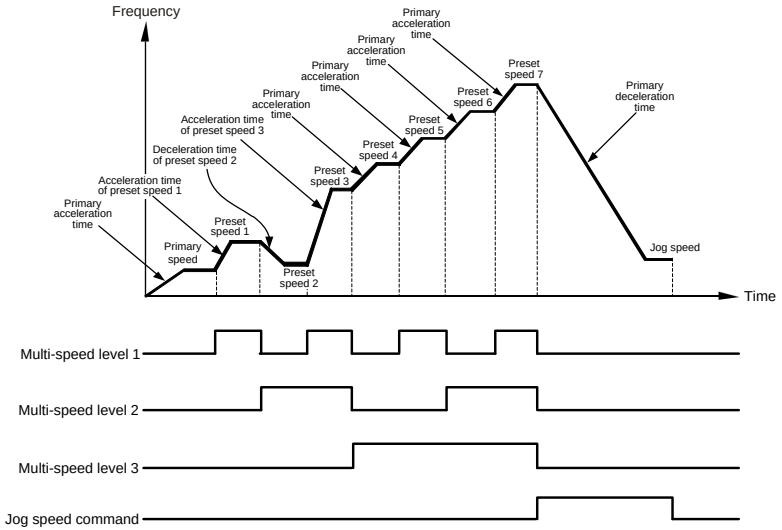
※ ***The ON/OFF conditions as below table are "contact a (N.O)" setting of functions.***

Jog speed command	Multi-speed level 3 command	Multi-speed level 2 command	Multi-speed level 1 command	Command Description
ON	**X**	**X**	**X**	Jog speed
OFF	OFF	OFF	OFF	Primary speed
OFF	OFF	OFF	ON	Preset speed 1
OFF	OFF	ON	OFF	Preset speed 2
OFF	OFF	ON	ON	Preset speed 3
OFF	ON	OFF	OFF	Preset speed 4
OFF	ON	OFF	ON	Preset speed 5
OFF	ON	ON	OFF	Preset speed 6
OFF	ON	ON	ON	Preset speed 7

Note:

1. " **X** " : Don't care
2. Jog speed has the highest priority. That is, when the jog speed is activated, other speed commands disabled.
3. Jog speed command and the multi-speed commands are programmed by the multi-function input terminals (X1 ~ X6) by functions (F_052 ~ F057). ON / OFF the terminal in accordance with above table to switch the speed.
4. " ON " :
   The terminal is short-circuit at contact a (N.O) setting.
   The terminal is open-circuit at contact b (N.C) setting.
   " OFF " :
   The terminal is open-circuit at contact a (N.O) setting
   The terminal is short-circuit at contact b (N.C) setting.
5. The priority of speed command: Jog speed>Multi-sped>primary speed

c. Multi-speed and acceleration/deceleration time



※ The acceleration / deceleration time of jog speed and preset speed 4~7 are according to the setting of primary acceleration / deceleration time (F_019, F_020).

※ Jog speed control include start command. When drive stop, activating the jog speed command can start the drive without start command.

※ Analog input terminals (Vin, Iin) are disabilities under jog speed, preset speed 1~7 and primary speed control.

※ Please refer to F_018 ~ F_029 for acceleration / deceleration time setting.

C. Multi-Speed Accel./Decel. Time Setup

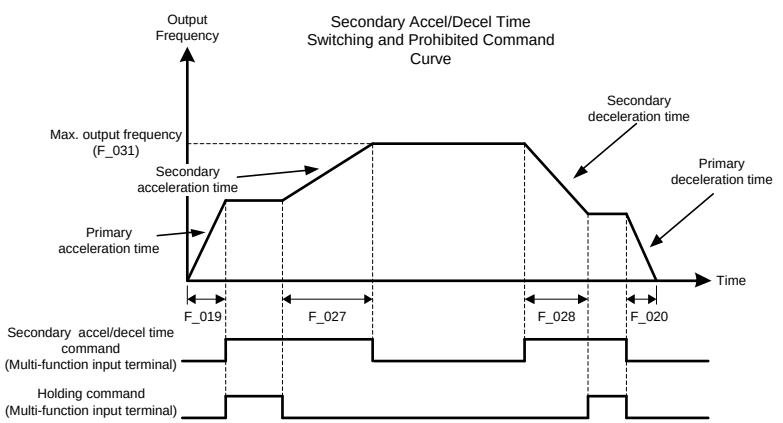
F_018	Reference Frequency of Accel/Decel Time
F_019	Primary Acceleration Time
F_020	Primary Deceleration Time
F_021	Acceleration Time of Preset Speed 1
F_022	Deceleration Time of Preset Speed 1
F_023	Acceleration Time of Preset Speed 2
F_024	Deceleration Time of Preset Speed 2
F_025	Acceleration Time of Preset Speed 3
F_026	Deceleration Time of Preset Speed 3
F_027	Secondary Acceleration Time
F_028	Secondary Deceleration Time
F_029	Set S-curve for Accel/Decel Time

a. The multi-speeds acceleration / deceleration time is the time interval from 0Hz to the setting of F_018 (Reference Frequency of Accel/Decel Time). Multi-speed level commands can simultaneously control preset speeds and the preset speed acceleration / deceleration time.

b. The acceleration / deceleration time of primary speed, preset speed 4 ~ 7 and jog speed are controlled by the setting of primary acceleration / deceleration time.

c. The switch between primary accel / decel and secondary accel / decel can be selected by multi-function input terminals.

Illustration is as follows:



d. The “holding command” is disabled when STOP command is activated.

※STOP command:

(I) When F_001 set 0 or 2, “FWD” and “REV” terminals are simultaneously short-circuit or open-circuit.

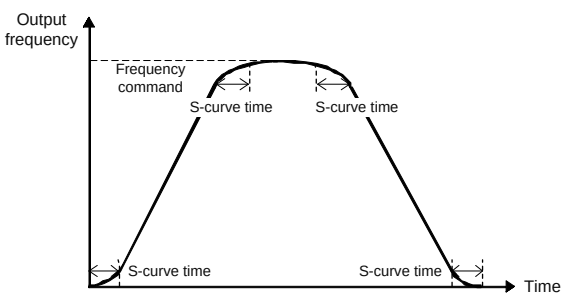
(II) When F_001 set 1, “FWD” terminal is open-circuit.

(III) When F_003 set 1, pressing the “STOP” key.

(IV) Press the “STOP” key when start command by keypad.

e. Set the S-curve function depend on the application to buffer the impact during start, stop, acceleration and deceleration.

EX: To buffer the impact when the object fall on the conveyor line or the running of elevator.



D. V/F Pattern Setup

F_030	Limitation of Output Voltage

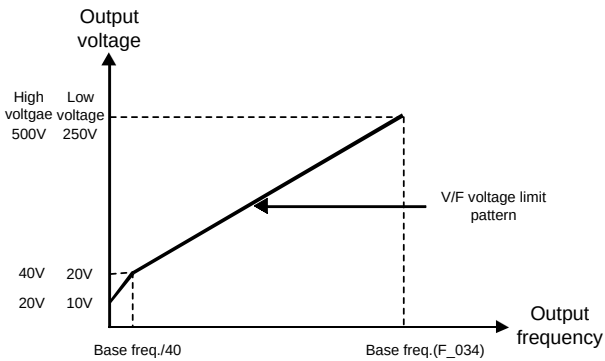
a. F_030 = 0

The output voltage of V/F pattern: No limit

b. F_030 = 1

The output voltage of V/F pattern :Limit (200V series: 250.0V; 400V series: 500.0V)

As the following figure：



F_031	Maximum Output Frequency

The setting range of max output frequency is 0.1 ~ 400.0.

F_032	Starting Frequency

F_033	Starting Voltage

The range of 200V series is 0.1 ~ 50.0V.

The range of 400V series is 0.1 ~ 100.0V.

F_034	Base Frequency

Motor base frequency;

The setting must be according to the nameplate of motor.

F_035	Base Voltage

Motor base voltage;

The setting must be according to the nameplate of motor.

(200V series: 0.1~255.0V; 400V series: 0.1~510.0V)

F_036	V/F Frequency 1

F_037	V/F Voltage 1

(200V series: 0.0~255.0V; 400V series: 0.0~510.0V)

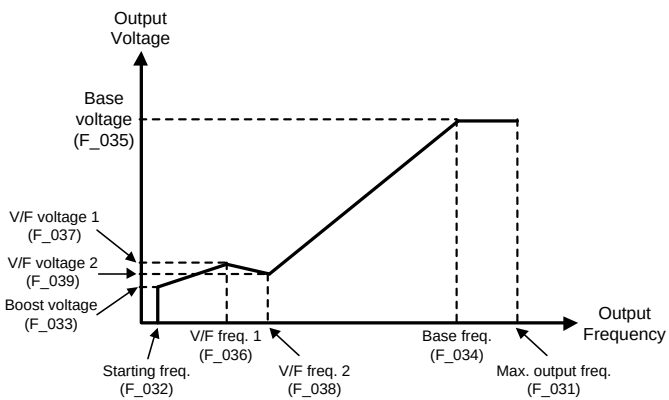
F_038	V/F Frequency 2

F_039	V/F Voltage 2

(200V series: 0.0~255.0V; 400V series: 0.0~510.0V)

F_031 ~ F_039 are the functions related to V/F pattern. Please refer to below figure:

V/F Pattern



Note: The interrelationships of above functions are explained as follow:

(I) The priority of frequency level:
Base frequency ＞ V/F frequency 2 ＞ V/F frequency 1 ＞ start frequency

(II) When the setting value of V/F frequency 2 is less than the setting value of V/F frequency1, the setting of V/F frequency (voltage) 2 is disable.

(III) When V/F frequency1 or V/F frequency 2 is less than the starting frequency, the V/F frequency (voltage) 1 or 2 is disable.

(IV) No limitation between F_033 (Starting Voltage), F_035 (Base Voltage), F_037 (V/F Voltage 1), F_039 (V/F Voltage 2) when setting the values.

E. Analog Input Command Setup

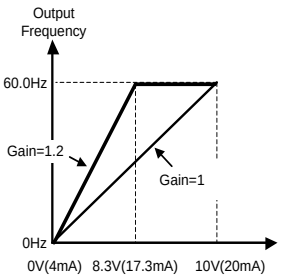
The analog input terminals:
"Vin" – "GND": 0~10V;
"Iin" – "GND": 4~20mA (2~10V) or 0~20mA (0~10V)

F_040	Vin Gain
F_127	Analog Input Gain (Iin)

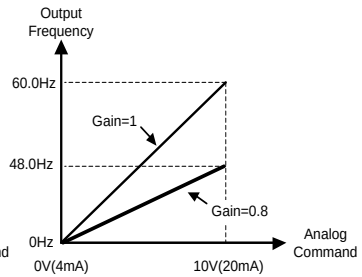
a. The corresponding frequency command value of analog command =
Maximum output frequency (F_031) x Analog input gain (F_040 or F_127)

EX: If analog input bias (F_041 or F_128) = 0.00

Maximum output frequency = 60.0Hz
Analog input gain = 1.20



Maximum output frequency = 60.0Hz
Analog input gain = 0.80



F_041	Vin Bias
F_128	Analog Input Bias (Iin)

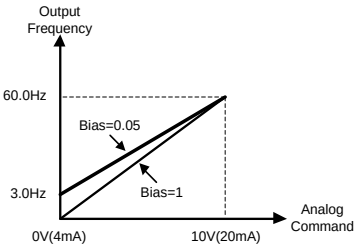
a. The corresponding frequency command value of analog command =
maximum output freq. (F_031) x analog input bias (F_041 or F_128)

b. $$\text{Freq.command} = \frac{(\text{Max. freq. command} - \text{C.V})}{10\text{V (or 20mA)}} \times (\text{Analog command}) + \text{C.V}$$

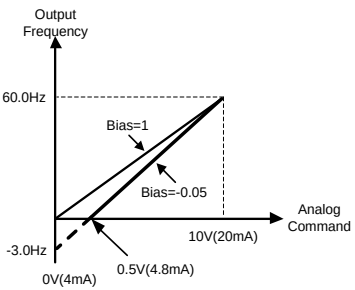
* C.V = The corresponding frequency command value of analog command

EX: If analog input gain (F_040 or F_127) = 1.00

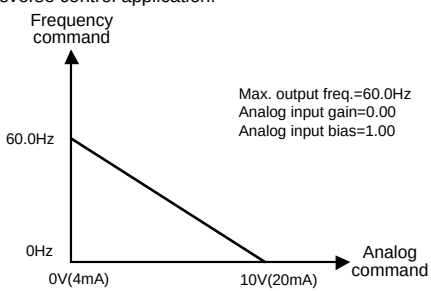
Maximum output frequency = 60.0Hz
Analog input bias = 0.05



Maximum output frequency = 60.0Hz
Analog input bias = -0.05



Example of reverse control application:



F_123	Analog Input Selection

0: Vin+Iin
1: Vin-Iin
2: Iin-Vin
3: Vin or Iin (switch by multi-function input terminal X1 ~ X6)

F_124	Analog Input Selection (Vin)

0: Analog input gain
1: Frequency command
2: Current limit level
The level setting range is 1 ~150%. (the setting value displays at F_133)
3: Output voltage adjustment of V/F pattern

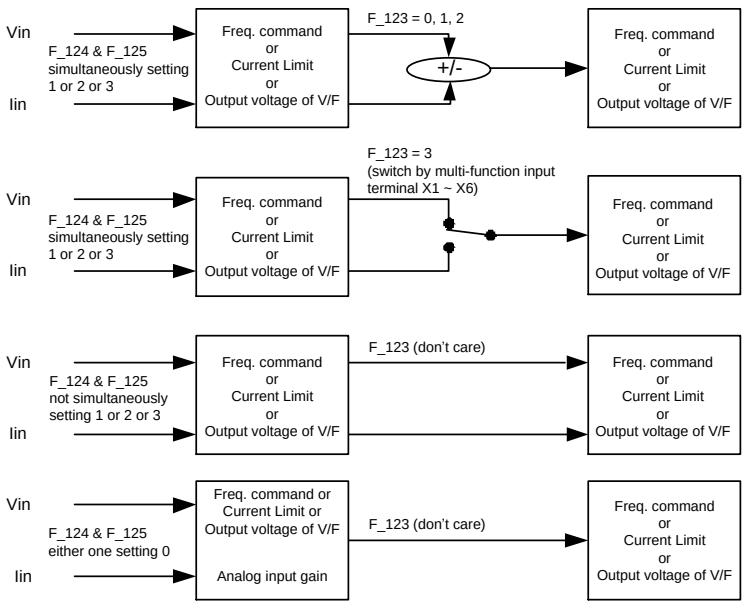
F_125	Analog Input Selection (Iin)

0: Analog input gain
1: Frequency command
2: Current limit level
The level setting range is 1 ~150%. (the setting value displays at F_133)
3: Output voltage adjustment of V/F pattern

F_126	Iin Range Selection

0: 4~20mA(2-10V)
1: 0~20mA(0-10V)

The interrelationships of F_123, F_124 and F_125 are shown as below figure:



The interrelationships table of F_123, F_124, F_125

F_123 Analog Input Selection	F_124 Analog Input Selection (Vin)	F_125 Analog Input Selection (Iin)	Description
0	1	1	Vin & Iin: Frequency command. Vin + Iin
0	2	2	Vin & Iin: Current limit level. Vin + Iin
0	3	3	Vin & Iin: Output voltage adjustment of V/F pattern. Vin + Iin
1	1	1	Vin & Iin: Frequency command. Vin - Iin
1	2	2	Vin & Iin: Current limit level. Vin - Iin
1	3	3	Vin & Iin: Output voltage adjustment of V/F pattern. Vin - Iin
2	1	1	Vin & Iin: Frequency command. Iin - Vin
2	2	2	Vin & Iin: Current limit level. Iin - Vin
2	3	3	Vin & Iin: Output voltage adjustment of V/F pattern. Iin - Vin
3	1	1	Vin & Iin: Frequency command. Vin or Iin (switch by multi-function input Terminal X1 ~ X6).
3	2	2	Vin & Iin: Current limit level. Vin or Iin (switch by multi-function input Terminal X1 ~ X6).
3	3	3	Vin & Iin: Output voltage adjustment of V/F pattern. Vin or Iin (switch by multi-function input Terminal X1 ~ X6).
X	1	0	Vin: Frequency command. Iin: Analog input gain of Vin.
X	0	1	Vin: Analog input gain of Iin. Iin: Frequency command.
X	1	2	Vin: Frequency command. Iin: Current limit level.

F_123 (Analog Input Selection)	F_124 Analog Input Selection (Vin)	F_125 Analog Input Selection (Iin)	Description
X	1	3	Vin: Frequency command. Iin: Output voltage adjustment of V/F pattern.
X	2	1	Vin: Current limit level. Iin: Frequency command.
X	2	3	Vin: Current limit level. Iin: Output voltage adjustment of V/F pattern.
X	3	1	Vin: Output voltage adjustment of V/F pattern. Iin: Frequency command.
X	3	2	Vin: Output voltage adjustment of V/F pattern. Iin: Current limit level.
X	1	0	Vin: Frequency command. Iin: Analog input gain of Vin.
X	0	1	Vin: Analog input gain of Iin. Iin: Frequency command.
X	1	2	Vin: Frequency command. Iin: Current limit level.
X	1	3	Vin: Frequency command. Iin: Output voltage adjustment of V/F pattern.
X	2	1	Vin: Current limit level. Iin: Frequency command.
X	2	3	Vin: Current limit level. Iin: Output voltage adjustment of V/F pattern.
X	3	1	Vin: Output voltage adjustment of V/F pattern. Iin: Frequency command
X	3	2	Vin: Output voltage adjustment of V/F pattern. Iin: Current limit level.

F_047	Filter Setting of Analog Input Signal

a. Filter the analog input signal when the frequency command by analog input terminals. (F_002=0).

b. The larger setting value will cause the slower response.

c. 0: Disable the filtering.

F_107	Analog Frequency Dead Band

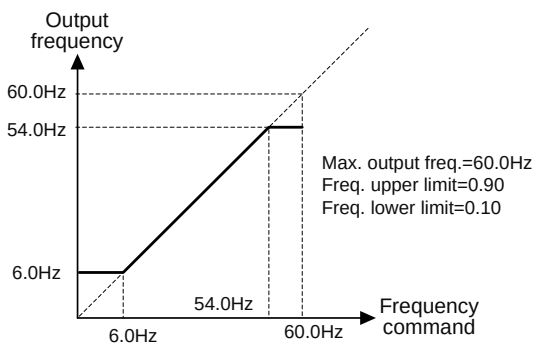
a. When the noise of analog input signal is large, appropriately increase the dead band to stabilize the frequency command. But adjusting this function will reduce the tuning linearity of input signal.

b. This setting must be applied along with the F_047.

F. The Upper and Lower Frequency Limit Setup

F_042	Frequency Upper Limit
F_043	Frequency Lower Limit

Illustrate as following figure:



a. Upper limit of output frequency = F_042 (Frequency Upper Limit) x F_031 (Maximum Output Frequency)

b. Lower limit of output frequency = F_043 (Frequency Lower Limit) x F_031 (Maximum Output Frequency)

G. Analog Output Setup

The analog output terminals:

"FM+" – "M-": DC 0 ~ 10V;

"AM+" – "M-": DC 0 ~ 10V

(1/2 HP ~ 5HP models are marked by "FM+" – "GND" and "AM+" – "GND")

F_044	Analog Output Signal Selection(FM+)
F_129	Analog Output Signal Selection(AM+)

0: Output frequency
The analog output terminal(FM+ or AM+) outputs DC 0~10V to correspond the output frequency. (the terminal will output signal when drive operation)

1: Frequency command
The analog output terminal(FM+ or AM+) outputs DC 0~10V to correspond the frequency command. (the terminal will output when drive is operation or stop)

2: Output current
The analog output terminal(FM+ or AM+) outputs DC 0~10V to correspond the output current. (max. corresponding value is rated output current of drive)

3: "Vin" analog input signal
The analog output terminal(FM+ or AM+) outputs DC 0~10V to correspond the signal of "Vin" analog input terminal. (the setting is activation when F_124=1)

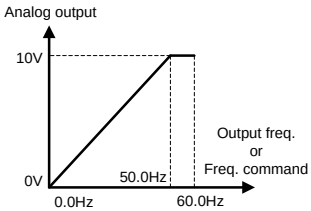
4: "Iin" analog input signal
The analog output terminal(FM+ or AM+) outputs DC 0~10V to correspond the signal of "Iin" analog input terminal. (the setting is activation when F_125=1)

F_045	Analog Output Gain(FM+)
F_130	Analog Output Gain(AM+)

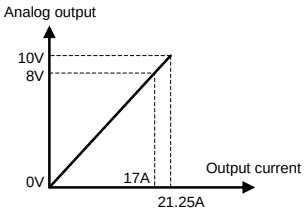
a. Analog output gain = $\frac{\text{Maximum output freq.}}{\text{Output freq. (freq. command)}}$ or $\frac{\text{Drive rated current}}{\text{Output current}}$

b. Analog output curve

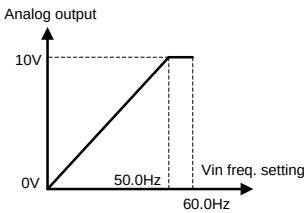
Maximum output freq. = 60.0Hz
Analog output signal selection = 0, 1
Analog output gain = 1.20



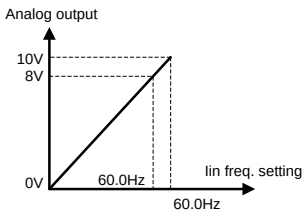
Driver rated current = 17A
Analog output signal selection = 2
Analog output gain = 0.80



Maximum output freq. = 60.0Hz
Analog output signal selection = 3
Analog output gain = 1.20



Maximum output freq. = 60.0Hz
Analog output signal selection = 4
Analog output gain = 0.08



H. Motor Protection Setup

F_046	Motor Overload Protection (OL)

Enable the function can preventing the motor from damage by operating in the overload condition for a long time.

0: Disable
1: Overload protection for dependent cooling fan type motor: Enabled (OL)
2: Overload protection for independent cooling fan type motor: Enabled (OL)

F_048	Motor Rated Current

F_049	Motor No-Load Current

F_050	Motor Slip Compensation

a. The slip of motor is variable depending on the load. When the load current is over the level of slip compensation, the drive will compensate the output frequency to output constant speed. The setting range is -9.9~10.0Hz.

b. Compensation frequency =

$$\frac{\text{Loading current} - (\text{No} - \text{load current (F\_049)})}{\text{Rated current(F\_048)} - (\text{No - load current (F\_049)})} \times \text{Slip compensation(F\_050)}$$

F_051	Number of Motor Poles

a. The settings are listed as below:
2P, 4P, 6P, 8P, 10P

b. The rotation speed display in the monitor mode:

$$\text{Motor speed(RPM)} = \frac{120}{\text{Number of motor poles(F\_051)}} \times \text{Output frequency}$$

I. Multi-Function Input Setup

F_052	Multi-function Input Terminal (X1)
F_053	Multi-function Input Terminal (X2)
F_054	Multi-function Input Terminal (X3)
F_055	Multi-function Input Terminal (X4)
F_056	Multi-function Input Terminal (X5)
F_057	Multi-function Input Terminal (X6)

a. "＋" represents positive logic (N.O; contact a)

b. "－" represents negative logic (N.C; contact b)

c. Multi-function terminals X1 ~ X6 can be set to perform following functions:

±1: Jog command (refer to F_017)

±2: Secondary accel/decel time command (refer to F_027, F_028)

±3: Multi-speed level 1 command (refer to F_010 ~ F_016)

±4: Multi-speed level 2 command (refer to F_010 ~ F_016)

±5: Multi-speed level 3 command (refer to F_010 ~ F_016)

±6: Reset command

When the drive trips to stop, executing reset command can clear the fault

±7: External fault command (thr)

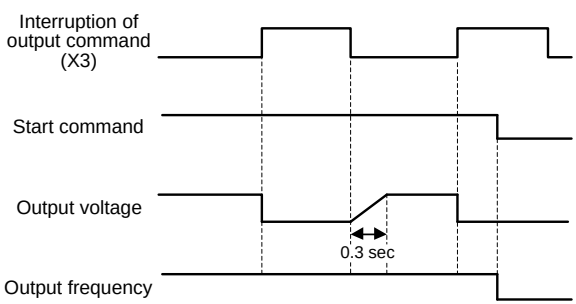
a. When the terminal received the fault command during operation, drive trips to stop.

b. This function is disabled when the drive at stop condition

±8: Interruption of output command (bb)

The parameter can interrupt the output voltage of drive.

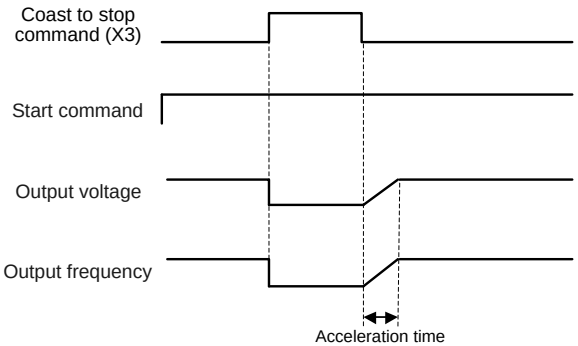
Interruption of output command (F_054=8)



±9: Coast to stop command (Fr)

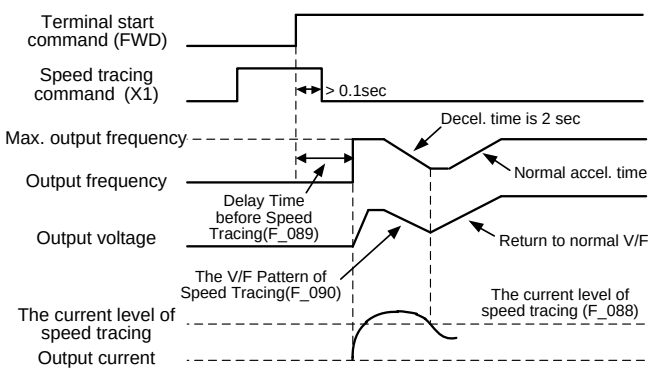
Cut off the control of motor from drive immediately.

Coast to stop command (F_055=9)



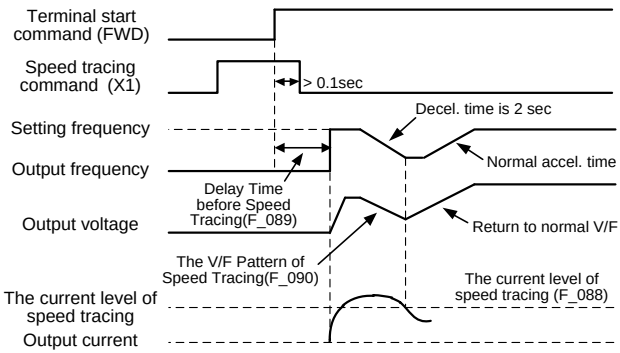
±10: Speed tracing from the maximum frequency

Speed tracing from the maximum frequency (F_053=10)



±11: Speed tracing from the setting frequency

Speed tracing from the setting frequency
(F_053=11)



±12: Holding command (refer to page 48)

±13: UP command

Frequency command can be increased by step.

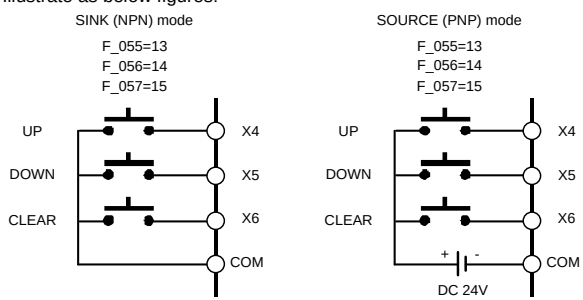
±14: DOWN command

Frequency command can be decreased by step.

±15: Clear UP/DOWN frequency command

Frequency command is cleared to 0.00Hz.

Illustrate as below figures:



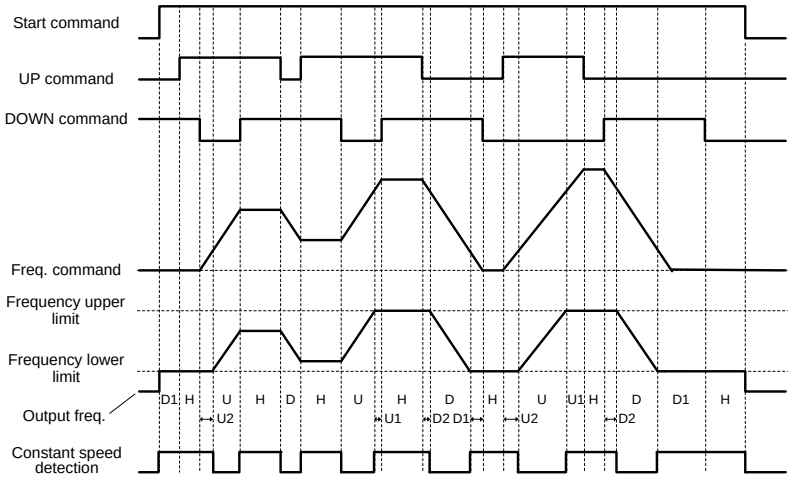
±16: Analog input source selection

Select one of analog input sources(Vin or Iin) as the input signal.

F_123 = 3 (Vin or Iin)

+16	Terminal short-circuit: Analog input source (Vin).
	Terminal open-circuit: Analog input source (Iin).
-16	Terminal short-circuit: Analog input source (Iin).
	Terminal open-circuit: Analog input source (Vin).

Time chart of UP/DOWN command



U=UP (acceleration) condition
D=DOWN (deceleration) condition
H=HOLD (constant speed) condition
U1=UP condition bounded at the upper limit of the frequency.
U2=UP condition bounded at the lower limit of the frequency.
D1=DOWN condition bounded at the lower limit of the frequency.
D2=DOWN condition bounded at the upper limit of the frequency.

d. When the parameter of F_052, F_053, F_054, F_055, F_056 and F_057 is set to "0", the functions are described as below:

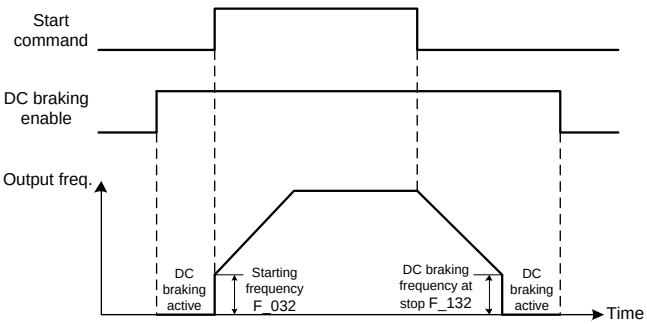
i. F_052: "UP/DOWN frequency command enter key" by X1.

X1 and COM is open-circuit:
UP/DOWN command can adjust the frequency command, but the output frequency will not be reacted by the frequency command.

X1 and COM is short-circuit:
The output frequency will start acceleration or deceleration until reaching the frequency command.

ii. F_053: "DC braking enable (at stop)" by X2

1. The terminal is activated and the drive is at stop condition: DC braking enabled.
2. When the DC braking is activated, the output current is according to the setting of F_075 (DC Braking Level).
3. The DC braking command will be cleared and the motor runs to the setting frequency when the start or jog command enabled.
4. The output frequency is decreased to the setting value of F_132 (DC Braking Frequency at Stop) and DC braking enabled, when the start command or jog command is disabled.



iii. F_054: "Current limit enable" by X3

Monitor the current limit level percentage by F_133 (Current Limit Level)

Use KP-201C keypad:

a. X3 and COM is short-circuit:

Analog terminal sets the current limit level: **Enable**

When F_124 (Analog Input Selection (Vin)) or F_125 (Analog Input Selection (Iin)) is set to 2, the user can set the current limit level from analog input terminal and monitoring the setting value at F_133 (range: 1~150%).

※The function is disable before stall occurring during acceleration and constant speed.

b. X3 and COM is open-circuit:

Analog terminal sets the current limit level: **Disable**

The setting value of current limit level is according to F_071(Stall Prevention Level at Constant Speed). (range: 30~200%)

iv. F_055: "Selection of primary or secondary frequency command" by X4

a. X4 and COM is short-circuit:

The output frequency will switch to secondary frequency command.

F_122 (Secondary Frequency Command Selection):
0: Frequency command by analog signal via terminal.
1: Frequency command by keypad.
2: Frequency command by UP/DOWN terminal.

b. X4 and COM is open-circuit:

The output frequency command by primary frequency.

F_002 (Primary Frequency Command Selection):
0: Frequency command by analog signal via terminal.
1: Frequency command by keypad.
2: Motor speed (RPM) command by keypad.
3: Machine speed (MPM) command by keypad.
4: Frequency command by UP/DOWN terminal.

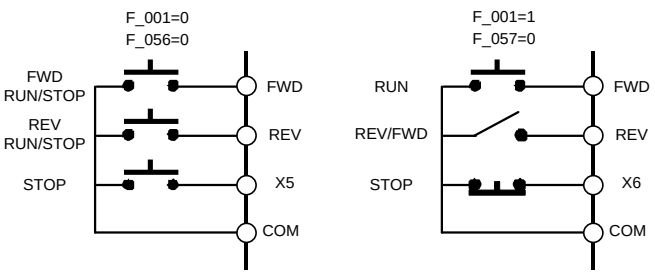
v. F_056: "Stop command with 3-wire start/stop circuit" by X5

N.O; contact a

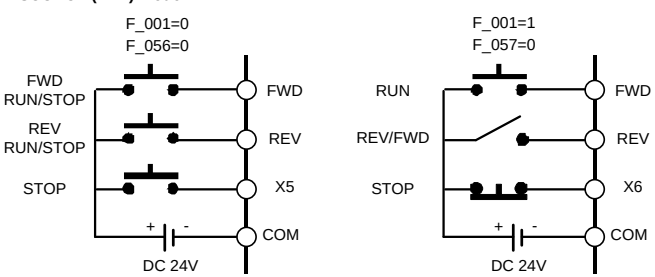
vi. F_057: "Stop command with 3-wire start/stop circuit" by X6

N.C; contact b

SINK (NPN) mode



SOURCE (PNP) mode



F_118	UP/DOWN Memory Selection

0: Clear the UP/DOWN frequency command when power failure.

Drive will clear the UP/DOWN frequency command to 0.00Hz when the power failure.

1: Save the UP/DOWN frequency command when power failure.

Drive will save the UP/DOWN frequency command to F_121 (UP/DOWN Frequency Adjustment) when the power failure.

F_119	UP/DOWN Frequency Resolution

Select the resolution of UP/DOWN frequency command.

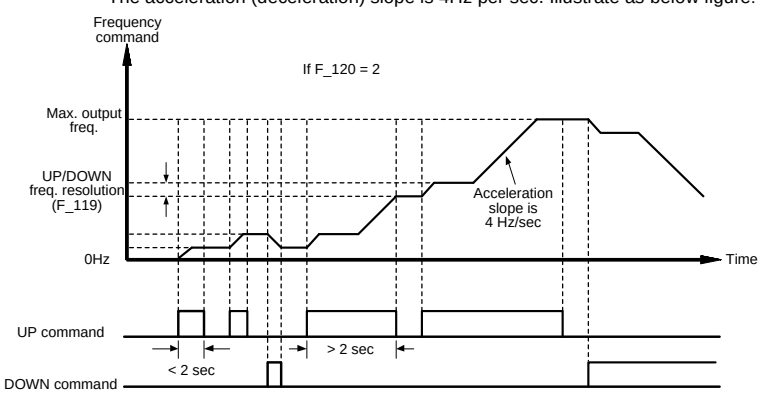
Setting value	Unit	Frequency command resolution
0	0.01Hz	Freq. command resolution = 0.01Hz
1~8	×0.05Hz	Freq. command resolution = Setting value × Unit EX: Setting value = 8; The variance is 8×0.05= 0.4Hz by inputting UP/DOWN command per time.
9	0.5Hz	Freq. command resolution = 0.5Hz
10~250	×0.1Hz	Freq. command resolution = Setting value × Unit EX: Setting value = 250; The variance is 250×0.1= 25Hz by inputting UP/DOWN command per time.

F_120	UP/DOWN Trigger Mode

1~5: Continuous accel./decel/ when the terminal is activated with the duration (1 ~ 5 unit: sec).

When the UP/DOWN command enabled and exceeding the setting value, the output frequency will accelerate(decelerate) to the upper(lower) limit output frequency until the UP/DOWN command disabled.

The acceleration (deceleration) slope is 4Hz per sec. Illustrate as below figure:



6: Edge trigger.

UP/DOWN signal triggers the drive during the transition of the signal(0→1 or 1→0). The signal response time is 30ms.

F_121	UP/DOWN Frequency Adjustment

Directly use KP-201C keypad to input the UP/DOWN frequency command.

Enter the parameter setting mode of F_121 to adjust the frequency command. The drive will output the frequency according to the setting value.

The drive will save the setting value to F_121 after 5 sec when the frequency command is changed.

F_108	Digital Input Response Time

a. Setting the input response time of multi-function terminals (X1~X6, FWD and REV) (digital debouncing).

b. If the signal width of digital inputs is smaller than the digital input response time, the program of drive will reject the input signal and do no process to input signal.

J. Multi-Function Outputs Setup

F_058	Multi-function Output Terminal (Y1)
F_059	Multi-function Output Terminal (Y2)
F_060	Multi-function Output Terminal (Ta1,Tb1)
F_131	Multi-function Output Terminal (Ta2/Tc2)

a. Y1 and Y2 are open-collector output terminals.
The maximum output specification is below DC48V / 50mA.

b. Ta1, Ta2 (N.O) and Tb1 (N.C) are relay output terminals.
The maximum output specification is AC 250V / 0.5A, cosθ=0.3.

c. "＋" represents positive logic (N.O; contact a)
"－" represents negative logic (N.C; contact b)

d. Y1, Y2, Ta1, Ta2, and Tb1 can be set as below functions:

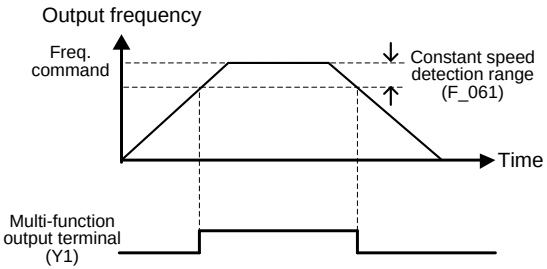
0: Disable (No function operated at terminals)

±1: Operation command detection. (Detection when start command is inputted)

±2: Constant speed detection.

Detection when drive runs at constant speed

Constant speed detection (F_058=2)

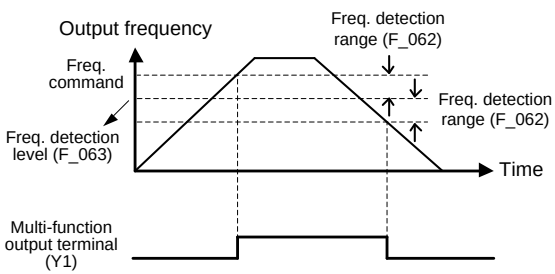


±3: Zero speed detection.

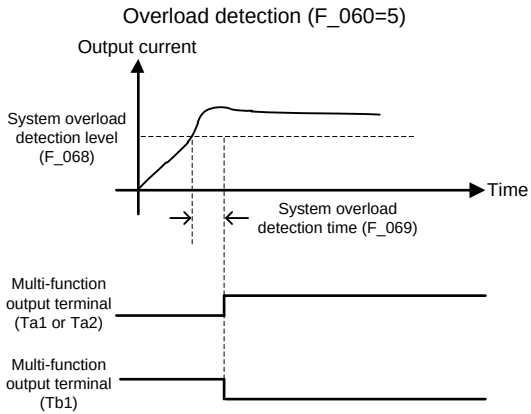
Detection when the drive at stop condition or the frequency command is less than the F_032 (Starting Frequency).

±4: Frequency detection

Frequency detection (F_059=4)

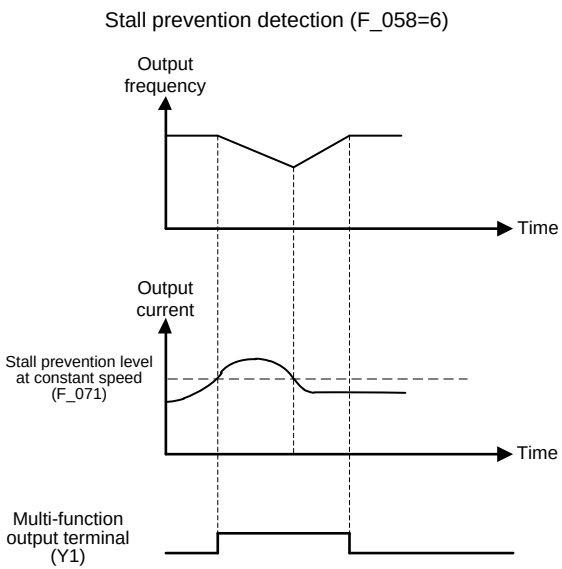


±5: Overload detection (OLO)



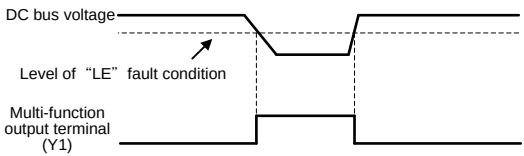
※ “Contact a”is short-circuit when detection is activated;
“Contact b”is open-circuit when detection is activated.

±6: Stall prevention detection



±7: Low voltage detection (LE)

Low voltage detection (F_058=7)



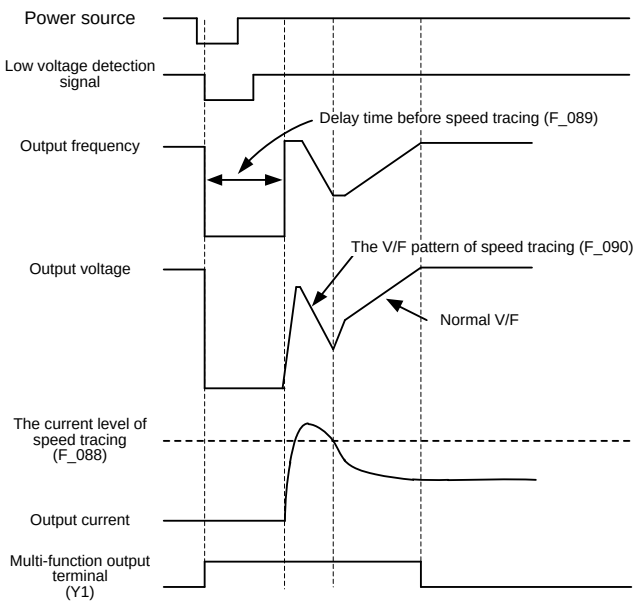
±8: Braking detection

Detection when the DC bus voltage is higher than dynamic brake voltage.

±9: Restart after instantaneous power failure detection

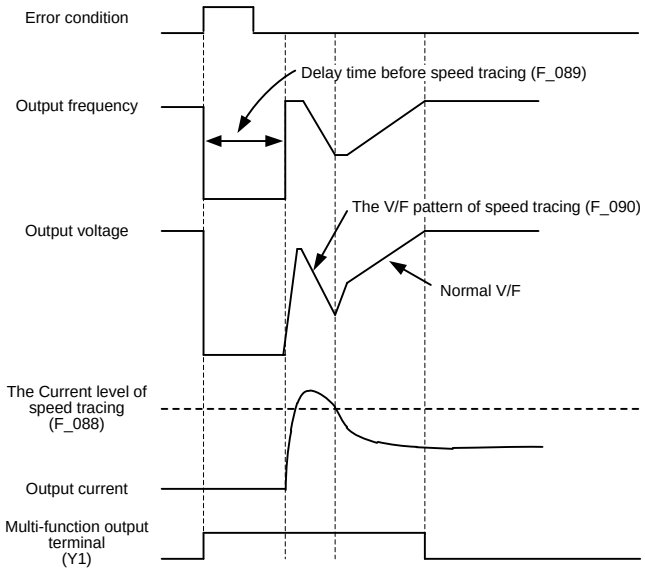
The parameter is activated when F_078 (Operation Selection at Instantaneous Power Failure) sets “1”.

Restart after instantaneous power failure detection (F_058=9)



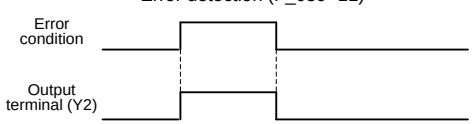
±10: Restart after error condition detection

Restart after error condition detection (F_058=10)



±11: Error detection

Error detection (F_059=11)



K. Frequency Detection

F_061	Constant Speed Detection Range

Refer to the “constant speed detection” for multi-function output terminal.

(refer to page 69)

F_062	Frequency Detection Range

Refer to the “frequency detection” for multi-function output terminal.

(refer to page 69)

F_063	Frequency Detection Level

Refer to “frequency detection” for multi-function output terminal.

(refer to page 69)

L. Automatic Torque Compensation

F_064	Automatic Torque Compensation Range

a.Dynamic compensation by voltage to avoid any insufficient voltage at heavy-duty load.

b.The adjustment method is to minimize the output current by adjusting the parameter. (maximum power factor).

M. Overload Detection Setup

F_065	System Overload Detection (OLO)

0: Disable

1: Enable

F_066	System Overload Detecting Selection

0: During constant speed only.

1: During operation (acceleration, deceleration or constant speed.)

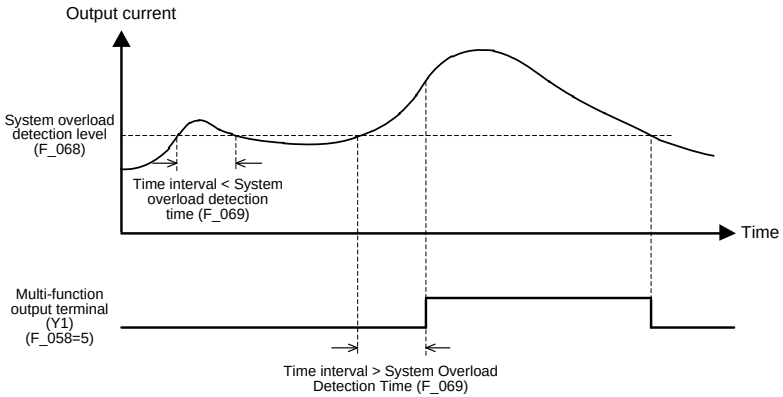
F_067	Output Setting after System Overload

0: Drive keeps operation when the overload is detected.

1: Drive trips to protection when the overload is detected.

F_068	System Overload Detection Level
F_069	System Overload Detection Time

a. System overload detection is shown as below figure:



b. The systeom overload detection is activated when the output current exceeds the value of F_068 (System Overload Detection Level) with the time interval of F_069 (System Overload Detection Time) and the keypad will displayed OL0

c. Detection during operation includes acceleration, deceleration or constant speed.

d. The purpose of overload detection is to prevent the system damage. The detection level and time can be set by user requirements.

N. Stall Prevention Setup

F_070	Stall Prevention Level at Acceleration
F_071	Stall Prevention Level at Constant Speed

The setting range is 30~200% of drive rated current.

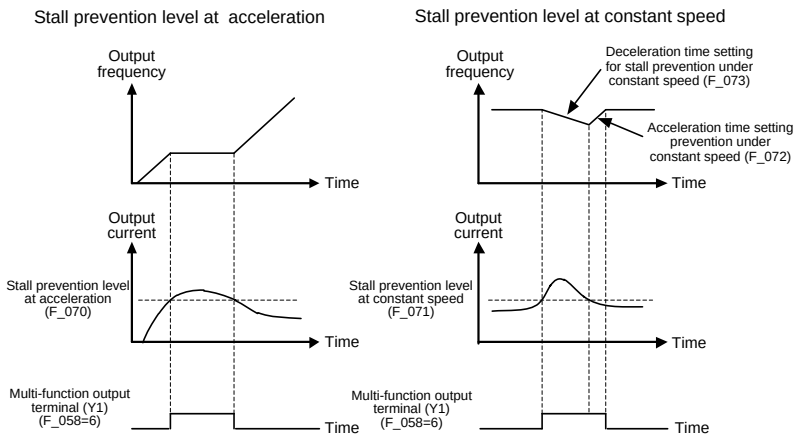
F_072	Acceleration Time Setting after Stall Prevention under Constant Speed

F_073	Deceleration Time Setting for Stall Prevention under Constant Speed

F_074	Stall Prevention Setting at Deceleration

0: Disable
1: Enable

a. The description is as shown in a figure below:



b. When enabling the F_074 (Stall Prevention Setting at Deceleration) and the stall occurs at deceleration, drive will operation at constant speed.

c. According to the actual requirement to disable the F_074 (Stall Prevention Setting at Deceleration), when connecting a dynamic brake unit.

d. If the DC bus voltage of drive is higher than the dynamic brake voltage level during stop, the KP-201C keypad will display "88" and the drive cannot be start by pressing RUN key. If the DC bus voltage is less than the dynamic brake voltage level, the drive will automatically recover to normal and displaying the main display.

O. DC Braking Setup

F_075	DC Braking Level

The current level setting of DC braking.

F_076	Time of DC Braking after Stop

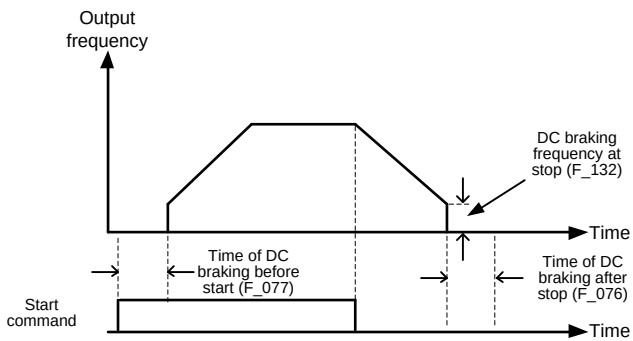
F_077	Time of DC Braking before Start

F_132	DC Braking Frequency at Stop

a.DC braking after stop is to prevent the motor from coasting.

b.DC braking before start is to prevent the motor from rotation due to external force at start.

DC Braking



※ If the frequency command is set below F_032 (Starting Frequency) during operation and the output frequency is below the starting frequency, the DC braking will be activated. The setting value of F_132 is disable at the moment.

P. Drive Status after Power Failure

F_078	Operation Selection at Instantaneous Power Failure

Restart selection after drive instantaneous power failure.

0: Drive cannot be restarted

1: Drive can be restarted
(Refer to the parameter description “Restart after instantaneous power failure detection” of multi-function output setting.)

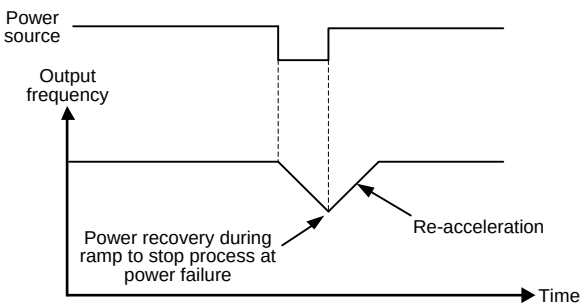
※ Drive cannot be restarted with generator simultaneously when the generator is instantaneous power failure. Please restart the drive after the generator is restarted.

Disposal after power failure.

2: Ramp to stop

3: Drive will re-accelerate again during ramp to stop interval, when the power is restored.
(Refer to the parameter description of F_079, F_103 ~ F_106.)

Re-acceleration after power recovery when the drive during ramp to stop process at power failure condition



F_079	Voltage Level of Ramp to Stop by Power Failure

Set the voltage of power source for ramp to stop.

200V series: 150.0~192.0V

400V series: 300.0~384.0V

F_103	Subtracted Frequency of Deceleration at Power Failure

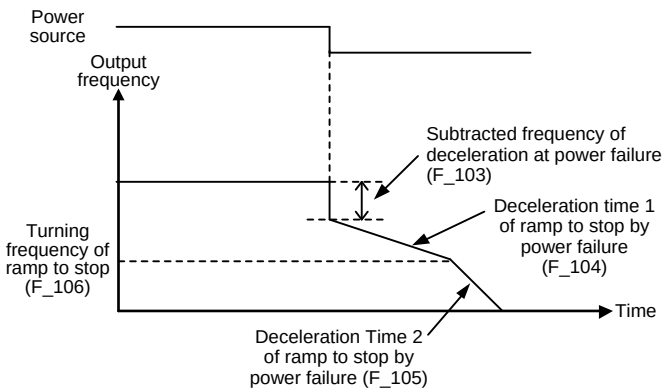
When the power failure, drive will reduce the frequency level before ramp to stop.

Output frequency(after) = Output frequency(before) – Subtracted Frequency.

F_104	Deceleration Time 1 of Ramp to Stop by Power Failure
F_105	Deceleration Time 2 of Ramp to Stop by Power Failure
F_106	Turning Frequency of Ramp to Stop

Set the turning frequency level of ramp to stop when the deceleration time is switched from F_104 setting value to F_105 setting value.

Ramp to stop at power failure



※ The ramp to stop at power failure function is suitable for the inertia load.

⚠ CAUTION

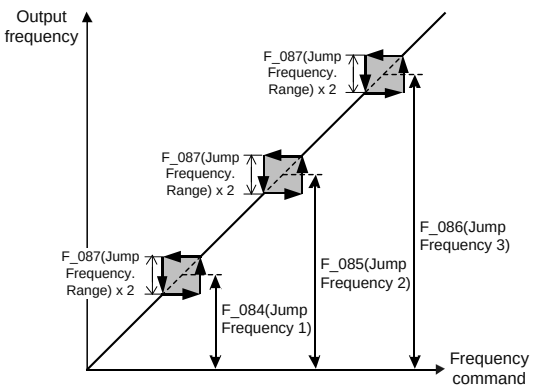
At the function F_078=1 or 3, the drive will automatically restart when the power is restored. Stay away from the motor and machine.

Q. Jump Frequency

F_084	Jump Frequency 1
F_085	Jump Frequency 2
F_086	Jump Frequency 3
F_087	Jump Frequency Range

a. In order to avoid the mechanical resonance, these parameters allow resonant frequency to be jumped.

b. There are three jump frequencies and one jump frequency interval.



R. Speed Tracing

F_088	The Current Level of Speed Tracing
F_089	Delay Time before Speed Tracing
F_090	The V/F Pattern of Speed Tracing

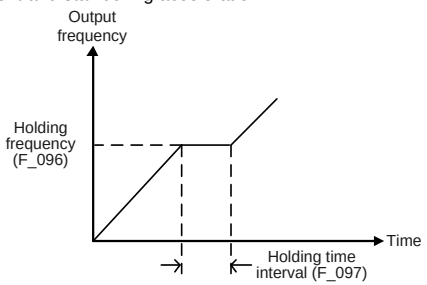
a. The main application of speed tracing function is used for the speed tracing for the restart after instantaneous power failure, fault restart or the speed tracing command by the multi-function input terminal.

b. Refer to speed tracing for multi-function input terminals (page 61,63).

S. Holding Frequency and Time Interval

F_096	Holding Frequency
F_097	Holding Time Interval

※ The main purpose of “holding” is to prevent the over slip of motor causing over-current and stall during acceleration.



T. Other Functions

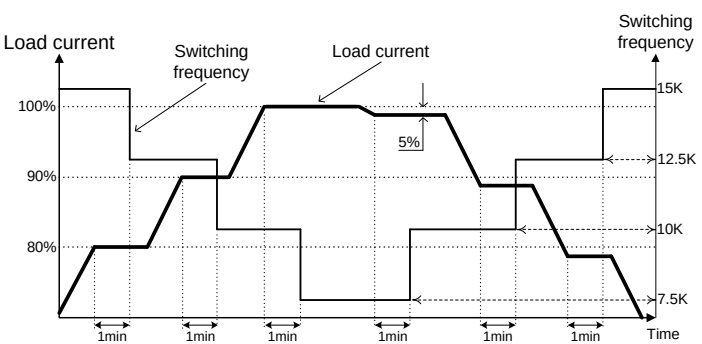
F_080	Auto-restart Times Setting of Error Trip
F_081	Switching Frequency

When the value of F_081 is set to “0”, the switching frequency of PWM voltage will be 800Hz and others switching frequency = F_081×2.5kHz.

The higher switching frequency has less noise. But using higher switching frequency must consider the cable length between drive and motor and must be adjusted according the connection distance between drive and motor. (Refer to the 2-3-6)

※Upper limit of switching frequency
WP5 series: →15kHz

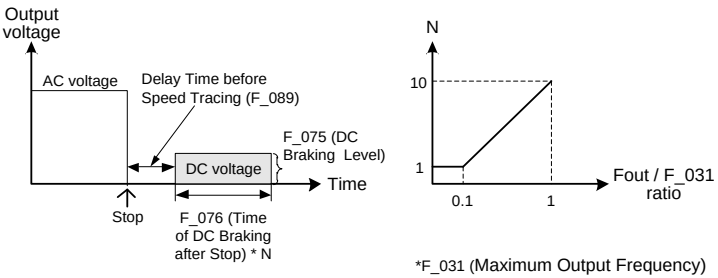
※ Switching frequency will be modulated with load automatically.



F_082	Stop Mode

0: Ramp to stop
1: Coast to stop
2: Coast to stop + DC braking

When the value of F_082 is set to “2”, the operation characteristic is shown as below figure:



*F_031 (Maximum Output Frequency)

When the output current of drive is abnormal at DC braking, appropriately increase the setting value of F_089 (Delay Time before Speed Tracing).

F_083	Reverse Prohibition

0: Reverse rotation allowed
1: Reverse rotation NOT allowed

F_091	Error Record

Display the latest 5 records of errors. Pressing the [▲] or [▼] key can display other error records. (1: the latest error)

F_092	Parameter Setting Lock

0: Parameters are changeable. Maximum frequency cannot exceed 120.0Hz.
1: Parameters are locked. Maximum frequency cannot exceed 120.0Hz.
2: Parameters are changeable. Maximum frequency can exceed 120.0Hz.
3: Parameters are locked. Maximum frequency can exceed 120.0Hz.

F_093	Automatic Voltage Regulation (AVR)

0: Disable
1: Enable

F_094	Drive Overload (OL1)

Prevent the drive damage due to overload.

0: Disable.
1: Thermal protection.
Drive trips to stop when the output current is over 150% of drive rated current for 1 min.(inverse time curve protection)
2: Current limit overload protection.
When the output current exceeds 200%, drive will limit the current to 200% and counting the times for tripping.
3: Both 1 and 2 enable.

F_095	Power Source

The setting value according to the actual power source voltage.
200V series setting range: 190.0 ~ 240.0V;
400V series setting range: 340.0 ~ 480.0V.

a. When the drive is power ON for first time and the power source voltage is lower than the 90% of F_095 setting value, the drive will display “LE” warning message.

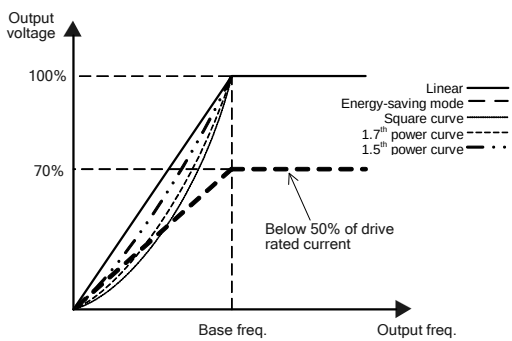
b. After the power ON for drive, the drive displays “LE” message when the power source is lower than the 70% of F_095 setting value.

F_098	Grounding Fault Protection (GF)

0: Disable
1: Enable

F_102	V/F Pattern Selection

0: Linear.
1: Energy-saving mode (auto-adjust V/F pattern according to the load condition.)
2: Square curve.
3: 1.7th power curve.
4: 1.5th power curve.



※ When the drive is used for fan or light-duty load applications, this function can be set to achieve the energy-saving purpose.

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Chapter 6 Operation Procedures and Fault Protection

6-1 Operation Procedures

⚠ DANGER

1. Do Not remove wires when the internal indicator of the drive remains ON.
2. After power off, the use must wait at least 5 minutes. Do Not touch the drive or perform any unwiring actions before drive indicator light (CHARGE) turns off. Use a multimeter with the DC voltage stage to measure the cross voltage between P(+) and N(-) ports (DC bus voltage must be less than 25V).

⚠ CAUTION

1. Check if the shield of wire is broken after wiring is completed to avoid electric leakage or short circuit.
2. Screws on the terminal must be fastened.

A. Verify and check the compatibility between power source, voltage, motor, and drive.

B. Connect the power to drive R/L1, S/L2, T/L3 (three-phases) or R/L1, S/L2 terminals (single-phase).

C. Set all required parameters and functions after power is ON and measure the output voltage of the drive at U/T1, V/T2, W/T3 terminals to check the output voltage with the required value. Press STOP/RESET when completing all verifications.

D. Switch off the power and wait for drive's power indicators off, and then connect drive's U/T1, V/T2, W/T3 terminals to the motor.

E. Operate the motor with the drive by low speed after power ON to verify the validity of the motor rotation direction and then to slowly increase the motor speed.

F. Motor start or stop must be controlled by drive control signal instead of switching the power ON / OFF. The lifetime of the drive will be significantly reduced if the invalid operation using the switch control of the power is applied to motor control.

G. Because the starting current of motor is 6~8 times of rated current, Do NOT install the magnetic contactor between the drive and motor for the motor operation.

6-2 Fault Protection Display and Troubleshooting

a: Description:

The drive has well protection functions to protect drive and motor when faults occur. When the fault occurs, the drive trips by the protection functions and display fault message on keypad. After the fault is troubleshooting, reset the drive by pressing STOP RESET of keypad or commanding the drive to reset through multi-function input terminals by external reset signal

b: Protection and Troubleshooting List:

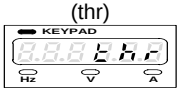
Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(EEr) 	**EEPROM error**	●EEPROM data write fault. ●EEPROM component defected.	●Return the drive to repair, when the fault cannot be eliminated.
(AdEr) 	**A/D converter error**	— — —	Please call customer service for drive repair.
(SC) 	**Fuse open**	●Drive internal fuse open. ●IGBT power module damage.	Please call customer service for drive repair.
(LE1) 	**Under voltage during operation** The internal DC bus voltage level is below 70%.	●Phase failure of input power. ●Instantaneous power off. ●Voltage variation of power source is too high. ●The equipment instantaneous overload causing the high voltage drop at power source.	Increase the power capacity.

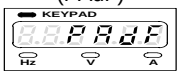
Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(OC) 	**Drive over current** The output current of drive during operation exceeds 220% of drive's rated current.	●The output terminals of drive are short. ●The load is too heavy. ●The acceleration time is too short. ●Drive starts running from zero speed when the motor is under rotation condition. ●Wrong wiring or improper insulation value of motor. ●Add power factor leading capacitor or filtering capacitor on motor terminal。	●Check wires of U/T1,V/T2,W/T3 terminals to verify if there is short between terminals. ●Check the motor and drive compatibility. ●Check if the motor operated in over-rated condition. ●Check the setting of acceleration time.
(GF) 	**Grounding fault** ●The sum of motor phase current is not zero and exceeding the 70% of drive's rated current. ●Grounding fault protection: F_098	The insulation value of motor or motor's wire is improper.	Check the insulation value of motor and the shield of motor's wire.
(OE) 	**Over voltage** ●The internal DC bus voltage of drive is over the protection level. ●100V / 200V series: About DC410V. ●400V series: About DC820V.	●The deceleration time of motor is too short causing the regeneration voltage on capacitor too high. ●Power voltage is too high. ●Surge voltage conduct in drive's input power.	●Increase the value of "deceleration time". ●Add dynamic brake unit. ●Check if the input power is within drive's rated input range. ●Add AC reactor at power input site.

Error Trip Messages of Drive

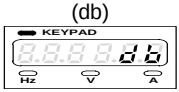
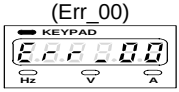
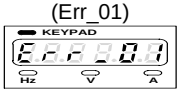
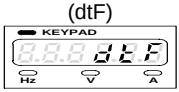
Display	Description	Cause	Troubleshooting
(OH) 	**Drive overheating** The temperature of drive's heat sink reaches the trip point.	●The surrounding temperature is too high. ●The heat sink has foreign body. ●The cooling fan of drive is fault.	●Improve the ventilation system. ●Clean the foreign body on the heat sink. ●Return the drive to replace the cooling fan.
(OL) 	**Motor overload** Operation current exceeds 150% of motor's rated current and reaches the motor overload protection time.	●Motor is overloaded. ●The setting of V/F pattern is not according to the characteristic of motor. ●The current setting of motor's rated current is invalid.	●Check the load of motor. ●Check if the acceleration or deceleration time is too short. ●Check if V/F setting is proper. ●Check if the rated current setting is valid.
(OL1) 	**Drive overload** Operation current exceeds 150% of drive's rated current for 1 minute.	●Motor overload. ●The voltage setting of V/F pattern is too high or too low. ●Drive capacity is too small.	●Check the load of motor if overload. ●Check if the acceleration time is too short. ●Check if V/F setting is proper. ●Select the higher capacity of drive.
(OLO) 	**System overload** ●Load system is overload and the operation current reaches the active level. ●Detection level: F_068. ●Detection time: F_069.	— — —	●Check the usage of mechanical equipment. ●Check the setting value of F_065 ~ F_069.
(thr) 	**External fault**	The multi-function terminal receives the external fault signal.	Clear the external fault command and then press STOP/RESET key.

Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(PAdF) 	**Keypad interruption during copy**	●The connecting wire of the keypad is loosen. ●The keypad jack of the drive is oxidized.	Check the connecting wire of keypad.

Warning Messages of Drive

*When the drive displays below messages, drive stops output. If the abnormal condition is removed, the drive auto-recovering to normal.

Display	Description	Cause	Troubleshooting
(LE) 	**Power source under voltage** The internal DC bus voltage level is below 70%.	The voltage of power source is too low.	Check if the voltage of power source is valid.
(bb) 	**Drive output interruption**	Drive stops the output when the output interruption command is activated.	Clear drive output interruption command.
(Fr) 	**Coast to stop**	Drive stops the output when the coast to stop command is activated.	Clear “coast to stop” command.
(db) 	**Over voltage at stop** The internal DC bus voltage of drive is over the protection level.	DC bus voltage is too high.	Increase the “deceleration time” or use high torque braking method and add dynamic brake unit.
(Err_00)  (Err_01) 	**Err_00: Keypad cable trip. (before connecting)** **Err_01: Keypad cable trip. (connected)**	●The connecting wire of the keypad is loosen. ●The keypad jack of the drive is oxidized.	Check the wire between the keypad and drive.
(dtF) 	**Direction command error**	Forward and reverse commands are inputted to the drive simultaneously	Check the direction command.
(Wr_F) 	**Different software version inter-copy**	The software version of drives are different.	Check up the software version.

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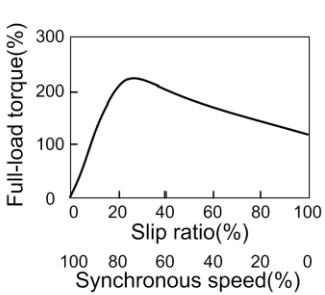
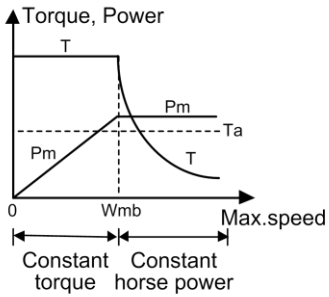
Appendix A Motor Selection and Insulation Measurement

a. Standard Motor

1. Must be used the 3-phase induction motor as load.
2. The speed of cooling fan will decrease when the motor is operated at low speed. Do Not operate the motor at low speed for a long time to prevent the temperature of motor from overheating. For the low speed with long time operation condition, please selecting the motor with independent cooling fan.
3. Standard three-phase induction motor (NEMA B) characteristics as follows:





4. When the motor speed exceeds the rated speed (50/60Hz), the torque will be decreased while the motor speed increasing.
5. Check the motor insulation. The standard requirement is 500V (or 1000V) / 100MΩ above for new motor.

b. Special Motors

a. Synchronous Motor: The higher starting current than the standard motor; lower V/F; the larger drive capacity required.

b. Submersible Motor: The higher rated current than standard motor; Caution the setting of V/F pattern, the minimum speed limit (approximately 30Hz), and the insulation quality. During the installation, be caution of the insulation resistance for motor (including wiring). Add ACL to drive's output terminal.

c. Explosion-proof Motor: Drive does not have the explosion-proof mechanism. Be attentive to installation safety.

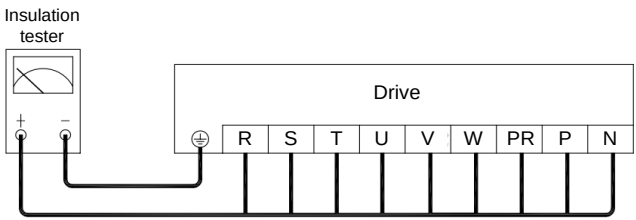
c. Insulation Measurement of Drive and Motor

1. Measure the drive insulation impedance

   1.) Please be extremely caution to following steps to test the main circuit insulation of drive. Any incaution operations while testing the drive insulation may possibly harm operating personnel and cause serious damages to drive.

   2.) Remove all wiring at main circuit terminal and control circuit terminal before the testing is performed. Please follow the below diagram to wire all power terminals in parallel with an insulation tester for drive insulation test.

   3.) Using an insulation tester with DC500V to test the insulation value of drive. The drive insulation impedance must be greater than 20MΩ. If drive insulation impedance is below 20MΩ, replace a drive and contact the customer support for repair service of drive.



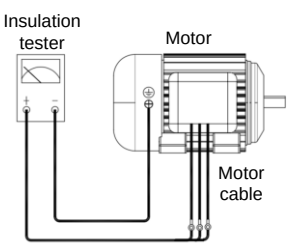
Drive Insulation Impedance Measurement

2. Measure the motor insulation impedance

   a. Remove the cables of motor from U/T1, V/T2, W/T3 terminals of drive before measuring the motor insulation impedance, and then measure the motor insulation impedance (including motor cables) using the insulation tester with DC500V. The motor insulation impedance (including motor cables) must be greater than 20MΩ when connecting to the drive.

   b. If motor insulation impedance is less than 20MΩ, Do Not connect motor with a drive or the drive lifetime may be shorten or the drive may be possibly damaged due to insufficient motor insulation.

   c. Please follow the below connection diagram for motor insulation test. Motor cables must be connected in parallel to the insulation tester with DC500V to test the insulation, and the motor insulation impedance must be greater than 20MΩ to connect the drive.



Motor Insulation Impedance Measurement (including motor cables)

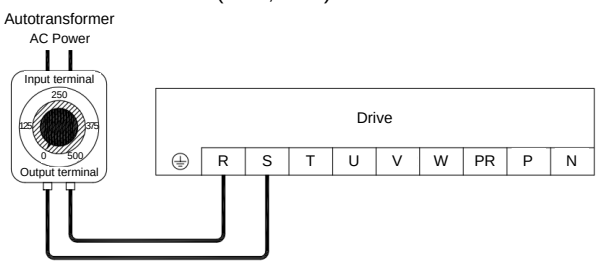
Appendix B Instruction of Drive Charging

⚠CAUTION

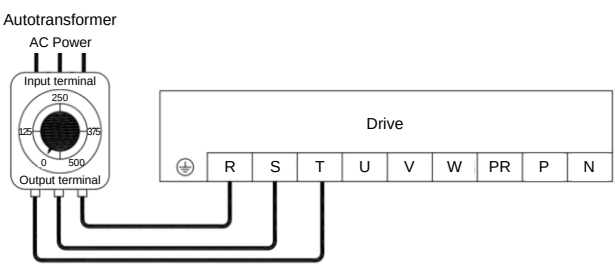
If the drive is unused or stored for a long time, the surface of aluminum foil of electrolytic capacitor within the drive will be cracked causing the L and C value up. This is the common characteristics of capacitor. Therefore, with directly applying the voltage and large transient current to drive after the drive is placed for a long time, the drive may be damaged due to the oxide foil cracked.

a. If the drive is stored or non-used (no power ON) over 1 year, it is necessary to charge the drive by autotransformer from zero volt to the half of drive's rated voltage for 30 minutes and then to apply drive's rated voltage to charge the drive for another 30 minutes.

b. When charging the internal capacitor of drive, the connection between autotransformer and terminals (R/L1, S/L2) of drive are shown as below:



Connection diagram between autotransformer and drive (single-phase series drive)



Connection diagram between autotransformer and drive (three-phase series drive)

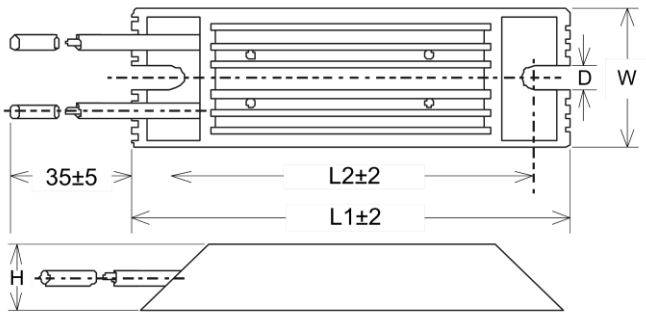
Note: If the drive is already applied with drive rated voltage but doesn't display  , on the display of the keypad, please contact the customer service for repair service.

Appendix C Dynamic Brake Unit and Braking Resistor

a. WP5 Full series built-in the braking transistor

b. Outline of braking resistor (option)

Aluminum Case Resistor



c. Rated specification of braking resistor

Model number	Specification	Dimensions (mm)					Max. weight (g)
		L1	L2	W	H	D	
MHL100-100	100W/100Ω	165	150	40	20	5.3	200
MHL100-400	100W/400Ω	165	150	40	20	5.3	200

※Notes:

1. When the braking is frequently applied, please increase the resistor wattage and add the cooling fan to prevent the resistor from overheating.
2. Aluminum case resistors have the better thermal performance. Please select 1.2 times rated power resistor by using general wirewound type resistor.
3. Please use the heat-resistant wire for the brake resistor wiring.

⚠ DANGER

When the dynamic brake unit is fault, the braking transistor maybe turn on for full cycle. Add the thermal protection device to cut off the power at high temperature to avoid the drive burnout (refer to the section e of Appendix C for wiring of braking resistor).

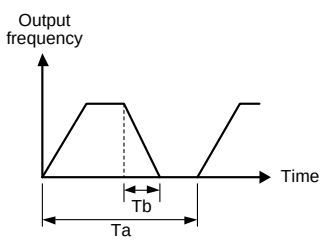
d. Recommending specification of braking resistor

AC 200V Series

Model number of drive	Braking resistor specification		Approximate braking torque (10%ED)
	Minimum specification	Recommending combination	
WP5-2001/2	100Ω/100W	MHL100-100*1	240
WP5-2001/2F			
WP5-2001/2F-1PH			
WP5-2001			140
WP5-2001F			
WP5-2001F-1PH			
WP5-2002			75
WP5-2002F			
WP5-2002F-1PH			

AC 400V Series

Model number of drive	Braking resistor specification		Approximate braking torque (10%ED)
	Minimum specification	Recommending combination	
WP5-4001	400Ω/100W	MHL100-400*1	145
WP5-4001F			
WP5-4002	200Ω/200W	MHL100-400*2 (2pcs in parallel)	180
WP5-4002F			
WP5-4003	133Ω/300W	MHL100-400*3 (3pcs in parallel)	180
WP5-4003F			



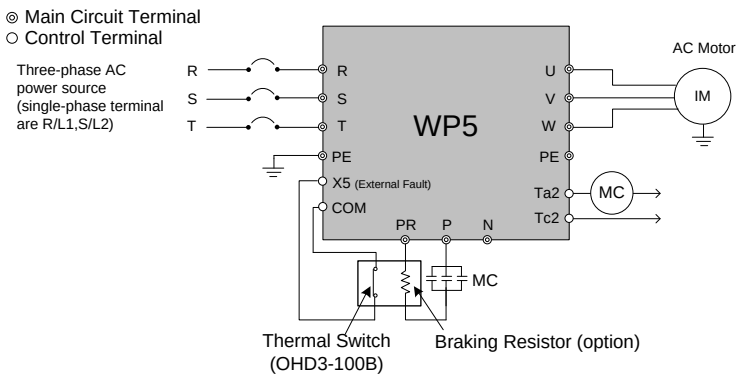
Note:

1. %ED (Effective Duty Cycle) = Tb/Ta*100% (continuous operation time Tb<15 sec).The definition is shown as left figure.
2. The wattages of recommending combination above the table are based on 10%ED.
3. 200V series drive or DBU braking activation voltage is DC 395V
4. 400V series drive or DBU braking activation voltage is DC 790V

e. Wiring Diagram of External Braking Resistor and Thermal Switch

⚠ CAUTION
Strongly recommend to Install the thermal switch for the brake protection to prevent the brake from any possible damages caused by the overheating on the braking resistor. Please refer to the figure 1 and 2 as following for the wiring diagram.

1.) Wiring diagram a



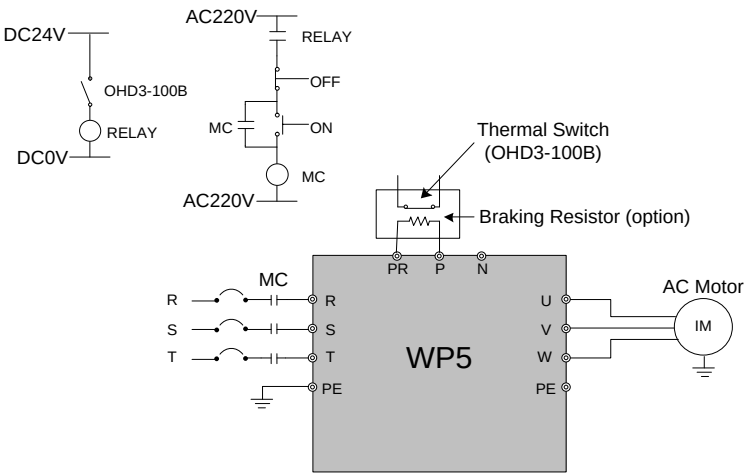
(Figure 1)

(1) Use the thermal switch to protect the braking resistor and then generate an external fault signal to the multi-function terminal (X5) to stop the drive when the braking resistor is overheating and interrupt the discharge loop of braking resistor by output terminals Ta2 / Tc2.

(2) Set the multi-function terminal (X5) to “-7” (External fault).

(3) Set the multi-function terminal (Ta2 / Tc2) to “-11” (Error detection).

2.) Wiring diagram b



(Figure 2)

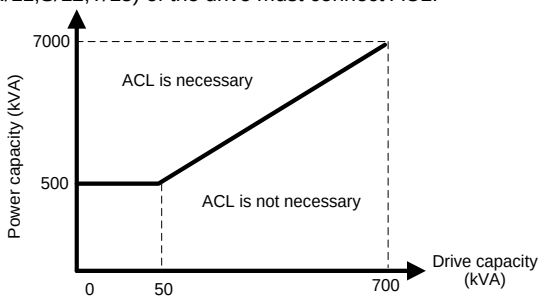
When drive's power is controlled by the magnet contactor (MC), using the thermal switch to control magnet contactor (MC). The magnet contactor (MC) will be disconnected when the braking resistor under overheating condition.

Appendix D Selection of Reactor

⚠ CAUTION
Due to the AC reactor(ACL) possibly produce the heat in use, please Do NOT touch the reactor and caution the environment conditions.

a. Suppress the harmonic current of power and improve the power faction is the main function of the ACL. Connect the ACL at the power source input terminal of the drive also can suppress the surge voltage to protect the drive.

b. When the power capacity is over 500kVA or more than ten times of the rated capacity of the drive, adding the ACL (as below figure) is necessary. The input terminal (R/L1,S/L2,T/L3) of the drive must connect ACL.



c. When the heater (with the SCR), air compressor, high-frequency equipment, or welding machine is installed at the same power source site, the harmonic current will interfere the drive. Thus, add the ACL at the input terminal (R/L1,S/L2,T/L3) of the drive is required.

d. When multiple drives of high horse power are used, due to harmonic wave exerted, adding ACL at the input terminal (R/L1,S/L2,T/L3) of the drives is required to prevent the drives from the possible interference and power quality deterioration.

e. When the cable length between the drive and motor is over 30 meters or multiple motors are used in parallel, please add ACL at the output terminal of the drive.

f. Add the ACL at the input terminal(R/L1,S/L2,T/L3), the power factor is above 75%; Add ACL, the power factor is above 90%.(the specifications of ACL.

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Appendix E Selection of Zero-Phase Radio Frequency Filter

Please read this manual carefully to understand the correct and safety operations before using the product to prevent possible personnel injuries caused by false operations.

⚠CAUTION

(1) Do Not touch zero-phase radio frequency filter(RFI Filter) to prevent the scald burn from the extreme high temperature when the drive is during running.
(2) Move the product with proper method and please be more caution of the sharp parts to avoid possible injuries.
(3) Wiring or inspection must be done by qualified professional technicians.

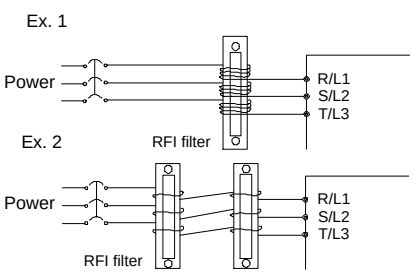
By installing the RFI filter(s), it can reduce the radio frequency interference generated by drive.

1. Specification of product:

	Model	WP5
Environmental Condition	Use Place	(1) Clean place without high temperature, high humidity, or flammable/corrosive gases. (2) If the zero-phase radio frequency filter is installed inside the power distribution panel, the surrounding temperature should not exceed the range(-10 ~ +50℃). (3) The heat will be generated in the zero-phase radio frequency filter, so the space should be reserved for heat dissipation.
	Surrounding Temperature	-10 ~ +50℃(Non-freezing and non-condensing)
	Relative Humidity	90%RH or less (No-condensing atmosphere)
	Vibration	Less than 5.9m/sec^2 (0.6G)

2. Wiring for RFI: Connect the RFI filter in accordance with the following wiring diagram.

(1) Install the RFI filter at the power source site of the drive

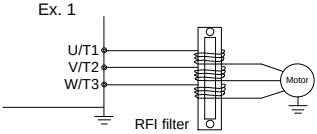


Wind all 3-phase power cords around RFI filter in same direction with same coil numbers, and then connect to the power input terminal of the drive. Caution: Do Not exceed 4 coils to prevent overheating of RFI filter.

Note:
The ground wire or the four-core cable with ground wire cannot pass through RFI filter, otherwise the filtration effect will be reduced.

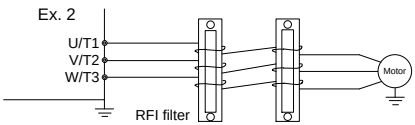
(2) Install the RFI filter at the output site of the drive

Ex. 1



Wind all 3-phase power cords around RFI filter in same direction with same coil number, and then connect to motor terminals of the drive.
Caution: Do Not exceed 4 coils to prevent overheating of RFI filter.

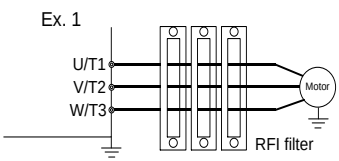
Ex. 2



Note:
The ground wire or the four-core cable with ground wire cannot pass through RFI filter; otherwise the filtration effect will be reduced.

(3) If the power cords are too thick to be winded, pass the power cords through RFI filter directly, and connect two or more RFI filter in series.

Ex. 1



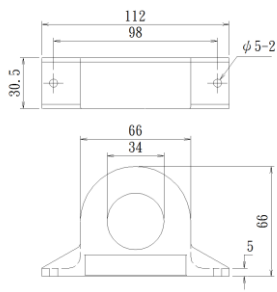
Pass all 3-phase power cords through RFI filter in same direction with same coil number, and then connect to motor terminals of the drive.

Note:
The ground wire or the four-core cable with ground wire cannot pass through RFI filter; otherwise the filtration effect will be reduced.

3. Increase the numbers of RFI filter when the radio frequency is too high.
4. The corresponding for wiring size, maximum winding numbers and RFI filters are shown as below table:

Main circuit wiring size (mm^2)	Maximum winding numbers (three-phase cable)	Model selection of RFI filter
2 / 3.5	4	RFI-01
5.5	3	
8 / 14	2	
22	1	

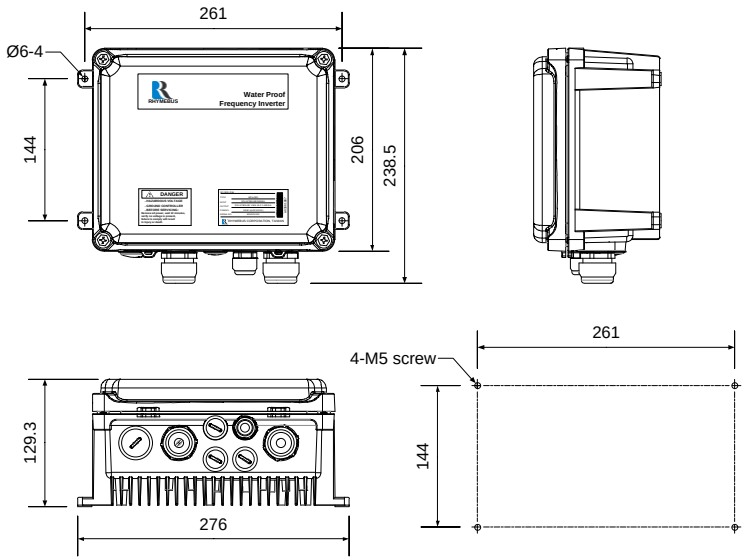
4. Outline dimensions of RFI-01:



(unit: mm)

Appendix F Outline Dimension Drawing of Drives

Model Number: WP5-2001/2 ~ WP5-2002;
WP5-4001 ~ WP5-4003;
WP5-2001/2F-1PH ~ WP5-2002F-1PH;
WP5-2001/2F ~ WP5-2002F;
WP5-4001F ~ WP5-4003F



(unit: mm)

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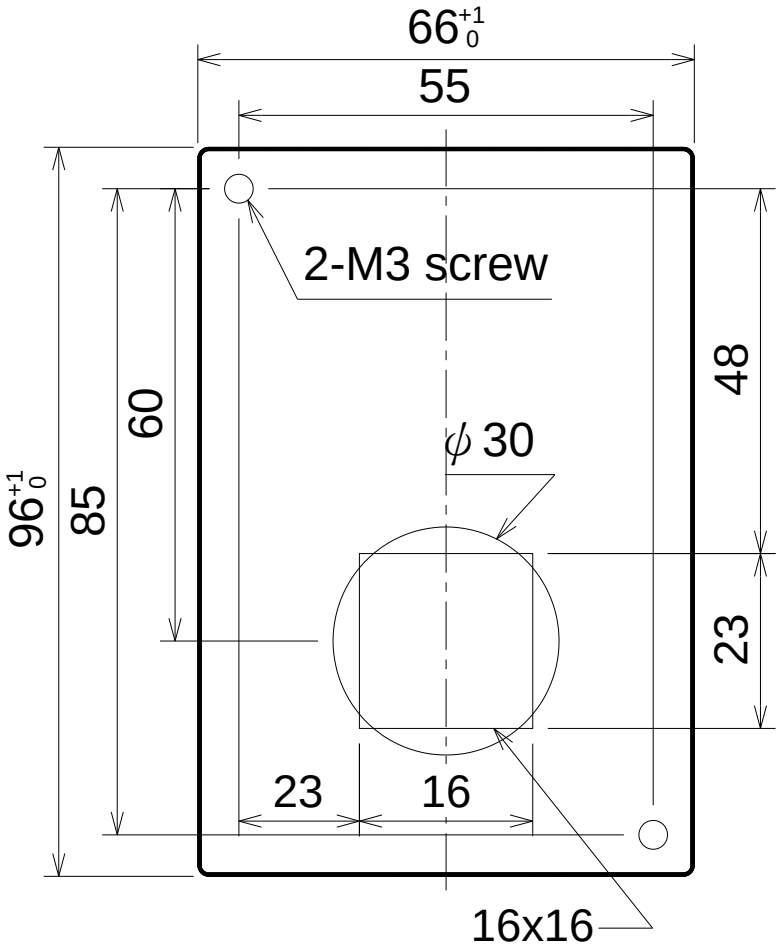
Attachment 1 Dimension of Keypad (KP-201C)



Scale: 1:1
Unit: mm

Attachment 2 Setting Memo

Func.	Description	Def60	Actual Setting Value	Func.	Description	Def60	Actual Setting Value
F_000		-		F_022		Note	
F_001		3		F_023		Note	
F_002		1		F_024		Note	
F_003		1		F_025		Note	
F_004		1		F_026		Note	
F_005		1		F_027		Note	
F_006		1		F_028		Note	
F_007		20.00		F_029		0.0	
F_008		0		F_030		0	
F_009		60.00 (50.00)		F_031		60.00 (50.00)	
F_010		10.0		F_032		0.5	
F_011		20.0		F_033		200V series: 8.0 400V series: 12.0	
F_012		30.0		F_034		60.00 (50.00)	
F_013		0.00		F_035		200V series: 220.0 400V series: 380.0	
F_014		0.00		F_036		0.0	
F_015		0.00		F_037		0.0	
F_016		0.00		F_038		0.0	
F_017		6.00		F_039		0.0	
F_018		60.00 (50.00)		F_040		1.00	
F_019		Note		F_041		0.00	
F_020		Note		F_042		1.00	
F_021		Note		F_043		0.00	

Func.	Description	Def60	Actual Setting Value
F_044		0	
F_045		1.00	
F_046		1	
F_047		20	
F_048		According to the rated current of motor	
F_049		1/3 motor rated current	
F_050		0.0	
F_051		4P	
F_052		3	
F_053		4	
F_054		1	
F_055		2	
F_056		7	
F_057		6	
F_058		3	
F_059		2	
F_060		11	
F_061		2.0	
F_062		2.0	
F_063		0.0	
F_064		1.0	
F_065		0	
F_066		0	
F_067		0	

Func.	Description	Def60	Actual Setting Value
F_068		160	
F_069		0.1	
F_070		170	
F_071		160	
F_072		Note	
F_073		Note	
F_074		1	
F_075		50	
F_076		0.5	
F_077		0.0	
F_078		0	
F_079		200V series: 175.0 400V series: 320.0	
F_080		0	
F_081		1	
F_082		0	
F_083		0	
F_084		0.0	
F_085		0.0	
F_086		0.0	
F_087		0.0	
F_088		150	
F_089		0.5	
F_090		100	

Attachment 2 Setting Memo

Func.	Description	Def60	Actual Setting Value	Func.	Description	Def60	Actual Setting Value
F_091		-		F_114		5	
F_092		0		F_115		3	
F_093		1		F_116		1	
F_094		3		F_117		0	
F_095		200V series: 220.0 400V series: 380.0		F_118		0	
F_096		0.5		F_119		0	
F_097		0.0		F_120		1	
F_098		1		F_121		0.00	
F_099		1		F_122		0	
F_100		2		F_123		0	
F_101		3		F_124		1	
F_102		0		F_125		1	
F_103		3.0		F_126		0	
F_104		Note		F_127		1.00	
F_105		Note		F_128		0.00	
F_106		0.0		F_129		2	
F_107		0.00		F_130		1.00	
F_108		10		F_131		1	
F_109		0		F_132		0.5	
F_110		1		F_133		-	
F_111		20		F_134		-	
F_112		17					
F_113		8					

Note:
The setting of value depends on the horse power (HP) of drive:
0.5 ~ 5HP → 5 sec
7.5 ~ 30HP → 15 sec
40HP above → 30 sec

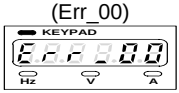
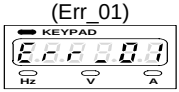
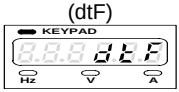
Attachment 3 Fault Display

Error Trip Messages of Drive

Display	Description	Display	Description
(EEr) 	EEPROM error	(OLO) 	System overload
(AdEr) 	A/D converter error	(thr) 	External fault
(SC) 	Fuse open	(PAdF) 	Keypad interruption during copy
(LE1) 	Under voltage during operation	-	-
(OC) 	Drive over current	-	-
(GF) 	Grounding fault	-	-
(OE) 	Over voltage	-	-
(OH) 	Drive overheating	-	-
(OL) 	Motor overload	-	-
(OL1) 	Drive overload	-	-

Warning Messages of Drive

*When the drive displays below messages, drive will stop output. If the abnormal condition is removed, the drive will auto-restart.

Display	Description	Display	Description
(LE) 	Power source under voltage	-	-
(bb) 	Drive output interruption	-	-
(Fr) 	Coast to stop	-	-
(db) 	Over voltage at stop	-	-
(PrEr) 	Software fault	-	-
(Err_00)  Err_00: Keypad cable trip. (before connecting) (Err_01)  Err_01: Keypad cable trip. (connected)		-	-
(dtF) 	Direction command error	-	-
(Wr_F) 	Different software version inter-copy	-	-