RHYMEBUS

AC MOTOR DRIVE
Operation Manual
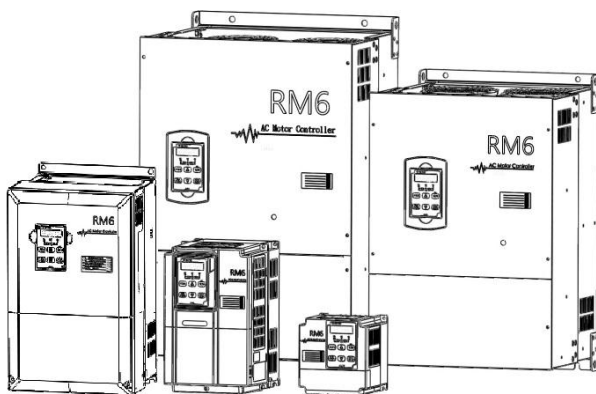
c**UL**us
LISTED

RM6 (9916) series

Quality • Satisfaction • Improvement • Innovation

Rhymebus Corporation

http://www.rhymebus.com.tw

PREFACE

Thank you for using RHYMEBUS RM6 series (9916) AC motor 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 3 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. If the product specification indicates IP00 (the protective level of the equipment structure), any human contact is forbidden to avoid the electric shock. The option of installing AC reactor(ACL) or DC reactor(DCL) shall be very cautious, too.
c. Please note the surrounding temperature shall not exceed 50°C when the installation needs to be placed inside the control panel.
d. For the environment of storage and installation, please follow the instructions of the environmental conditions illustrated in the sections of the common specification of RM6 series (9916).

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⊕, N, N⊙, P1 and PR 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. Do Not connect 200V series drives to the electric source of 346/380/415/440/460/480V.

e. The main circuit and multi-function terminals cannot connect to ground (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 phase 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 more than 10 times of drive's rated capacity.

m. After power off (30HP below models must wait at least 5 minutes; 40HP~75HP models must wait at least 10 minutes; 100HP above models must wait at least 20 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 RM6 series (9916) 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 wires to avoid possible interferences.

c. The control circuit must use a shielded or twisted-pair shielded wires to avoid possible interferences and confirm the grounding.

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.
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 $\boxed{\text{OFF}_{\text{RESET}}}$ key on keypad is ineffective. For safety operation, please install an emergency stop switch.
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 $\boxed{\text{OFF}_{\text{RESET}}}$ key to release the alarm.

⚠ CAUTION
a. Do Not touch the heat sink or brake resistors due to the high heat.
b. Some models attach nylon rope when shipping. Do Not proceed the movement or hanging the drive by this nylon rope to avoid unexpecting accident. Please select a suitable rope to proceed the movement or hanging the drive.

Compliance with UL standards and CSA standards (cUL-listed for Canada)

⚠ **CAUTION**

1. "Risk of Electric Shock"

   Before starting or inspection, turn OFF the power and wait at least 5 minutes, and check for residual voltage between terminal P and N with a multi-meter or similar instrument has dropped to the safe level (50VDC or below), to avoid a hazard of electric shock.

2. These devices are intended for use in Pollution Degree 2 environments.

3. "Maximum surrounding air temperature 50°C for RM6 series(9916).

4. Short circuit rating

   "Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240V maximum for 200V class. Models RM6 series(9916) rated for 200V class input."

   "Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 480V ma ximum for 400V class. Models RM6 series(9916) rated for 400V class input."

   "Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes."

5. Install UL certified branch circuit fuse between the power supply and the drive, referring to the table below.

Single-Phase 200V Series

Model number	Fuse type	Fuse current rating (A)
RM6-2001/2-1PH-9916	Class RK5 (250Vac, 200kA I.R.)	10
RM6-2001-1PH-9916		20
RM6-2002-1PH-9916		50

Three-Phase 200V Series

Model number	Fuse type	Fuse current rating (A)
RM6-2001/2-9916	Class RK5 (250Vac, 200kA I.R.)	5
RM6-2001-9916		10
RM6-2002-9916		15
RM6-2003-9916		20
RM6-2005-9916		30
RM6-2007-9916	Class T (300Vac, 200kA I.R.)	50
RM6-2010-9916		80
RM6-2015-9916		100

Compliance with UL standards and CSA standards (cUL-listed for Canada) (continued)

⚠ CAUTION

Three-Phase 400V Series

Model number	Fuse type	Fuse current rating (A)
RM6-4001-9916	Class RK5 (600Vac, 200kA I.R.)	5
RM6-4002-9916		10
RM6-4003-9916		15
RM6-4005-9916		20
RM6-4007-9916	Class T (600Vac, 200kA I.R.)	30
RM6-4010-9916		30
RM6-4015-9916		40
RM6-4020-9916		60

6. Main circuit terminal wiring
   "Use 75°C Cu wire only."
   "Field wiring connection must be made by a UL Listed and CSA Certified closed loop terminal connector sized for the wire gauge involved. Connector must be fixed using the crimp tool specified by the connector manufacturer."
   See table below for main circuit wire size.

200V Class Series

Model number	Wire size AWG (mm²)		Grounding
	Input (R/L1, S/L2, T/L3)	Output (U/T1, V/T2, W/T3)	
RM6-2001/2-1PH-9916	16 (1.3)	16 (1.3)	16 (1.3)
RM6-2001-1PH-9916	12 (3.3)	16 (1.3)	12 (3.3)
RM6-2002-1PH-9916	12 (3.3)	16 (1.3)	
RM6-2001/2-9916	16 (1.3)	16 (1.3)	16 (1.3)
RM6-2001-9916	16 (1.3)	16 (1.3)	
RM6-2002-9916	14 (2.1)	16 (1.3)	14 (2.1)
RM6-2003-9916	14 (2.1)	14 (2.1)	
RM6-2005-9916	10 (5.3)	10 (5.3)	10 (5.3)
RM6-2007-9916	8 (8.4)	8 (8.4)	
RM6-2010-9916	6 (13.3)	6 (13.3)	8 (8.4)
RM6-2015-9916	4 (21.1)	4 (21.1)	

Compliance with UL standards and CSA standards (cUL-listed for Canada)

⚠ CAUTION

400V Class Series

Model number	Wire size AWG (mm²)		
	Input (R/L1, S/L2, T/L3)	Output (U/T1, V/T2, W/T3)	Grounding
RM6-4001-9916	18 (0.8)	18 (0.8)	18 (0.8)
RM6-4002-9916	18 (0.8)	18 (0.8)	
RM6-4003-9916	16 (1.3)	16 (1.3)	16 (1.3)
RM6-4005-9916	14 (2.1)	14 (2.1)	14 (2.1)
RM6-4007-9916	12 (3.3)	12 (3.3)	12 (3.3)
RM6-4010-9916	10 (5.3)	10 (5.3)	10 (5.3)
RM6-4015-9916	8 (8.4)	10 (5.3)	
RM6-4020-9916	8 (8.4)	8 (8.4)	

INTRODUCTIONS

Features

1. **Setting value and pratical value can be displayed simultaneously on the monitor.**

2. **PID control function for constant pressure.**

3. **With the temperature management and fan control functions to increase the lifetime of cooling fan and saving the energy.**

4. **User can monitor the temperature of drive and setting the pre-alarm level to forecast the maintenance cycle of cooling fan.**

5. **Allow RS-485 communication interface control (Modbus RTU communication protocol).**

6. **System fault protection includes OP, no Fb,OLO,etc.**

7. **9 types monitor display of drive**

8. **Pressure switch (ON/OFF) control mode.**

9. **It's available to connecet three independent monitor(DM-501) displaying state during operation.**

10. **16 sets preset speed control.**

Table of Contents

No Text on This Page

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 RM6-2050-9916) of the drive to verify the product descriptions with the order specification.

ISO 9001 IP20

Model Number →	TYPE	RM6-2050-9916
Input Power Specs →	INPUT	AC 3PH 200-240V 50/60Hz
Output Current & Capability →	OUTPUT	0.1-400.0Hz 7.5kW 33A
Software Number →	PGM NO.	9916-FS1(AZXXXXXX)
Product Serial Number →	SERIAL NO.	CXXXXXXXX

R® Rhymebus Corporation, TAIWAN

1-1-2 The description of nomenclature:

RM6 – 2 050 B (-1PH) - 9916

→ Input Power Phase
-1PH:Single-Phase
Blank:Three-Phase

→ B: build-in braking transistor
Below 200V class15HP, and 400V class 25HP type is
standard complimentary, so it is not indicated in the
nameplate of the drive.
Blank: without Braking Transistor

→ Model code
(see maximum
applicable motor)

→ Input Voltage
1:AC 100~120V
2:AC 200~240V
4:AC 380~480V

→ Product Series

Model code table for maximum applicable motor

Model code	HP/kW		Model code	HP/kW		Model code	HP/kW		Model code	HP/kW	
001/2	0.5	0.4	015	15	11	075	75	55	300	300	220
001	1	0.75	020	20	15	100	100	75	350	350	250
002	2	1.5	025	25	18.5	125	125	90	420	420	315
003	3	2.2	030	30	22	150	150	110	500	500	375
005	5	3.7	040	40	30	175	175	132	600	600	450
007	7.5	5.5	050	50	37	200	200	160	—	—	—
010	10	7.5	060	60	45	250	250	200	—	—	—

Chapter 1   Cautions Before Installation

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 Standard Specifications

1-2-1 Single-Phase 100V Series

Model name (RM6-□□□□-1PH-9916)	1001/2	1001	1002
Maximum applicable motor (HP / kW)	0.5/0.4	1/0.75	1.5/1.1
Rated output capability (kVA)	1	1.6	2.3
Rated output current (A)	2.5	4.2	6
Rated output voltage (V)	Three-phase 200~240V		
Range of output frequency (Hz)	0.1~400.00Hz		
Power source (ϕ, V, Hz)	Single-phase 100~120V 50/60Hz		
Input current (A)	8.8	18	24
Permissible AC power source fluctuation	90~132V 50/60Hz / ±5%		
Overload protection	150% of drive rated output current for 1 min.		
Cooling method	Nature cooling		Fan cooling
Applicable safety standards	—		
Protective structure	IP20		
Weight / Mass(kg)	1.7	1.8	1.8

1-2-2 Single-Phase 200V Series

Model name (RM6-□□□□-1PH-9916)	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	1.9	3
Rated output current (A)	3	5	8
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		
Input current (A)	7	13.5	19
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		Fan cooling
Applicable safety standards	UL508C, CSA C22.2 No. 14-05		
Protective structure	IP20, UL open type		
Weight / Mass(kg)	1.8	1.9	2

※Please refer to page 137 for the single-phase application of 220V.

1-2-2 Three-Phase 200V Series

Model name (RM6-□□□□-9916)	2001/2	2001	2002	2003	2005	2007	2010	2015
Maximum applicable motor (HP / kW)	0.5/0.4	1/0.75	2/1.5	3/2.2	5/3.7	7.5/5.5	10/7.5	15/11
Rated output capability (kVA)	1.1	1.9	3	4.2	6.5	9.5	13	18
Rated output current (A)	3	5	8	11	17	25	33	46
Rated output voltage (V)	Three-phase 200~240V							
Range of output frequency (Hz)	0.1~400.00Hz							
Power source (ϕ , V, Hz)	Three-phase 200~240V 50/60Hz							
Input current (A)	5	6	10	14	18	30	40	60
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	Fan cooling						
Applicable safety standards	UL508C, CSA C22.2 No.14-05							
Protective structure	IP20, UL open type							
Weight / Mass(kg)	1.8	1.8	1.9	2	2.1	5.3	5.4	5.7

Model name (RM6-□□□□-9916)	2020	2025	2030	2040	2050	2060	2075	2100
Maximum applicable motor (HP / kW)	20/15	25/18.5	30/22	40/30	50/37	60/45	75/55	100/75
Rated output capability (kVA)	23	28	34	44	55	67	84	112
Rated output current (A)	60	74	90	115	145	175	220	295
Rated output voltage (V)	Three-phase 200~240V							
Range of output frequency (Hz)	0.1~400.00Hz							
Power source (ϕ , V, Hz)	Three-phase 200~240V 50/60Hz							
Input current (A)	71	98	110	133	176	200	240	280
Permissible AC power source fluctuation	176~264V 50/60Hz / ±5％							
Overload protection	150% of drive rated output current for 1 min.							
Cooling method	Fan cooling							
Applicable safety standards	—							
Protective structure	IP20				IP00 (IP20 OPTION)			
Weight / Mass(kg)	16	16	16	17	40	41	44	61

1

Model name (RM6-□□□□-9916)	2125	2150	2200	2250	—	—
Maximum applicable motor (HP / kW)	125/90	150/110	200/160	250/200	—	—
Rated output capability (kVA)	132	154	223	267	—	—
Rated output current (A)	346	405	585	700	—	—
Rated output voltage (V)	Three-phase 200~240V					
Range of output frequency (Hz)	0.1~400.00Hz					
Power source (ϕ, V, Hz)	Three-phase 200~240V 50/60Hz					
Input current (A)	330	380	550	660	—	—
Permissible AC power source fluctuation	176~264V 50/60Hz / ±5％					
Overload protection	150% of drive rated output current for 1 min.					
Cooling method	Fan cooling					
Applicable safety standards	—					
Protective structure	IP00 (IP20 OPTION)					
Weight / Mass(kg)	89	90	164	167	—	—

1-2-3 Three-Phase 400V Series

Model name (RM6-□□□□-9916)	4001	4002	4003	4005	4007	4010	4015	4020
Maximum applicable motor (HP / kW)	1/0.75	2/1.5	3/2.2	5/3.7	7.5/5.5	10/7.5	15/11	20/15
Rated output capability (kVA)	1.9	3	4.6	6.9	11	14	18	23
Rated output current (A)	2.5	4	6	9	14	18	24	30
Rated output voltage (V)	Three-phase 380~480V							
Range of output frequency (Hz)	0.1~400.00Hz							
Power source (ϕ, V, Hz)	Three-phase 380~480V 50/60Hz							
Input current (A)	3.5	5	8	12	16	22	28	38
Permissible AC power source fluctuation	332~528V 50/60Hz / ±5％							
Overload protection	150% of drive rated output current for 1 min.							
Cooling method	Nature cooling	Fan cooling						
Applicable safety standards	UL508C				UL508C, CSA C22.2 No.14-05			
Protective structure	IP20, UL open type							
Weight / Mass(kg)	1.8	1.9	2	2	5.3	5.4	5.6	5.7

Model name (RM6-□□□□-9916)	4025	4030	4040	4050	4060	4075	4100	4125
Maximum applicable motor (HP / kW)	25/18.5	30/22	40/30	50/37	60/45	75/55	100/75	125/90
Rated output capability (kVA)	30	34	46	56	66	84	114	134
Rated output current (A)	39	45	61	73	87	110	150	176
Rated output voltage (V)	Three-phase 380~480V							
Range of output frequency (Hz)	0.1~400.00Hz							
Power source (ϕ , V, Hz)	Three-phase 380~480V 50/60Hz							
Input current (A)	45	61	74	90	105	130	155	177
Permissible AC power source fluctuation	332~528V 50/60Hz / ±5％							
Overload protection	150% of drive rated output current for 1 min.							
Cooling method	Fan cooling							
Applicable safety standards	－							
Protective structure	IP20					IP00 (IP20 OPTION)		
Weight / Mass(kg)	5.8	16	16	17	18	44	45	47

Model name (RM6-□□□□-9916)	4150	4175	4200	4250	4300	4350	4420	4500	4600
Maximum applicable motor (HP / kW)	150/110	175/132	200/160	250/200	300/220	350/250	420/315	500/375	600/450
Rated output capability (kVA)	160	193	232	287	316	366	446	533	655
Rated output current (A)	210	253	304	377	415	480	585	700	860
Rated output voltage (V)	Three-phase 380~480V								
Range of output frequency (Hz)	0.1~400.00Hz								
Power source (ϕ , V, Hz)	Three-phase 380~480V 50/60Hz								
Input current (A)	196	217	282	355	385	440	540	650	800
Permissible AC power source fluctuation	332~528V 50/60Hz / ±5％								
Overload protection	150% of drive rated output current for 1 min.								
Cooling method	Fan cooling								
Applicable safety standards	－								
Protective structure	IP00 (IP20 OPTION)								
Weight / Mass(kg)	65	91	95	97	159	163	164	217	272

※The weight illustrated in the standard specifications of RM6 series (9916) does not include the weights of AC reactor(ACL) and DC reactor(DCL).

1

Chapter 1   Cautions Before Installation

1-3 Common Specifications

1-3-1 The Features of Control and Operation

<table>
<tr><td rowspan="11" style="writing-mode: vertical">Control Characteristics</td><td>Control method</td><td>• Voltage vector sinusoidal PWM control (V/F control).
• Switching frequency: 800Hz~16kHz.</td></tr>
<tr><td>Range of frequency setting</td><td>0.1~400.00Hz</td></tr>
<tr><td>Resolution of frequency setting</td><td>• Digital Keypad: 0.01Hz
• Analog signal: 0.06Hz / 60Hz</td></tr>
<tr><td>Resolution of output frequency</td><td>0.01Hz</td></tr>
<tr><td>Frequency setting signal</td><td>DC 0~10V, 4~20mA.</td></tr>
<tr><td>Overload protection</td><td>150% of drive rated output current for 1 minute.</td></tr>
<tr><td>DC braking</td><td>• Time of DC braking after stop / before start: 0~20.0sec
• DC braking frequency at stop: 0.1~60Hz
• DC baking level: 0~150% of rated current</td></tr>
<tr><td>Braking torque</td><td>Approximately 20%(with built-in braking resistor connected, braking torque is approximately 100%).</td></tr>
<tr><td>Acceleration/ deceleration time</td><td>• 0sec(coast to stop), 0.0~3200.0sec(independent setting of the acceleration / deceleration).
• The setting of accelerationl time from 0Hz to 60Hz is 0.015sec ~ 19,200,000sec(222 days).
• The setting of deceleration time from 60Hz to 0Hz is 0.015sec ~ 19,200,000sec(222 days).</td></tr>
<tr><td>V/F pattern</td><td>• Linear, Energy saving mode (square of 2, 1.7, 1.5 curve)
• V/F pattern (2 V/F points).
• V/F pattern can be adjusted independently by analog input signal.</td></tr>
<tr><td>Other functions</td><td>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</td></tr>
</table>

Operation Characteristics	Input	Start method	Forward/ Reverse, Communication interface(RS-485 Modbus), 16 sets preset speed.
		Multi-function inputs	4 sets programmable input terminals: X1~X4
			Refer to the function setting description of F_052~F_055
		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-207)	output frequency, frequency command, output voltage, DC bus voltage, output current, motor speed(RPM), machine speed(MEM), terminal status and heat sink temperature, actual pressure and setting pressure.
		External indicator (DM-501)	Independent external display can be added for up to three sets(96mm * 48mm, 5 digits) to show output frequency, frequency command, output voltage, DC bus voltage, output current, terminal status and heat sink temperature, Machine speed, Motor speed.
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 overheat (OH), Drive overheat (Ht), Motor overload(OL), Drive overload(OL1), System overload(OLO), External fault(thr), NTC thermistor sensor fault(ntCF), Keypad interruption during copy(PAdF), Modbus communication overtime(Cot)
		Error trip messages of drive for pressure control	PID feedback signal error(no Fb), Over pressure(OP)
		Warning messages of drive	Power source under voltage(LE), Drive output interruption (bb), Coast to stop(Fr), Dynamic brake transistor over voltage(db), Software fault(PrEr), Drive overhea (Ht), Keypad cable trip before connecting(Err_00), Keypad cable trip during operation(Err_01), Over pressure(OP)

	Cooling method	• Nature cooling: 1001/2, 1001, 2001/2, 2001, 4001,4002 models. • Fan cooling: Three fan control methods for cooling(forced air, operation air, temperature level setting) for other models.
Environment	Atmosphere	Non-corrosive or non-conductive, or non-explosive gas or liquid, and non-dusty
	Surrounding temperature	-10°C (14°F) ~ +50°C (122°F) (Non-freezing and non-condensing)
	Storage temperature	-20°C (-4°F) ~ +60°C (149°F)
	Relative humidity	90% RH or less (No-condensing atmosphere)
	Vibration	Less than 5.9m/sec² (0.6G)
	Altitude	Less than 1000m (3280 ft.)

No Text on This Page

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 provide 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.

Note: RM6 series (9916) is only used for three-phase induction motor control, and must not be used for single-phase motor.

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 RM6 series (9916) 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:
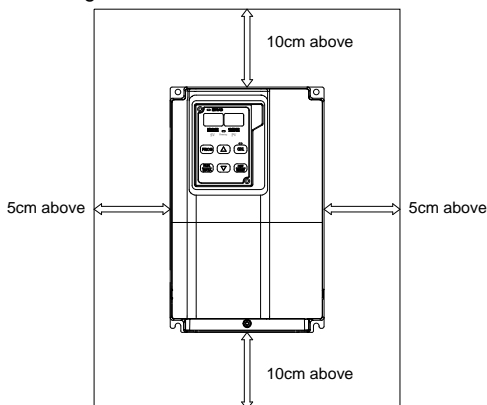
2-2-3 Arrangement: Due to the heat generated at the machine operation, the drive must be installed in the ventilate space. The installations of drive are shown as below figure 1 and figure 2:
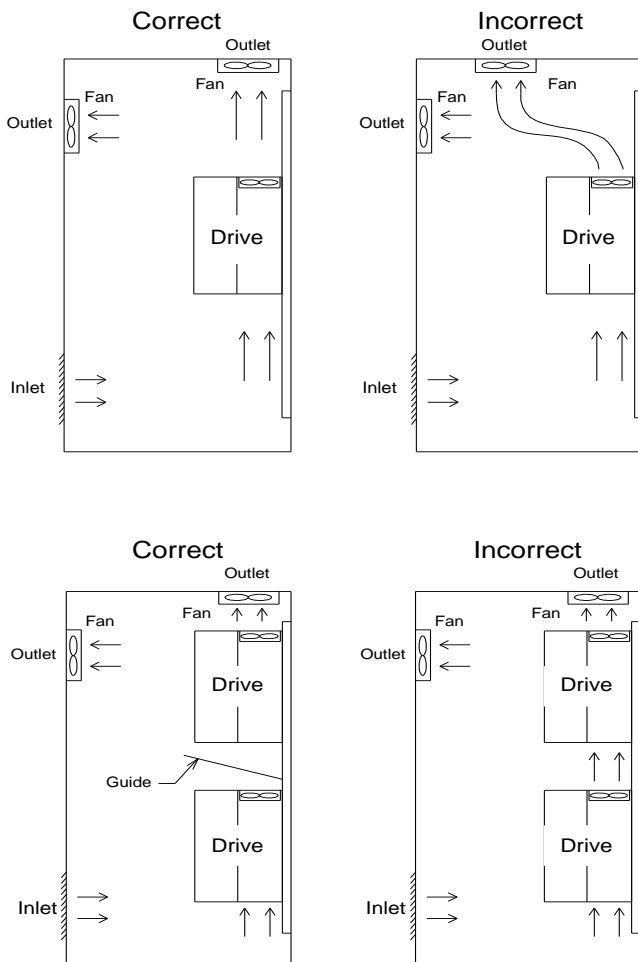
a. Internal cooling

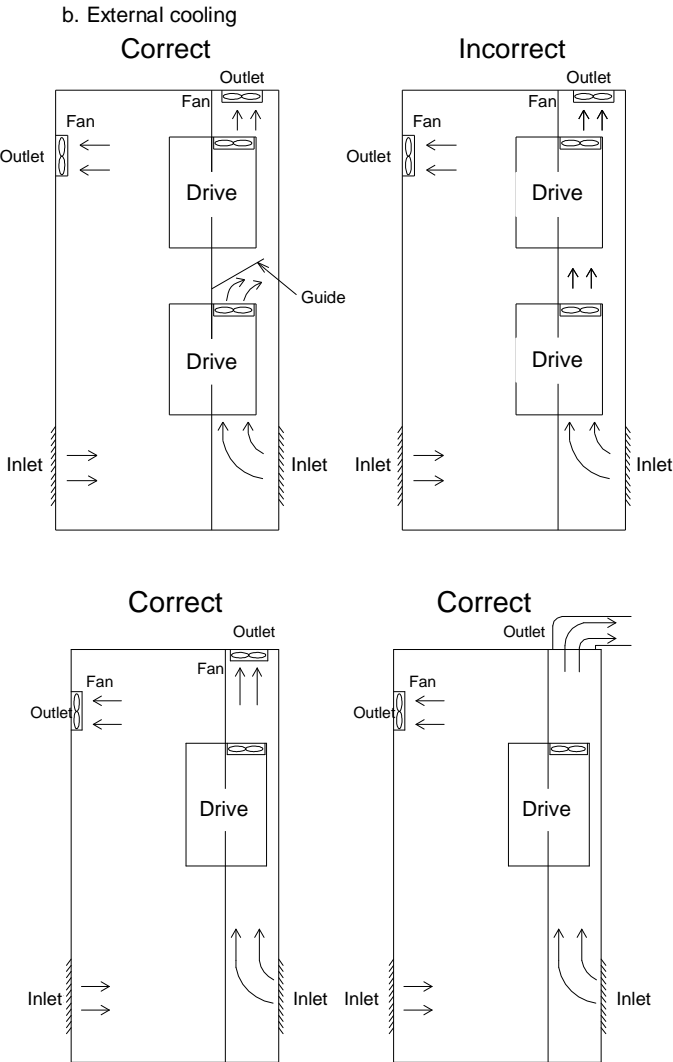Figure 1: Drive mounting inside the cabinet/control panel

11

b. External cooling

Figure 2: Drive mounting outside the cabinet/control panel

Note: The external cooling is suitable for 7.5HP above. Please ensure all air vents to be ventilated using the external cooling.

2-2-4 Specifications of Associated Accessories: The specifications of the accessories must be according to the specifications of the drive. Otherwise, the drive will be damaged and the life span of the drive will be shorten.

⚠ Do Not add any power factor leading capacitor(RC, LC or other capacitance component) between the drive and motor to avoid any accidents.

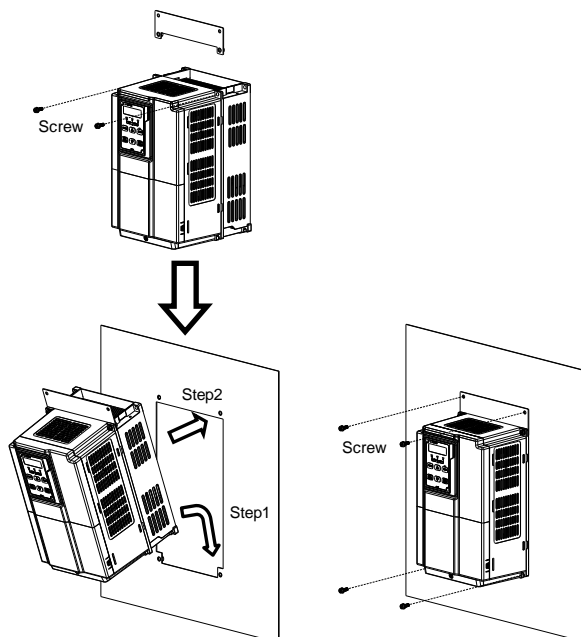**2-2-5 Cleaning of Environment:** The installed location of drive must consider the ventilation, cleanliness and moisture.

2-2-6 Operator: Only the qualified personnel can perform the operation and troubleshooting.

2-2-7 Drive Supporting Frame (option):
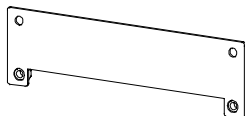
a. Applicable mode: RM6-2007-9916 ~ RM6-2015-9916;
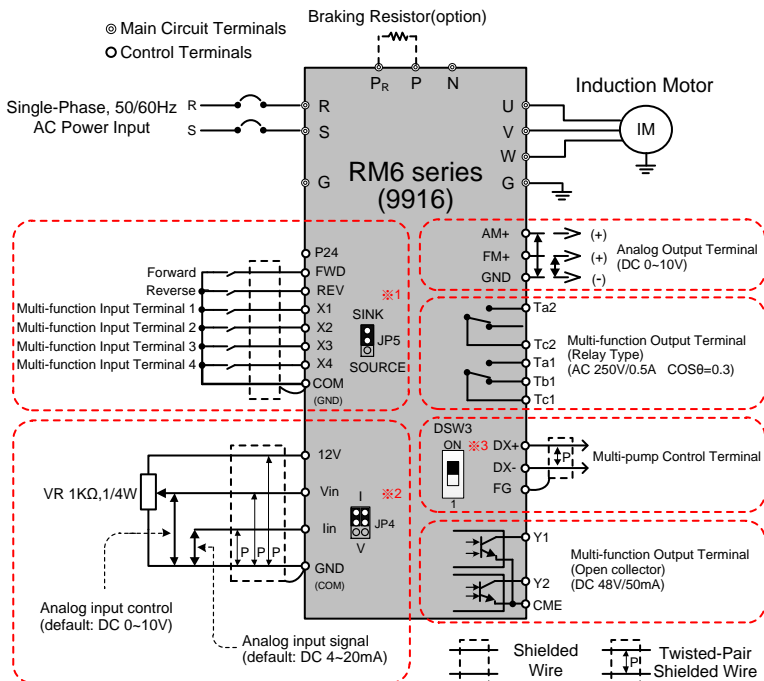RM6-4007-9916 ~ RM6-4025-9916

b. Instruction:

2-3 Descriptions of Terminal and Wiring Diagram

2-3-1 Wiring Diagram

Model: RM6-1001/2-1PH-9916 ~ RM6-1002-1PH-9916;
RM6-2001/2-1PH-9916 ~ RM6-2002-1PH-9916

※1.JP5: SINK / SOURCE selection;

The signal input selection of multi-function input terminal, please see the section **2-3-2 SINK / SOURCE Definition**
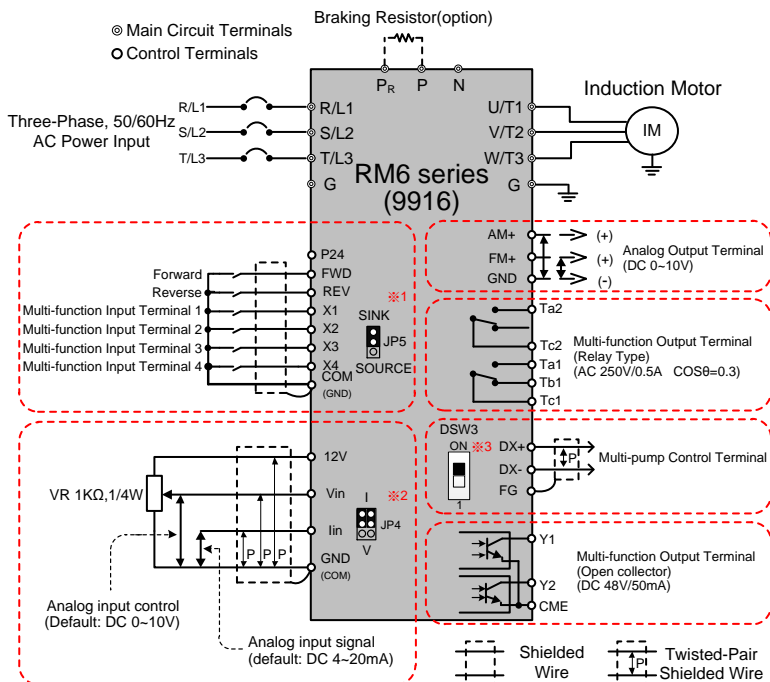
※2.JP4: I / V selection;

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

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

※3.DSW3: The terminal resistor selection for multi-pump control: The internal resistance is 100Ω.

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

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

Model: RM6-2001/2-9916 ~ RM6-2005-9916;
        RM6-4001-9916 ~ RM6-4005-9916

※1.JP5: SINK / SOURCE selection;
        The signal input selection of multi-function input terminal, please see the
        section **2-3-2 SINK / SOURCE Definition**
※2.JP4: I / V selection;
        I position: Iin-GND terminal is inputted with the current signal.(default)
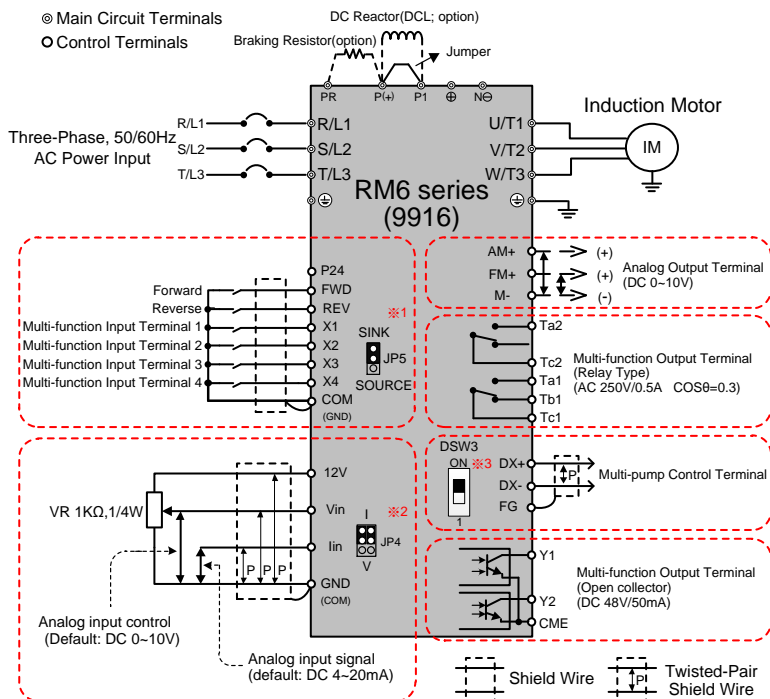   V position: Iin-GND terminal is inputted with the voltage signal.
※3.DSW3: The terminal resistor selection for multi-pump control: The internal
          resistance is 100Ω.
※4.The analog input selection is set by F_126 (default: DC 2~10V(4~20mA))
※5.The tightening torqure of control terminal is 5 lb-in(5.7 kgf-cm).

Model:RM6-2007-9916 ~ RM6-2015-9916;
       RM6-4007-9916 ~ RM6-4020-9916

※1.JP5: SINK / SOURCE selection;

   The signal input selection of multi-function input terminal, please see the section **2-3-2 SINK / SOURCE Definition**
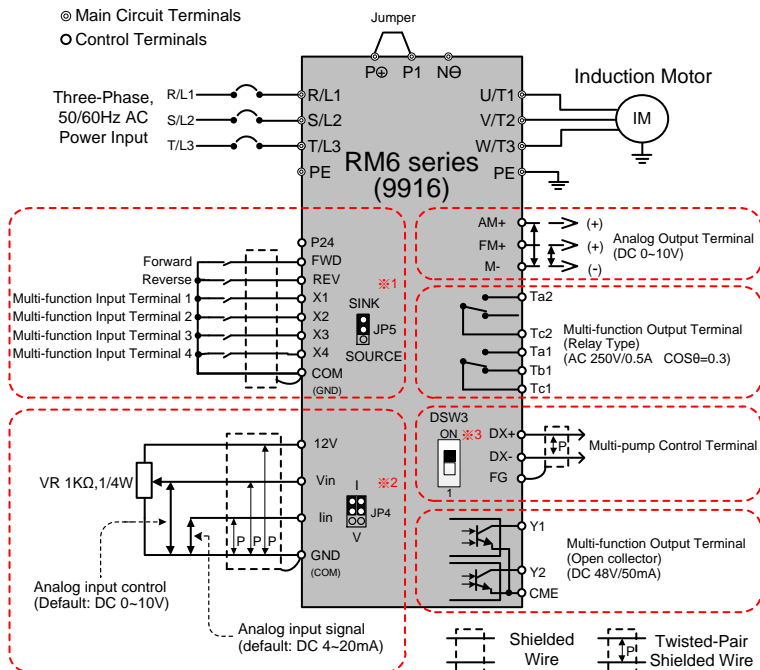
※2.JP4: I / V selection;

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

※3.DSW3: The terminal resistor selection for multi-pump control: The internal resistance is 100Ω.

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

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

Model:RM6-2020-9916 ~ RM6-2075-9916;
RM6-4030-9916 ~ RM6-4075-9916

◎ Main Circuit Terminals
O Control Terminals

※1.JP5: SINK / SOURCE selection;
   The signal input selection of multi-function input terminal, please see the
   section **2-3-2 SINK / SOURCE Definition**

※2.JP4: I / V selection;
   I position: Iin-GND terminal is inputted with the current signal. (default)
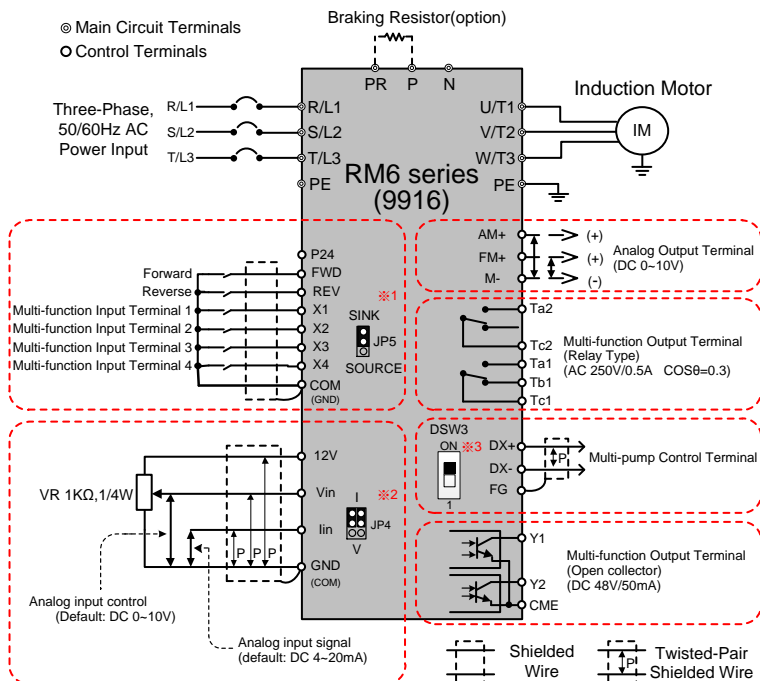   V position: Iin-GND terminal is inputted with the voltage signal.

※3.DSW3: The terminal resistor selection for multi-pump control: The internal
   resistance is 100Ω.

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

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

2

Model:RM6-2020B-9916 ~ RM6-2075B-9916;
RM6-4030B-9916 ~ RM6-4125B-9916

※1.JP5: SINK / SOURCE selection;

　　　The signal input selection of multi-function input terminal, please see the section **2-3-2 SINK / SOURCE Definition**

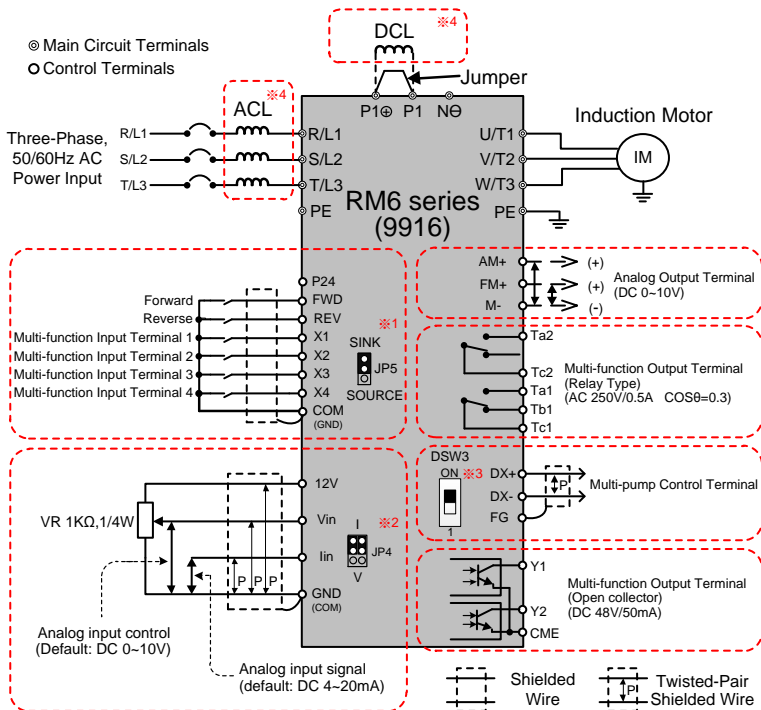※2.JP4: I / V selection;

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

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

※3.DSW3: The terminal resistor selection for multi-pump control: The internal resistance is 100Ω.

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

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

Model:RM6-2100-9916 ~ RM6-2250-9916;
　　　　RM6-4100-9916 ~ RM6-4600-9916

※1.JP5: SINK / SOURCE selection;
　　　The signal input selection of multi-function input terminal, please see the
　　　section **2-3-2 SINK / SOURCE Definition**

※2.JP4: 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.DSW3: The terminal resistor selection for multi-pump control: The internal
　　　resistance is 100Ω.

※4.100HP above drives: AC reactor (ACL) is the standard accessory;
　　　175HP above drives: DC reactor (DCL) is the standard accessory.
　　　Please remove the jumper between P1 and P terminal, when connecting the
　　　external DC reactor (DCL). Do Not remove the jumper, when DC reactor (DCL)
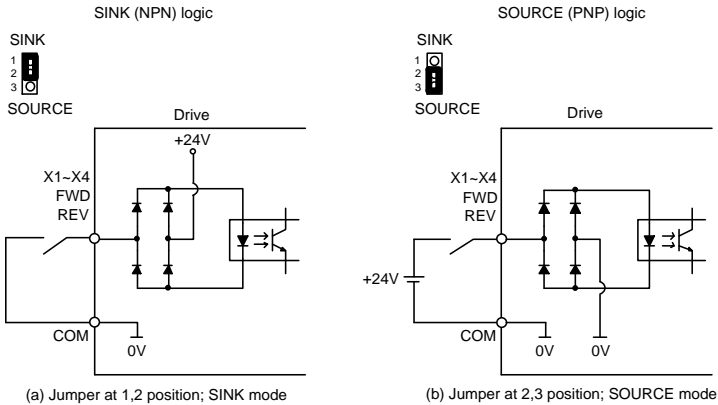　　　does not be connected.

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

※6.The tightening torqure of control terminal is 6.9 lb-in(8 kgf-cm).

2-3-2 SINK / SOURCE Definition

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

SINK (NPN) logic   SOURCE (PNP) logic

(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 X4, 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:

SINK (NPN) logic   SOURCE (PNP) logic

Jumper at 1,2 position; SINK mode   (b) Jumper at 2,3 position; SOURCE mode
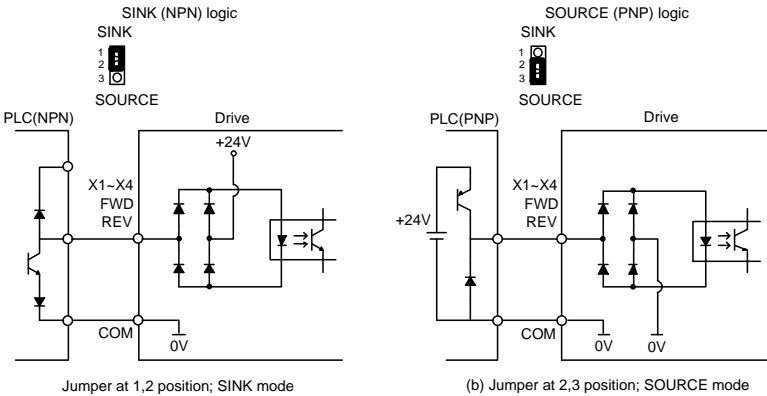
Figure(a) and (b) show two examples by using PLC to control X1 to X4, FWD, or REV terminals with sink or source mode.

2-3-4 Description of Terminals

a. Main Circuit Terminals

| Type	Symbol	Function	Description
Power Source	R,S	AC power source input terminals	Single-phase; sinusoidal power source 110V terminals.
	R,S,T (L1,L2,L3)		Three-phase; sinusoidal power source input terminal.
	⊕, N⊖	DC power source input terminals	External DC power source terminal. ※Only 2007, 2010, 2015, 4007, 4010, 4015, 4020, 4025 models have the terminal.
Motor	U,V,W (T1,T2,T3)	Drive outputs to motor terminals	Output three-phase variable frequency and voltage to motor.
Power and Braking	P(+), N(-)	Dynamic brake unit terminal	The terminals can connect to dynamic braking unit (option).
	P⊕, N⊙		
	P, N		
	P, PR	External braking resistor terminal	The terminals can connect to external brake resistor (option).
	P(+), PR		
	P⊕, PR		
	P(+), P1	External reactor terminal	The terminal can connect to DC reactor (DCL) for improving power factor. The default setting is connected by a jumper.
	P⊕, P1		
Grounding	PE(or G) ⊕	Grounding terminal	Ground the drive in compliance with the NEC standard or local electrical code.

b. Main Circuit Connection

(1)
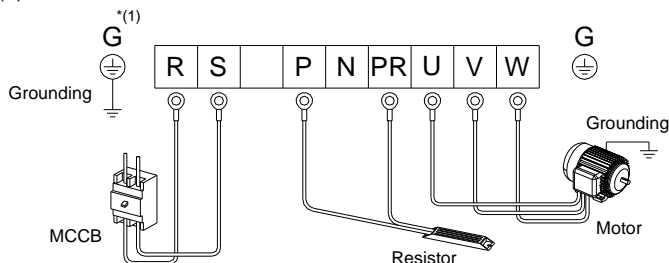
*(1): The grounding marking of 100V series is PE.

Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 1001/2-1PH, 1001-1PH, 1002-1PH 2001/2-1PH, 2001-1PH, 2002-1PH	M4	13.8 (15)	M4	13.8 (15)

(2)
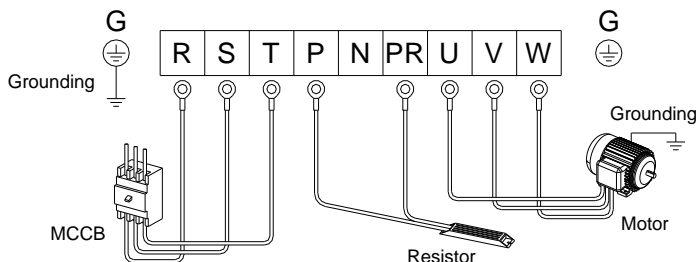
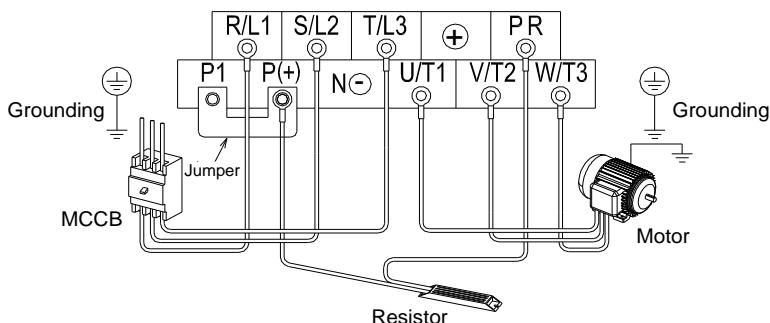| Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2001/2, 2001, 2002, 2003, 2005 4001, 4002, 4003, 4005	M4	13.8 (15)	M4	13.8 (15)

(3)

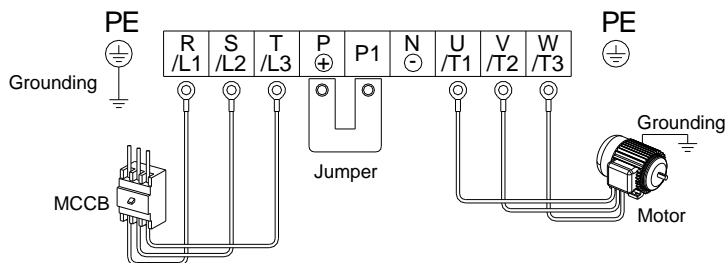| Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2007, 2010, 2015, 4007, 4010, 4015, 4020, 4025	M5	20.8 (24)	M4	13.8 (15)

(4)

Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2020, 2025, 2030, 2040, 4030, 4040, 4050, 4060	M6	69.4(80)	M5	20.8 (24)

2

(5)

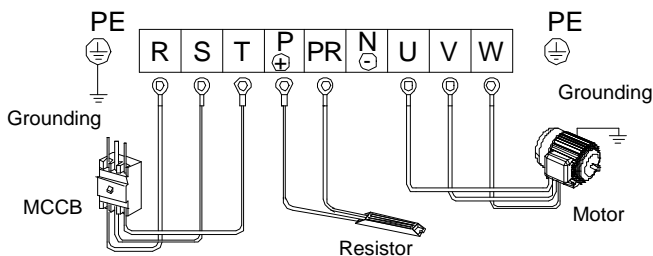| Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2020B, 2025B, 2030B, 2040B; 4030B, 4040B, 4050B, 4060B	M6	69.4 (80)	M5	20.8 (24)

(6)

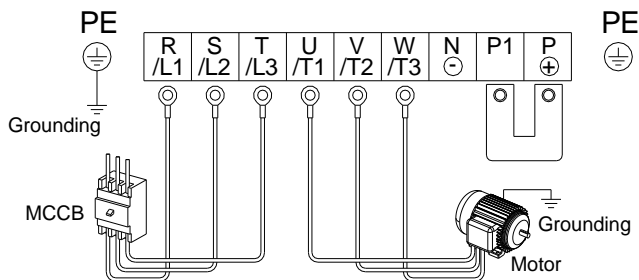| Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2050, 2060, 2075, 4075, 4100, 4125	M8	104 (120)	M8	104 (120)

(7)

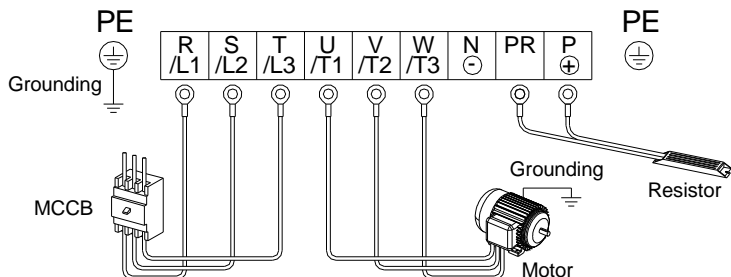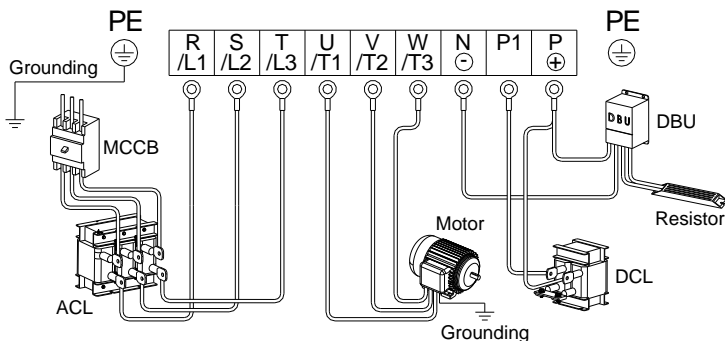| Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2050B, 2060B, 2075B; 4075B, 4100B, 4125B	M8	104 (120)	M8	104 (120)

(7)

Model number	Terminal screw size (except grounding terminal)	Tightening torque lb-in (kgf-cm)	Grounding terminal size	Tightening torque lb-in (kgf-cm)
RM6-_____-9916: 2100, 2125, 2150, 2200, 2250, 4075, 4100, 4125, 4150, 4175, 4200, 4250, 4300, 4350, 4420, 4500, 4600	M12	347 (400)	M8	104 (120)

※**Be cautious of the electrodes of DBU when connecting to P⊕, N⊖ terminals of drive to avoid any possible damages to drive.**

25

2

c. Voltage Selection Board of Cooling Fan
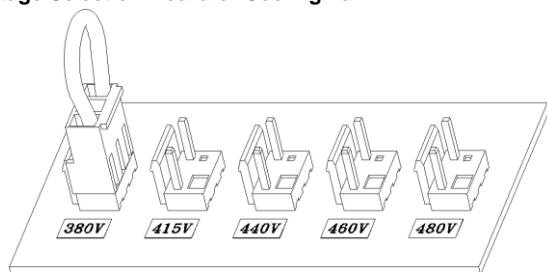
※RM6-4075-9916 above models have the voltage selection board shown in above figure when removing the back cover of the drive. Please carefully select the jumper position according to the power source (actual power voltage level) to avoid the burnout of the fan or the overheating of the drive.
(EX: When the power source is 460V, selecting the position from 380V to 460V)

d. Control Terminals

Type		Symbol	Function	Description
Control circuit terminal	Control power	P24	Power terminal; Control device usage	Output DC+24V; Maximum supplied current is 50mA.
		P12/12V		Output DC+12V; Maximum supplied current is 20mA.
		GND (COM)	Common of analog input control terminal	Common terminal for control power (P12/12V,P24) and analog input terminal (Vin, Iin). Common terminal of COM and GND.
	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

Type		Symbol	Function	Description
Control circuit terminal	Input terminals	COM (GND)	Common of digital input control terminals	Common of digital input control signal terminals. (FWD, REV and X1 ~ X4)
		Vin	Analog input terminal	Input range: DC 0~10V。

		Iin	Analog input terminal	• Input signal selection
				  JP4: I position (current signal)
				  JP4: V position (voltage signal)
				• Input range: DC 4~20mA (2~10V) or
				             DC 0~20mA (0~10V)
				• The function is set by F_126.

Control circuit terminal	Output terminals	FM+ AM+	Analog output terminals	• Voltage meter with 10V full scale spec. (meter impedance: 10kΩ above) • Maximum output current: 1mA
		M-	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: Detection during operating). • 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.
		Y2		• Capacity: DC48V, 50mAMax
		CME		Common terminal of Y1, Y2.
		FM_P	Reserved	

e. Control Terminals and Switch for External Communication

Type	Symbol	Function	Description
External Communication	DX+	Signal transmission terminal(+)	• Connect the RM6 series (9916) drive by transmission cable, when the drive is controlled by RS-485 communication interface. • Communication protocol: Modbus
	DX-	Signal transmission terminal(-)	
	FG	Grounding terminal of signal transmission	Grounding terminal of shielding wire.
Terminal resistor	DSW3	Terminal resistor switch	• When external device control multiple drives, switch the DSW3 to "ON" position at the first and last drive • Terminal resistance: 100Ω

Note: The total length of connecting cable can not exceed 500 meters.

2-3-5 Control Board

(1) RM6-1001/2-1PH-9916 ~ RM6-1002-1PH-9916
(2) RM6-2001/2-1PH-9916 ~ RM6-2002-1PH-9916
(3) RM6-2001/2-9916~RM6-2005-9916
(4) RM6-4001-9916 ~ RM6-4005-9916
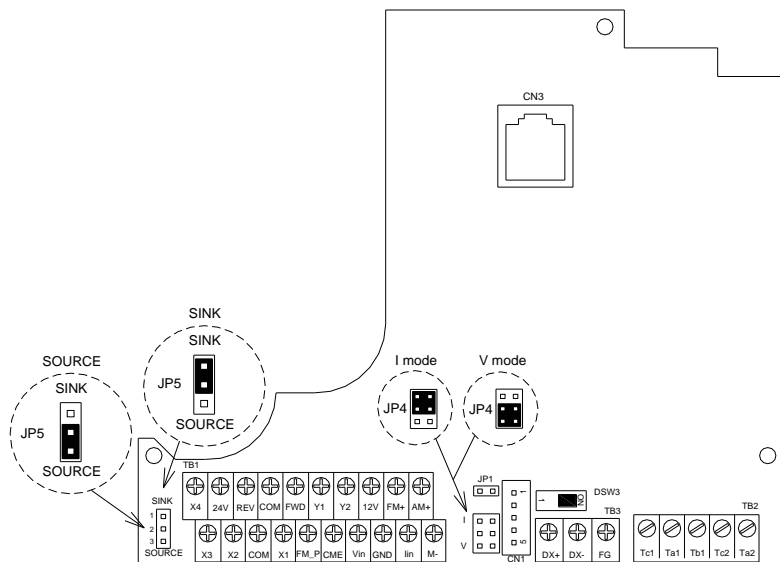
CN1: External indicator (DM-501) socket.

CN3: Digital keypad (KP-207) socket.

TB1: Input/Output terminals.

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

TB3: Connection terminals for external communication interface.

JP1: Input impedance selection of Iin (short circuit: 250Ω ; open circuit: 500Ω); Default: short circuit.

JP4: Input signal type selection of Iin (voltage/current). Default: current

JP5: SINK/SOURCE mode selection of X1 to X4, FWD or REV (refer to page 19). Default: SINK

DSW3: Terminal resistor switch (ON: enable; 1: disable).

(5) RM6-2007-9916 ~ RM6-2250-9916
   RM6-4007-9916 ~ RM6-4600-9916

CN1: External indicator (DM-501) socket.

CN2: Digital keypad (KP-207) socket.

TB1: Input/Output terminals.

TB3: Connection terminals for external communication interface.

JP1: Input impedance selection of Iin (short circuit: 250Ω ; open circuit: 500Ω);
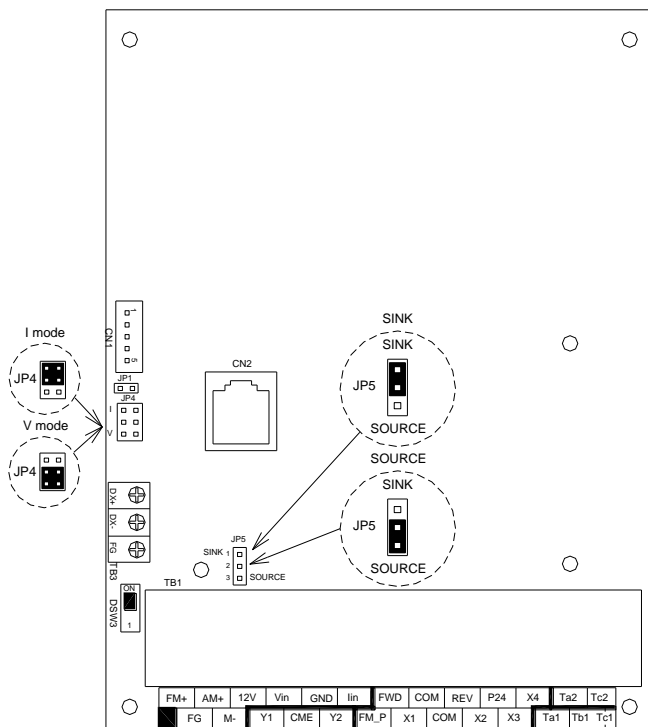   Default: short circuit.

JP4: Input signal type selection of Iin (voltage/current). Default: current

JP5: SINK/SOURCE mode selection of X1 to X4, FWD or REV (refer to page 19).
     Default: SINK

DSW3: Terminal resistor switch (ON: enable; 1: disable).

29

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 / Rated power	10m	20m	30m	50m	100m	100m above
1/2~5HP	10KHz	7.5KHz	5KHz	2.5KHz	800Hz	800Hz
7.5~10HP	10KHz	7.5KHz	5KHz	2.5KHz	800Hz	800Hz
15~30HP	7.5KHz	5KHz	2.5KHz	2.5KHz	800Hz	800Hz
40~75HP	5KHz	5KHz	2.5KHz	2.5KHz	800Hz	800Hz
100~600HP	2.5KHz	2.5KHz	2.5KHz	800Hz	800Hz	800Hz

The setting of switching frequency is determined by F_081

				Note:
F_081	=0	Switching frequency	800Hz	1. When the setting value of F_081 exceeds 4(10kHz) in RM6 series (9916) drive, recommending decrease the output current or selecting the higher rated output capacity.
	=1		2.5KHz	
	=2		5KHz	
	=3		7.5KHz	
	=4		10KHz	2. Do Not adjust the setting value of switching frequency (F_081) of 75HP above drives while the drive is running.
	=5		12.5KHz	
	=6		16KHz	

b. The wiring length between 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.
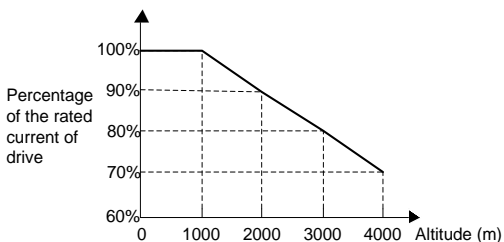
d.Recommend wire size and Molded Case Circuit Breaker(MCCB)

Single-Phase 100V Series

Model number RM6-_____-9916	Input current (A)	MCCB (A)	Input wire size (R/L1,S/L2,T/L3) (mm²)	Control circuit wire size (mm²)	Grounding wire size (mm²)
1001/2-1PH	8.8	15			
1001-1PH	18	30	2.0	0.75~1.25	2.0
1002-1PH	24	50			

Single-Phase 200V Series

Model number RM6-_____-9916	Input current (A)	MCCB (A)	Input wire size (R/L1,S/L2,T/L3) (mm²)	Control circuit wire size (mm²)	Grounding wire size (mm²)
2001/2-1PH	7	10			
2001-1PH	13.5	20	2.0	0.75 ~ 1.25	2.0
2002-1PH	19	50			

Three-Phase 200V Series

Model number RM6-_____-9916	Input current (A)	MCCB (A)	Input wire size (R/L1,S/L2,T/L3) (mm²)	Control circuit wire size (mm²)	Grounding wire size (mm²)
2001/2	5	5	2.0		2.0
2001	6	10	2.0		2.0
2002	10	15	2.0		2.0
2003	14	20	2.0		2.0
2005	18	30	3.5		3.5
2007	30	50	5.5		5.5
2010	40	80	8		8
2015	60	100	14		14
2020	69	110	22		22
2025	85	125	22		22
2030	103	150	38	0.75 ~ 1.25	38
2040	132	200	60		60
2050	176	300	80		80
2060	200	350	100		100
2075	240	400	60*2		60*2
2100	280	500	100*2		100*2
2125	330	500	150*2		150*2
2150	380	600	200*2		200*2
2200	550	800	200*2		200*2
2250	660	1000	250*2		250*2

2

Three-Phase 400V Series

| Model number RM6-_____-9916	Input current (A)	MCCB (A)	Input wire size (R/L1,S/L2,T/L3) (mm²)	Control circuit wire size (mm²)	Grounding wire size (mm²)
4001	3.5	5	2.0		2.0
4002	5	10	2.0		2.0
4003	8	15	2.0		2.0
4005	12	20	3.5		3.5
4007	16	30	3.5		3.5
4010	22	30	5.5		5.5
4015	28	40	8.0		8.0
4020	38	60	8.0		8.0
4025	45	70	14		14
4030	52	90	22		22
4040	70	100	22		22
4050	84	125	22		22
4060	100	150	38	0.75 ~ 1.25	38
4075	130	200	60		60
4100	155	250	80		80
4125	177	300	100		100
4150	196	300	60*2		60*2
4175	217	350	100*2		100*2
4200	282	400	100*2		100*2
4250	355	600	150*2		150*2
4300	385	600	200*2		200*2
4350	440	700	250*2		250*2
4420	540	800	250*2		250*2
4500	650	1000	325*2		325*2
4600	800	1200	325*2		325*2

Cautions:
  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.

2-4 The Setting and Installing of Pessure Transducer
Wiring for Pessure Transducer
Example:

Pressure Transducer
Power Supply:DC24V
Output Single:DC4~20mA
Accuracy:0~10bar
±1% F.S.

Drive

JP4
I

V

P24   Iin
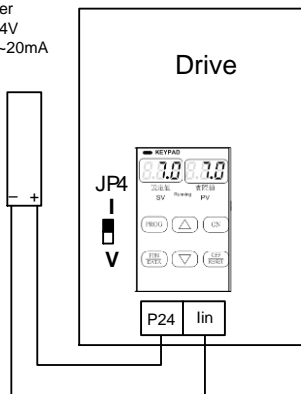
Parameter Setting
Range of Pessure Transducer :0~10bar

	Func.	Setting	**Description**
Analog Input Selection	F_125	Setting 4	Feedback signal cammand
Iin Selection	F_126	Setting 0	4~20mA
Maximum Value of Sensor	F_151	Setting 10	Corresponding value of pessure transducer 20mA
Minimum Value of Sensor	F_152	Setting 0	Corresponding value of pessure transducer 4 mA
PID Selection	F_153	Setting 1～4	Forward command, Postposition D
JP4 check for swithching gear at I position			

※Others feedback signal setting refer to Y definition on page 110.

No Text on This Page

Chapter 3 The Setting of Keypad

3-1-1 Functions of Keypad (KP-207)
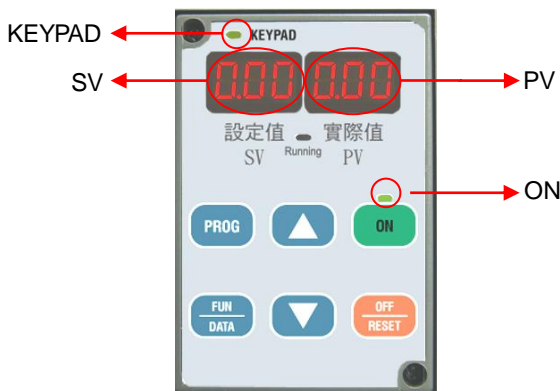
3-1-1 Indicators of Keypad

Symbol	Name	Description
KEYPAD	Command source indicator	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.
SV	Setting pressure indicator	Indicate the setting pressure
PV	Actual pressure indicator	Indicate the actual pressure
ON	Operation indicator	Blinking: Under acceleration or deceleration ON: Constant speed OFF: Stop

3

3-1-2 Keys of Keypad (KP-207)

PROG key

FUN/DATA key

UP key

Operation key

DOWN key

OFF/RESET key
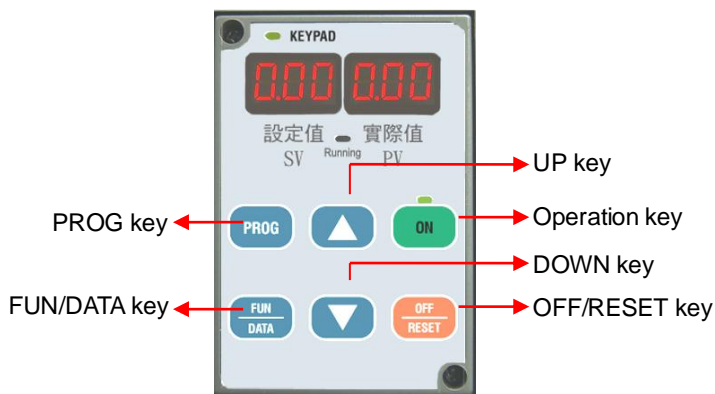
3-1-2 Keys of Keypad

| Symbol	Name	Description
PROG	Function key	1.Enter the function setting mode 2.Back to the monitor mode
FUN DATA	Function/ Parameter key	1.Enter the parameter setting mode 2.Back to the function setting mode 3.Switch the monitor mode
▲	UP key	Up/down key of changing functions and parameters
▼	DOWN key	
ON	Operation key	Drive start key
OFF RESET	Off/Reset key	1.Drive stops (Cut off the output frequency of U/T1,V/T2,W/T3 terminals) 2.Fault reset.

Note:

● KP-207 cables: Only used with 8-pin telephone cable (flat) or network cable (AMP)

● 8-pin telephone cable: The cable length must be within 5 meters.

● Network cable (AMP): The cable length can be over 5 meters (the longest length is 100 meters)

● There are 6 specifications length of network cable (AMP) for KP-207 keypad (1M, 2M, 3M, 5M, 7M, 10M).

3

3-2 The Operation of Keypad(KP-207) 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:
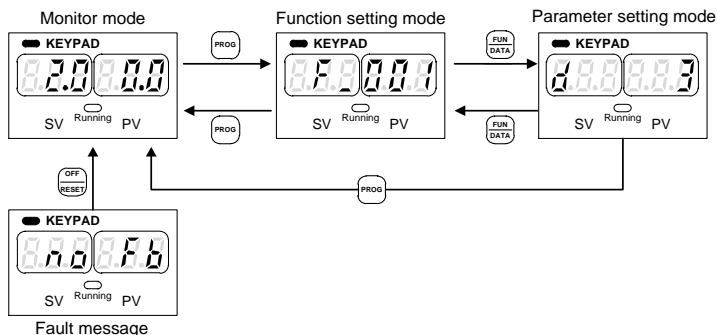
The operation steps are shown as below table (by $dEFC3$ or $dEFC4$)

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 OFF RESET key to clear the fault and return to the monitor mode.	

37

3

3-2-2 Description of Monitor Mode

(1)Air compressor mode ($\mathit{dEFC3}$ or $\mathit{dEFC4}$)

There are nine displays can be selected in the monitor mode. Press FUN/DATA key to switch the display in accordance with below sequence under monitor mode.
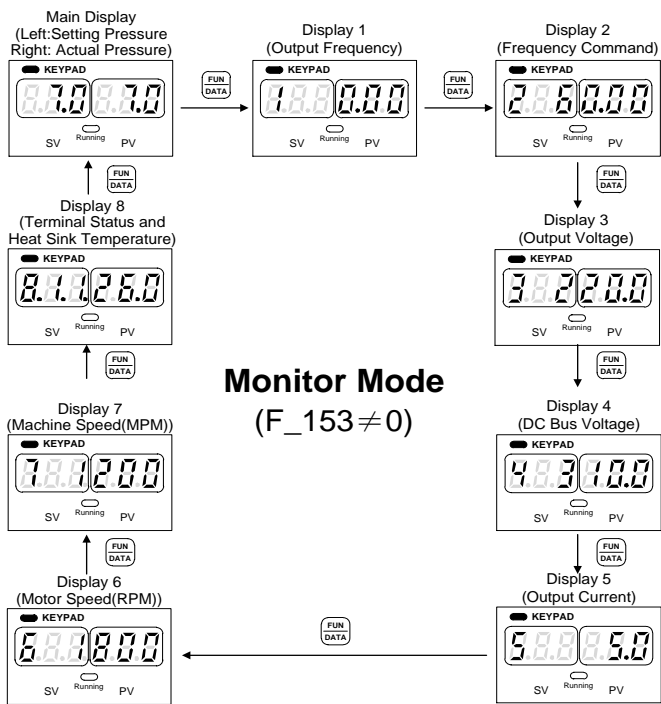
Monitor Mode
(F_153≠0)

The descriptions of monitor modes are shown as below table
(by $\mathit{dEFC3}$ or $\mathit{dEFC4}$ setting)

Name	Description	Display
Display 0	Setting value(SV) and practical value(PV)	KEYPAD SV Running PV
Display 1	Output frequency	KEYPAD SV Running PV
Display 2	Frequency command	KEYPAD SV Running PV

Name	Description	Display
Display 3	Output voltage	KEYPAD $3\,8.2\,2\,0.0$ SV Running PV
Display 4	DC bus voltage	KEYPAD $4\,8.3\,1\,0.0$ SV Running PV
Display 5	Output current	KEYPAD $5\,8.8\,8.5.0$ SV Running PV
Display 6	Motor speed(RPM)	KEYPAD $6\,8.8\,8\,0\,0$ SV Running PV
Display 7	Machine speed(MPM)	KEYPAD $7\,8.9\,2\,0\,0$ SV Running PV
Display 8	Terminal status and heat sink temperature	KEYPAD $8.1.1.2\,6.0$ SV Running PV
Display 9	Setting pressure and actual pressure	KEYPAD $8.7.0\,8.7.0$ SV Running PV

a. In F_153≠0 close-loop condition , F_006=Disable (Selection of Main Display).

b. The significance of seven-segment displays of Display 8 (Terminal status and heat sink temperature) is shown as below figure.
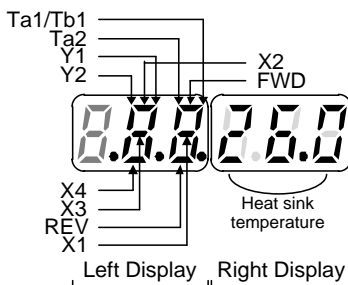
*grey-color digit in above figure means blinking

Right display: The temperature of heat sink.
Left display:

1. Blinking number "8": Indicate the Display 8
2. Horizontal line of seven-segment displays: X1~X4, FWD, REV terminals
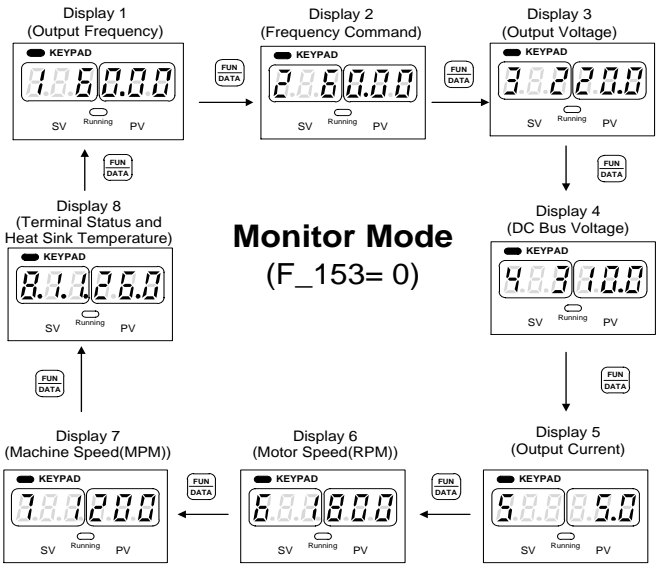   Vertical line of seven-segment displays: Y1, Y2, Ta1, Tb1, Ta2 terminals

39

3

Chapter 3   The Setting of Keypad

The significance of seven-segment displays

Display	Terminal	Description	Display	Terminal	Description
$\boxed{B.\!\!.\!\!.}\boxed{25.0}$	FWD	FWD terminal is active	$\boxed{B.\!\!.\!\!.}\boxed{25.0}$	X4	X4 terminal is active
$\boxed{B.\!\!.\!\!.}\boxed{25.0}$	REV	REV terminal is active	$\boxed{B.\!\!.\!\!.}\boxed{25.0}$	Ta1,Tb1	Ta1,Tb1 terminal is active
$\boxed{B.\!\!.\!\!-}\boxed{25.0}$	X1	X1 terminal is active	$\boxed{B.\!\!.1}\boxed{25.0}$	Ta2	Ta2 terminal is active
$\boxed{B.\!\!-.}\boxed{25.0}$	X2	X2 terminal is active	$\boxed{B.1.}\boxed{25.0}$	Y1	Y1 terminal is active
$\boxed{B.-.}\boxed{25.0}$	X3	X3 terminal is active	$\boxed{B1.\!\!.}\boxed{25.0}$	Y2	Y2 terminal is active

(2) General Mode ($\boxed{dEF.60}$ or $\boxed{dEF.50}$)

In (F_153=0) open-loop condition, it can be set any moitor mode 1~8 from F_006 (Selection of Main Display) at monitor mode, the drive will automatically switch back to the main display after 3 minute.

Display 1
(Output Frequency)

Display 2
(Frequency Command)

Display 3
(Output Voltage)

Display 8
(Terminal Status and Heat Sink Temperature)

Monitor Mode
(F_153= 0)

Display 4
(DC Bus Voltage)

Display 7
(Machine Speed(MPM))

Display 6
(Motor Speed(RPM))

Display 5
(Output Current)

3-2-3 Description of Function Setting Mode

In function setting mode, there are 211 functions (F_000 ~ F_210) can be selected for RM6 series(9916) drive, and the setting steps are as below:

Operation Steps	Display
1.In the monitor mode, press [PROG] key to enter function setting mode.	KEYPAD F 000 SV Running PV
2.Press [▲] key to increase the function number.	KEYPAD F 001 設定值 實際值 SV Running PV
3.Press [▼] key to decrease the function number.	KEYPAD F 000 設定值 實際值 SV Running PV

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.	KEYPAD F 001 SV Running PV
2.Press [FUN DATA] key to enter parameter setting mode.	KEYPAD d 3 設定值 實際值 SV Running PV
3.Press [▼] key to decrease the value of F_001 from 3 (default value) to 2.	KEYPAD d 2 設定值 實際值 SV Running PV
4.Press [FUN DATA] key and return to function setting mode.	KEYPAD F 001 設定值 實際值 SV Running PV

3-2-5 Operation at Monitor Mode

In monitor mode(F_153≠0), user can change the value of setting pressure (SV). The operation steps are shown as below.

(by $dEF.C3$ or $dEF.C4$)

Operation Steps	Display
1.In monitor mode, the display of setting pressure(SV) and actual pressure(PV) as right figure.	KEYPAD 2.0 0.0 SV Running PV
2.Press [▲] key for several times or keep pressing the [▲] key to increase the setting value of pressure to 2.5.	KEYPAD 2.5 0.0 SV Running PV
3.After completing the setting, press [FUN DATA] key within 5 seconds (the setting value is under blinking status) the drive will automatically save the SV.	

In monitor mode(F_153=0), user can change the setting value of frequency command.

Refer to operation steps, adjusted the frequency from 60Hz to 50Hz.

Operation Steps	Display
1.In monitor mode, setting frequency：60Hz。	KEYPAD 60.00 SV Running PV
2. Press ▼ key or press ▼ key for a while，down to 50Hz。	KEYPAD 50.00 SV Running PV
3. After completing the setting, press [FUN DATA] key within 5 seconds (the setting value is under blinking status) or waiting the drive automatically save the setting value.	

3-2-6 Parameter Copy; Restore Default Value; Save/Restore Setting Value

a. Parameter Copy:

Including writing and readout functions. Parameter settings of two drives can be copied by " $r d.E E$ " and " $U U r.E E$ " functions via keypad (KP-207).

(Parameter Read Out: Drive parameter → Keypad)

Operation steps	Display
1.In the monitor mode, press [PROG] key to enter function setting mode.	KEYPAD F 000 SV Running PV
2.Press ▼ or ▲ key to select the function to F_210 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	KEYPAD F 210 SV Running PV
3.Press ▲ key and then select $r d.E E$ parameter and then press [FUN DATA] key to execute the parameter readout.	KEYPAD r d E E SV Running PV
4.Drive will start to copy the parameters to keypad, and then display the copy process on keypad.	KEYPAD CoP 9.00 SV Running PV
5.After completing the copy, the keypad will display End message and automatically back to function setting mode.	KEYPAD E n d SV Running PV

(Parameter Write In: Keypad parameter → Drive)

Operation steps	Display
1.In the monitor mode, press [PROG] key to enter function setting mode.	KEYPAD F 000 SV Running PV

2. Press ▼ or ▲ key to select the function to F_210 (Default Setting) and then press FUN DATA key to enter parameter setting mode.	● KEYPAD *F.S 2I0* SV Running PV
3. Press ▲ key and then select *UUr EE* parameter and then press FUN DATA key to execute the writing.	● KEYPAD *UUr EE* SV Running PV
4. Keypad will start to copy the parameters to drive, and then display the copy process on keypad.	● KEYPAD *CoP 9.00* SV Running PV
5. After completing the copy, the keypad will display *End* message and automatically back to function setting mode.	● KEYPAD *End* SV Running PV

※*Do Not execute the copy for different software version, otherwise the parameters will occur error and the keypad will display* *UUr F* *message.*

b. Restore Default Value:

RM6 series(9916) drive provide four default values for using. User can according to the demand to restore default values.

dEF 60 (Restore the default value of general drive for 60 Hz)

dEF 50 (Restore the default value of general drive for 50Hz)

dEF C3 (Restore the default value of air compressor for 50Hz)

dEF C4 (Restore the default value of air compressor for 60Hz)

※*Be cautious of the usage of this parameter! This parameter will clear the saved setting value via* *SAu* *parameter.*

Select the $dEFC3$ parameter as an example, and the operation steps as below:

Operation Steps	Display
1.Press ▼ or ▲ key selecting the function to F_210 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	KEYPAD F.2 210 SV Running PV
2.Press ▲ key to select $dEFC3$ parameter, and then press [FUN DATA] key to execute the restoring.	KEYPAD dEFC3 SV Running PV
3.After completing the restoring, the keypad will display End message and back to the function setting mode.	KEYPAD 8.8.8 End SV Running PV

c . Save / Restore Setting Value:

(Save the setting value)

Operation Steps	Display
1.Press ▼ or ▲ key to select the function to F_210 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	KEYPAD F.2 210 SV Running PV
2.Press ▲ key to select SAu parameter, and then press [FUN DATA] key to execute the saving.	KEYPAD 8.8.8 SAu SV Running PV
3.After completing the saving, the keypad will display End message and back to the function setting mode.	KEYPAD 8.8.8 End SV Running PV

(Restore the setting value)

Operation Steps	Display
1.Press ▼ or ▲ key to select the function to F_210 (Default Setting) and then press [FUN DATA] key to enter parameter setting mode.	KEYPAD F.2 210 SV Running PV
2.Press ▲ key to select rES parameter, and then press [FUN DATA] key to execute the restoring.	KEYPAD 8.8.8 rES SV Running PV
3.After completing the restoring, the keypad will display End message and back to function setting mode.	KEYPAD 8.8.8 End SV Running PV

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

Chapter 4 Parameter List

Func.	Name	Description			Range of Setting	Unit	Defc4	Page
F_000	Drive Information	0: Software version 1: Drive model number 2: Drive running hours 3: Drive power supplying time 4: Software checksum code 5: Reserved			—	—	—	62
F_001	Start Command Selection		Start command	Rotation direction command	0~11	—	1	62
		0	FWD or REV terminal	FWD or REV terminal				
		1	FWD terminal	REV terminal				
		2	Keypad "ON" key	FWD or REV terminal				
		3		Forward direction				
		4		Reverse direction				
		5~7	Reserved	Reserved				
		8	Communication interface	Communication interface				
		9	Communication interface	REV terminal				
		10	FWD terminal	Communication interface				
		11	Keypad "ON" key	Communication interface				
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. 5: Frequency command by communication interface.			0~5	—	1	66
F_003	Selection of "STOP" Key Validity	0: Start command by terminal, "OFF" key disabled. 1: Start command by terminal, "OFF" key enabled.			0,1	—	1	67
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	67
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	67
F_006	Selection of Main Display	F_153=0 KP_207 Setting of main display			1~8	—	1	68

X: Don't care   [   ] function can be set during the operation.

Func.	Name	Description				Range of Setting	Unit	Defc4	Page
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	68
F_008	Digits of Decimal Value (Machine Speed)	Select the digits of decimal values displaying the machine speed.				0~3	—	0	68
F_009	Primary Speed	Multi-speed level 4 command	Multi-speed level 3 command	Multi-speed level 2 command	Multi-speed level 1 command			00.00	69
		OFF	OFF	OFF	OFF				
F_010	Preset Speed 1	OFF	OFF	OFF	ON			10.00	69
F_011	Preset Speed 2	OFF	OFF	ON	OFF			20.00	69
F_012	Preset Speed 3	OFF	OFF	ON	ON			30.00	69
F_013	Preset Speed 4	OFF	ON	OFF	OFF			0.00	69
F_014	Preset Speed 5	OFF	ON	OFF	ON			0.00	69
F_015	Preset Speed 6	OFF	ON	ON	OFF			0.00	69
F_016	Preset Speed 7	OFF	ON	ON	ON	0.00~400.00	0.01 Hz	0.00	69
F_196	Preset Speed 8	ON	OFF	OFF	OFF			0.00	69
F_197	Preset Speed 9	ON	OFF	OFF	ON			0.00	69
F_198	Preset Speed 10	ON	OFF	ON	OFF			0.00	69
F_199	Preset Speed 11	ON	OFF	ON	ON			0.00	69
F_200	Preset Speed 12	ON	ON	OFF	OFF			0.00	69
F_201	Preset Speed 13	ON	ON	OFF	ON			0.00	69
F_202	Preset Speed 14	ON	ON	ON	OFF			0.00	69
F_203	Preset Speed 15	ON	ON	ON	ON			0.00	69
F_017	Jog Speed	Frequency setting by manual						6.00	69

X: Don't care　　　　　　　　function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
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)	72
F_019	Primary Acceleration Time	The acceleration time of primary speed, preset speed 4~7, and jog speed.				72
F_020	Primary Deceleration Time	The deceleration time of primary speed, preset speed 4~7, and jog speed.				72
F_021	Acceleration Time of Preset Speed 1	Acceleration time of preset speed 1.				72
F_022	Deceleration Time of Preset Speed 1	Deceleration time of preset speed 1.				72
F_023	Acceleration Time of Preset Speed 2	Acceleration time of preset speed 2.	0.0~ 3200.0	0.1 sec	15.0 (Note5)	72
F_024	Deceleration Time of Preset Speed 2	Deceleration time of preset speed 2.				72
F_025	Acceleration Time of Preset Speed 3	Acceleration time of preset speed 3.				72
F_026	Deceleration Time of Preset Speed 3	Deceleration time of preset speed 3.				72
F_027	Secondary Acceleration Time	Switch to secondary acceleration time by multi-function input terminal.				72
F_028	Secondary Deceleration Time	Switch to secondary deceleration time by multi-function input terminal.				72
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	72
F_030	Limitation of Output Voltage	0: Output voltage of V/F pattern is not limited , decrease the swithching frequency. 1: Output voltage of V/F pattern is limited, decrease the switching frequency. 2: The output voltage of V/F pattern is not limited. 3: The output voltage of V/F pattern is limited .	0~3	—	0	74

X: Don't care   function can be set during the operation.

4

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_031	Maximum Output Frequency	Maximum output frequency of drive.	0.1~400.0	0.1Hz	50.0 (Note1) / 60.0 (Note2)	74
F_032	Starting Frequency	Starting frequency of drive's output.	0.1~10.0	0.1Hz	0.5	74
F_033	Starting Voltage	The voltage corresponds to the output starting frequency.	0.1~50.0	0.1V	8.0 (Note3) / 12.0 (Note4)	74
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)	74
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)	74
F_036	V/F Frequency 1	Frequency at the first point of V/F pattern.	0.0~399.9	0.1Hz	0.0	75
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	75
F_038	V/F Frequency 2	Frequency at the second point of V/F pattern.	0.0~399.9	0.1Hz	0.0	75
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	75
F_040	Vin Gain	Analog input "Vin" gain ratio adjustment.	0.00~2.00	0.01	1.00	76
F_041	Vin Bias	Analog input "Vin" bias ratio adjustment.	-1.00~1.00	0.01	0.00	77
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	77
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	77
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	83
F_045	Analog Output Gain (FM+)	Analog output gain ratio adjustment.	0.00~2.00	0.01	1.00	84
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	85
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	81
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	85

Func.	Name	Description		Range of Setting	Unit	Defc4	Page
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	85
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	85
F_051	Number of Motor Poles	Determine the RPM display value of monitor mode.		2~10	P	4P	85
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			3	
F_053	Multi-function Input Terminal (X2)	=0: DC braking enable (at stop)	±5: Multi-speed level 3 command ±6: Reset command ±7: External fault command (thr) ±8: Interruption of output command (bb)			4	
F_054	Multi-function Input Terminal (X3)	=0: Current limit enable	±9: Coast to stop command (Fr) ±10: Speed tracing from the maximum frequency ±11: Speed tracing from the setting frequency			1	
F_055	Multi-function Input Terminal (X4)	=0: Selection of primary or secondary frequency command **(ON: secondary frequency command)**	±12: Holding command ±13: UP command ±14: DOWN command ±15: Clear UP/DOWN frequency command ±16: Analog input source selection	-21 ~ +21 (Note 8)	—	18	86
F_056	Reserved	Reserved	±17: Stop command with 3-wire start/stop circuit ±18: Under close-loop control condition (F_153≠0), open-loop selection.			—	
F_057	Reserved	Reserved	±19: Reset the integrator at close-loop control condition (F_153≠0) ±20: Stop command ±21: Multi-speed level 4 command			—	

X: Don't care ▭ function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_058	Multi-function Output Terminal (Y1)	0: Disable ±1: detection during operation ±2: Constant speed detection ±3: Zero speed detection ±4: Frequency detection ±5: Overload detection (OLO)			1	
F_059	Multi-function Output Terminal (Y2)	±6: Stall prevention detection ±7: Low voltage detection (LE) ±8: Braking detection ±9: Restart after instantaneous power failure detection	-16 ~ +16 (Note 8)	—	2	94
F_060	Multi-function Output Terminal (Ta1,Tb1)	±10: Restart after error condition detection ±11: Error detection ±12: Overheating detection ±13: Upper limit of feedback detection ±14: On-Off dead band detection ±15: On-Off range detection ±16: Fan detection during operation			11	
F_061	Constant Speed Detection Range	Set the bandwidth of constant speed detection range.	0.0~10.0	0.1Hz	2.0	94
F_062	Frequency Detection Range	Set the bandwidth of frequency detection range.	0.0~10.0	0.1Hz	2.0	95
F_063	Frequency Detection Level	Set the frequency detection level of multi-function output terminal.	0.0~400.0	0.1Hz	0.0	95
F_064	Automatic Torque Compensation 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	99
F_065	System Overload Detection (OLO)	0: Disable 1: Enable	0,1	—	0	99
F_066	System Overload Detecting Selection	0: Detection during constant speed only 1: Detection during operation only	0,1	—	0	99
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	99
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	99
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.	0.1~25	0.1 sec	2.0	99

function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
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	100
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	100
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	15.0 (Note5)	100
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	15.0 (Note5)	100
F_074	Stall Prevention Setting at Deceleration	0: Disable 1: Enable	0,1	—	1	100
F_075	DC Braking Level	Set the current level of DC braking.	0~150% of drive rated current	1%	50	101
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	101
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	101
F_078	Operation Selection at Instantaneous 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	102
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	0.1V	175.0 (Note3)	102
			300.0~384.0		320.0 (Note4)	
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	106
F_081	Switching Frequency	The setting value is higher and the motor noise is lower.	0~6	—	1 (Note9)	106

[　　　　　] function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_082	Stop Mode	0: Ramp to stop 1: Coast to stop 2: Coast to stop + DC braking	0~2	—	1	107
F_083	Reverse Prohibition	0: Reverse rotation allowed. 1: Reverse rotation NOT allowed.	0,1	—	0	107
F_084	Jump Frequency 1	Avoid mechanical resonance point 1.	0.0~400.0	0.1Hz	0.0	104
F_085	Jump Frequency 2	Avoid mechanical resonance point 2.	0.0~400.0	0.1Hz	0.0	104
F_086	Jump Frequency 3	Avoid mechanical resonance point 3.	0.0~400.0	0.1Hz	0.0	104
F_087	Jump Frequency Range	Set the range of the jump frequency 1, 2, 3.	0.0~25.5	0.1Hz	0.0	104
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	104
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	104
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	104
F_091	Error Record	Display the latest 5 error records.	—	—	—	107
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	107
F_093	Automatic Voltage Regulation (AVR)	0: Disable 1: Enable	0,1	—	1	107
F_094	Drive Overload (OL1)	0: Disable 1: Electric thermal protection 2: Current limit overload protection 3: Electric thermal and Current limit overload protection are enabled.	0~3	—	3	106
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)	106
F_096	Holding Frequency	The drive accelerates to the holding frequency and running at constant speed.	0.0~400.0	0.1Hz	0.5	105

☐ function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
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	105
F_098	Grounding Fault Protection (GF)	0: Disable 1: Enable (GF)	0,1	—	1	108
F_099	External Indicator 1	Select the monitor mode of external indicator 1 0: Disable	0~10	—	1 (Note7)	105
F_100	External Indicator 2	Select the monitor mode of external indicator 2 0: Disable	0~10	—	5 (Note7)	105
F_101	External Indicator 3	Select the monitor mode of external indicator 3 0: Disable	0~10	—	2 (Note7)	105
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	108
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	102
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	15.0 (Note5)	102
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	15.0 (Note5)	102
F_106	Switching the Frequency of Ramp to Stop	Set the F_106 when the deceleration time is switched from F_104 setting value to F_105 setting value.	0.0~400.0	0.1Hz	0.0	102
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	81
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	93

☐ function can be set during the operation.

53

4

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_109	Communication Interface Selection	0: RJ-45 1: DX+ / DX-	0,1	—	1	109
F_110	Communication Address	The followers use the address to send and receive messages from the host (0: disable)	0~254	—	0	109
F_111	Communication Baud Rate	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	0~3	—	1	109
F_112	Communication Protocol	0: 8,N,2 1: 8,E,1 2: 8,O,1 3: 8,N,1	0~3	—	1	109
F_113	Communication Overtime (Cot)	When the message transmission during communication transmission is interrupted, has no data transmitting, or delays, drive displays "Cot" message. (0.0: Communication overtime disable)	0.0~100.0	0.1 sec	0.0	109
F_114	Communication Overtime Disposal	0: Warning (Cot) ；Continue operation 1: Warning (Cot) ；Ramp to stop 2: Warning (Cot) ；Coast to stop	0~2	—	0	109
F_115	Control Selection of Multi-Func-tion Input Terminals	0: Multi-function input terminals (X1~X4) selves 1: Multi-function input terminals (X1~X4) command by communication interface	0,1	—	0	109
F_116	Fault Reset Selection	0: Auto-restart after error trip(OC,OE,GF only) 1: Auto reset 2: Auto reset without executing error detection (If the drive is operating over 24hrs without any error trip, the drive will automatically reset the counting number)	0~2	—	0	106
F_117	Error Tripping Time Interval before Auto-Restart	Set the error tripping time interval before drive auto restarts for F_116 when the drive trips to stop.	1~200	10sec	6	106
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	92
F_119	UP/DOWN Frequency Resolution	0：0.01Hz 1～8 ：× 0.05Hz 9：0.5Hz 10～250：× 0.1Hz	0~250	—	0	92
F_120	UP/DOWN Trigger Mode	1~5: Cntinuous accel./decel. when the terminal is activated with the duration (1 ~ 5 sec). 6: Edge trigger.	1~6	—	1	92

[   ] function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_121	UP/DOWN Frequency Adjustment	Adjust UP/DOWN frequency by KP-207 keypad.	0.00~400.00	0.01 Hz	0.00	92
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. 3: Frequency command by communication interface.	0~3	—	0	92
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 ~ X4).	0~3	—	0	78
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. 4: Feedback signal	0~4	—	1	78
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. 4. Feedback signal.	0~4	—	4	78
F_126	Iin Range Selection	0: 4~20mA (2~10V). 1: 0~20mA (0~10V).	0,1	—	0	79
F_127	Analog Input Gain (Iin)	The gain ratio of analog input terminal Iin.	0.00~2.00	0.01	1.00	76
F_128	Analog Input Bias (Iin)	The bias ratio of analog input terminal Iin.	-1.00~1.00	0.01	0.00	77
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	83
F_130	Analog Output Gain (AM+)	AM+ analog output adjustment ratio.	0.00~2.00	0.01	1.00	84
F_131	Multi-function Output Terminal (Ta2/Tc2)	The way of settings are same as multi-function output terminals setting. (F_058 ~ F_060)	-16~16 (Note 8)	—	1	94
F_132	DC Braking Frequency at Stop	Active frequency level of DC braking at stop.	0.1~60.0	0.1Hz	0.5	101
F_135	200% Current limit	0: Disable 1: Enable	0,1	—	1	106

[   ] function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_136	PID Error Gain	When the PID command	0.1~8.0	—	1.0	110
F_137	Delay Time before Stop	When the "stop command" is activation at multi-funtion input terminal, drive will delay the setting time before stop.	0~1200	1sec	0	90
F_138	Overheating Level Adjustment	Overheating level(OH)=setting level+85℃	0.0~25.0	0.1℃	0.0	118
F_139	Operation Condition Memory	Record the last status of drive before power off. 0: Enable (F_001=2,3,4) 1: Disable	0,1	—	1	103
F_140	NTC Thermistor Setting	0: Disable. 1: Enable.	0,1	—	1	117
F_141	Drive Overheating Warning Selection	0: Disable 1: Warning (Ht): Continue operation. 2: Warning (Ht): Drive de-rates the switching frequency automatically per 5 minutes. 3: Warning (Ht): Stop operation.	0~3	—	0	117
F_142	Drive Overheating Warning Level	Set the warning level to prevent drive overheating.	45~85	1℃	70	117
F_143	Drive Overheating Dead Band	Set the temperature dead band of F_142 and F_145.	2.0~10.0	0.1℃	3.0	117
F_144	Fan Control Selection	0: Forced air: Start the fan at power ON. 1: Operation air: Start the fan at running. 2: Temperature level setting: Start the fan according to the setting of F_145.	0~2	—	1	118
F_145	Temperature Level of Fan Activation	Set the temperature level of fan activation.	25~60	1℃	50	118
F_146	Minimum Operation Time of Fan	Set the minimum operation time of fan when the fan stops.	0.1~25.0	0.1 min	0.5	118
F_147	"SV" Value	Set the "SV" value	F_152~ F_151	0.1	2.0	110
F_148	PID Control Display	0: PV value 1: Integration value 2: Deviation value 3: PID command value 4: PID feedback value	0~4	—	0	110
F_149	"SV-PV" Value Display	Main display selection(under PID control and command by "SV" condition) 0: "PV" value 1: "SV-PV" value	0,1	—	1	110
F_150	PID Control Command	0: By F_002 1: Analong frequency command controls "SV" 2: Keypad conrols "SV" 3: Communication interface controls "SV"	0~3	—	2	110

[   ] function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_151	Upper Limit of Transmitter	Set the value in accordance with the maximum specification of transmitter.	-800.0~800.0	0.1	10.0	114
F_152	Lower Limit of Transmitter	Set the value in accordance with the minimum specification of transmitter.	-800.0~800.0	0.1	0.0	114
F_153	PID Control Mode Selection	0: Open-loop operation 1: Forward control; D postposition 2: Forward control; D preposition 3: Reverse control; D postposition 4: Reverse control; D preposition	0~4	—	0	110
F_154	P Selection	0: P postposition 1: P preposition	0,1	—	1	112
F_155	Proportional Gain(P)	Set the gain value for deviation adjustment. (0.0: P control disabled)	0.0~25.0	0.1	2.0	112
F_156	Integration Time(I)	Set the integration time for deviation adjustment. (0.0: I control disabled)	0.0~100.0	0.1 sec	1.0	112
F_157	Derivative Time(D)	Set the derivative time for deviation adjustment. (0.00: D control disabled)	0.00~2.50	0.01 sec	0.00	112
F_158	Derivative Time of Feedback	Set the derivative time for feedback signal.	0.00~2.50	0.01 sec	0.00	112
F_159	Integration Upper Limitation	Set the upper limitation value of integrator.	0.00~1.00	0.01	1.00	112
F_160	Integration Lower Limitation	Set the lower limitation value of integrator.	-1.00~1.00	0.01	0.40	112
F_161	Integrator Initialized Value	Set the initial value of thr integrator before PID starts.	-1.00~1.00	0.01	0.00	112
F_162	PID Buffer Space	Set the buffer space of PID output value.	0~255	—	2	112
F_163	Feedback Signal Filter	Filter the feedback signal.	0~255	—	10	114
F_164	Feedback Signal Trip Detection	0: Disable 1: Enable (at F_126=0)	0,1	—	1	114
F_165	Feedback Signal Selection r	0: Direct proportion signal. 1: Inverse proportion signal.	0,1	—	0	114
F_166	(2nd PI Control) Active Range	Drive command by 2nd PI control when the deviation value is within the setting range(F_147-"PV" value) 0.0: Disable	0.0~25.0	0.1	2.0	113
F_167	(2nd PI Control) Active Time	Drive command by 2nd control with the time duration and then switching back the primary PI control. 0.0: Disable	0.0~300.0	0.1	15.0	113
F_168	Proportional Gain(P2)	Set the gain value for deviation adjustment. (0.0: P control disabled)	0.0~25.0	0.1	2.0	113
F_169	Integration Time(I2)	Set the integration time for deviation adjustment. (0.0: I control disabled)	0.0~25.0	0.1 sec	1.0	113

☐ function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_170	Display Setting by Open-Loop Command	Main display selection when the drive command by PID and executing open-loop command. 0: PV display 1: According to the setting value of F_006	0,1	—	0	112
F_171	Setting Selection by Open-Loop Command	Primary speed selection when the drive command by PID and executing open-loop command. 0: Analog input terminals 1: Keypad 2: UP/DOWN command 3: Communication interface	0~3	—	1	112
F_172	Keypad Selection by Open-Loop Command	Command can be adjusted by keypad when the drive command by PID and executing open-loop command. 0: Primary speed 1: "SV" value	0,1	—	1	113
F_173	Reserved					
F_174	(On-Off) Control Selection	0: Forward control 1: Reverse control	0,1	—	0	116
F_175	(On-Off) Delay Time Conrol	0: Disable 1: Enable	0,1	—	0	115
F_176	(On) Range Setting	Drive is activation when the "PV" value exceeds the "On" range.	-12.8~12.7	0.1	1.0	116
F_177	(Off) Range Setting	Drive is activation when the "PV" value exceeds the "Off" range.	0.0~10.0	0.1	1.0	116
F_178	(On) Delay Time	Drive is activation when the "PV" value exceeds the "On" range and maintaining a duration(F_178)	0~250	1sec	0	116
F_179	(Off) Delay Time	Drive is activation when the "PV" value exceeds the "Off" range and maintaining a duration(F_179)	0~250	1sec	0	116
F_180	(On-Off) Accel/Decel Time Selection	0: Primary accel./decel. time 1: Secondary accel./decel. time	0,1	—	1	117
F_181	(Off) Holding Time	Hold the "Off" condition with the duration.	0~240	1sec	0	117
F_182	Air Conditioning Mode	0: Disable 1: Enable	0,1	—	0	118
F_183	(Air Conditioning Mode) Temperature Response Time	The respone time of "PV" value is according to the setting value of F_183. PV > (SV+F186) , Variation of acceleration: (Hz/sec) = (F_184/ F183)	0.0~25.0	0.1 sec	5.0	118

▢ function can be set during the operation.

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_184	(Air Conditioning Mode) Variation Frequency	Change the frequency according to the setting value of F_183 PV > (SV+F187)，Variation of deceleration: (Hz/sec) = (F_184/ F183)*4.	0.1~25.0	0.1Hz	2.0	118
F_185	(Air Conditioning Mode) Upper Limit Range of Temperature	**Upper limit value = "SV" value + F_185** **Lower limit value = "SV" value + F_186** When the temperature is over uppr limit value, drive outputs the setting value of F_042(Frequency Upper Limit)	F_184~ 20.0	0.1	3.0	118
F_186	(Air Conditioning Mode) Lower Limit Range of Temperature	When the temperature is under lower limit value, drive outputs the setting value of F_043(Frequency Lower Limit)	0~F_184	0.1	1.0	118
F_187	(Air Conditioning Mode) Holding Frequency Level		0.00~1.00	0.01	0.50	
F_188	(Air Conditioning Mode) Detection Time of Holding Frequency	When the operation frequency of drive is under (F_031*F_187) and maintaining F_188 duration, drive outpus full speed by oper-loop condition and maintaining a duration(F_189) and then recovering PID control. *F_188=0 Disable	0.0~25.0	0.1hr	0.0	119
F_189	(Air Conditioning Mode) Full Speed Time		0.0~25.0	0.1 min	1.0	
F_190	(Feedback Limit) Detection	0: Disable 1: Warning detection；Continue operation 2: Warning detection；Stop output 3: Error detection；Error trip	0~3	—	0	114
F_191	(Feedback Limit) Level	Set the physical volume according to the specification of transmitter(refer to F_151, F_152)	-800.0~ 800.0	0.1	8.0	115
F_192	(Feedback Limit) Detection Setting	0: Detection when "PV" > F_191 1: Detection when "PV" < F_191	0,1	—	0	115
F_193	(Feedback Limit) Detection Time	When the feedback signal exceeds the setting value of F_191 and maintaining a duration, drive is detection. Drive will close the detection when the feedback signal is without the range of feedback limit. (Set the range according to the physical volume of transmitter)	0~2550	1 sec	300	115
F_194	(Feedback Limit) Range Setting		0~20.0	0.1 unit	1.0	115

function can be set during the operation.

Chapter 4　Parameter List

Func.	Name	Description	Range of Setting	Unit	Defc4	Page
F_195	(Feedback Limit) Condition Selection	0: Enable during operation 1: Enable full time	0,1	─	1	115
F_204 ~ F_209	Reserved					
F_210	Default Setting	0: Disable	─	─	0	68
		CLF: Clear error 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				
		dEFC3: Restore the default value of air compressor for 50Hz				
		dEFC4: Restore the default value of air compressor for 60Hz				
		dEFC1~dEFC6: Customize default value				

☐ function can be set during the operation.

Note:
1. The default value of 50 Hz.
2. The default value of 60 Hz.
3. Specification of 200V.
4. Specification of 400V.
5. 0.5 ~ 5HP: 5 sec
   7.5~30HP: 15sec
   40HP above: 30 sec
6. Displayed "OLO"
7. Setting value=0, represented for " no display"
8. + : Represents a contact (N.O)
   ─ : Represents b contact (N.C)
   Up/Down control wiring must not exceed over 20m when multi-function terminals are used for Up/Down control.
9. When RM6(9916) setting value of switching frequency(F_81)exceeds "4", the drive must be de-rating or change higher capacity.
10. Function : F_056、F_057、F_133、F_134、F_173、F_204~F_209 = Reserved
11. "dEF" the default value refer to < Appendix2 Default Value List>
    dEF60:60Hz: general type
    dEF50:50Hz: general type
    dEFC3:50Hz: air compressor
    dEFC4:60Hz: air compressor

No Text on This Pag

4

Chapter 5   Parameter Setting Description

A. The Keypad Setup

F_000	Drive Information

0: Software version

1: Drive model number.

2: Drive running hours.

3: Drive power supplying time.

4: Software checksum code.

5: Reserved

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

b. 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:

FWD RUN / STOP — FWD (OFF: stop ON: forward running)

REV RUN / STOP — REV (OFF: stop ON: reverse running)

COM

SOURCE (PNP) mode:

FWD RUN / STOP — FWD (OFF: stop ON: forward running)

REV RUN / STOP — REV (OFF: stop ON: reverse running)

COM

+ | − DC 24V
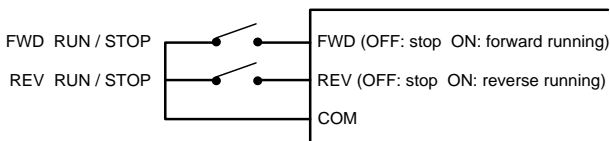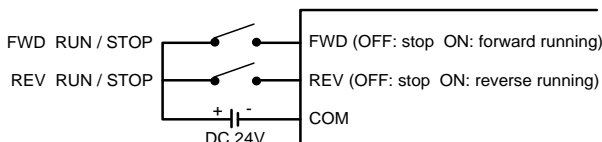
b. F_001=1

Start command by FWD terminal.
Rotation direction command by REV terminal.

SINK (NPN) mode:

RUN / STOP —— FWD (OFF: stop ON: running)
REV / FWD —— REV (OFF: forward ON: reverse)
COM

SOURCE (PNP) mode:

RUN / STOP —— FWD (OFF: stop ON: running)
REV / FWD —— REV (OFF: forward ON: reverse)
+ − COM
DC 24V
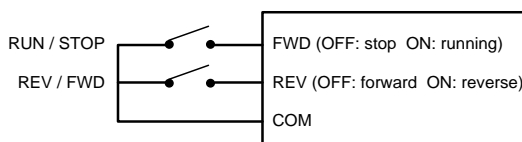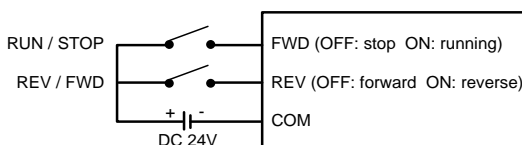
c. F_001=2

(I).   **Start command by keypad "[ON]" 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:

FWD —— FWD (OFF: stop ON: forward)
REV —— REV (OFF: stop ON: reverse)
COM
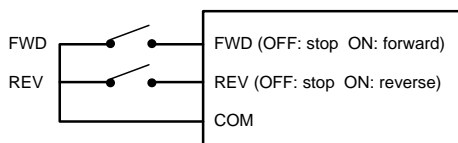
SOURCE (PNP) mode:
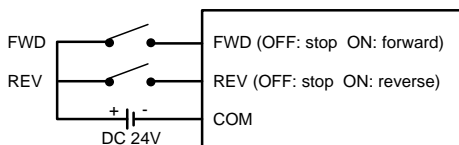
d. F_001=3

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

e. F_001=4

   (I).   **Start command by keypad "⟨ON⟩" key.**
          Motor rotates at the reverse direction (counterclockwise).
   (II). **The most left digit of output frequency will show " – ".**

f. F_001=8

   Start command and rotate direction by the RS-485 communication interface.
   Related control command refer to "6-6 Drive Registors and Command Code".

g. F_001=9

   Start command by RS-485 communication interface.
   Rotation direction command by REV terminal.
   Related control command refer to "6-6Drive Registors and Command Code"

h. F_001=10

   Start command by FWD terminal.
   Rotation direction command by RS-485 communication interface.
   Related control command refer to "6-6 Drive Registors and Command Code"

i. F_001=11

   Start command by Keypad
   Rotation direction command by RS-485 communication interface.
   Related control command refer to "6-6Drive Registors and Command Code"

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 " dEF " (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
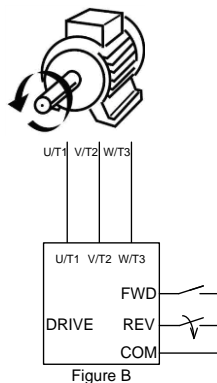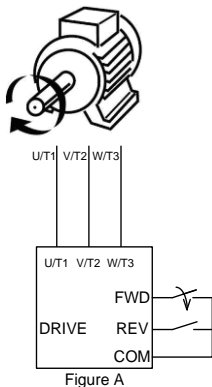
Figure A   Figure B

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.
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-207).

d. F_002=3

Machine speed (MPM) command by keypad (KP-207).

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.

f. F_002=5

Frequency command by RS-485 communication interface.
Related control command refer to 6-6 " Drive Registors and Command Code"

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.

1. 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 $\quad \mathit{0.0.0.0.0.0}$ 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.

2.Normal stop:

F_001=2 or 3, the start command by "ON" key of keypad KP-201C and the stop is

controlled by "STOP RESET" key.

F_004	KP-207 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	KP-207 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	KP-207 Selection of Main Display

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_210	Default Setting

Drive can restore the default setting values and restoring the parameter setting values. The parameter of F_210 are described as below table:

$\boxed{0}$ (0): Disable
CLF (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
$dEFC3$ (dEFC3):Restore the default value of air compressor for 50Hz.
$dEFC4$ (dEFC4)：Restore the default value of air compressor for 60Hz.
dEFC1~dEFC6：Dedicated machine default.

Note: rd_EE and Wr_EE are used to copy functions to several drives with the same setting value.

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
F_196	Preset Speed 8
F_197	Preset Speed 9
F_198	Preset Speed 10
F_199	Preset Speed 11
F_200	Preset Speed 12
F_201	Preset Speed 13
F_202	Preset Speed 14
F_203	Preset Speed 15

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_055).

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 4 command	Multi-speed level 3 command	Multi-speed level 2 command	Multi-speed level 1 command	Command Description
ON	ON	**X**	**X**	**X**	Jog speed
OFF	OFF	OFF	OFF	OFF	Primary speed
OFF	OFF	OFF	OFF	ON	Preset speed 1
OFF	OFF	OFF	ON	OFF	Preset speed 2
OFF	OFF	OFF	ON	ON	Preset speed 3
OFF	OFF	ON	OFF	OFF	Preset speed 4
OFF	OFF	ON	OFF	ON	Preset speed 5
OFF	OFF	ON	ON	OFF	Preset speed 6
OFF	OFF	ON	ON	ON	Preset speed 7
OFF	ON	OFF	OFF	OFF	Preset speed 8
OFF	ON	OFF	OFF	ON	Preset speed 9
OFF	ON	OFF	ON	OFF	Preset speed 10
OFF	ON	OFF	ON	ON	Preset speed 11
OFF	ON	ON	OFF	OFF	Preset speed 12
OFF	ON	ON	OFF	ON	Preset speed 13
OFF	ON	ON	ON	OFF	Preset speed 14
OFF	ON	ON	ON	ON	Preset speed 15

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 ~ X4) by functions (F_052 ~ F055). 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
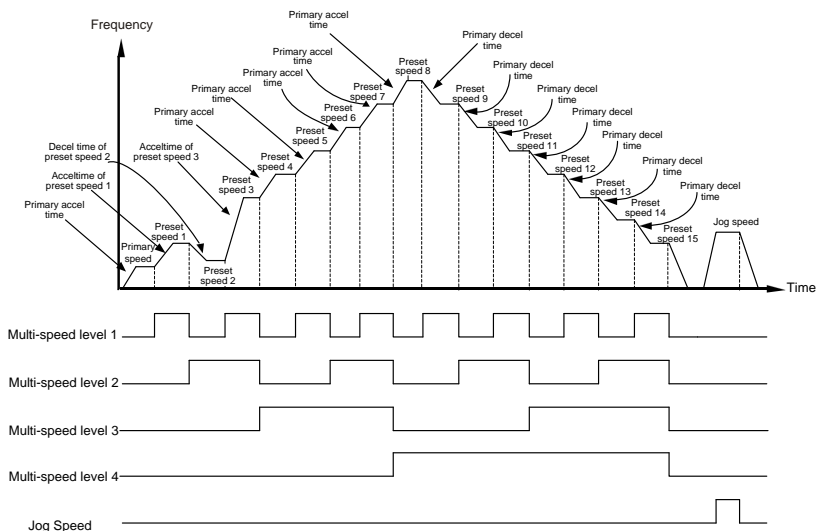
※ The acceleration / deceleration time of jog speed and preset speed 4~15 are according to the setting of primary acceleration / deceleration time (F_019, F_020).

※ 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 1~15 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 ~ 15 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:
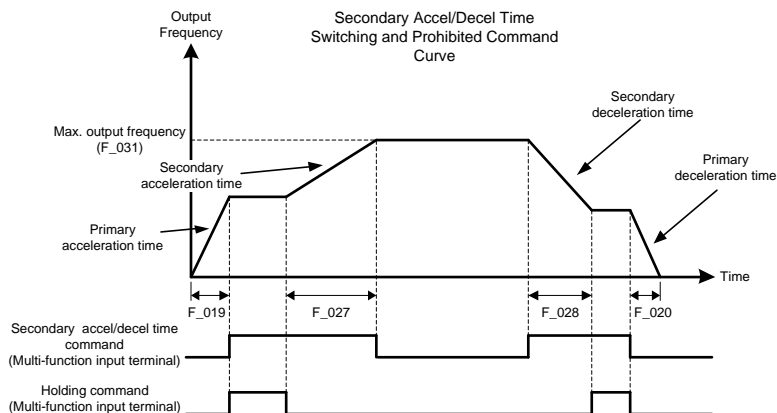
d. The "holding command" is disabled when STOP command is activated.

　※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 "$\boxed{\frac{OFF}{RESET}}$" key.

(IV)　Press the "$\boxed{\frac{OFF}{RESET}}$" 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.
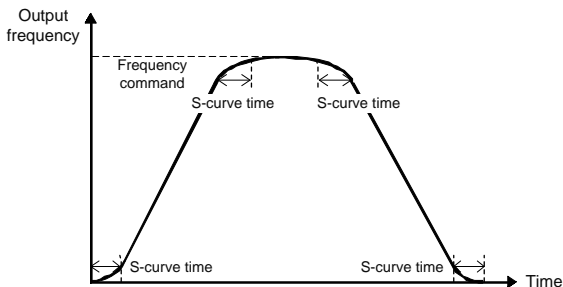
D. V/F Pattern Setup

F_030	Limitation of Output Voltage

a.　　F_030 = 0

The output voltage of V/F pattern: No limit, auto-decrease of swithching frequency.

b.　　F_030 = 1

The output voltage of V/F pattern :Limit (200V series: 250.0V; 400V series: 500.0V).
auto-decrease of swithching frequency

c.　　F_030 = 2

The output voltage of V/F pattern: No limit, swithching frequency

d.　　F_030 = 3

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

F_031	Maximum Output Frequency

RM5G series: The setting range of max output frequency is 0.1 ~ 400.0.

RM5P series: The setting range of max output frequency is 0.1 ~ 120.0.

F_032	Starting Frequency	Range: 0.1~10.0Hz

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	Range 0.0 ~ 399.9Hz。
F_038	V/F Frequency 2	
F_037	V/F Voltage 1	200V series: 0.0~255.0V
F_039	V/F Voltage 2	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
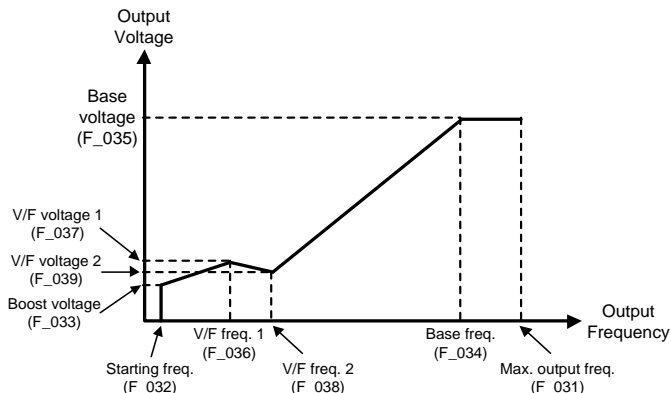
Note: The interrelationships of above functions are explained as follow:

(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.

5

E. Analog Input Command Setup

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

F_040	Vin Gain	Rate 0~2.00
F_127	Analog Input Gain (Iin)	

a. (General Mode)

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
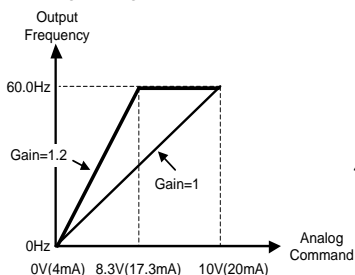
Maximum output frequency = 60.0Hz
Analog input gain = 0.80
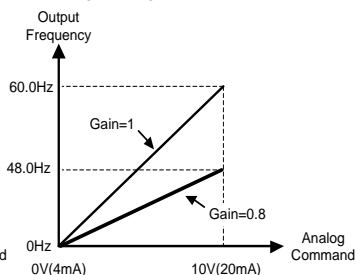
b.   (Air Compressor Mode)

PV value = Maximum transmitter(F_151) x Analog input gain(F_40 or F_127)
EX: If analog input bias (F_041 or F_128) = 0.00

Maximum transmitter=10bar
Analog input gain = 1.20
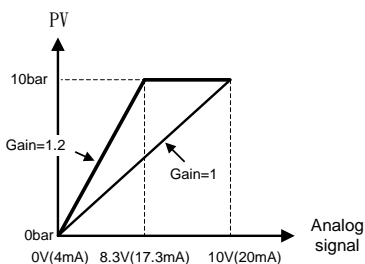
Maximum transmitter=10bar
Analog input gain = 0.80
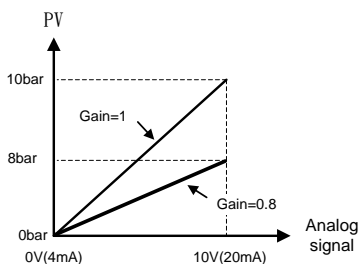
F_041	Vin Bias	Rate 0~1.00
F_128	Iin Bias	

a. (General Mode)

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

EX: If analog input gain (F_40 or F_127) = 1.00

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

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

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

Example of reverse control application:

b. (Air compressor mode)
PV value = Maximum transimitter (F_151) x Analog input gain(F_041 or F_128)

F_123	Analog Input Selection

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
4: Feedback signal

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
4: Feedback signal

F_126	Iin Range Selection

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

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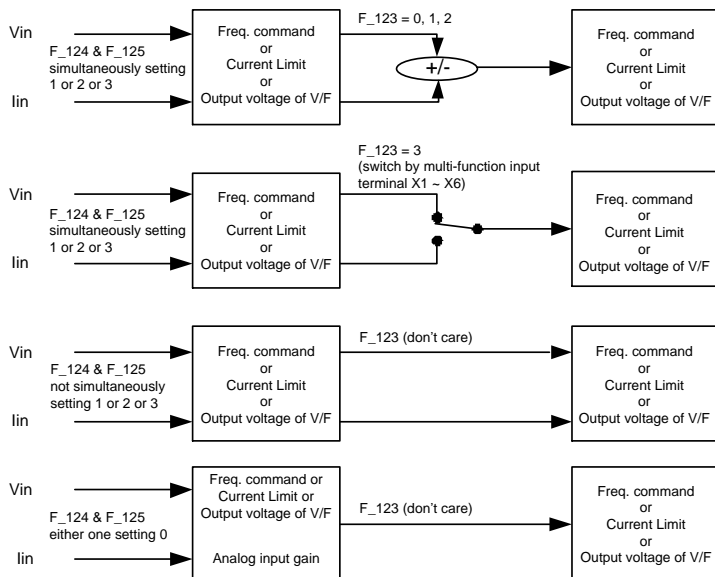
The interrelationships table of F_123, F_124, F_125

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).

F_123 (Analog Input Selection)	F_124 Analog Input Selection (Vin)	F_125 Analog Input Selection (Iin)	Description
X	1	0	Vin: Frequency command. Iin: Vin analog input
X	0	1	Vin: Iin Aanalog Input 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:

Max. output freq.=60.0Hz
Freq. upper limit=0.90
Freq. lower limit=0.10
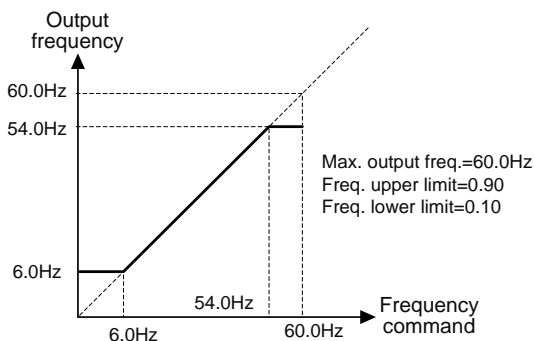
Upper limit of output frequency = F_042 (Frequency Upper Limit) x F_031 (Maximum   Output Frequency)
Lower limit of output frequency = F_043 (Frequency Lower Limit) x F_031 (Maximum Output Frequency)

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

4: "Iin" analog input signal
The analong output terminal(FM+ or AM+) outputs DC 0~10V to correspond the signal of "Iin" analong 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 = $\dfrac{\text{Maximum output freq.}}{\text{Output freq. (freq. command)}}$ or $\dfrac{\text{Drive rated current}}{\text{Output current}}$

b. Analog output curve

Maximum output freq. = 60.0Hz
Analog output signal selection = 0, 1
Analog output gain = 1.20
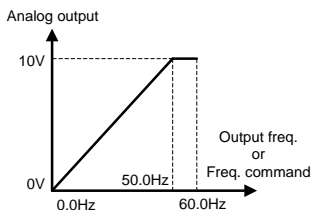
Driver rated current = 17A
Analog output signal selection = 2
Analog output gain = 0.80
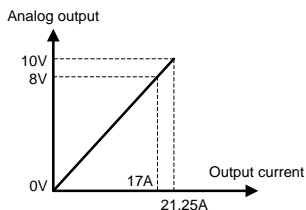
Maximum output freq. = 60.0Hz
Analog output signal selection = 3
Analog output gain = 1.20
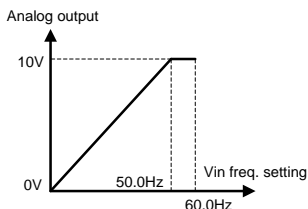
Maximum output freq. = 60.0Hz
Analog output signal selection = 4
Analog output gain = 0.08
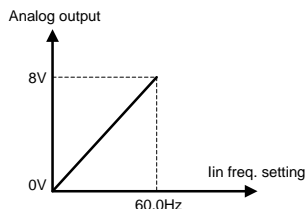
H. Motor Protection Setup

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)

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

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

    c. Multi-function terminals X1 ~ X4 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)
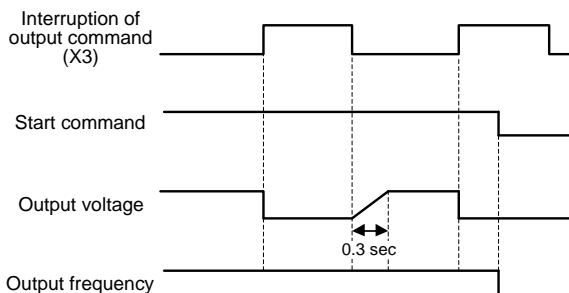
±9: Coast to stop command (Fr)

Cut off the control of motor from drive immediately.

Coast to stop command (F_055=9)

Coast to stop command (X3)

Start command

Output voltage

Output frequency

Acceleration time
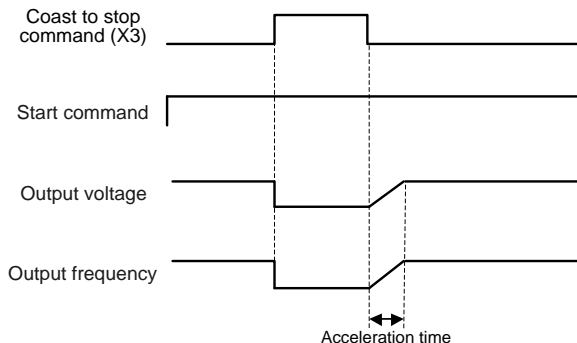
±10: Speed tracing from the maximum frequency

Speed tracing from the maximum frequency
(F_053=10)

Terminal start command (FWD)

Speed tracing command (X1)

> 0.1sec

Max. output frequency

Decel. time is 2 sec

Output frequency

Normal accel. time

Delay Time before Speed Tracing(F_089)

Output voltage

Return to normal V/F

The V/F Pattern of Speed Tracing(F_090)

The current level of speed tracing (F_088)

The current level of speed tracing

Output current
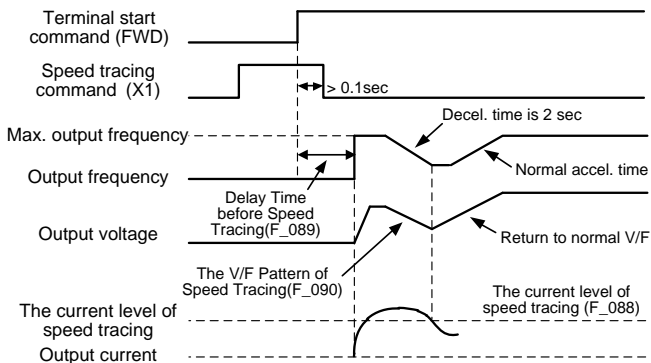
±11: Speed tracing from the setting frequency

Speed tracing from the setting frequency
(F_053=11)

Terminal start command (FWD)	
Speed tracing command (X1)	> 0.1sec
Setting frequency	Decel. time is 2 sec
Output frequency	Normal accel. time
	Delay Time before Speed Tracing(F_089)
Output voltage	Return to normal V/F
	The V/F Pattern of Speed Tracing(F_090)
The current level of speed tracing	The current level of speed tracing (F_088)
Output current	
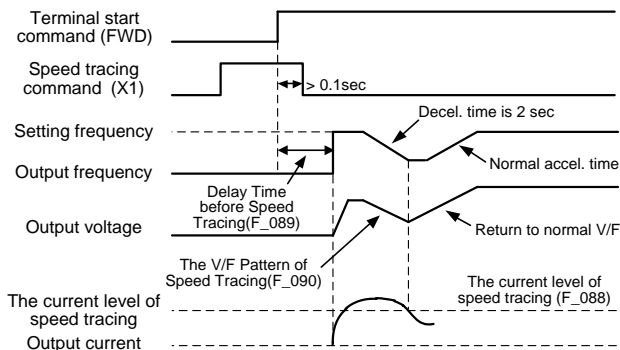
±12: Holding command

±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:

SINK (NPN) mode

F_055=13
F_056=14
F_057=15

UP ——○ X4
DOWN ——○ X5
CLEAR ——○ X6
——○ COM

SOURCE (PNP) mode

F_055=13
F_056=14
F_057=15

UP ——○ X4
DOWN ——○ X5
CLEAR ——○ X6
+ - ——○ COM
DC 24V
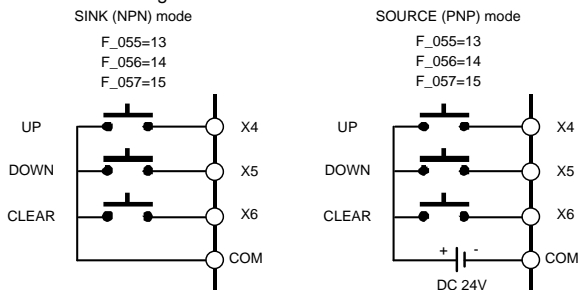
±16: Analog input source selection

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
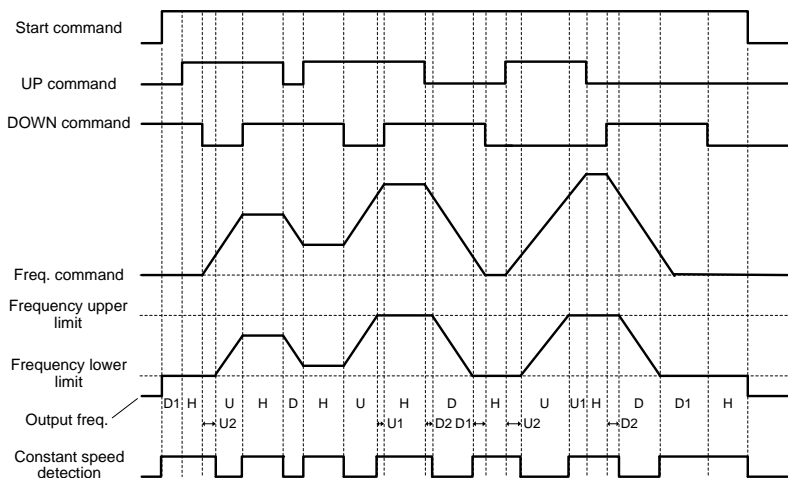
U=UP (acceleration) condition

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.

±17:   Stop command with 3-wire start/stop circuit.

SINK (NPN) mode

F_001=0
F_056=0

FWD RUN/STOP — FWD
REV RUN/STOP — REV
STOP — X5
— COM

F_001=1
F_057=0

RUN — FWD
REV/FWD — REV
STOP — X6
— COM

SOURCE (PNP) mode

F_001=0
F_056=0

FWD RUN/STOP — FWD
REV RUN/STOP — REV
STOP — X5
+ − COM
DC 24V

F_001=1
F_057=0

RUN — FWD
REV/FWD — REV
STOP — X6
+ − COM
DC 24V
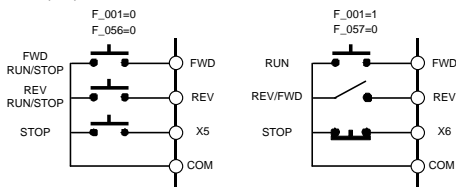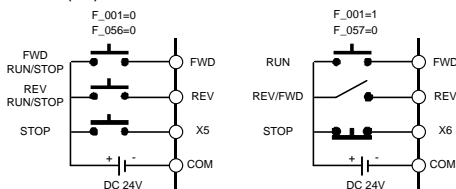
±18: Under the PID control, speed selection by open-loop command.

±19: Under the PID control, reset the integrator.

±20: Stop mode

±21: Multi-speed level 4 command

F_137	Delay Time before Stop	0~1200 sec

d. When the parameter of F_052, F_053, F_054, F_055 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.
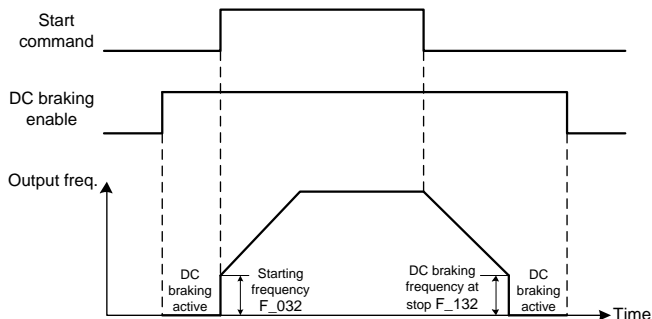
iii.　F_054: "Current limit enable" by X3

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

Use KP-207C 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%)

Use KP-207　keypad:

a. X3 and COM is short-circuit:

The current limit enabled when the function of pot knob of KP-202 is defined as current limit. (range: 1~150%)

b. X3 and COM is open-circuit:
The current limit disabled.

EX: F_054=0; X3 and COM is short-circuit; F_124=2, F_125=1

(Input 0~10V to Vin terminal will corresponding to the setting of 1~150% of drive rated current)

5

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.
  5: Freqency command by RS-485 communication interface.

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: Edge trigger or 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:
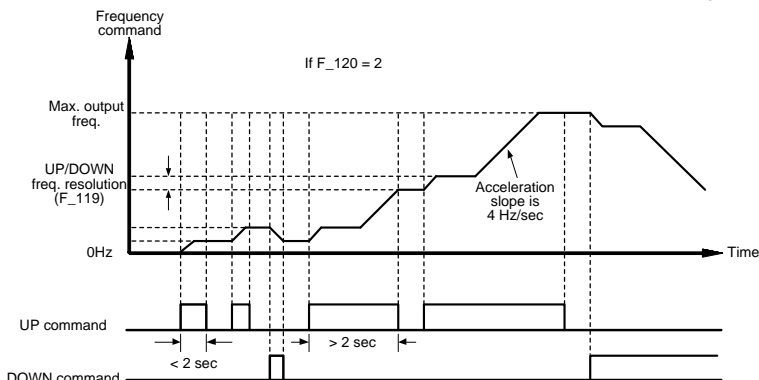
6: Edge trigger.

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	Range 0~400Hz

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	Range 5~16ms

a. Setting the input response time of multi-function terminals (X1~X4, 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

5

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.

F_061	Detection when drive runs at constant speed.	0~10Hz

Constant speed detection (F_058=2)
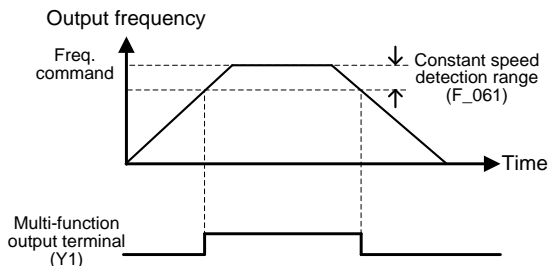
±3: Zero speed detection.

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

±4: Frequency detection

F_062	Frequency Detection Range	0~10Hz
F_063	Frequency Detection Level	0~400Hz

Frequency detection (F_059=4)
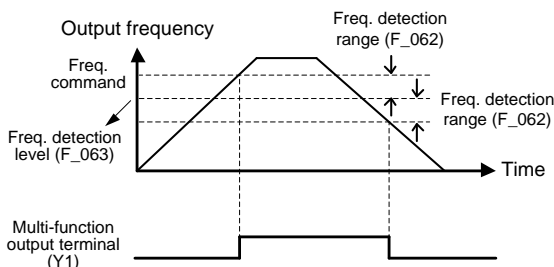
±5: Overload detection (OLO)

Overload detection (F_060=5)
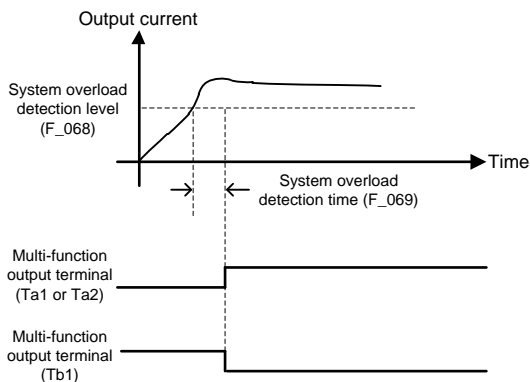
※ "Contact a"is short-circuit when detection is activated;
   "Contact b"is open-circuit when detection is activated.

±6: Stall prevention detection

Stall prevention detection (F_058=6)

Output
frequency

Time

Output
current

Stall prevention level
at constant speed
(F_071)

Time

Multi-function
output terminal
(Y1)
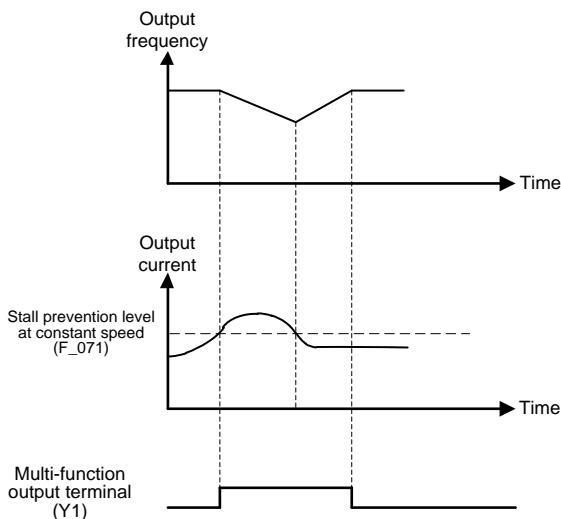
±7: Low voltage detection (LE)

Low voltage detection (F_058=7)

DC bus voltage

Level of "LE" fault condition

Multi-function
output terminal
(Y1)
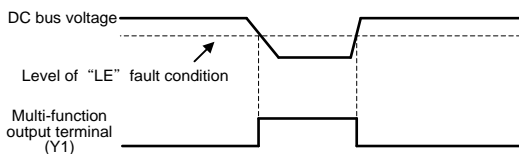
±8: Braking detection

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)
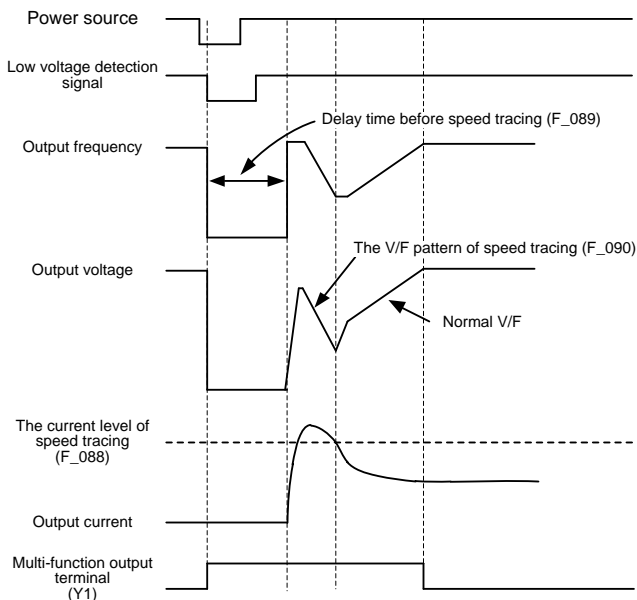
±10: Restart after error condition detection

Restart after error condition detection (F_058=10)

Error condition

Output frequency

Delay time before speed tracing (F_089)

Output voltage

The V/F pattern of speed tracing (F_090)

Normal V/F

The Current level of speed tracing (F_088)

Output current

Multi-function output terminal (Y1)
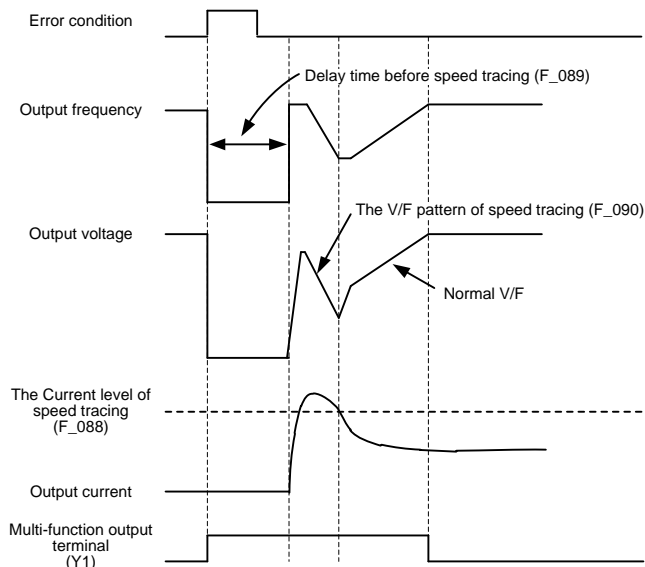
±11: Error detection

Error detection (F_059=11)
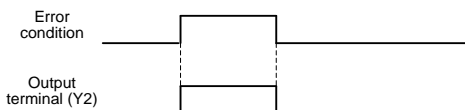
Error condition

Output terminal (Y2)

±12: Overheating detection

±13: Upper limit of feedback detection

±14: On-Off dead band detection

±15: On-Off range detection

±16: Fan detection during operation.

K. Automatic Torque Compensation

F_064	Automatic Torque Compensation Range	0~25.5V

Dynamic compensation by voltage to avoid any insufficient voltage at heavy-duty load.
The adjustment method is to minimize the output current by adjusting the parameter.
(maximum power factor).
Higher compensation setting will result higher current.

L. Overload Detection Setup(OLO)

F_065	System Overload Detection (OLO)	0: Disable 1: Enable(OLO)

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	30%~200% Rated current
F_069	System Overload Detection Time	Range 0.1~25sec.

System overload detection is shown as below figure:

Output current

System overload detection level (F_068)

Time interval<System overload detection time(F_069)

Time

Multi-function output terminal (Y1) (F_058=5)

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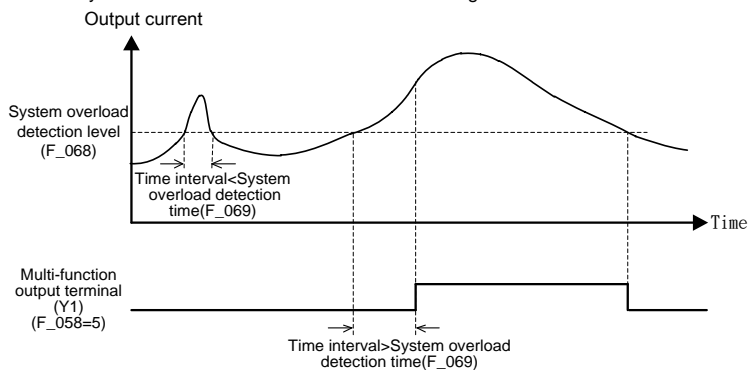
The systeom overload detection is activated when the output current exceeds the value of F_068 (System Overload Detection Level) with the time interval of F_069 (System Overload Detection Time) and the keypad will displayed OLO

Detection during operation includes acceleration, deceleration or constant speed.
The purpose of overload detection is to prevent the system damage. The detection level and time can be set by user requirements.

5

M. Stall Prevention Setup

F_070	Stall Prevention Level at Acceleration	30%~200% Rated Current
F_071	Stall Prevention Level at Constant Speed	

When the drive is RM5P series, the setting range is 30~160% of drive rated current. When the setting value is 160, the stall prevention disable.

F_072	Acceleration Time Setting after Stall Prevention under Constant Speed	0.1~3200sec.

F_073	Deceleration Time Setting for Stall Prevention under Constant Speed	0.1~3200sec.

F_074	Stall Prevention Setting at Deceleration	0: Disable 1: Enable

The description is as shown in a figure below:
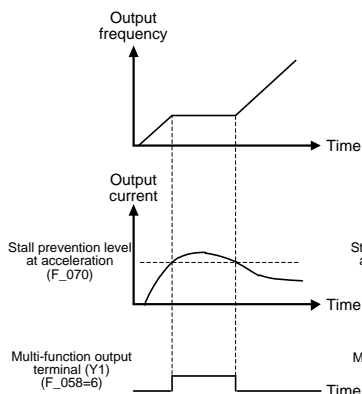
Stall prevention level at acceleration   Stall prevention level at constant speed
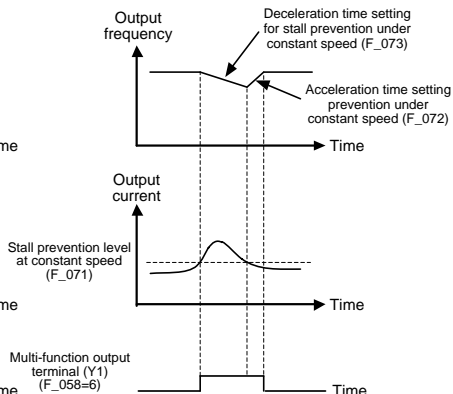
When enabling the F_074 (Stall Prevention Setting at Deceleration) and the stall occurs at deceleration, drive will operation at constant.

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

If the DC bus voltage of drive is higher than the dynamic brake voltage level during stop, the KP-201C keypad will display " db " 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.

N. DC Braking Setup

F_075	DC Braking Level	The current level setting of DC braking.

F_076	Time of DC Braking after Stop	0~20sec

F_077	Time of DC Braking before Start	0~20sec

F_132	DC Braking Frequency at Stop	0.1~60Hz

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

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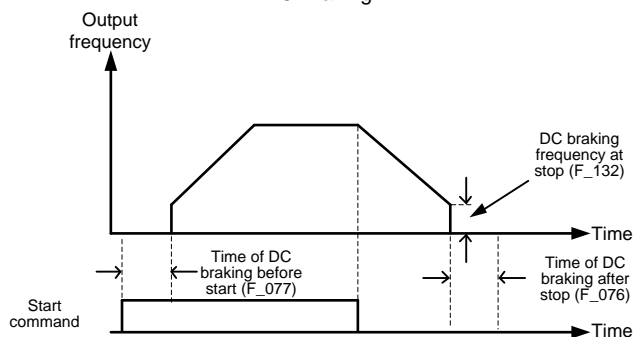
If the frequency command is set below F_032 (Starting Frequency) during operation and the output frequency is below the starting frequency, the DC braking will be activated. The setting value of F_132 is disable at the moment.

O. 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
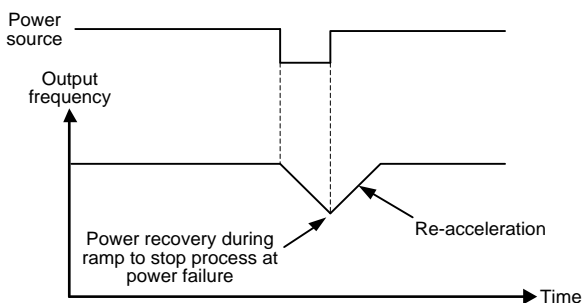
F_079	Voltage Level of Ramp to Stop by Power Failure

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
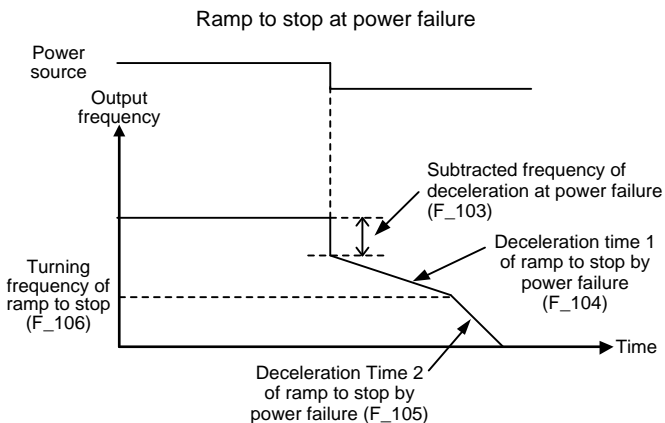
F_139	Operation Condition Memory	0: Enable(F_001=2,3,4) 1: Disable

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.

P. Jump Frequency

F_084	Jump Frequency 1	
F_085	Jump Frequency 2	Setting Range:0~400Hz
F_086	Jump Frequency 3	
F_087	Jump Frequency Range	Setting Range:0~25.5Hz

In order to avoid the mechanical resonance, these parameters allow resonant frequency to be jumped.
There are three jump frequencies and one jump frequency interval.
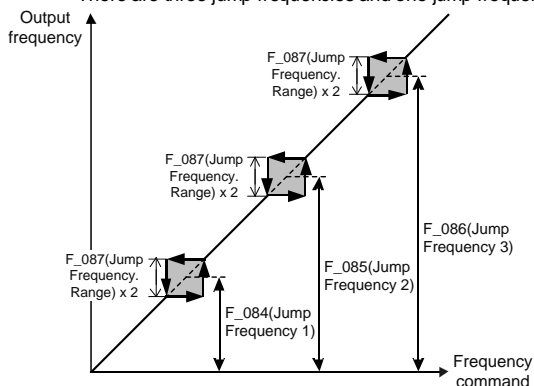
Q. Speed Tracing

F_088	The Current Level of Speed Tracing	0~200% Rate current
F_089	Delay Time before Speed Tracing	Time for speed tracing before stop output 0.1~5 sec
F_090	The V/F Pattern of Speed Tracing	0~100%V/F voltage

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.
Refer to speed tracing for multi-function input terminals.

R. Holding Frequency and Time Interval

F_096	Holding Frequency	0~400Hz
F_097	Holding Time Interval	0~25.5sec

The main purpose of "holding" is to prevent the over slip of motor causing over-current and stall during acceleration.
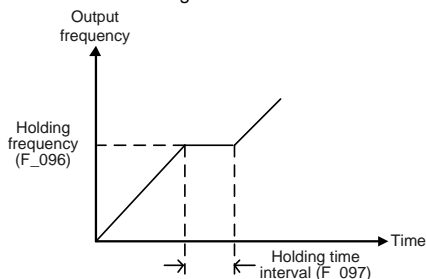
S. External Indicators

F_099	External Indicator 1
F_100	External Indicator 2
F_101	External Indicator 3

a. F_099 ~ F_101 can be set according to the setting method of F_006.
b. Please select twisted-pair shield wiring and shielding connected to the GND terminal of drive's control board.
c. The wiring diagram of external indicators is shown as below:
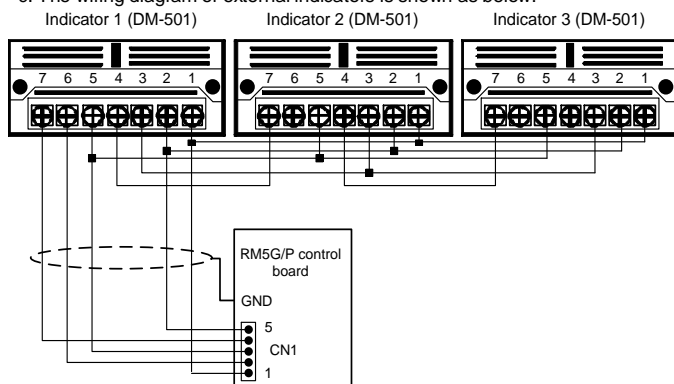
d. The position of connecter (CN1).

T. Fault Protection and Auto-reset

F_080	Auto-restart Times Setting of Error Trip	Use of Times:0~16.
F_116	Fault Reset Selection	

0: Auto-restart after error trip(OC,OE,GF only) RESET immediately,
1: Auto reset, F_117 interval time after auto-restart from 0 Hz
2: Auto reset without executing error detection
(If the drive is operating over 24hrs without any error trip, the drive will automatically reset the counting number)

F_117	Error Tripping Time Interval before Auto-Restart	Range:1~200, 1unit=10sec

U. Drive Overload Protection

F_135	200% Current Limitation	0：Disable 1：Enable

0: Diable
   If drive's output current exceeds 220% rated current, the drive will display OC.
1: Enable
   If drive's current exceeds 200% rated current, the drive will control PWM output voltage. (Limit current:200%)

F_094	Drive Overload (OL1)

Prevent the drive damage due to overload.
0: Disable.
1: Electric thermal protection
   Drive trips to stop when the output current is over 150%(RM5P series: 120%) of drive rated current for 1 min.(inverse time curve protection)
2: Current limit overload protection.
   When the outuput current exceeds 200%, drive will limit the current to 200% and counting the times for tripping.
3: Electric thermal and Current limit overload protection are enabled.

V. Others Function

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
   RM6-(9916):   1/2HP~75HP   →   16kHz
                      Above 100HP   →   10kHz
   ※ Switching frequency will be modulated with load automatically.
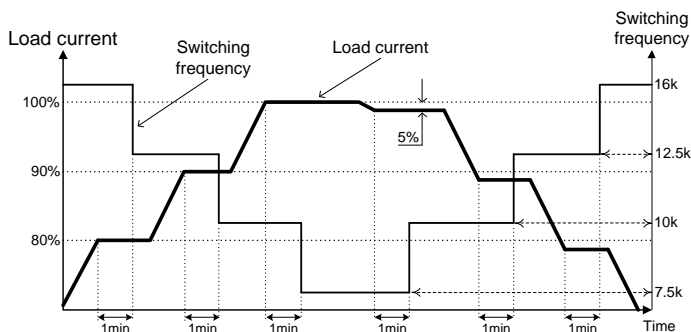
F_082	Stop Mode	0: Ramp to stop 1: Coast to stop 2: Coast to stop + DC braking

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

*F_031 (Maximum Output Frequency)
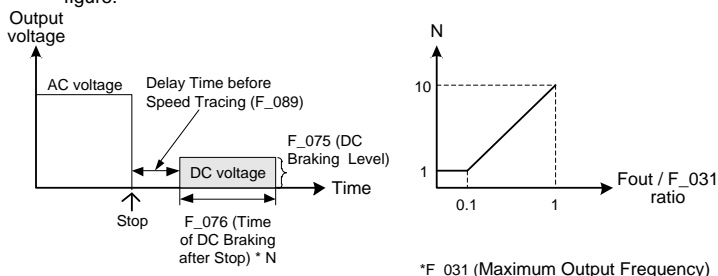
When the output current of drive is abnormal at DC braking, appropriately increase the setting value of F_089 (Delay Time before Speed Tracing).

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　The value of setting according to F_095.
1: Enable　PWM output voltage will modulate automatically according to PN voltage

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.
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.
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

If the leakage current exceeds 70% rated cureent of drive, the drive will trip to stop.

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: 1.7^{th} power curve.
4: 1.5^{th} power curve.
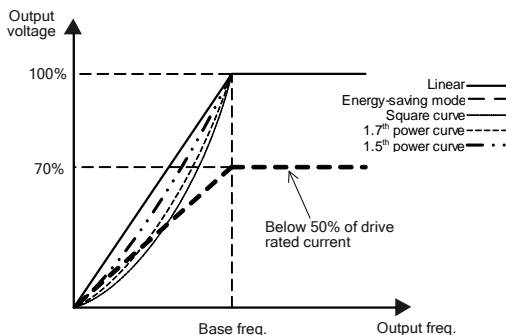
When the drive is used for fan or light-duty load applications, this function can be set to achieve the energy-saving purpose.

W. Communication Setting

F_109	Communication Interface Selection	0：RJ-45 1：DX+ / DX-

F_110	Communication Address	0: disable

The followers use the address to send and receive messages from the host

Single Control   Multi Control
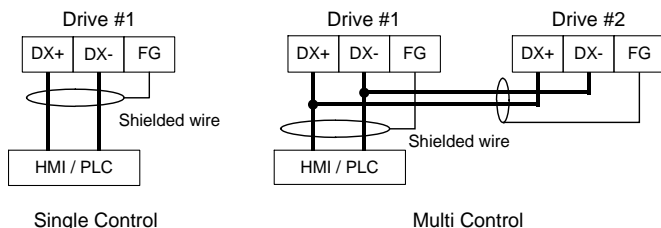
F_111	Communica-tion Baud Rate	0: 4800bps 2: 19200bps 1: 9600bps 3: 38400bps
F_112	Communication Protocol	0: 8,N,2 1: 8,E,1 2: 8,O,1 3: 8,N,1
F_113	Communication Overtime (Cot)	

When the message transmission during communication transmission is interrupted, has no data transmitting, or delays, drive displays "Cot" message.

F_114	Communication Overtime Disposal	0: Warning (Cot)；Continue operation 1: Warning (Cot)；Ramp to stop 2: Warning (Cot)；Coast to stop
F_115	Control Selection of Multi-Function Input Terminals	0: Multi-function input terminals selves 1: Multi-function input terminals command by communication interface

X. PID Control Functions

F_153	PID Control Mode Selection

0: Open-loop operation
1: Forward control; D postposition
2: Forward control; D preposition
3: Reverse control; D postposition
4: Reverse control; D preposition

※   Forward control: When the system actual value is less than the setting value, the drive will start to accelerate.

※   Forward control: When the system actual value is less than the setting value, the drive will start to decelerate.

F_136	PID Error Gain

When PID command to select SV value, the PID error may multiply F_155, setting of physical quantity to change as frequency value.

F_147	SV Setting	Set the "SV" value for adjustment

F_148	PID Control Display

PID calculated value, enter F_148 and setting from PV value:
0: PV value
1: Integration value
2: Deviation value
3: PID command value
4: PID feedback value

F_149	Main Display (F_153≠0)

0: "PV" value
1: "SV-PV" value. Left side display SV value, Right side display PV value.

F_150	PID Control Command

To select PID command (Refer to the picture description below)
0: By F_002
1: Analong frequency command controls "SV"
2: Keypad conrols "SV"
3: Communication interface controls "SV"

※As frequency setting SVvalue, according maximum frequency (F_031) corresponds to maximum value of sensor, and 0Hz corresponds to maximum sensor minimum value of sensor.
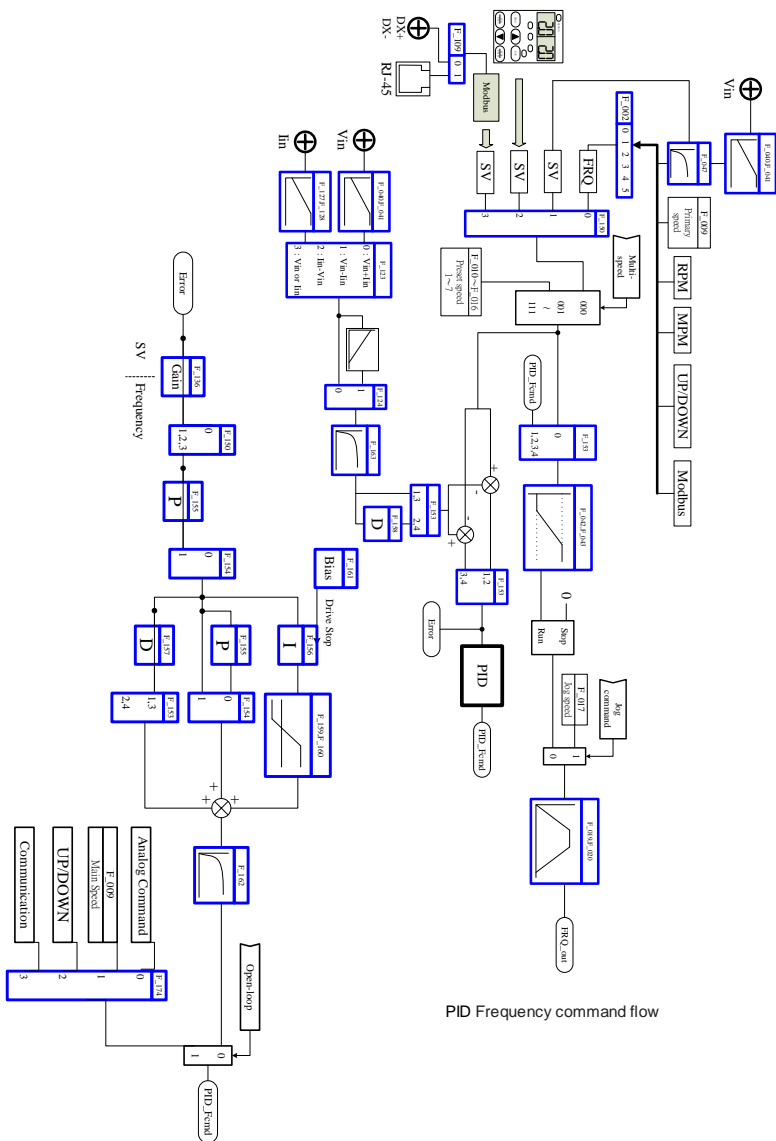
PID Frequency command flow

PID Control instruction

F_154	P Selection	0: P postposition, Parallel for PID control 1: P preposition, Tandem for PID control

F_155	Proportional Gain(P)	Set the gain value for deviation adjustment. Range 0~25.0

This proportional gain is to compensate the gain for the deviation value of proportional setting. Higher gain value may easily cause system to vibrate, but lower gain value may result the slow reaction of drive.

F_156	Integration Time(I)	Set the integration time for deviation adjustment. (0.0: I control disabled) Range:0~100sec.

The integration time is to compensate the stable deviation of the system.
The integration time setting is according to the response time of the system feedback.

F_157	Derivative Time(D)	Set the derivative time for deviation adjustment. Range: 0~2.50 sec.

This derivative time is to compensate the variance of deviation value.

Higher derivative time setting of deviation value will result higher compensation to system.

F_158	Derivative Time of Feedback	Set the derivative time for feedback signal. Range 0~2.50 sec.

To evaluate the variance of feedback value. (Refer to F_153)

F_159	Integration Upper Limitation	Set the upper limitation value of integrator. The maximum output frequency 0~1.00
F_160	Integration Lower Limitation	Set the lower limitation value of integrator. The maximum output frequency-1.00~1.00
F_161	Integrator Initialized Value	The maximum output frequency-1.00~1.00

Function F_161 is to set the initial value of the staring frequency of integrator to accumulate and subtract this initial value according to the deviation value. The upper/lower limitation of frequency is set by function F_159 and F_160.

F_162	PID Buffer Space	Set the buffer space of PID output value. Range 0~255

Filtering the frequency command after adding P, I, D setting value. Higher setting value of F_162 will slow down the drive output.

F_170	Display Setting by Open-Loop Command
F_171	Setting Selection by Open-Loop Command

When the open-loop instruction is acting, frequency command by F_171 to select and operate, displaying content set by F_170.
※   F_153≠0

F_172	Keypad Selection by Open-Loop Command

Under control of PID to select Open-Loop Command，as F_171=1, Keypad can be adjusted.
0: Primary Speed
1: SV

F_166	(2nd PI Control) Active Range	Range:0~25.0
F_167	(2nd PI Control) Active Time	Range:0~300sec
F_168	Proportional Gain(P2)	Range:0~25.0
F_169	Integration Time(I2)	Range:0~25sec

When the deviation of SV and PV within the limits by F_166, PID control using P2 and I2.
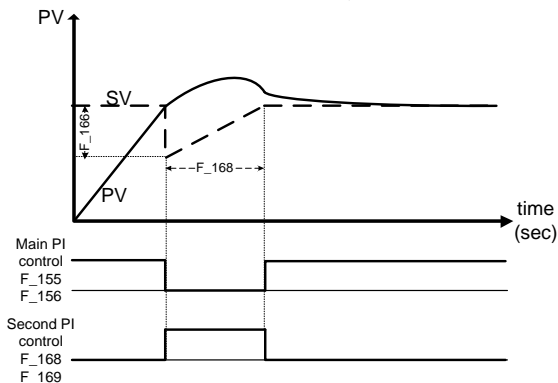
Y.Feedback Signal

When the transmitter connect Vin terminal, F_124 setting number is 4 and then the transmitter connected Iin terminal ,F_125 setting number is 4.
If the gap between PV value and real value is still different, user can fine tuning the F_151 and F_152.

F_151	Upper Limit of Transmitter	Setting range: -800~800
F_152	Lower Limit of Transmitter	

Setting to the transmitter of specification enable to SV/PV value accordance with system display.
Maximum value of transmitter: 20mA(or 10V) correspond with value.
Minimum value of transmitter: 4mA(or 2V) correspond with value (F_126=0);
0 mA(or 0V) correspond with value(F_126=1).

F_163	Feedback Signal Filter	Range 0~255

When the feedback signal produces interference phenomenon that can raise the value of feedback signal filter to prevent interference. If the value setting too high, the response of feedback signal will become slowly.

F_164	Feedback Signal Trip Detection

0: Disable
1: Enable.
Disconnect detection: Suitable for 4~20mA transmitter output terminal, hoewever, when the transmitter detect 0mA that represent for disconnecting.

F_165	Feedback Signal Selection

0: Direct proportion signal. PV value displays maximum value of sensor.
1: Inverse proportion signal.PV value displays minimum value of sensor.

F_190	(Feedback Limit)Detection (OP)

0: Disable
1: Warning detection；Continue operation
2: Warning detection；Stop output
3: Error detection；Error trip

F_191	(Feedback Limit)Level	Range -800~800
F_192	(Feedback Limit) Detection Setting	

Feedback Limit Setting=0: PV value > Limit level detection
Feedback Limit Setting=1 PV value < Limit level detection

F_193	(Feedback Limit)Detection Time	Range 0~2550sec
F_194	(Feedback Limit)Range Setting	Range 0~5.0
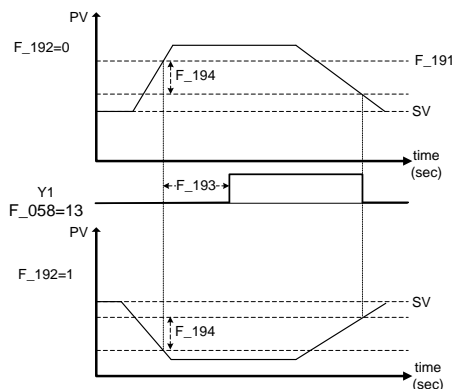
F_195	(Feedback Limit)Condition Selection

0: Valid during operation
When the drive of start command is displaying "On", OP detecting function is valid during operation.
1: Full-time valid(* *F_001=1)
The drive of start command On / Off are valid for full time.

F_175	(On-Off)Delay Time Conrol

F_153≠0
The drive according to On/Off set value to control start/stop.
0: Disable   1: Enable

115

F_176	(On) Range Setting	Range-12.8~12.7
F_177	(Off) Range Setting	Range 0~10.0
F_178	(On)Delay Time	Range 0~250sec
F_179	(Off)Delay Time	
F_174	(On-Off)Control Selection	0：Forward 1：Reverse

Forward : Start condition is PV value < SV value. Stop condition is PV value > SV value.
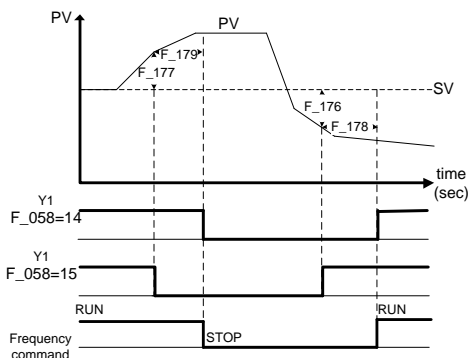
Reverse: Start condition PV value > SV value. Stop condition is PV < SV value.
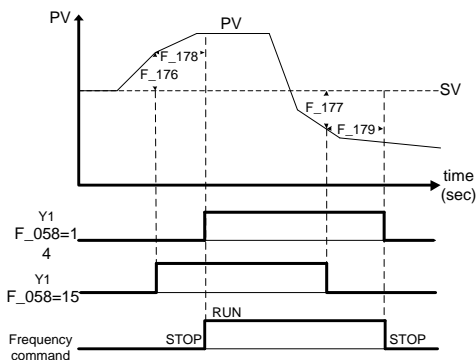
F_180	(On-Off)Accel/Decel Time Selection

0: Primary accel./decel. time
1: Secondary accel./decel. time

F_181	(Off)Holding Time

When the Off function of drive is acting, it can be forced to set holding time.
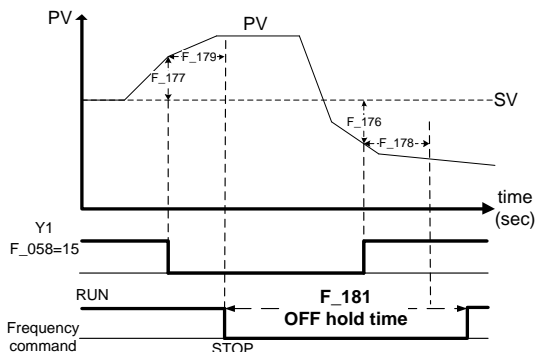
F_140	NTC Thermistor Setting

The drive should be enclosed NTC thermistor that can detect the temperature of sink and fan control.
0:Disable
1:Enable

F_141	Drive Overheating Warning Selection	
F_142	Drive Overheating Warning Level	Range: 45~85℃
F_143	Drive Overheating Dead Band	Range: 2.0~10

When the drive heat sink temperature is over the pre-alarm level, the drive displays " Ht " until the temperature drops below the drive overheat dead band.
a. The settings are listed as below:
  0: Disable
  1: Warning: Continuous operation.
  2: Warning: Drive de-rates the switching frequency automatically every 5 minutes.
  3: Warning: Drive trips to stop, and the cooling fans activate. After the temperature decreases lower than "drive overheat dead band, drive starts to operate again.
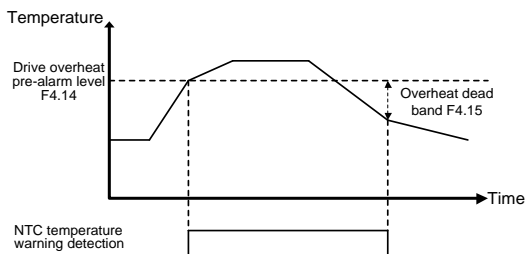
F_144	Fan Control Selection	
F_145	Temperature Level of Fan Activation	Range: 25~60℃
F_146	Minimum Operation Time of Fan	Range: 0.1~25min

Function: Increase the lifetime of drive cooling fans, save energy and extend the maintenance cycle time of heat sink.
The settings are listed as below:
0:Forced air cooling
   Start and continuously operate the cooling fans of drive when power ON.
1:Operation air cooling
   Cooling fans of drive is start when the drive is operation. Cooling fans will stop when the drive disable and after waiting at the minimum operation time.
2: Temperature control
   Drive cooling fans activate when the drive temperature is over the temperature level of fan activation. Cooling fans will stop when the temperature of drive drops below the overheat dead band of drive after waiting at the minimum operation time.

F_138	Overheat Level Adjustment	Overheat（OH）Level=Setting Value＋85℃

F_182	Air Condi-tioning Mode	0:Disable 1:Enable
F_183	(Air Condi-tioning Mode) Temperature Response Time	Range: 0~25sec
F_184	(Air Condi-tioning Mode) Variation Frequency	Range: 0.1~25Hz
F_185	(Air Condi-tioning Mode) Upper Limit Range of Temperature	Range: 0~20
F_186	(Air Condi-tioning Mode) Lower Limit Range of Temperature	Range: -12~12

1. Under control of air condition mode: PV > (SV+F_186),output frequency accelerate the rate of change (Hz/sec)=(F_184/F_183).
2. Under control of air condition mode: PV >(SV+F_187),output frequency decelerate the rate of change (Hz/sec)=(F_184/F_183)*4.
3. Start command: the frequency lower than frequency limit range(F_043), the accelerating time is second acceleration time(F_027); Stop command: decelerating time follow the second deceleration time(F_028).

Output frequency
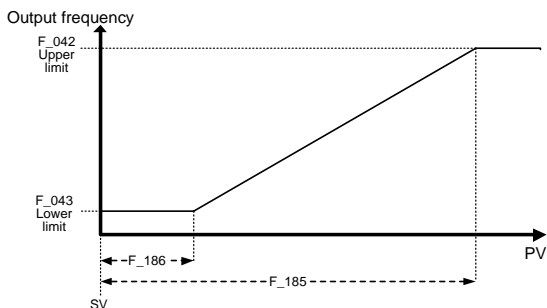
F_187	(Air Condi- tioning Mode) Holding Frequency Level	Range: 0~1.00
F_188	(Air Condi- tioning Mode) Detection Time of Holding Frequency	Range: 0.0~25 hr
F_189	(Air Condi- tioning Mode) Full Speed Time	Range: 0.0~25min

In air compressor mode:
When the drive under the level of holding speed (F_187) and the time continue to over holding speed (F_188); the drive will force open-loop to run at full speed and after maintain at full speed time (F_189), the drive will return to PID operation.

1. When the drive is operating under the level of holding speed (F_187), and the counter may start moving. If output frequency is over holding speed, the counter will clean the value as 0.
2. When the counter reach at holding speed (F_188), the drive may run at full speed and after persisted for a moment (F_189) that the drive returns would be normal.
3. F_188 setting as 0, it stand for closing this function.

Chapter 6 Communication Description
6-1 Control Terminals and Switch for   Communication

Type	Symbol	Function	Description
External Communication	DX+	Signal transmission terminal(+)	• Connect the RM6 series (9916) drive by transmission cable, when the drive is controlled by RS-485 communication interface. • Communication protocol: Modbus
	DX-	Signal transmission terminal(-)	
	FG	Grounding terminal of signal transmission	Grounding terminal of shielding wire.
Terminal resistor	DSW3	Terminal resistor switch	• Switch the DSW3 to "ON" position when the drive is installed at the last position in the sequence. • Terminal resistance: 100Ω

Note: The total length of connecting cable can not exceed 500 meters.

6-2 The Setting of Communication Parameter

●F_110: Communication Address：00~254（0: Disable）

●F_111: Communication Baud Rate
   0: 4800bps
   1: 9600bps
   2: 19200bps
   3: 38400bps

●F_112: Communication Format：
   0: 8,N,2 for RTU
   1: 8,E,1 for RTU
   2: 8,O,1 for RTU

●F_113: Communication Overtime (Cot)：
   0.0: No overtime detection
   0.1~100.0sec: The setting of overtime detection

●F_114: Communication Overtime Disposal：
   0: Warning (Cot): Continue operation
   1: Warning (Cot): Ramp to stop
   2: Warning (Cot): Coast to stop

●F_115: Multi-Function Input Selection：
   0: Multi-function inputs from multi-function terminals
   1: Multi-function inputs from communication control

6-3 Communication Protocol

Serial data transmission is an asynchronous serial data transmission: 1 frame = 11 bits (3 types of format shown in below figures)

● 8,N,2: 1 start bit，8 data bits，2 stop bits

START	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	STOP	STOP

● 8,E,1: 1 start bit，8 data bits，1 even parity bit，1 stop bit

START	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	EVEN PARITY	STOP

● 8,O,1: 1 start bit，8 data bits，1 odd parity bit，1 stop bit

START	BIT 0	BIT 1	BIT 2	BIT 3	BIT 4	BIT 5	BIT 6	BIT 7	ODD PARITY	STOP

6-4 Message Format

Address (Drive)	OP Code	Data n	…	Data 1	Data 0	CRC 0	CRC1	END
Drive Address No. (1 Byte)	Operation Message (1 Byte)	Data Message (Data length "n": depending on OP Code)				CRC Checksum		No Transmitting ≧10ms

●**Address:** Drive address number for host to control.

      00H: The host broadcasts messages to all receivers (drives). All receivers only receive the message but has no messages returned to the host.

      01H~FEH: The host designates the receiver (drive) by defining the drive address number.

●**OP Code(Operation Code):** The operation of the host to the drive.

      03H- Read multi-registers
      06H- Write to single register
      08H- Receiver detection
      10H- Write to multi-registers

●**Data:** Including start register, several registers, data length (maximum 8 data), data content (maximum 16 bits)

    Note: Data length – 1 byte, others – 1 word(2 bytes)

●**CRC Checksum:** Cyclical Redundancy Check performs XOR and bit shifting operations for all hexadecimal values in the message to generate the checksum code to verify the communication validity. Checksum is to sum all message bits for 16-bit CRC calculations. (See CRC Checksum)

●**Message Length:** Message length is listed in between maximum and minimum values. Message lengths of OP code 03H and 10H are dependent on the number of registers required in one message. (See Operation Code(OP Code) Description)

OP Code	Description	Instruction Code		Return Code	
		Min(bytes)	Max(bytes)	Min(bytes)	Max(bytes)
03H	Read multi-registers	8	8	7	21
06H	Write to single register	8	8	8	8
08H	Drive Detection	8	8	8	8
10H	Write to multi-registers	11	25	8	8

●**Operation Code(OP Code) Description:**

※**03H (Read multi-registers):**
Example: Read data from registers 2101H and 2102H of the drive 1

Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Numbers to Readout		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	03H	21H	01H	00H	02H	9FH	C4H

This example shows the host to read the drive data from 2 registers of the drive. The host identifies drive 1 by calling the drive address (02H) with the "read" operation command (03H) to read the drive data from the registers (2101H – starting register) to the register (2102H – Register Numbers to Readout defines the numbers of register for data readouts).

Return Code (Drive to Host)

Address	OP Code	Data Bytes	2101H(Register) Data		2102H(Register) Data		CRC Checksum	
			MSB	LSB	MSB	LSB	LSB	MSB
02H	03H	04H	55H	00H	17H	70H	D6H	EBH

The host reads registers 2101H and 2102H of drive (02H) (drive status and speed command). After the drive receives the host's command, the drive returns 4 bytes data (2101H=5500H and 2102H=1770H) to the host.

Caution: The host cannot simultaneously broadcast 03H OP code to drives when multiple drives connected or all drives reject host's OP code.

※**06H (Write to single register)**
Example: Write a data (1770H) into the drive register (2001H)

Message Code (Host to Drive)

Address	OP Code	Drive Register		Register Data		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	06H	20H	01H	17H	70H	DDH	EDH

This example shows the host to write the data (1770H) to the register (2001H) of the drive. The host identifies drive 1 by calling the drive address (02H) with the "write" operation command (06H) to write the data (1770H) into the register (2001H).

Return Code (Drive to Host)

Address	OP Code	Drive Register		Register Data		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	06H	20H	01H	17H	70H	DDH	EDH

The host writes data 1770H into the drive register 2001H. After receiving data from the host and writing data into drive's registers, the drive returns the original receiving message to the host. OP code-06H of the host can synchronously broadcast to all drives but has no return code to the host.

※**08H (Drive detection): Only use when testing the communication**

OP code – 08H is to detect if the drive is correctly receiving the data from the host. The main purpose of using this OP code is to ensure the host data to be correctly sent to the drive.

Example: Verify the data (0000H and AA55H) to be correctly received by the drive.

Message Code (Host to Drive)

Address	OP Code	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	08H	00H	00H	AAH	55H	5EH	A7H

The host sends OP-code (08H) to verify the data 0000H and AA55H to be correctly received by the drive.

Return Code (Drive to Host)

Address	OP Code	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	08H	00H	00H	AAH	55H	5EH	A7H

The drive returns the same message to the host to confirm the data well received from the host. Data 1 must be 0000H but Data 2 can be any values.

Note: The host cannot simultaneously broadcast 08H OP code to all drives when multiple drives connected or drives reject drive's OP codes.

※**10H (Write to multi-registers)**

When multiple data need to write into the drive from the host, the host can define how many registers and data to be written into the drive.

This example is illustrating 2 data (1011H and 1770H) from the host to be written into 2 drive registers (2000H and 2001H).

Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Number to Write		Data Length	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB		MSB	LSB	MSB	LSB	LSB	MSB
02H	10H	20H	00H	00H	02H	04H	10H	11H	17H	70H	3FH	FBH

The host calls the drive 1 by defining the drive address (02H) with the write to multi-registers OP code (10H) to write 2 data (1011H and 1770H) into the drive registers (2000H and 2001H) which are defined by calling starting register (2000H) with "register number to write" (0002H). In this example, if user has 4 data to write to 4 drive registers, the message code can be as follows:

        a. Starting register: 2000H (still)

        b. Register number to write: 0004H

Then, 4 data will be sequentially written into 4 registers starting from 2000H, 2001H, 2002H, to 2003H.

Return Code (Drive to Host)

Address	OP Code	Starting Register		Register Numbers to Write		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
02H	10H	20H	00H	00H	02H	4AH	3BH

The host writes 2 data (1011H and 1770H) with total data length 4 byte to 2000H and 2001H registers of drive. The drive receives and writes the data to the registers, and then returns the message to the host. The host can synchronously broadcast all drives to write multi-data to multi-registers in order to change the data synchronously.

6-5 CRC Checksum Algorithm

CRC checksum code is to verify the message validity during the communication and its algorithm is to apply each code in the message to perform XOR and bit shifting operations to generate the CRC code.

Here is the checksum algorithm diagram to generate CRC code.
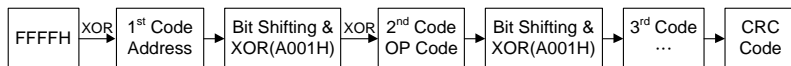
The following example shows how CRC code is generated.

Example: To generate CRC code D140 from Address Code: 02H and OP Code: 03H

The following example of using C language to create a sample program for CRC checksum algorithm

Example: C language sample program

```
unsigned char *data;              // Message pointer
unsigned char length;             // Message length
unsigned int crc_chk(unsigned char *data,unsigned char length)
{
      int i;
      unsigned int reg_crc=0xffff;
      while(length--)
       {
        reg_crc^=*data++;
        for(i=0;i<8;i++)
           if(reg_crc&0x01)
             reg_crc=(reg_crc>>1)^0xa001;
           else
             reg_crc=reg_crc>>1;
       }
}
```

6-6 Processing Time of Communication Transmission
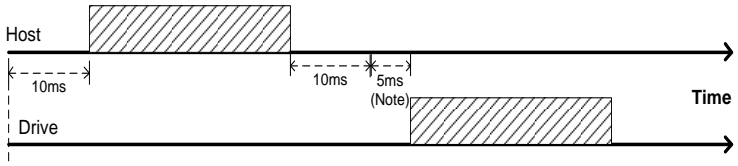
Communication Starts/Resets

The communication waits for 10ms to start the communication transmission after the drive powers on or the communication function of the drive changes. The drive needs 5ms processing time to return the message to the host after the message are received from the host. If the broadcast do not send back the massage , the host can start sending the message code after 5ms.

Note: if the message code is to "Read" or "Write" the parameter, the drive needs 100ms processing time to return the message to the host.

6-7 Communication Troubleshooting

1. When error occurs at the communication network, the drive provides the self-testing function to identify where error occurs. Please check communication function settings to verify the validity of functions.

2. When the host receives returned error messages from a drive, the host sends the invalid operation command to drive. The following table is the error message format.

Address	OP Code	Error Code	CRC Checksum	
			LSB	MSB
02H	1xxxxxxxB	xxH	xxH	xxH

OP code sets MSB (bit7) as 1 for the original command message, but error code gives different values according to different types of errors. The below table is describing types of error code:

Error Code	Error Type	Descriptions
0 0	Serial communication format error	Parity error of serial communication
0 1		Data frame error of serial communication
0 2		Over-bit error of serial communication
0 3	Modbus OP code error	OP code is not in either 03H,06H,08H, or 10H
0 4	Modbus CRC error	CRC checksum error
0 5	Modbus data range error	1. Data length in transmission not matched with the protocol 2. Data range over the register length at "write"
0 6	Modbus register characteristics error	Registers writes into read-only registers
0 7	Modbus register error	No-defined registers

6-8 Drive Registers and Command Code

●**Registers – Write Operation**

Reg. No.	Name	Description		
10nnH	Function setting	Drive function setting/monitoring; nn: F_000~F_195		
2000H	Operation command 1	b0~b1	00: No use	
			01: Stop	
			10: Start	
			11: JOG command	
		b2~b3	Reserved	
		b4~b5	00: No use	
			01: Forward command	
			10: Reverse command	
			11: Rotation direction change command	
		b6~b7	00: Primary acc./dec. time	
			01: Second acc./dec. time	
			10: Third acc./dec. time	
			11: Fourth acc./dec. time	
		b8~bB	0000: Primary speed (communication)	
			0001: Preset speed 1	
			0010: Preset speed 2	
			0011: Preset speed 3	
			0100: Preset speed 4	
			0101: Preset speed 5	
			0110: Preset speed 6	
			0111: Preset speed 7	
			1000: Preset speed 8	
			1001: Preset speed 9	
			1010: Preset speed 10	
			1011: Preset speed 11	
			1100: Preset speed 12	
			1101: Preset speed 13	
			1110: Preset speed 14	
			1111: Preset speed 15	
		bB	Reserved	
		bC~bD	00: No use	
			01: b6~bB functions (*Note 1)	
			10: Enable operation command 2 resister.	
			11: 01 and 10 Disable	
		bE~bF	Reserved	

●**Registers – Write Operation**

2001H	Frequency command	Primary frequency is set by communication (unit: 0.01Hz)	
2002H	Operation command 2	b0	1: External fault command
		b1	1: Reset command
		b2	1: Jog command
		b3	1: Output interruption command
		b4	1: Coast to stop command
		b5	1: Secondary accel/decel command
		b6	1: Accel/decel prohibition command
		b7	1: Select analog input source
		b8	1: DC braking enable
		b9	1: Secondary frequency selection
		bA~bF	Reserved
2003H	SV settimg value	Setting value of constant pressure (unit: 0.1)	

●**Registers – Read Operation**

Reg. No.	Name	Description	
2100H	Drive error code	00H	No error
		01H	Drive over current (OC)
		02H	Over voltage (OE)
		03H	Drive overheat (OH)
		04H	Drive overload (OL1)(OL2)
		05H	Motor overload (OL)
		06H	External fault (thr)
		07H	Short protection (SC)
		08H	A/D converter error (AdEr)
		09H	Reserved
		0AH	Reserved
		0BH	Reserved
		0CH	Reserved
		0DH	Grounding fault (GF)
		0EH	Under voltage during operation (LE1)
		0FH	EEPROM error (EEr)
		10H	Reserved
		11H	Drive output interruption (bb)
		12H	System overload (OLO)
		13H	Reserved
		14H	Reserved
		15H	Coast to stop (Fr)

● **Registers – Read Operation**

2101H	Drive status 1	b0~b7	Reserved
		b8	1: Frequency command by communication
		b9	1: Frequency command by analog inputs
		bA	1: Operation command by communication
		bB	1: Parameter locks
		bC	1: Drive running status
		bD	1: Jog running status
		bE	1: Forward indication
		bF	1: Reverse indication
2102H	Frequency command	Monitor drive's frequency command (unit: 0.01Hz)	
2103H	Output frequency	Monitor drive's output frequency(unit: 0.01Hz)	
2104H	Output current	Monitor drive's output current(unit: 0.1A)	
2105H	DC bus voltage	Monitor drive's DC bus voltage(unit: 0.1V)	
2106H	Output voltage	Monitor drive's AC output voltage(unit: 0.1V)	
2107H	Frequency of multi-speed	Monitor drive's frequency of multi-speed (*Note 2)	
2108H	PV	Practical pressure value (unit:0.1 pressure sensor unit)	
210DH	Drive's temperature	Moniter the temperature of heat sink(unit:0.1℃)	
2300H	I/O terminal status	b0	1: FWD terminal operation
		b1	1: REV terminal operation
		b2	1: X1 terminal operation
		b3	1: X2 terminal operation
		b4	1: X3 terminal operation
		b5	1: X4 terminal operation
		b6	Reserved
		b7	Reserved
		b8	1: Y1 terminal detection
		b9	1: Y2 terminal detection
		bA	1: Ta1,Tb1 terminal detection
		bB	1: Ta2/Tc2 terminal detection
		bC	1: Primary speed is controlled by analog input.
		bD	1: Primary speed is controlled by keypad.
		bE	1: Primary speed is controlled by UP/DOWN command.
		bF	1: Primary speed is controlled by communication.

● **Registers – Read Operation**

2301H	Drive status 2	b0	Reserved
		b1	1: Constant speed
		b2	1: Zero speed
		b3	1: Frequency detection
		b4	1: System overload
		b5	1: Stall prevention
		b6	Reserved
		b7	1: Braking action
		b8	Reserved
		b9	Reserved
		bA	1: Error occurs
		bB~bF	Reserved
2302H	Reserved		
2303H	Fault record 1	Fault record 1 (*Note 3)	
2304H	Fault record 2	Fault record 2 (*Note 3)	
2305H	Fault record 3	Fault record 3 (*Note 3)	
2306H	Fault record 4	Fault record 4 (*Note 3)	
2307H	Fault record 5	Fault record 5 (*Note 3)	

6

Note:

1. When the b6~Bb function is enabled, multi-function command –Multi-speed 1, 2, 3,4 will be inactive.

2. 0: Analog
   1: Primary speed
   2~8: Multi-speed 1~7
   9: Jog speed
   11: Communication
   12~19: Preset speed 8~15

3. Fault record table

Error code	Drive display		Description
01H	$AdEr$	(AdEr)	A/D converter error
08H	OC	(OC)	Drive over current
0CH	OE	(OE)	Over voltage
0DH	$LE1$	(LE1)	Under voltage during operation
0EH	GF	(GF)	Grounding fault
0FH	OH	(OH)	Drive overheat
10H	OL	(OL)	Motor overload
11H	$OL1$	(OL1)	Drive overload
12H	OLO	(OLO)	System overload
13H	thr	(thr)	External fault
14H	$PAdF$	(PAdF)	Keypad interruption during copy
16H	$ntcF$	(ntcF)	Fuse open

4. 10nnH—Write and read allowed
   2000H~2002H—Write only, read prohibited
   2100H~210FH—Read only, write prohibited

6-9 Programming Examples – Register and Command

6-9-1 Access Drive Function Setting – Write Operation

Example: Set function F_009 (primary speed) = 30 Hz
a. Drive register used: 0009H(9 (decimal value)=0009H(hex)
b. Register data: 0BB8H(30Hz=30.00Hz(resolution:0.01Hz)
→ 30.00÷0.01=3000(decimal)=0BB8H(hex))

Code to write to drive register from the host (CRC exclusive)

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10H	09H	0BH	B8H

6-9-2 Host Control to Drive – Write Operation

When the host control by Modbus communication, user can simply create an icon or active key/button to activate the drive. The following examples shows how to program the communication control.

1. Start the drive:

a. Create an icon or active button/key on the host for "Drive Start"
b. Program the host with the following code for "Drive Start"
c. The drive register to be written for start operation: 2000H
d. The register data for start operation: 0002H

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	02H

2. Forward rotation command:

a. Create an icon or active button/key on the host for "Forward"
b. Program the host with following code for "Forward" rotation control
c. The drive register to be written for forward command: 2000H
d. The register data for forward command: 0010H

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	10H

3. Speed Setting (frequency command) – without using drive function setting:

Set the speed to be 30.05Hz (resolution: 0.01Hz)
a. The drive register to be written for Speed setting(frequency command): 2001H
b. Convert 30.05Hz to hexadecimal value:
   30.05 x 100 (by the resolution) = 3005 (decimal) = 0BBDH

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	01H	0BH	BDH

4.Primary Acceleration/Deceleration Time Setting:

Set the acceleration/deceleration time = 1.5 seconds (resolution: 0.1 seconds)

Primary accel time

a. Set F_019 (Primary accel time) = 1.5 seconds
   Register number: 1013H (19 (decimal) = 0013H(hex)).

b. Register data:
   000FH (1.5÷0.1(resolution:0.1sec.)=15(decimal)=000FH(hex)

Primary decel time

a. Set F_020 (Primary dec. time) = 1.5 seconds
   Register number: 1014H(20(decimal)=0014H(hex))

b. Register data:
   000FH(1.5÷0.1(resolution:0.1sec.) = 15(decimal)=000FH(hex)

Acceleration/Deceleration Time Setting

a. Register number: 2000H

b. Register data: 000HH(b6~b7)

Set the acceleration time F_019 = 1.5 seconds

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10	13	00H	0FH

Set the deceleration time F_020 = 1.5 seconds

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10	14	00H	0FH

Select primary acceleration/deceleration time

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	00H

6-9-3 Host Control to Drive – Read Operation
1. Drive Error Trips (Fault Code):

Example: Drive error trips due to "GF" (grounding fault) and the fault message displayed at the host.

a. The host sends the below codes to access the drive register to monitor drive faults (read only one register data)
   -Drive register: 2100H
   -Number of register to read: 1 ➔ 0001H

Message Code (Host to Drive)

Address	OP Code	Drive Register		Register Numbers to Readout	
		MSB	LSB	MSB	LSB
01H	03H	21H	00H	00H	01H

b. The drive returns the fault code to the host when "GF" occurs:
   -GF code: 0DH

Return Code (Drive to Host)

Address	OP Code	Data Byte	2100H(Register) Data	
			MSB	LSB
01H	03H	02H	00H	0DH

c. Program the host to convert register data 000DH to "GF" message

2. Drive Frequency Output Readout:

Example: If the drive frequency outputs = 40.65Hz, read the data output from the drive and display 40.05Hz in the host.

a. The host sends the below codes to access the drive register to read out the frequency output data (read only one register data)

-Drive register: 2103H

-Number of register to read: 1 ➔ 0001H

Message Code (Host to Drive)

Address	OP Code	Drive Register		Register Numbers to Readout	
		MSB	LSB	MSB	LSB
01H	03H	21H	03H	00H	01H

b. The drive returns the frequency output readouts to the host

-Output frequency readouts from the drive (2103H register data):

Return Code (Drive to Host)

Address	OP Code	Data Byte	2103H(Register) Data	
			MSB	LSB
01H	03H	02H	0FH	E1H

c. Program the host to convert register data 0FE1H (Hex value) = 4065 (Decimal value)

d. Display the output frequency (resolution = 0.01): 4065/100 = 40.65 (unit in Hz)

No Text on This Page

Chapter 7   Operation Procedures and Fault Protection

7-1 Operation Procedures

/⚡\ **DANGER**
1. Do Not remove wires when the internal indicator of the drive remains ON.

/!\ **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 verify if the output voltage and current are valid. Press $\boxed{\frac{\text{OFF}}{\text{RESET}}}$ 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.

H. When using the single-phase power source to drive the three-phase drive (not the standard type of single-phase power input), first confirm the horsepower of motor, and then calculate the motor rated current by multiplying the motor rated current by 2 times to the base value of drive rated current. The drive selection for this single-phase power must have the rated current equal to the calculated drive rated value.

Formula: Motor rated current **×** 2 = Drive rated output current

App.A

Example:

    a. Drive selection:

      Motor specification: 220VAC, 1HP ; rated current: 3.1A

      Base value of drive rated current=3.1 (A) $\times$ 2 = 6.2 (A)

      Drive specifications: 220VAC, 1HP drive = 5A (rated output current)

                                   2HP drive = 8A (rated output current)

           ⇨ Select 2HP drive for 1HP AC motor.

    b. Wiring of power: Connect the single-phase power line to R, S terminals.

    c. Parameter settings:
      Please reset below functions. If the parameters are not modified, the motor and drive could be possibly damaged.

      F_048 Motor Rated Current = 3.1A
      (the setting must be based on the motor rated current)

      F_068 System Overload Detection Level = 80
      (the half of the default setting value 160%)

      F_071 Stall Prevention Level at Constant Speed = 80
      (the half of the default setting value 160%)

7-2 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 troubleshooted, reset the drive by pressing $\boxed{\frac{\text{OFF}}{\text{RESET}}}$ of keypad or command the drive to reset through multi-function input terminals by an external reset signal

b: Protection and Troubleshooting List:

Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(EEr) KEYPAD $\boxed{8.8.8\ E E r}$ SV Running PV	**EEPROM error**	●EEPROM data write fault. ●EEPROM component defected.	●Please reset all parameters to default value and restart the drive. ●Return the drive to repair, when the fault cannot be eliminated.
(AdEr) KEYPAD $\boxed{8.8.Ad E r}$ SV Running PV	**A/D converter error**	● A/D converter broke down	Please call customer service for drive repair.
(SC) KEYPAD $\boxed{8.8.8\ S C}$ SV Running PV	**Fuse open**	●Drive internal fuse open. ●IGBT power module damage.	Please call customer service for drive repair.
(LE1) KEYPAD $\boxed{8.8.8\ L E 1}$ SV Running PV	**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. ●Motor with instant overload causing the high voltage drop.	Increase the power capacity.

App.A

Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(OC) KEYPAD 8.8.8.8.0C SV　Running　PV	**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 at zero speed while the motor is still running in rotation condition. ●Wrong wiring or bad insulation. ●Starting voltage is too high. ●The motor terminal installs an advance-phase or filter capacitor.	●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 for possible over loading condition at the motor. ●Check if the the acceleration time is too short.
(GF) KEYPAD 8.8.8.8.GF SV　Running　PV	**Grounding fault** ●The three-phase output current is unbalance and exceeding the detection level of grounding fault. ●Grounding fault protection: F_098	Check for possible bad insulation at motor's output side or wire.	Check the insulation of motor's wire and motor.
(OE) KEYPAD 8.8.8.8.OE SV　Running　PV	**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 DC bus too high. ●Power voltage is too high. ●Surge voltage occurs in drive's input power side.	●Increase deceleration time. ●Add dynamic brake unit. ●Check if the power input is within drive's rated input range. ●Add AC reactor at power input terminal.

Error Trip Messages of Drive

(OH) KEYPAD `8.8.8.8.OH` SV Running PV	**Drive overheat** The temperature of drive's heat sink reaches the trip level..	●The surrounding temperature is too high. ●The heat sink has foreign body. ●The cooling fan of drive is fault.	●Improve the system ventilation. ●Clean the foreign body on the heat sink. ●Return the drive to replace the cooling fan.
(OL) KEYPAD `8.8.8.8.OL` SV Running PV	**Motor overload** Operation current exceeds 150% of motor's rated current and reaches the motor overload protection time.	●Motor overloaded. ●The voltage setting of V/F pattern is too high or too low. ●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) KEYPAD `8.8.8.OL.1` SV Running PV	**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 if the load of motor overload. ●Check if the acceleration or deceleration time is too short. ●Check if V/F setting is proper. ●Select the higher capacity of drive.
(OLO) KEYPAD `8.8.8.OLO` SV Running PV	**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.

Error Trip Messages of Drive

Display	Description	Cause	Troubleshooting
(thr) KEYPAD SV Running PV	**External fault**	The multi-function terminal receives the external fault signal.	Clear the external fault and then press OFF/RESET key.
(ntCF) KEYPAD SV Running PV	**NTC thermistor sensor fault**	NTC thermistor sensor is fault.	Please call customer service for drive repair.
(PAdF) KEYPAD SV Running PV	**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.

Error Trip Messages of Drive at Constant Pressure Control

Display	Description	Cause	Troubleshooting
(no Fb) KEYPAD $\boxed{\text{no Fb}}$ SV Running PV	**PID feedback signal error**	Under closed loop control, the feedback signal wire is loosen/ tripped.	Check the feedback signal wire.
(OP) KEYPAD $\boxed{\text{OP}}$ SV Running PV	**Over pressure**	Under closed loop control, the feedback limit is abnormal.	●Check if the settings of function is appropriate (F_190 ~ 194) ●Check if the pressure of the compressor is normal.

Warning Messages of Drive

*When the drive displays below messages, drive stops output. If the abnormal condition is removed, the drive auto recovers the normal operation.

Display	Description	Cause	Troubleshooting
(LE) KEYPAD $\boxed{\text{LE}}$ SV Running PV	**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) KEYPAD $\boxed{\text{bb}}$ SV Running PV	**Drive output interruption**	Drive stops the output when the output interruption command is activated.	Clear drive output interruption command.
(Fr) KEYPAD $\boxed{\text{Fr}}$ SV Running PV	**Coast to stop**	Drive stops the output when the coast to stop command is activated.	Clear "coast to stop" command.
(db) KEYPAD $\boxed{\text{db}}$ SV Running PV	**Dynamic brake over voltage** The internal DC bus voltage of drive is over the protection level.	DC bus voltage is too high .	Check if the input power is within drive's rated input range.

App.A

Chapter 7　Operation Procedures and Fault Protection

Warning Messages of Drive

*When the drive displays below messages, drive stops output. If the abnormal condition is removed, the drive auto recovers the normal operation.

Display	Description	Cause	Troubleshooting
(PrEr) ⬛KEYPAD `8.8.PrEr` SV Running PV	**Program fault**	— — —	Check the software version of drive.
(Ht) ⬛KEYPAD `8.8.8.Ht` SV Running PV	**Drive overheat** ●The temperature of drive's heat sink reaches the warning level. ●Warning level: F_142.	●The surrounding temperature is too high. ●The heat sink has foreign body. ●The cooling fan of drive is fault.	●Improve the system ventilation. ●Clean the dust on the heat sink. ●Return the drive to replace the cooling fan.

(Err_00)
⬛KEYPAD
`Err 00`
SV Running PV
 	
(Err_01)
⬛KEYPAD
`Err 01`
SV Running PV
	Err_00: Keypad cable trip before connecting
	
	Err_01: Keypad cable trip during operation
		●The connecting wire of the keypad is loosen.
		●The keypad jack of the drive is oxidized.
			Check the wire between the keypad and drive.

(OP) ⬛KEYPAD `8.8.8.OP` SV Running PV	**Over pressure**	●Under closed loop control, the feedback limit alarm.	●Check if the settings of function is appropriate (F_190 ~ 194) ●Check if the pressure of the compressor is normal.
(Cot) ⬛KEYPAD `8.8.8.Cot` SV Running PV	**Communication overtime** ●Detection time: F_113 ●F_114=0	●Communication wire is loosen or connecting wire is incorrect. ●Communication setting of host and receiver are different. ●Communication signal is inconnect	●Check the wiring of communication wire. ●Check the communication setting. ●Check if the F_113 Communication detect time is appropriate.

No Text on This Page

App.A

Appendix A   Applicable Safety Regulation

A.1 UL Safety Regulation and cUL Certification

Underwriters Laboratories Inc.(UL) is an independent organization for the product safety test. Focus the safety of product to establish the standard and test procedure to against the fire or other accidents to protect the user, customer service engineer and general people.

cUL is represented that the product is confirmed by UL and compile with safty standard made by Canadian Standard Association, cUL certicate product have available efficiency with CSA specification.

Model number	Corresponding standard
RM6-9916	UL508C
	CSA C22.2 No.14-05

A.2 Europen Safety Regulation

To relate the CE safety regulation mark of drive not guarantee the mechanical equipment totally corresponding to the request of CE safety regulation by using the drive. To pass the request of CE safety regulation, the mechanical equipment must satisfy some conditions. The mechanical equipment usually use not only the drive but also other devices. Therefore, the mechanical manufacturer must estimate if the specification of total equipment is corresponding to the regulation.

If the user hopes the product to correspond the regulation, please refer to page 169-170 to select the suitable EMC filter and installing the filter correctly according to the figures as below.
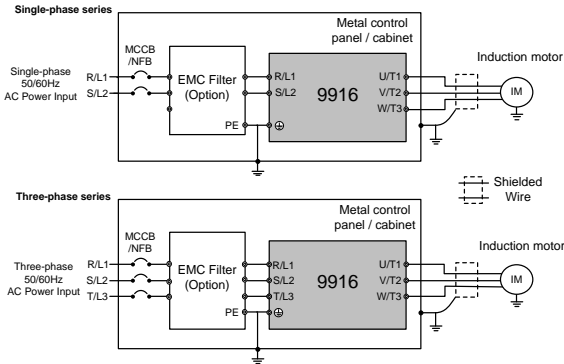
Model number	Corresponding standard
RM6 (9916)	EMC：EN61000-6-2, -4、EN61800-3
	LVD：EN61800-5-1

Note：Please indeed ground the drive, motor and metal control panel/cabinet and connecting the shielded wire with metal control panel/cabinet. Please select shielded cable for motor usage and reducing the cable length as short as possible.

Appendix B   Peripheral Equipment of Drive

⚠ CAUTION
1. When the drive requires the following equipment, please select the proper external equipment. The incorrect setup will result in the failure of drive, reducing drive's life, and even damage the drive.
2. The surrounding temperature of drive will influence drive's life. Please monitor the surrounding temperature of drive to avoid the temperature exceeding the permitting specifications when the drive is installed in closed place. In addition, the control signal should be far away from the wiring of main circuit to avoid the signal interference.
3. To prevent the engineer from electric shocks, please do the grounding well of motor and drive. Motor's grounding must connect to drive's grounding terminal.

Power source — Please use within the permissible power supply for the drive.

Molded Case Circuit Breaker (MCCB) or Fuse — When the power is ON, a large in-rush current flow will be inputted into the drive. The breaker must be selected carefully.

Magnetic Contactor (MC) — Option. When it is used for external control or the DBU is used, it should be installed at the primary side. Do not use MC to start/stop the drive, otherwise the life of drive will be reduced.

R S T
L1 L2 L3   P P₁   U V W
T1 T2 T3

AC reactor (ACL) — Reduce the harmonic interference for low frequency of power. (Please refer to p.97)

DC reactor (DCL) Improve power factor of driver (Please refer to p.97)

The ACL can reduce the leakage current of motor effectively; It is used as the motor is far away from the drive. (Please refer to p.97)

EMI filter — Reduce conduction interference. (Please refer to p.106)

Zero-phase radio frequency filter (RFI)

Reduce radiation interference. The range of limited frequency is 1MHz - 10MHz. (Please refer to p.102)

Zero-phase radio frequency filter (RFI) — Reduce radiation interference. The range of limited frequency is 1MHz - 10MHz. (Please refer to p.102)

Motor

147

Appendix C   Selection of Motor

A. Standard Motor

a. Must be used the 3-phase induction motor as load.

b. 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.

c. Standard three-phase induction motor (NEMA B) characteristics as follows:
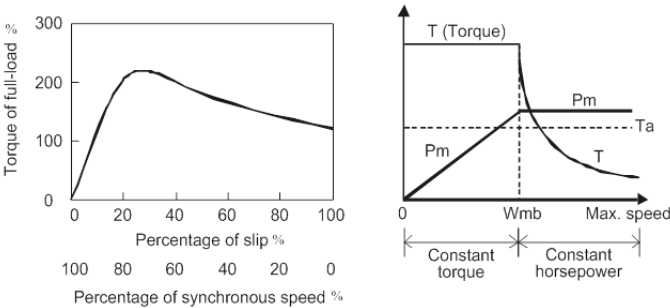
d. When the motor speed exceeds the rated speed (50/60Hz), the torque will be decreased while the motor speed increasing.

e. Check the motor insulation. The standard requirement is 500V (or 1000V) / 100MΩ above.

B. Insulation Measurement of Drive and Motor

1. Measure the drive insulation impedance

    a. Please be extremely cautious to following steps to test the main circuit insulation of drive. Any incautious operations while testing the drive insulation may possibly harm operating personnel and cause serious damages to drive.

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

    c. 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, please contact with the customer service.
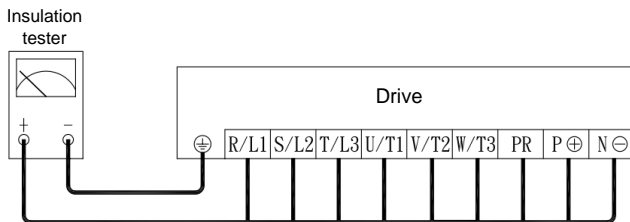
Drive Insulation Impedance Measurement

2. Measure the motor insulation impedance

    a. Remove the U/T1, V/T2, W/T3 cables of motor from the 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.

    b. If motor insulation impedance is less than 20MΩ, Do Not install a drive, or the lifetime of 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.
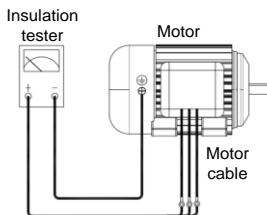
Motor Insulation Impedance Measurement (including motor cables)

App.C

Appendix D   Instruction of Drive Charging

Caution: If the drive is unused or stored in the storage over 1 year, the surface of aluminum foil of electrolytic capacitor within the drive will be oxidized and cracked causing the L and C value up. This is the common characteristics of capacitor. Therefore, if drive placed for a long time and user input the voltage directly, it may cause drive damaged due to high current or oxide film 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 for 30 minutes from 0 volt to the half of drive's rated voltage and then to apply drive rated voltage to charge the drive for another 30 minutes.

B. When charging the internal capacitor of drive, the wiring between autotransformer and terminals (R/L1, S/L2) of drive is 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 and doesn't display
 on the keypad, please contact the customer service for repair service.

Appendix E   Dynamic Brake Unit and Braking Resistor

a. Braking transistor is installed in the following models

Standard built-in type: RM6-2001/2-9916 ~ 2015-9916; RM6-4001-9916 ~ 4025-9916

Optional type: RM6-2020B-9916 ~ 2075B-9916 ; RM6-4030B-9916 ~ 4125B-9916

b. Outline of braking resistor (option)

Aluminum Case Resistor
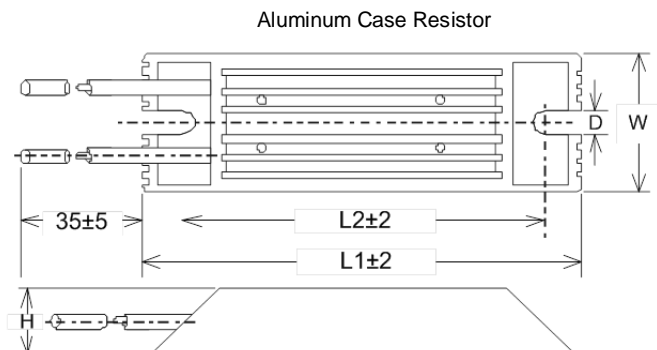
c. Rated specification of braking resistor

Model number	Specification	Dimensions (mm)					Max. weight
		L1	L2	W	H	D	(g)
MHL100-100	100W/100Ω	165	150	40	20	5.3	200
MHL100-400	100W/400Ω	165	150	40	20	5.3	200
MHL500-40	500W/40Ω	335	320	60	30	5.3	1100

※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 f of Appendix D for wiring of braking resistor).

Appendix E　Dynamic Brake Unit and Braking Resistor

d. Recommend specification of braking resistor

AC 200V Series

Model number of drive	Braking resistor specification		Approximate braking torque (10%ED)
	Minimum specification	Recommend combination	
RM6-2001/2-9916	100Ω/100W	MHL100-100*1	240
RM6-2001-9916			140
RM6-2002-9916			75
RM6-2003-9916	40Ω/500W	MHL500-40*1	160
RM6-2005-9916			105
RM6-2007-9916	20Ω/1000W	MHL500-40*2 (2pcs in parallel)	140
RM6-2010-9916			110
RM6-2015-9916	13.3Ω/1500W	MHL500-40*3 (3pcs in parallel)	115
RM6-2020-9916	10Ω/2000W	MHL500-40*4 (4 pcs in parallel)	120
RM6-2025-9916	8Ω/2500W	MHL500-40*5 (5 pcs in parallel)	120
RM6-2030-9916	6.6Ω/3000W	MHL500-40*6 (6 pcs in parallel)	120
RM6-2040-9916	3.3Ω/6000W	MHL500-40*12 (12 pcs in parallel)	190
RM6-2020-9916	10Ω/2000W	MHL500-40*4 (4 pcs in parallel)	120
RM6-2050B-9916	2.5Ω/8000W	MHL500-40*16 (16 pcs in parallel)	200
RM6-2060B-9916			165
RM6-2075B-9916	2.0Ω/10000W	MHL500-40*20 (20 pcs in parallel)	160

AC 400V Series

| Model number of drive | Braking resistor specification | | Approximate braking torque (10%ED) |
	Minimum specification	Recommending combination	
RM6-4001-9916	400Ω/100W	MHL100-400*1	145
RM6-4002-9916	200Ω/200W	MHL100-400*2 (2pcs in parallel)	180
RM6-4003-9916	133Ω/300W	MHL100-400*3 (3pcs in parallel)	180
RM6-4005-9916	100Ω/400W	MHL100-400*4 (4pcs in parallel)	160
RM6-4007-9916	80Ω/1000W	MHL500-40*2 (2pcs in series)	125
RM6-4010-9916			100
RM6-4015-9916	40Ω/2000W	MHL500-40*4 (2pcs in parallel, 2 sets in series)	150
			120
RM6-4025-9916	27Ω/3000W	MHL500-40*6 (3 pcs in parallel, 2 sets in series)	135
RM6-4030-9916	20Ω/4000W	MHL500-40*8 (4 pcs in parallel, 2 sets in series)	160
RM6-4040-9916			120
RM6-4050-9916	13.3Ω/6000W	MHL500-40*12 (6 pcs in parallel, 2 sets in series)	150
RM6-4060-9916	10Ω/8000W	MHL500-40*16 (8 pcs in parallel, 2 sets in series)	165
RM6-4075B-9916	8Ω/10000W	MHL500-40*20 (10 pcs in parallel, 2 sets in series)	160
RM6-4100B-9916			120
RM6-4125B-9916			100

Appendix E   Dynamic Brake Unit and Braking Resistor

e. Recommend specification of dynamic brake unit (DBU6) and braking resistor

AC 200V Series

Drive	DBU specification		Braking resistor specification		Approximate braking torque (10%ED)
Model number	Model (DBU6-)	Unit (set)	Recommend combination	Unit (set)	
RM6-2100-9916	L400	1	MHL500-40*18 (9000W / 2.2Ω; 18pcs in parallel)	1	110
RM6-2125-9916	L400	1	MHL500-40*22 (11000W / 1.82Ω; 22pcs in parallel)	1	115
RM6-2150-9916	L400	1	MHL500-40*26 (13000W / 1.54Ω; 26pcs in parallel)	1	115
RM6-2200-9916	L400	2	MHL500-40*18 (9000W / 2.2Ω; 18pcs in parallel)	2	110
RM6-2250-9916	L400	2	MHL500-40*22 (11000W / 1.82Ω; 22pcs in parallel)	2	115

AC 400V Series

Drive	DBU specification		Braking resistor specification		Approximate braking torque (10%ED)
Model number	Model (DBU6-)	Unit (set)	Recommend combination	Unit (set)	
RM6-4100-9916	H200	1	MHL500-40*24 (12000W / 6.6Ω; 12pcs in parallel, 2 sets in series)	1	145
RM6-4125-9916					120
RM6-4150-9916	H300	1	MHL500-40*36 (18000W / 4.4Ω; 18pcs in parallel, 2 sets in series)	1	155
RM6-4175-9916					130
RM6-4200-9916	H400	1	MHL500-40*48 (24000W / 3.3Ω; 24pcs in parallel, 2 sets in series)	1	140
RM6-4250-9916					115
RM6-4300-9916	H300	2	MHL500-40*36 (18000W / 4.4Ω; 18pcs in parallel, 2 sets in series)	2	155
RM6-4350-9916	H300	2	MHL500-40*40 (20000W / 4Ω; 20pcs in parallel, 2 sets in series)	2	150
RM6-4420-9916	H400	2	MHL500-40*44 (22000W / 3.63Ω; 22pcs in parallel, 2 sets in series)	2	135
RM6-4500-9916	H400	2	MHL500-40*52 (26000W / 3.08Ω; 26pcs in parallel, 2 sets in series)	2	130
RM6-4600-9916	H400	3	MHL500-40*44 (22000W / 3.63Ω; 22pcs in parallel, 2 sets in series)	3	140
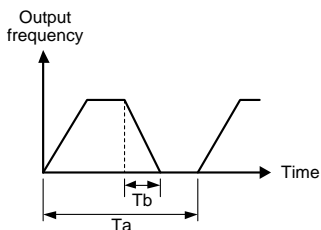
Note:

1. %ED (Effective Duty Cycle) = Tb/Ta*100% (continuous operation time Tb<15 sec).The definition is shown as left figure.

2. Above wattages of table is defined at 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

f. 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 temperature of braking resistor and generate an external fault signal to the multi-function terminal (X4) to stop the drive when the braking resistor is overheating and interrupt the connection of magnet contactor (MC) by output terminals Ta2 / Tc2.

(2) Set the multi-function terminal (X4) to "-7" (External fault).

(3) Set the multi-function terminal (Ta2 / Tc2) to "-11" (Error detection).
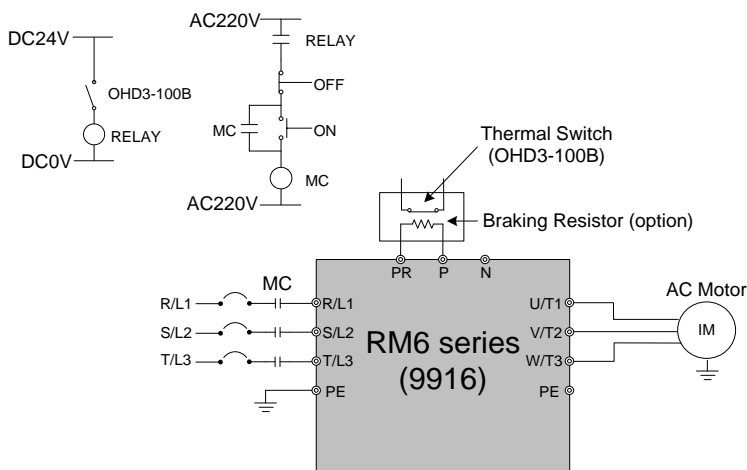
2.) Wiring diagram b

(Figure 2)

When the drive power is controlled by the magnet contactor (MC), use the thermal switch to control magnet contactor (MC). When the braking resistor is overheating, the contactor (MC) is disconnected.

g. Wiring Diagram of External Dynamic Brake Unit(DBU) and Thermal Switch
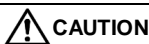
⚠ CAUTION
Strongly recommend to Install the thermal switch for the brake protection to prevent the brake from any possible damages caused by the overheating on the braking resistor. Please refer to the figure 1 and 2 as following for the wiring diagram.

1.) Wiring diagram a

⊚ Main Circuit Terminal
○ Control Terminal
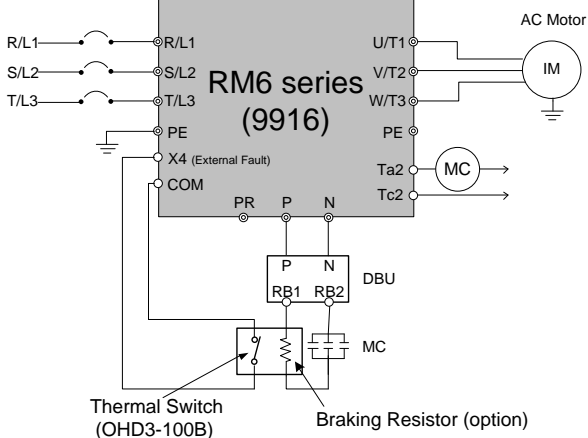
(Figure 1)

(1) Use the thermal switch to protect the temperature of braking resistor and generate an external fault signal to the multi-function terminal (X4) to stop the drive when the braking resistor is overheating and interrupt the connection of magnet contactor (MC) by output terminals Ta2 / Tc2.

(2) Set the multi-function terminals (X4) to "-7" (External fault).

(3) Set the multi-function terminals (Ta2 / Tc2) to "-11" (Error detection).
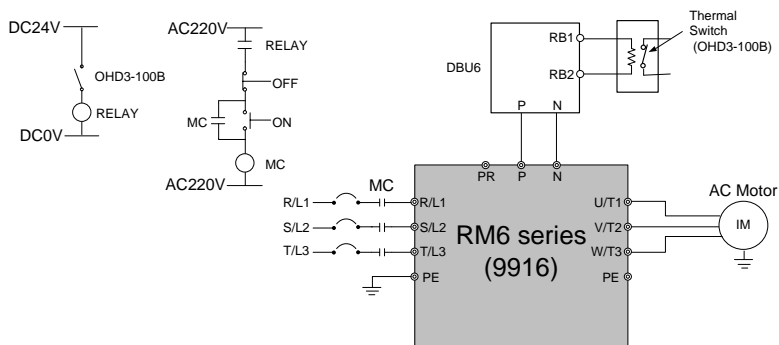
2.) Wiring diagram b

(Figure 2)

When the drive power is controlled by the magnet contactor (MC), use the thermal switch to control magnet contactor (MC). When the braking resistor is overheating, the contactor (MC) is disconnected.

Appendix F   Selection of Reactor

⚠ CAUTION
Due to the AC reactor(ACL) or DC reactor(DCL) possibly produce the heat (about 100℃) in use, please Do NOT touch the reactor and note the environment conditions.

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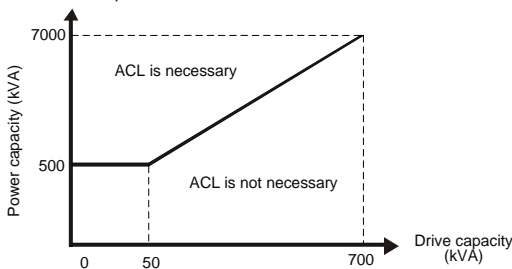
c. When the heater (with the SCR), air compressor, high-frequency equipment, or welding machine is installed at the same power source system, the harmonic current will interfere the drive. Thus, add the ACL at the input terminal (R/L1,S/L2,T/L3) of the drive is required.

d. When multiple drives of high horse power are used, due to harmonic wave generate, 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 and DCL, the power factor is above 90%.(the specifications of ACL and DCL, please refer to page 162 ~165)

g. When horse power of drive is 100HP(included) or above, ACL is the standard equipment. When the drive is 175HP(included) or above, DCL is the standard equipment.

h. The connecting cable between the drive and DCL must be the same specifications with the cable of input terminal(R/L1,S/L2,T/L3).

App.F

AC Reactor (ACL) Specifications

Drive model number	Input (R/L1,S/L2,T/L3)		Output (U/T1,V/T2,W/T3)		Drive model number	Input (R/L1,S/L2,T/L3)		Output (U/T1,V/T2,W/T3)	
	(mH)	(A)	(mH)	(A)		(mH)	(A)	(mH)	(A)
RM6-2001/2-9916	0.45	15	0.45	15	RM6-4001-9916	0.45	15	0.45	15
RM6-2001-9916	0.45	15	0.45	15	RM6-4002-9916	0.45	15	0.45	15
RM6-2002-9916	0.45	15	0.45	15	RM6-4003-9916	0.45	15	0.45	15
RM6-2003-9916	0.45	15	0.45	15	RM6-4005-9916	0.45	15	0.45	15
RM6-2005-9916	0.2	30	0.2	30	RM6-4007-9916	0.2	30	0.2	30
RM6-2007-9916	0.2	30	0.13	50	RM6-4010-9916	0.2	30	0.2	30
RM6-2010-9916	0.13	50	0.13	50	RM6-4015-9916	0.2	30	0.13	50
RM6-2015-9916	0.13	50	0.07	75	RM6-4020-9916	0.13	50	0.13	50
RM6-2020-9916	0.07	75	0.05	100	RM6-4025-9916	0.13	50	0.13	50
RM6-2025-9916	0.05	100	0.05	100	RM6-4030-9916	0.13	50	0.07	75
RM6-2030-9916	0.05	100	0.035	150	RM6-4040-9916	0.07	75	0.05	100
RM6-2040-9916	0.035	150	0.025	200	RM6-4050-9916	0.05	100	0.05	100
RM6-2050-9916	0.025	200	0.025	200	RM6-4060-9916	0.05	100	0.035	150
RM6-2060-9916	0.025	200	0.015	300	RM6-4075-9916	0.035	150	0.025	200
RM6-2075-9916	0.015	300	0.013	400	RM6-4100-9916	0.025	200	0.025	200
RM6-2100-9916	0.013	400	0.013	400	RM6-4125-9916	0.025	200	0.015	300
RM6-2125-9916	0.013	400	0.01	600	RM6-4150-9916	0.015	300	0.015	300
RM6-2150-9916	0.01	600	0.01	600	RM6-4175-9916	0.015	300	0.013	400
RM6-2200-9916	0.006	800	0.006	800	RM6-4200-9916	0.013	400	0.013	400
RM6-2250-9916	0.006	800	0.005	1000	RM6-4250-9916	0.013	400	0.01	600
—	—	—	—	—	RM6-4300-9916	0.01	600	0.01	600
—	—	—	—	—	RM6-4350-9916	0.01	600	0.006	800
—	—	—	—	—	RM6-4420-9916	0.006	800	0.006	800
—	—	—	—	—	RM6-4500-9916	0.006	800	0.005	1000
—	—	—	—	—	RM6-4600-9916	0.005	1000	0.005	1000

DC Reactor (DCL) Specifications

Drive model number	200V Series		Drive model number	400V Series	
	(mH)	(A)		(mH)	(A)
RM6-2007-9916	1.2	30	RM6-4007-9916	1.5	20
RM6-2010-9916	0.9	50	RM6-4010-9916	1.2	30
RM6-2015-9916	0.5	75	RM6-4015-9916	1.2	30
RM6-2020-9916	0.5	75	RM6-4020-9916	0.9	50
RM6-2025-9916	0.4	100	RM6-4025-9916	0.9	50
RM6-2030-9916	0.4	100	RM6-4030-9916	0.9	50
RM6-2040-9916	0.25	150	RM6-4040-9916	0.5	75
RM6-2050-9916	0.2	200	RM6-4050-9916	0.4	100
RM6-2060-9916	0.2	200	RM6-4060-9916	0.4	100
RM6-2075-9916	0.15	300	RM6-4075-9916	0.25	150
RM6-2100-9916	0.177	400	RM6-4100-9916	0.2	200
RM6-2125-9916	0.177	400	RM6-4125-9916	0.2	200
RM6-2150-9916	0.126	600	RM6-4150-9916	0.15	300
RM6-2200-9916	0.09	800	RM6-4175-9916	0.15	300
RM6-2250-9916	0.09	800	RM6-4200-9916	0.177	400
―	―	―	RM6-4250-9916	0.177	400
―	―	―	RM6-4300-9916	0.126	600
―	―	―	RM6-4350-9916	0.126	600
―	―	―	RM6-4420-9916	0.09	800
―	―	―	RM6-4500-9916	0.09	800
―	―	―	RM6-4600-9916	0.07	1000

App.F

Appendix F　Selection of Reactor

Outline dimensions of AC reactor (ACL)
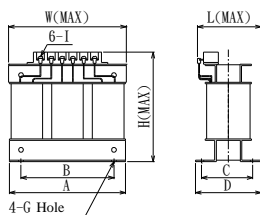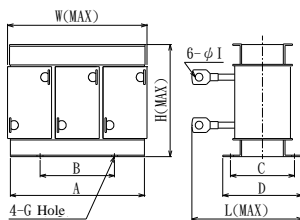
Figure A　　　　　　　　　　　　Figure B
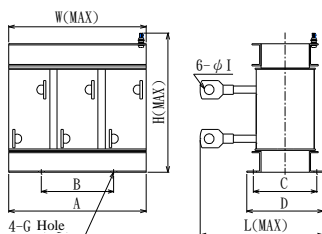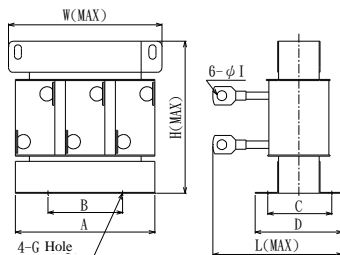
Figure C　　　　　　　　　　　　Figure D

Specifications of AC reactor (ACL)

Capacity	Figure	A	B	C	D	W (MAX)	L (MAX)	H (MAX)	G	I	Weight (kg)
0.45mH/15A	A	150	80	66	85	152	97	146	16×8	M4	4.0
0.2mH/30A	B	150	80	66	85	152	127	130	16×8	6	4.2
0.13mH/50A	B	150	80	68	85	152	134	131	16×8	6	4.6
0.07mH/75A	B	150	80	68	85	151	134	131	16×8	6	4.8
0.05mH/100A	B	180	100	77	97	182	145	149	16×8	8	8.0
0.035mH/150A	B	180	100	77	97	182	148	149	16×8	8	8.6
0.025mH/200A	B	180	100	90	107	182	165	153	16×8	8	9.8
0.015mH//300A	C	190	120	104	130	225	220	210	25×14	12	19
0.013mH//400A	C	230	120	104	130	230	240	200	22×10	12	20.2
0.01mH//600A	C	280	140	120	135	280	270	235	22×10	16	29.3
0.006mH/800A	D	300	150	140	174	300	300	305	25×13	15	65
0.005mH/1000A	D	350	160	145	184	350	290	320	25×13	14	84.6

(unit: mm)

Outline dimensions of DC reactor (DCL)
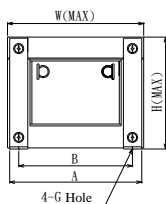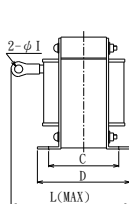
Figure A   Figure B
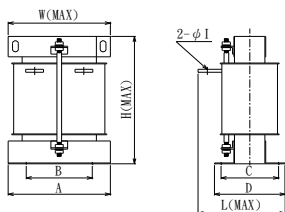
Figure C

Specifications of DC reactor (DCL)

Capacity	Figure	A	B	C	D	W (MAX)	L (MAX)	H (MAX)	G	I	Weight (kg)
1.5mH/20A	A	96	80	81	98	96	120	85	11×5	5	3.0
1.2mH/30A	A	114	95	89	110	114	150	100	13×6	6	4.4
0.9mH/50A	A	134	111	87	107	134	160	115	14×6	6	6.5
0.5mH/75A	A	134	111	87	107	134	160	115	14×6	6	6.8
0.4mH/100A	A	162	135	102	133	162	180	140	17×8	8	12.5
0.25mH/150A	A	162	135	114	145	162	188	140	17×8	8	13.8
0.2mH/200A	A	162	135	122	153	162	200	139	17×8	8	15.5
0.15mH/300A	B	160	120	123	140	190	225	230	21×10	12	19
0.177mH/400A	B	200	150	160	170	200	280	270	22×13	12	34.7
0.126mH/600A	C	240	182	175	194	240	320	315	20×13	14	60.5
0.09mH/800A	C	250	150	150	190	250	290	385	25×13	15	72
0.07mH/1000A	C	270	160	155	200	270	310	400	25×13	15	86

(unit: mm)

Appendix G   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) to prevent the scald burn from the extreme high temperature during the operation.
(2) While lift up product, please note the weight of product and move it with proper method to avoid possible injuries.(Please be more cautious to the sharp parts).
(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.
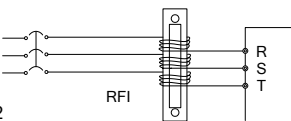
1. Specification of product:

	Model	RM6 series (9916)
Environmental Condition	Use Place	(1) Clean place without high temperature, high humidity, and flammable gases. (2) If the zero-phase radio frequency filter is installed inside the power distribution panel, the around 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.
	Ambient Temperature	-10 ~ +50℃ (no condensation)
	Ambient Humidity	90％RH(no dew)
	Vibration	Below 5.9m/ s^2 (0.6G)
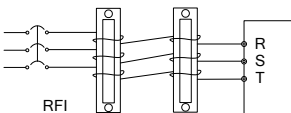
2. Wiring for RFI: Connect the RFI filter in accordance with the following wiring diagram.

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

Ex. 1

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

Ex. 2

(Note)
Either 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

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. Caution: Do Not exceed 4 coils to prevent overheating of RFI filter.

(Note)
Either the ground wire or the four-core cable with ground wire cannot pass through RFI filter; otherwise the filtration will be reduced

Ex. 2
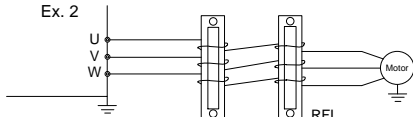
(3) If the power cords are too thick to be winded, pass the power cords through RFI filter directly, and connect two or more RFI in series.

Ex. 1
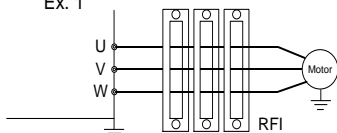
Pass all 3-phase power cords through RFI filter in same direction with same coil number, and then connect to motor terminals of the drive. Caution: Do Not exceed 4 coils to prevent overheating of RFI filter.

(Note)
Either the ground wire or the four-core cable with ground wire cannot pass through RFI filter; otherwise the filtration will be reduced.

3. If noise of radio frequency is too high, user can add mount of RFI to reduce the noise.

4.

Model	Wire Size (mm²)	Coil Number of 3-Phase Wire
RFI-01	2/3.5	4
	5.5	3
	8/14	2
	22	1
RFI-02	22/38	4
	50/60	2
	80/100/125/150	1
RFI-03	50/60	3
	80/100/125/150	2
	200	1
RFI-04	50/60	4
	80/100	3
	125/150	2
	200	2
	250	1

App.G

4.Outline dimensions of RFI-01:
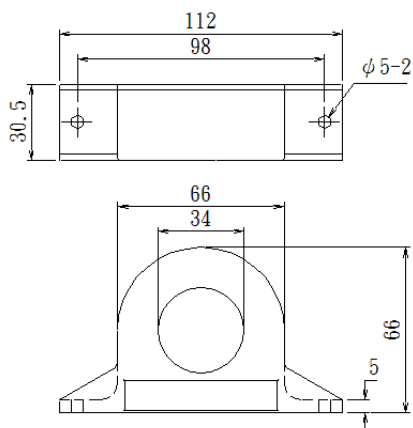
(unit: mm)

5.Outline dimensions of RFI-02:
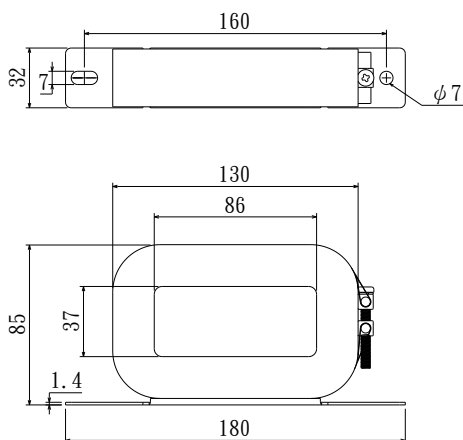
(unit: mm)

6.Outline dimensions of RFI-03:
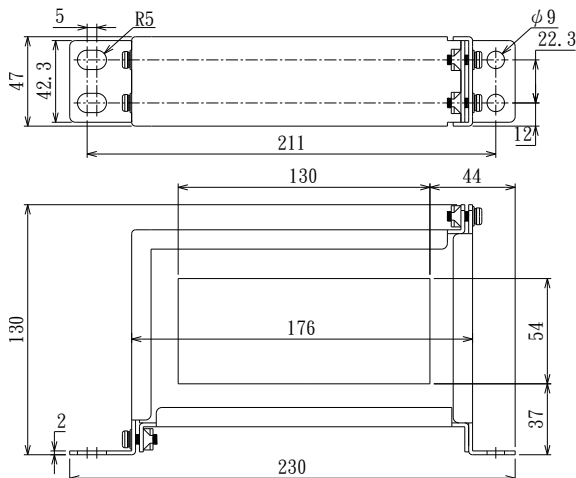
(unit: mm)

7. Outline dimensions of RFI-04:
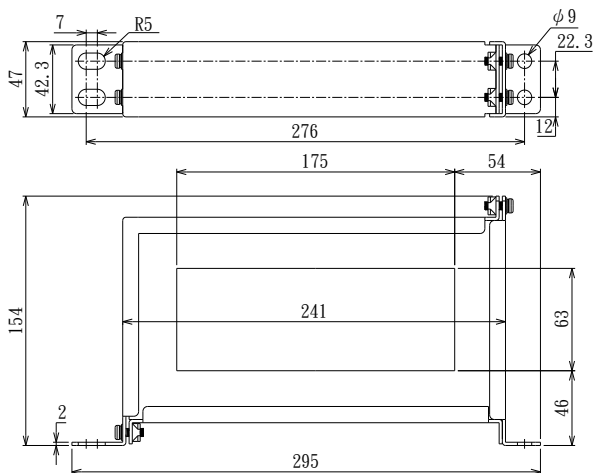
(unit: mm)

Appendix H   Selection of EMI Filter

In many countries especially in Europe have the strict limit for the AC motor drive generated the electromagnetic interference(EMI).

Drive will generate high-frequency / low-frequency noise to interfere the peripheral equipment by radiation or conduction when the drive is running.

⚠ CAUTION
(1) Keep all grounding connections together.
(2) Use the largest area as grounding conductor, for example the cabinet wall.
(3) The filter must be mounted on the same panel as the drive.

Recommending specification of EMI filter

Select an EMI filter in accordance with the model number of drive to suppress drive's electromagnetic interference.

100V/200V Series

Drive model number	EMI filter model number	Rated current / phase
RM6-1001/2-1PH-9916	FN2090-10-06	10A / 1Ψ
RM6-1001-1PH-9916	FN2090-20-06	20A / 1Ψ
RM6-1002-1PH-9916	FN2090-30-08	30A / 1Ψ
RM6-2001/2-1PH-9916	FN2090-10-06	10A / 1Ψ
RM6-2001-1PH-9916	FN2090-10-06	10A / 1Ψ
RM6-2002-1PH-9916	FN2090-20-06	20A / 1Ψ
RM6-2001/2-9916	FN3270H-10-44	10A / 3Ψ
RM6-2001-9916	FN3270H-10-44	10A / 3Ψ
RM6-2002-9916	FN3270H-10-44	10A / 3Ψ
RM6-2003-9916	FN3270H-20-44	20A / 3Ψ
RM6-2005-9916	FN3270H-20-44	20A / 3Ψ
RM6-2007-9916	FN3270H-35-33	35A / 3Ψ
RM6-2010-9916	FN3270H-35-33	35A / 3Ψ
RM6-2015-9916	FN3270H-50-34	50A / 3Ψ
RM6-2020-9916	FN3270H-65-34	65A / 3Ψ
RM6-2025-9916	FN3270H-80-35	80A / 3Ψ
RM6-2030-9916	FN3270H-100-35	100A / 3Ψ
RM6-2040-9916	FN3270H-150-99	150A / 3Ψ
RM6-2050-9916	FN3270H-200-99	200A / 3Ψ
RM6-2060-9916	FN3270H-200-99	200A / 3Ψ
RM6-2075-9916	FN3270H-250-99	250A / 3Ψ
RM6-2100-9916	FN3270H-320-99	320A / 3Ψ
RM6-2125-9916	FN3270H-400-99	400A / 3Ψ
RM6-2150-9916	FN3270H-600-99	600A / 3Ψ
RM6-2200-9916	FN3270H-800-99	800A / 3Ψ
RM6-2250-9916	FN3270H-800-99	800A / 3Ψ

400V series

Drive model number	EMI filter model number	Rated current / phase
RM6-4001-9916	FN3270H-10-44	10A / 3Ψ
RM6-4002-9916	FN3270H-10-44	10A / 3Ψ
RM6-4003-9916	FN3270H-10-44	10A / 3Ψ
RM6-4005-9916	FN3270H-10-44	10A / 3Ψ
RM6-4007-9916	FN3270H-20-44	20A / 3Ψ
RM6-4010-9916	FN3270H-20-44	20A / 3Ψ
RM6-4015-9916	FN3270H-35-33	35A / 3Ψ
RM6-4020-9916	FN3270H-35-33	35A / 3Ψ
RM6-4025-9916	FN3270H-50-34	50A / 3Ψ
RM6-4030-9916	FN3270H-50-34	50A / 3Ψ
RM6-4040-9916	FN3270H-65-34	65A / 3Ψ
RM6-4050-9916	FN3270H-80-35	80A / 3Ψ
RM6-4060-9916	FN3270H-100-35	100A / 3Ψ
RM6-4075-9916	FN3270H-150-99	150A / 3Ψ
RM6-4100-9916	FN3270H-200-99	200A / 3Ψ
RM6-4125-9916	FN3270H-200-99	200A / 3Ψ
RM6-4150-9916	FN3270H-250-99	250A / 3Ψ
RM6-4175-9916	FN3270H-320-99	320A / 3Ψ
RM6-4200-9916	FN3270H-320-99	320A / 3Ψ
RM6-4250-9916	FN3270H-400-99	400A / 3Ψ
RM6-4300-9916	FN3270H-600-99	600A / 3Ψ
RM6-4350-9916	FN3270H-600-99	600A / 3Ψ
RM6-4420-9916	FN3270H-800-99	800A / 3Ψ
RM6-4500-9916	FN3270H-800-99	800A / 3Ψ
RM6-4600-9916	FN3270H-1000-99	1000A / 3Ψ

Note:
1: The leakage current of FN2090 series approximately 0.5mA ~ 1.02mA
2: The leakage current of FN3270 series approximately 26.4mA ~ 59.5mA

Appendix I   Instruction of Remote Controller and External Display

a. Remote controller: KP-207

Two types of the remote controller: Internal panel type and external panel type:

1. Dimension of internal panel type (consist of A-01, KP-207)
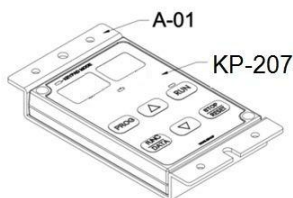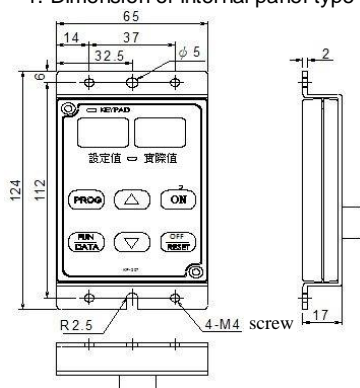
(unit: mm)

2. Dimension of external panel type (consist of A-01, A-02, KP-207)
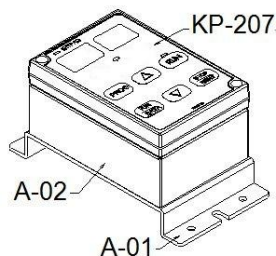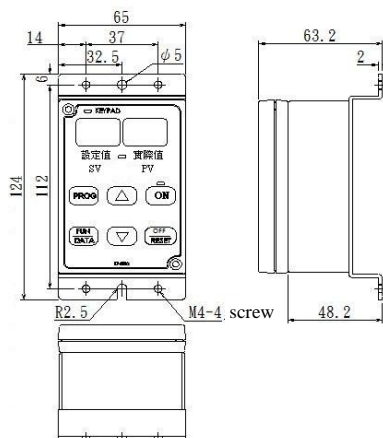
(unit: mm)

3. Dimension of External Type(Compose of A-01, A-02, RAC-01)

(1) RAC-01 is usually used to remote control indepently or distribution panel
(2) Pointer-type, 1KΩ (1/2W) Frequency adjustment VR and ON/OFF switch

A-02

A-01
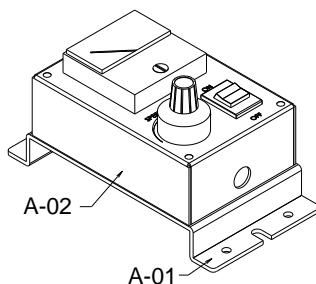
(3) Definition diagram of size and wiring

65
14
37
32.5
Ψ 5
6
72.8
124
112
SPEED
SPEED SET
ON
A-02
OFF
R2.5
4-M4 screw
2
Ψ 10

SPEED
SPEED SET
ON
A-02
OFF
FM+
M-
Vin
GND
12V
FWD
COM
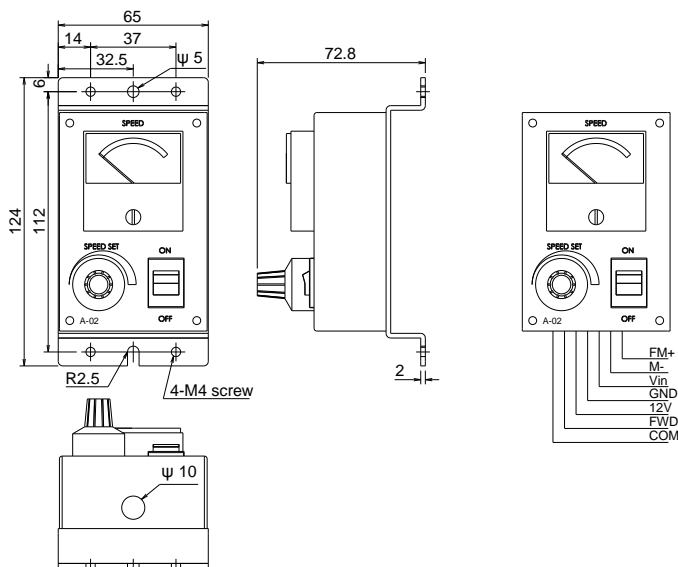
b. External display: DM-501

DM-501 don't connect extral power to the drive;DM-501 can display Voltage, Current, Frequency, machine speed,etc.

1. Outline dimensions

Unit:mm
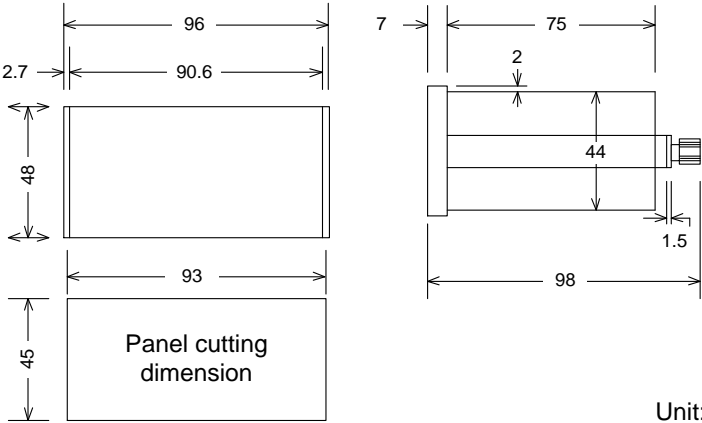
2. Appearance of display panel
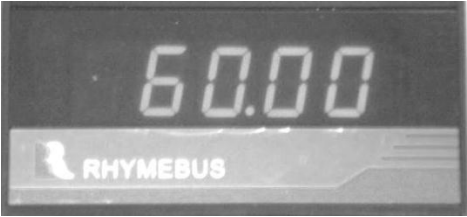
3. The standard length of 2.54/5P wires is 1.5 m and 3 m respectively. Do not exceed this length.

Appendix J   Outline Dimension Drawing of Drives

Model Number: RM6-1001/2-1PH-9916 ~ RM6-1002-1PH-9916;
　　　　　　　RM6-2001/2-9916 ~ RM6-2005-9916；
　　　　　　　RM6-4001-9916 ~ RM6-4005-9916

(unit: mm)

Model Number: RM6-2007-9916 ~ RM6-2015-9916;
　　　　　　　RM6-4007-9916 ~ RM6-4025-9916

Internal cooling type　　　　　　　　External cooling type

(unit: mm)

173
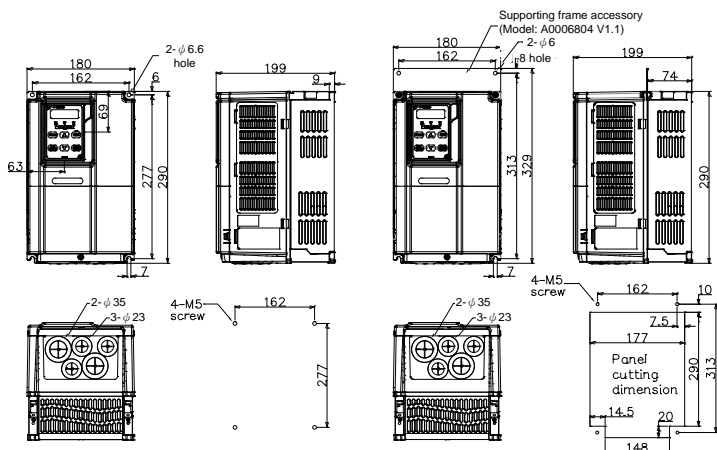
Appendix J   Outline Dimension Drawing of Drives

Model Number: RM6-2020-9916 ~ RM6-2040-9916;
RM6-4030-9916 ~ RM6-4060-9916
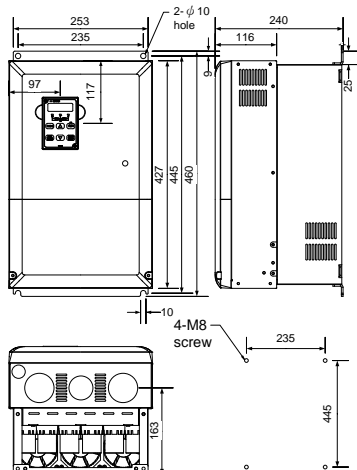
Internal cooling type   External cooling type
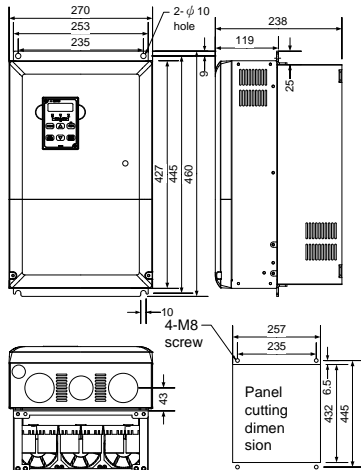
(unit: mm)

Model Number: RM6-2050-9916 ~ RM6-2250-9916;
RM6-4075-9916 ~ RM6-4600-9916
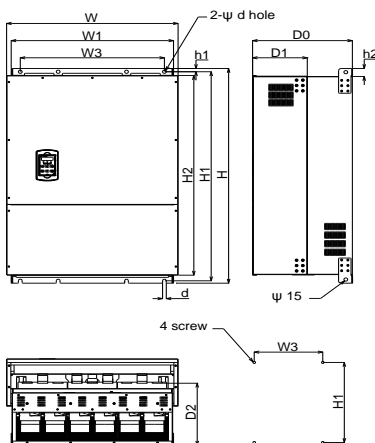
Internal cooling type   External cooling type
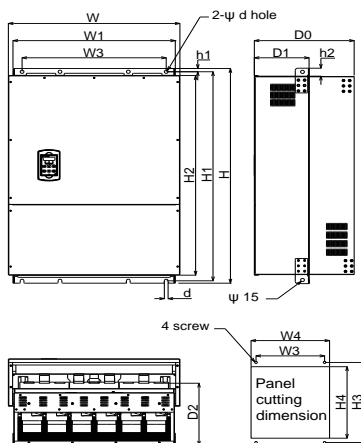
*Refer to below table for outline dimension   (unit: mm)

RM6 series (9916) 200V Series

Model number	W	W1	W3	W4	H	H1	H2	H3	H4	h1	h2	h3	D0	D1	D2	d	d1	Screw (mm)
RM6-2050-9916 RM6-2060-9916 RM6-2075-9916	386	361	275	365	584	562	539	564	545	11	25	10	325	170	242	10	3	M8
RM6-2100-9916	446	418	275	427	685	660	630	662	634	14	30	12	334	172	246	12	3	M10
RM6-2125-9916 RM6-2150-9916	508	479	275	487	818	785	751	788	758	19	35	12	366	183	257	15	3	M12
RM6-2200-9916 RM6-2250-9916	696	654	580	657	1000	974	929	978	936	15	39	18	405	224	294	15	3	M12

RM6 series (9916) 400V Series

Model number	W	W1	W3	W4	H	H1	H2	H3	H4	h1	h2	h3	D0	D1	D2	d	d1	Screw (mm)
RM6-4075-9916 RM6-4100-9916 RM6-4125-9916	386	361	275	365	584	562	539	564	545	11	25	10	325	170	242	10	3	M8
RM6-4150-9916	446	418	275	427	685	660	630	662	634	14	30	12	334	172	246	12	3	M10
RM6-4175-9916 RM6-4200-9916 RM6-4250-9916	508	479	275	487	818	785	751	788	758	19	35	12	366	183	257	15	3	M12
RM6-4300-9916 RM6-4350-9916 RM6-4420-9916	696	654	580	657	1000	974	929	978	936	15	39	18	405	224	294	15	3	M12
RM6-4500-9916 RM6-4600-9916	992	954	710	958	1030	1003	963	1007	968	15	39	19	419	235	308	15	3	M12

No Text on This Page

Appendix K   Auxiliary Controller (ACE-S Series)

Type	Name	Application
ACE-S02/02B/02C	**DEVIATION DETECTOR**	Convert the angle deviation which is detected by ADD-02 (SYNCHRO) into DC voltage signal. The deviation detector can control the drive operation by switching the aligned-speed, synchronized, and constantly tensile operations. The built-in tilt circuit for output signal can slow the acceleration/deceleration time and reduce the mechanical impact.
ACE-S04/06	**RATIO / DIFFERENTIAL CONTROLLER**	The controller can select ratio (ACE-S04) or differential (ACE-S06) control mode. One set controller can connect with 6 set of drivers, when the controller is set to ratio or differential mode. (Default setting is ratio control mode(ACE-S04)). The built-in tilt circuit for output signal can slow the acceleration/deceleration time and reduce the mechanical impact.
ACE-S08/09	**SPEED SIGNAL TRANSFER / FEEDBACK CONTROLLER**	Convert the rotation speed of motor into DC voltage by tachogenerator or photo-interrupter pulse generator as the frequency control signal or feedback signal of rotation speed to the drive. The controller can match with the potentiometer or deviation detector to enable constant tension, constantly liner speed and slack of winding for cloth, wire or plastic applications. The controller can match with tachogenerator to enable constantly linear speed or constant speed control for motor. The built-in tilt circuit for output signal can slow the acceleration/deceleration time and reduce the mechanical impact.
ACE-S10	**MULTI-FUNCTION CONTROLLER**	**Multi-place control:** The drive can be started, accelerated, decelerated, and stopped by remote control, and the drive can auto-storing the operation frequency when the power failure by using multi-function controller. **Traverse control:** Used in the occasion of making silk thread move around by traverse winding equipment. **Sequential operation control with multi-speed:** Execute the sequential control in accordance with the setting speed, and supporting the circulation operation.

Type	Name	Application
ACE-S12	**SIGNAL DISTRIBUTOR**	Transfer the input current into voltage signal and then sending to 5 sets output terminal in simultaneously (The output signal can be switched to current or voltage signal). For multiple drives with constant pressure application. The pressure signal can be sent to more than 1 drive simultaneously so that remaining the constant pressure control.
ACE-S13A/13B	**SIGNAL ISOLATION CONVERTER**	Having DC 0~10V/DC 4~20mA(0~20mA) signals input-output isolation circuit by converting the input signal. Four signals (I-I, I-V, V-V, V-I). ACE-S13A: Output current range : DC 0 ~ 20mA ACE-S13B: Output current range : DC 4 ~ 20mA

Attachment 1   Dimension of Keypad (KP-207)

66^{+1}_{0}

55

2-M3 screw

48

60

96^{+1}_{0}

85

$\phi\,30$

23

16   23

23x23
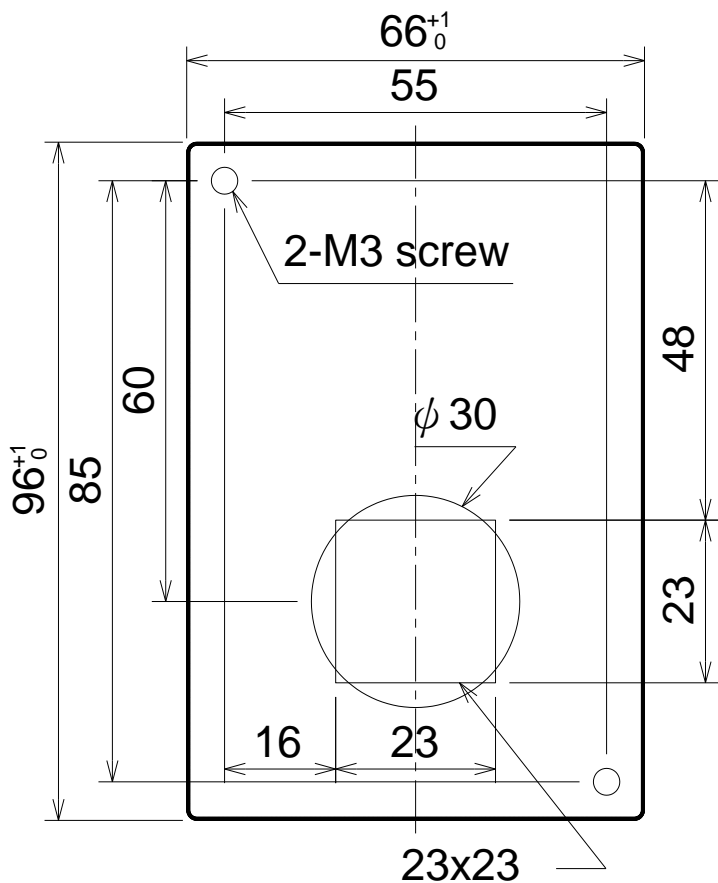
Scale: 1:1
Unit: mm

Attachment 2　Default Value List

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_000	Drive Information	—	—	—	—
F_001	Start Command Selection	3	3	1	1
F_002	Selection of Command	1	1	1	1
F_003	Selection of "STOP" Key Validity	1	1	1	1
F_004	Frequency Command Selection	1	1	1	1
F_005	Selection of Frequency Command Auto-Storing	1	1	1	1
F_006	Selection of Main Display	1	1	1	1
F_007	Machine Speed Ratio	20.00	20.00	20.00	20.00
F_008	Digits of Demical Value(MPM)	0	0	0	0
F_009	Primary Speed	60	50	00.0	00.0
F_010	Multi-speed 1	10.0	10.00	10.00	10.00
F_011	Multi-speed 2	20.00	20.00	20.00	20.00
F_012	Multi-speed 3	30.00	30.00	30.00	30.00
F_013	Multi-speed 4	0.00	0.00	0.00	0.00
F_014	Multi-speed 5	0.00	0.00	0.00	0.00
F_015	Multi-speed 6	0.00	0.00	0.00	0.00
F_016	Multi-speed 7	0.00	0.00	0.00	0.00
F_196	Multi-speed 8	0.00	0.00	0.00	0.00
F_197	Multi-speed 9	0.00	0.00	0.00	0.00
F_198	Multi-speed 10	0.00	0.00	0.00	0.00
F_199	Multi-speed 11	0.00	0.00	0.00	0.00
F_200	Multi-speed 12	0.00	0.00	0.00	0.00
F_201	Multi-speed 13	0.00	0.00	0.00	0.00
F_202	Multi-speed 14	0.00	0.00	0.00	0.00
F_203	Multi-speed 15	0.00	0.00	0.00	0.00
F_017	Jog Speed	6.00	6.00	6.00	6.00
F_018	Based Frequency of Accel/Decel Time	60.00	50.00	50.0	60.00
F_019	Primary Acceleration Time	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_020	Primary Deceleration Time	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_021	Preset Speed1	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_022	Preset Speed1	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)

Att.2

Attachment 2　Default Value List

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_023	Preset Speed2	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_024	Preset Speed2	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_025	Preset Speed3	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_026	Preset Speed3	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_027	Secondary Acceleration Time	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_028	Secondary Deceleration Time	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_029	Set S-curve for Accel/Decel Time	0.0	0.0	0.0	0.0
F_030	Limitation of Output Voltage	0	0	0	0
F_031	Maximum Output Frequency	60.00	50.00	50.00	60.00
F_032	Starting Freauency	0.5	0.5	0.5	0.5
F_033	Starting Voltage	8.0 (note:2) 12.0 (note:3)	8.0 (note:2) 12.0 (note:3)	8.0 (note:2) 12.0 (note:3)	8.0 (note:2) 12.0 (note:3)
F_034	Base Frequency	60.00	50.00	50.00	60.00
F_035	Base Voltage	200 (note:2) 380 (note:3)	200 (note:2) 380 (note:3)	200 (note:2) 380 (note:3)	200 (note:2) 380 (note:3)
F_036	V/F Frequency1	0.0	0.0	0.0	0.0
F_037	V/F Frequency1	0.0	0.0	0.0	0.0
F_038	V/F Frequency2	0.0	0.0	0.0	0.0
F_039	V/F Frequency2	0.0	0.0	0.0	0.0
F_040	Vin Gain	1.00	1.00	1.00	1.00
F_041	Vin Bias	0.00	0.00	0.00	0.00
F_042	Frequency Upper Limit	1.00	1.00	1.00	1.00
F_043	Frequency Lower Limit	0.00	0.00	0.40	0.40
F_044	FM+ Analog Output Signal Selection	0	0	0	0
F_045	FM+ Analog Output Gain	1.00	1.00	1.00	1.00
F_046	Motor Overload Protection (OL)	1	1	1	1
F_047	Filter Setting of Analog Input Signal	20	20	20	20
F_048	Motor Rated Current	—	—	—	—
F_049	Motor No-Load Current	—	—	—	—
F_050	Motor Slip Compensation	0.0	0.0	0.0	0.0

Att.2

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_051	Number of Motor Poles	4P	4P	4P	4P
F_052	Multi-function Input Terminal X1	3	3	3	3
F_053	Multi-function Input Terminal X2	4	4	4	4
F_054	Multi-function Input Terminal X3	1	1	1	1
F_055	Multi-function Input Terminal X4	2	2	18	18
F_056	Reserved	—	—	—	—
F_057	Reserved	—	—	—	—
F_058	Multi-function Output Terminal Y1	1	1	1	1
F_059	Multi-function Output Terminal Y2	2	2	2	2
F_060	Multi-function Output Terminal Ta1,Tb1	11	11	11	11
F_061	Constant Speed Detection Range	2.0	2.0	2.0	2.0
F_062	Frequency Detection Range	2.0	2.0	2.0	2.0
F_063	Frequency Detection Level	0.0	0.0	0.0	0.0
F_064	Automatic Torque Compensation Range	1.0	1.0	1.0	1.0
F_065	System Overload Detection (OLO)	0	0	0	0
F_066	System Overload Detecting Selection	0	0	0	0
F_067	Output Setting after System Overload	0	0	0	0
F_068	System Overload Detection Level	160	160	160	160
F_069	System Overload Detection Time	2.0	2.0	2.0	2.0
F_070	Stall Prevention Level at Acceleration	170	170	170	170
F_071	Stall Prevention Level at Constant Speed	160	160	160	160
F_072	Acceleration Time Setting after Stall Prevention under Constant Speed	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_073	Deceleration Time for Stall Prevention under Constant Speed	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_074	Stall Prevention Setting at Deceleration	1	1	1	1
F_075	DC Braking Level	50	50	50	50
F_076	Time of DC Braking after Stop	0.5	0.5	0.5	0.5
F_077	Time of DC Braking before Start	0.0	0.0	0.0	0.0

Att.2

Attachment 2　　Default Value List

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_078	Operation Selection at Instantaneous Power Failure	0	0	0	0
F_079	The Voltage Level Setting at Power Failure	175 (Note2) 320 (Note3)	175 (Note2) 320 (Note3)	175 (Note2) 320 (Note3)	175 (Note2) 320 (Note3)
F_080	Auto-restart Times Setting of Error Trip	0	0	0	0
F_081	Switching Frequency	1	1	1	1
F_082	Stop Mode	0	0	1	1
F_083	Reverse Prohobition	0	0	0	0
F_084	Jump Frequency1	0.0	0.0	0.0	0.0
F_085	Jump Frequency2	0.0	0.0	0.0	0.0
F_086	Jump Frequency3	0.0	0.0	0.0	0.0
F_087	Jump Frequency Range	0.3	0.3	0.3	0.3
F_088	The Current Level of Speed Tracing	150	150	150	150
F_089	Delay Time for Speed Tracing	0.5	0.5	0.5	0.5
F_090	The V/F Pattern of Speed Tracing	100	100	100	100
F_091	Error Record	—	—	—	—
F_092	Parameter Setting Lock	0	0	0	0
F_093	Automatic Voltage Regulation (AVR)	1	1	1	1
F_094	Drive Overload (OL1)	3	3	3	3
F_095	Power Source	220.0 (Note2) 380.0 (Note3)	220.0 (Note2) 380.0 (Note3)	220.0 (Note2) 380.0 (Note3)	220.0 (Note2) 380.0 (Note3)
F_096	Analog Frequency Dead Band	0.5	0.5	0.5	0.5
F_097	Holding Time Interval	0.0	0.0	0.0	0.0
F_098	Grounding Fault Protection (GF)	1	1	1	1
F_099	External Indicator 1	1	1	1	1
F_100	External Indicator 2	5	5	5	5
F_101	External Indicator 3	2	2	2	2
F_102	V/F Pattern Selection	0	0	0	0
F_103	Subtracted Frequency of Deceleration at Power Failure	3.0	3.0	3.0	3.0
F_104	Deceleration Time 1 of Ramp to Stop by Power Failure	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)
F_105	Deceleration Time 2 of Ramp to Stop by Power Failure	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)	15.0 (Note1)

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_106	Switching the Frequency of Ramp to Stop	0.0	0.0	0.0	0.0
F_107	Analog Frequency Dead Band	0.00	0.00	0.00	0.00
F_108	Digital Input Response Time	10	10	10	10
F_109	Communica-tion Interface Selection	1	1	1	1
F_110	Communication Address	0	0	0	0
F_111	Communica-tion Baud Rate	1	1	1	1
F_112	Communication Protocol	1	1	1	1
F_113	Communication Overtime (Cot)	0.0	0.0	0.0	0.0
F_114	Feedback Signal Trip Detection	0	0	0	0
F_115	Control Selection of Multi-Function Input Terminals	0	0	0	0
F_116	Fault Reset Selection	0	0	0	0
F_117	Error Tripping Time Interval before Auto-Restart	6	6	6	6
F_118	UP/DOWN Memory Selection	0	0	0	0
F_119	UP/DOWN Frequency Resolution	0	0	0	0
F_120	Water Shortage Detection by Current Level	1	1	1	1
F_121	UP/DOWN Frequency Adjustment	0.00	0.00	0.00	0.00
F_122	Secondary Frequency Command Selection	0	0	0	0
F_123	Analog Input Selection	0	0	0	0
F_124	Analog Input Selection (Vin)	1	1	1	1
F_125	Analog Input Selection (Iin)	1	1	4	4
F_126	Iin Range Selection	0	0	0	0
F_127	Iin Gain (Analog Input)	1.00	1.00	1.00	1.00
F_128	Iin Bias (Analog Input)	0.00	0.00	0.00	0.00
F_129	AM+ Analog Output Signal Selection	2	2	2	2
F_130	AM+ Analog Output Gain	1.00	1.00	1.00	1.00
F_131	Multi-function Output Terminal Ta2/Tc2	1	1	1	1
F_132	DC Braking Frequency at Stop	0.5	0.5	0.5	0.5
F_133	Reserved	-	-	-	-
F_134	Reserved	-	-	-	-
F_135	Current Limitation	0	0	1	1
F_136	PID Deviation Gain	1.0	1.0	1.0	1.0
F_137	Delay Time before Stop	0	0	0	0

Att.2

Attachment 2　Default Value List

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_138	Overheat Protection and Temperature Adjustment	0.0	0.0	0.0	0.0
F_139	Operation Condition Memory	1	1	1	1
F_140	NTC Thermistor Setting	1	1	1	1
F_141	Drive Overheating Warning Selection	0	0	0	0
F_142	Drive Overheating Warning Level	70	70	70	70
F_143	Drive Overheating Dead Band	3.0	3.0	3.0	3.0
F_144	Fan Control Selection	1	1	1	1
F_145	Temperature Level of Fan Activation	50	50	50	50
F_146	Minimum Operation Time of Fan	0.5	0.5	0.5	0.5
F_147	SV Setting	2.0	2.0	2.0	2.0
F_148	PID Control Display	0.0	0.0	0.0	0.0
F_149	"SV-PV"　Value Display	1	1	1	1
F_150	PID Control Command	2	2	2	2
F_151	Upper Limit of Transmitter	10.0	10.0	10.0	10.0
F_152	Lower Limit of Transmitter	0.0	0.0	0.0	0.0
F_153	PID Control Mode Selection	0	0	1	1
F_154	P Selection	1	1	1	1
F_155	Gain Value(P)	1.0	1.0	2.0	2.0
F_156	Integration Time (I)	2.0	2.0	1.0	1.0
F_157	Derivative Time (D)	0.00	0.00	0.00	0.00
F_158	Feedback Derivative Time	0.00	0.00	0.00	0.00
F_159	Integration Upper Limitation	1.00	1.00	1.00	1.00
F_160	Integration Lower Limitation	0.00	0.00	0.40	0.40
F_161	Integrator Initialized Value	0.00	0.00	0.00	0.00
F_162	PID Buffer Space	2	2	2	2
F_163	Feedback Signal Filter	10	10	10	10
F_164	Feedback Signal Detection	1	1	1	1
F_165	Feedback Signal Selection	0	0	0	0
F_166	(2nd PI Control)Active Range	0.0	0.0	2.0	2.0
F_167	(2nd PI Control)Active Time	0.0	0.0	15.0	15.0
F_168	P2, Gain Value	1.0	1.0	2.0	2.0
F_169	I2, Integration Value	2.0	2.0	1.0	1.0
F_170	Display Setting by Open-Loop Command	0	0	0	0

Func.	Name	dEF60 60Hz General	dEF50 50Hz General	dEFC3 50Hz Air Compressor	dEFC4 60Hz Air Compressor
F_171	Setting Selection by Open-Loop Command	1	1	1	1
F_172	KP Selection by Open-Loop Command	0	0	1	1
F_174	On-Off Control Selection	0	0	0	0
F_175	(On-Off) Delay Time Conrol	0	0	0	0
F_176	(On) Range Setting	1.0	1.0	1.0	1.0
F_177	(Off) Range Setting	1.0	1.0	1.0	1.0
F_178	(On)Delay Time	0	0	0	0
F_179	(Off)Delay Time	0	0	0	0
F_180	(On-Off)Accel/Decel Time Selection	1	1	1	1
F_181	(Off)Holding Time	0	0	0	0
F_182	Air Conditioning Mode	0	0	0	0
F_183	(Air Condi- tioning Mode) TemperatureResponse Time	5.0	5.0	5.0	5.0
F_184	(Air Condi- tioning Mode) Variation Frequency	2.0	2.0	2.0	2.0
F_185	(Air Condi- tioning Mode) Upper Limit Range of Temperature	3.0	3.0	3.0	3.0
F_186	(Air Condi- tioning Mode) Lower Limit Range of Temperature	1.0	1.0	1.0	1.0
F_187	(Air Condi- tioning Mode) Holding Frequency Level	0.50	0.50	0.50	0.50
F_188	(Air Condi- tioning Mode) Detection Time of Holding Frequency	0.0	0.0	0.0	0.0
F_189	(Air Condi- tioning Mode) Full Speed Time	1.0	1.0	1.0	1.0
F_190	(Feedback Limit) Detection (OP)	0	0	0	0
F_191	(Feedback Limit) Level	8.0	8.0	8.0	8.0
F_192	(Feedback Limit) Detection Setting	0	0	0	0
F_193	(Feedback Limit) Detection Time	300	300	300	300
F_194	(Feedback Limit) Range Setting	1.0	1.0	1.0	1.0
F_195	(Feedback Limit) Detection Condition	1	1	1	1
F_210	Default Setting	-	-	-	-

Att.2

Attachment 3   Setting Memo

Func.	Description	dEFC4	Setting Value	Func.	Description	dEFC4	Setting Value
F_000		-		F_022		Note	
F_001		1		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		00.00		F_031		60.00 (50.00)	
F_010		10.00		F_032		0.5	
F_011		20.0		F_033		200Vseries 8.0 400Vseries: 12.0	
F_012		30.0		F_034		60.00 (50.00)	
F_013		0.00		F_035		200Vseries: 220.0 400Vseries 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		0.40	

Func.	Description	dEFC4	Setting Value	Func.	Description	dEFC4	Setting Value
F_044		0		F_068		160	
F_045		1.00		F_069		2.0	
F_046		1					
F_047		20		F_070		170	
F_048		According to the rated current of motor		F_071		160	
F_049		1/3 motor Rated current		F_072		Note	
F_050		0.0		F_073		Note	
F_051		4P		F_074		1	
F_052		3		F_075		50	
F_053		4		F_076		0.5	
F_054		1		F_077		0.0	
F_055		18		F_078		0	
F_056		―		F_079		200Vseries 175.0 400Vseries 320.0	
F_057		―		F_080		0	
F_058		1		F_081		1	
F_059		2		F_082		1	
F_060		11		F_083		0	
F_061		2.0		F_084		0.0	
F_062		2.0		F_085		0.0	
F_063		0.0		F_086		0.0	
F_064		1.0		F_087		0.0	
F_065		0		F_088		150	
F_066		0		F_089		0.5	
F_067		0		F_090		100	

Att.3

Func.	Description	dEFC4	Setting Value	Func.	Description	dEFC4	Setting Value
F_091		—		F_116		0	
F_092		0		F_117		6	
F_093		1		F_118		0	
F_094		3		F_119		0	
F_095		200Vseries 220.0 400Vseires 380.0		F_120		1	
F_096		0.5		F_121		0.00	
F_097		0.0		F_122		0	
F_098		1		F_123		0	
F_099		1		F_124		1	
F_100		5		F_125		4	
F_101		2		F_126		0	
F_102		0		F_127		1.00	
F_103		3.0		F_128		0.00	
F_104		Note		F_129		2	
F_105		Note		F_130		1.00	
F_106		0.0		F_131		1	
F_107		0.00		F_132		0.5	
F_108		10		F_133		—	
F_109		1		F_134		—	
F_110		0		F_135		1	
F_111		1		F_136		1.0	
F_112		1		F_137		0	
F_113		0.0		F_138		0.0	
F_114		0		F_139		1	
F_115		0		F_140		1	

Func.	Description	dEFC4	Setting Value	Func.	Description	dEFC4	Setting Value
F_141		0		F_167		15.0	
F_142		70		F_168		1.0	
F_143		3.0		F_169		2.0	
F_144		1		F_170		0	
F_145		50		F_171		1	
F_146		0.5		F_172		1	
F_147		2.0		F_173		—	
F_148		0		F_174		0	
F_149		1		F_175		0	
F_150		2		F_176		1.0	
F_151		10.0		F_177		1.0	
F_152		0.0		F_178		0	
F_153		1		F_179		0	
F_154		1		F_180		1	
F_155		2.0		F_181		0	
F_156		1.0		F_182		0	
F_157		0.00		F_183		5.0	
F_158		0.00		F_184		2.0	
F_159		1.00		F_185		3.0	
F_160		0.40		F_186		1.0	
F_161		0.00		F_187		0.50	
F_162		2		F_188		0.0	
F_163		10		F_189		1.0	
F_164		1		F_190		0	
F_165		0		F_191		8.0	
F_166		2.0		F_192		0	

Att.3

Attachment 3　Setting Memo

Func.	Description	dEFC4	Setting Value	Func.	Description	dEFC4	Setting Value
F_193		300		F_202		0.00	
F_194		1.0		F_203		0.00	
F_195		1		F_204		—	
F_196		0.00		F_205		—	
F_197		0.00		F_206		—	
F_198		0.00		F_207		—	
F_199		0.00		F_208		—	
F_200		0.00		F_209		—	
F_201		0.00		F_210		0	

Note:
  0.5 ~ 5HP → 5 sec
  7.5 ~ 30HP → 15 sec
  40HP 以上 → 30 sec

Attachment 4　Fault Display

Error Trip Messages of Drive

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

Error Trip Messages of Drive for Constant Pressure Control

(no Fb)	PID feedback signal error	(OP)	Over pressure

193

Warning Messages of Drive

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

Display	Description	Display	Description
(LE)	Power source under voltage	(Cot)	Communication overtime
(bb)	Drive output interruption	(OP)	Over pressure
(Fr)	Coast to stop	(Ht)	Drive overheating
(db)	Dynamic brake transistor over voltage	(PrEr)	Software fault
(Err_00)	Err_00: Keypad cable trip before connecting		
(Err_01)	Err_01: Keypad cable trip during operation		

Notes