## 1

## RHYMEBUS INVERTER AC MOTOR CONTROLLER



RM5G Series

# Pre-quality Satisfied Service 




Analog Keypad (KP-202C)


Digital Keypad (KP-201C)

RHYMEBUS CORPORATION
V1.0 2004.1.9 http://www.rhymebus.com.tw

## FOREWORD

Thank you for choosing the RHYMEBUS " RM5G Series "high-function, inverter. This instruction manual gives information on installation, wiring, parameter unit operation, etc. as well as maintenance and inspection procedures. However, it is essential to read this manual carefully to use the equipment safely, correctly, and to it's full capability. Please forward this manual to the end user.

## SAFETY PRECAUTIONS

Please read this manual thoroughly prior to installation, wiring, operation, maintenance and trouble shooting. Also, any statement and symbol denoted by "DANGER" or "CAUTION" should be read carefully.


DANGER : Indicate dangerous cases that accompany the possibility of death or serious injury caused by erroneous handling not in accordance with manual.


CAUTION : Indicate dangerous cases that accompany the possibility of medium or light injury or material damage caused by erroneous handling not in accordance with manual.
> * Note : that although 1 CAUTION indicate medium or light injury or material damage can be caused, there is possibility of serious injury.

Note :
that installation, wiring, operation and trouble shooting can be performed only by experienced peoples who know the principles, constructions, properties and operational procedures of inverter, can prevent damages, and read this manual completely.

## INTRODUCTIONS

## Features

- Low noise
- High torque
- Automatic voltage regulation
- User friendly
- Restart after instantaneous power interruption
- 9 levels for speed settings and 5 independent acc/dec time settings
- 6 digits display
- Programmable inputs and outputs
- Store and copy settings by using KP-201C digital keypad
- Connect to the external indicators for displaying the status of inverter
- Energy saving
- RM5G series apply to the constant torque loaded; RM5P series apply to the variable torque loaded.


## - Low noise

Using IGBT by which the maximum switching frequency of sinusoidal PWM is 10 kHz to 15 kHz , the motor is operated smoothly and efficiently with low noise.



## - High torque

At low speed, the torque compensation by which the compensated torque can be above $150 \%$ of rated torque is provided for smooth start in the case of heavy load.

- Automatic voltage regulation (AVR)

In spite of the fluctuation of power source, output voltage of inverter can be kept at the desired level.

- User friendly

There are two types of operating keypad, one for advanced applications and the other for usual use. User can choose one of them to function inverter easily and properly. Besides, the connector between inverter and keypad is the same as that of telephone. The remote control is then easily realized with maximum distance of 25 m .

## - Restart after instantaneous power interruption

If the power source is shutdown during running, the functions of recording the speed of motor before power interruption and resuming that after restart are provided.

## - 9 levels for speed settings and 5 independent acc/dec time settings

There are 5 independent acc/dec time settings in the 9 steps speed level. The setting range is $0.0 \sim 3200.0$ seconds. Speed from 0 Hz to 60 Hz , the minimum acceleration time is 0.015 sec .(except free running), the maximum acceleration time is 19200000 sec . (about 222 days).

## - 6 digits display

There are 8 status of inverter can be displayed (frequency, speed, voltage, current, etc).

## - Programmable inputs and outputs

There are 17 functions programmed by using input terminals X1~X6 and 12 functions programmed by output terminals, Y1 and Y2 (open collector), and two relay output.

- Connect to the external indicator for displaying the status of inverter There are 3 external indicators( $96 \mathrm{~mm} \times 48 \mathrm{~mm}$, 5 digits)can be used simultaneously to indicate the inverter status such as frequency, speed, voltage, current, and line velocity etc. Therefore, it is not needed to use the other instruments or sensors such as CT etc., and the cost and wiring will be reduced.


## - Energy saving

Under the light load condition, the less energy is outputted for the purpose of saving energy.

- Store and copy settings

The settings can be stored in KP-201C and download to other inverter . This function is useful in the case of several inverters with the same data settings. If any alarm occurs during copy, the keypad will show "Wr_F" and copying will stop.

Note: Check the version of software(F_000) first, only the same version software inverter then it can be do the store and copy setting function.


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## CHAPTER 1 INSPECTIONS AT PURCHASE

(1) Confirmation of product

Although this product is under a rigorous quality control, the damages may be made by impact and vibration etc. during transportation.Upon unpacking of the inverter at site, please check the follows accordingly. If there is any defect, contact your local dealer at once.
A. Confirmation of appearance

Is there any damage, filth or distortion to the appearance of inverter?
B. Do the rated capacity and specification shown on nameplate confirm to your requirements?

| TYPE | RM5G-2015B | 三 ${ }^{\text {a }} \rightarrow$ Model number |
| :---: | :---: | :---: |
| INPUT | AC 3PH 200~240V 50/60Hz | $\underline{\text { 止 }} \rightarrow$ Input power source specification |
| OUTPUT | $0-400 \mathrm{~Hz} 11 \mathrm{KW} 46 \mathrm{~A}$ | $\underset{\text { ] }}{ } \rightarrow$ Output current \& capacity |
| PGM No. | Pxxxxx | $\bigcirc \rightarrow$ Version of software |
| SERIAL No. | 8021520 | ${ }^{\infty} \rightarrow$ Serial number |

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C. Model number scheme:

D. Confirmation of accessories

Generally, there is one user's manual. If there are some accessories, such as braking resistor and AC/DC reactor etc., are ordered please check inclusively.
E. Please refer to the standard specifications and confirm to your requirements.
(2) Standard specifications
A. Specification

| Series No. (RM5G) | 2001 | 2001 | 2002 | 2003 | 2005 | 2007 | 2010 | 201 | 2020 | 2025 | 2030 | 2040 | 2050 | 2060 | 2075 | 2100 | 2125 | 2150 | - | - | - | - |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Rated power of the motor (HP/KW) | ${ }_{0} 0.5 / 0.4$ | 1/0.75 | 2/1.5 | 3/2.2 | 5/3.7 | 7.5/5.5 | 1007.5 | 15/1 | 20/15 | 52018. | $30 / 2$ | 40/30 | 50/37 | 60145 | 75/55 | 10075 | 12590 | 150110 | - | - | - | - |
| Rated continuous output power (KVA) | 1.3 | 2 | 3 | 4 | 6 | 9 | 13 | 18 | 22 | 28 | 33 | 44 | 55 | 67 | 84 | 115 | 132 | 160 | - | - | - | - |
| Rated continuous output current (A) | 3 | 5 | 8 | 11 | 17 | 25 | 33 | 46 | 60 | 74 | 90 | 115 | 145 | 175 | 220 | 295 | 346 | 405 | - | - | - | - |
| Rated output voltage (V) | $3 \mathrm{PH} 200 \sim 240 \mathrm{~V}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Range of output frequency | $0.01 \sim 400.00 \mathrm{~Hz}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Power source( $\mathrm{PH}, \mathrm{V}, \mathrm{Hz}$ ) | 1PH/3PH,200~240V,50/60Hz |  |  |  |  | $3 \mathrm{PH}, 200 \sim 240 \mathrm{~V}, 50 / 60 \mathrm{~Hz}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tolerance of power | $176 \sim 264 \mathrm{~V}, 50 / 60 \mathrm{~Hz}$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Tolerance of frequency fluctuation | $\pm 5 \%$ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Construction protected | IP20 |  |  |  |  |  |  |  |  |  |  | IP00 (IP20 OPTION) |  |  |  |  |  |  |  |  |  |  |

RM5G-400V Series

| Series No. (RM5G) | 4001 | 4002 | 4003 | 4005 | 4007 | 4010 | 4015 | 402 | 402 | 403 | , | 4050 | 4060 | 4075 | 4100 | 4125 | 4150 |  | 420 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Rated power of the motor (HP/KW) | 1/0.75 | 2/1.5 | 3/2.2 | 5/3.7 | 7.5/5.5 | 107.5 | 15/11 | $20 / 1$ | 25118.5 | 30122 | 40/30 | 50/37 | 6045 | 75/55 | 10075 | 125190 | 150110 | 17513 | 200/100 | 1200200 | 30022 | 2201315 |
| Rated continuous output power (KVA) | 1.9 | 3.3 | 4 | 7 | 10 | 14 | 18 | 23 | 30 | 34 | 46 | 56 | 66 | 84 | 104 | 134 | 165 | 193 | 232 | 287 | 316 | 445 |
| Rated continuous output current (A) | 2.5 | 4 | 6 | 9 | 14 | 18 | 24 | 30 | 39 | 45 | 61 | 73 | 87 | 110 | 150 | 176 | 210 | 253 | 304 | 377 | 415 |  | 3 PH $380 \sim 480 \mathrm{~V}$

$0.01 \sim 400.00 \mathrm{~Hz}$
$3 \mathrm{PH}, 380 \sim 480 \mathrm{~V}, 50 / 60 \mathrm{~Hz}$
$332 \sim 528 \mathrm{~V}, 50 / 60 \mathrm{~Hz}$

$$
\pm 5 \%
$$

RM5G-200V Series

## B. Common specification

|  | User interface | Digital and analog operating keypads with remote control. |
| :---: | :---: | :---: |
|  Control <br> characteristics <br> Rhange of frequency <br> R <br> control  |  | Voltage vector sinusoidal PWM control. |
|  |  | RM5G: $0.1 \sim 400.00 \mathrm{~Hz}$ / RM5P: 0.1~120.00Hz |
|  |  | Digital keypad: 0.01 Hz , Analog keypad: $0.06 / 60 \mathrm{~Hz}$ |
|  |  | 0.01 Hz |
|  |  | $\mathrm{DC} 0 \sim 10 \mathrm{~V}(20 \mathrm{~K} \Omega), ~ 4 \sim 20 \mathrm{~mA}(500 \Omega)$ |
| $\begin{aligned} & \underset{0}{0} \\ & 0 \\ & 0 \\ & 0 \\ & 0 \end{aligned}$ | Overload current | RM5G type: $150 \%$ inverter rated current output for 1 minute RM5P type: $120 \%$ inverter rated current output for 1 minute |
|  | steps acceleration/ deceleration times | Zero sec for free running, $0.1 \sim 3200$ seconds for each setting |
|  | Braking torque | About 20\% (For the inverter rated power less than 10 hp , the braking transistor is included, and braking torque can be about $100 \%$ ) |
|  | V/F pattern | The pattern can be set arbitrarily. |
|  | Stall prevention | The |
| Operational characteristics | $\begin{gathered} \text { Start and } \\ \text { direction control } \\ \hline \end{gathered}$ | FWD/REV control by terminals or by using 3-line sustaining circuit |
|  | Multiple function | Stop command by using the 3 -line sustaining circuit, jogging operation, secondary acc/dec time, multiple-level speed command $1 \sim 3$, reset, command for fault conditions, command of inhibiting output ,command of stop by free running, command of frequency search from the max. frequency, command of frequency search from the set frequency, acc/dec inhibition command, UP/DOWN command ,UP/DOWN frequency command clear/enter analog input select, DC braking enable, current limit enable, primary and secondary speed select |
|  | Analog inputs | Vin-GND (0 ~ 10V), Iin-GND ( $4 \sim 20 \mathrm{~mA}$ ) |
|  | Multiple function | Running, constant speed, zero speed, frequency detection, overload detection, stall prevention, under voltage, braking, restart after instantaneous power interruption, restart after trouble shooting, fault conditions, programmable contacts a and b . |
|  | $\bigcirc$ Analog outputs | Analog voltage, DC 0~10 V with adjustable gain, for representing output frequency, frequency setting, or output current |
| 㒲 | Displays of keypad | Output frequency, frequency settings, output voltage, DC voltage, output current, motor speed, line velocity of motor, status of terminals |
| $\frac{0}{a}$ | Displays of external indicators | There are 3 external indicators ( 96 mm x 48 mm , 5 digits) can be used simultaneously to indicate the frequency, speed, voltage, current, and line velocity etc. |
| $\begin{aligned} & \text { n } \\ & .0 \\ & .0 \\ & 0 \\ & 0 \\ & 0.0 \\ & 0 \end{aligned}$ | Fault Display | Over current (OC), over voltage (OE), under voltage (LE), motor overload (OL), inverter overload (OL1), over heat (OH), ground fault current(GF), fuse open (SC), disconnection of KP-202C during running (PAdF). |
|  | Diagnostics | Disconnection of digital keypad (Err_00, Err_01), EEPROM error (EEr) |
|  | Cooling | Force cooling (natural cooling for rated power of $1 / 2$ and 1 HP ) |
|  | Environment | Non-corrosive non-conductive, or non-explosive gas or liquid, and non-dusty. |
|  | Temperature | $-10^{\circ} \mathrm{C}\left(14^{\circ} \mathrm{F}\right) \sim+50^{\circ} \mathrm{C}\left(122^{\circ} \mathrm{F}\right)$,non-freezing and non-condensing |
|  | Storage temperature | $-20^{\circ} \mathrm{C}\left(-4^{\circ} \mathrm{F}\right) \sim+60^{\circ} \mathrm{C}\left(140^{\circ} \mathrm{F}\right)$ |
|  | Relative humidity | $90 \% \mathrm{RH}$ or less (non-condensing atmosphere) |
|  | Vibration | Less than $5.9 \mathrm{~m} / \mathrm{sec}^{2}(0.6 \mathrm{G})$ |
|  | Altitude | Less than 1000 m ( 3280 ft ) |

## CHAPTER 2 INSTALLATIONS AND CONFIRMATIONS

(1) Basic setup

The inverters have to be incorporated with some elementary devices for driving motor. The essentially elementary devices of basic setup are
A. Power source

The power source should be agreed with the specifications of Inverter.
B. No fuse brake (NFB)

The rating of NFB should be greater than the start current.
C. Inverter

This is main device of driving motor. Referring to the lists of standard specifications of inverter, inverter is chosen in accordance with the specifications of motor driven.
D. Motor

The specifications of motor are determined from the requirement of applications.
(2) Environment

For correct and safety operation, the operational environment of inverter should be cared and described as followings
A. Power source

The power source should be agreed with the specifications of inverter.
B. Location

For the considerations of heat generated by the operating machine, inverter has to be installed in the ventilate space. The installations of inverter are shown as followings.
a. The space of installation is good for power dissipation or not

b. The cooling is needed if the inverter is installed in an enclosure.

c. If the inverter is installed in an enclosure (suitable for $7.5 \sim 420 \mathrm{hp}$ ) and the cooling system is on or outside enclosure, it should be mentioned that the hole for airflow is adequate or not.

C. Specifications of the associated accessories

The specifications of the associated accessories have to be in accordance with the specifications of inverter used. Otherwise, the inverter will be damaged and the lifetime of inverter will be decreased.
D. Cleaning of environment

The ventilation, cleanliness and moisture of the space in which the inverter is installed have to be considered.
E. Operator

Only experienced peoples can perform operation and trouble shooting.
(3) Descriptions of terminals and wiring diagram
A. Wiring diagram

Note that the terminals represented by and are denoted for main and control circuits, respectively.
a. Wiring diagram for $1 / 2 \sim 5 \mathrm{HP}(200 \mathrm{~V}$ class $) / 1 \sim 5 \mathrm{HP}(400 \mathrm{~V}$ class)

(DC $4 \sim 20 \mathrm{~mA}$ )

※Built-in brake transistor
b. Wiring diagram for $7.5 \sim 15 \mathrm{HP}(200 \mathrm{~V}$ class $) / 7.5 \sim 20 \mathrm{HP}(400 \mathrm{~V}$ class)

(DC 4~20mA)

※Built-in brake transistor
※Switch the DIP switch DSW1 on the control board.
" I " side: mean Iin-GND inputting current command. (Factory setting)
"V" side: mean Iin-GND inputting voltage command.
The setting range set by $\mathrm{F}_{-} 126$.
c. Wiring diagram for $20 \sim 60 \mathrm{HP}(200 \mathrm{~V}$ class $) / 25 \sim 75 \mathrm{HP}(400 \mathrm{~V}$ class)


In case $20 \sim 60 \mathrm{HP}(200 \mathrm{~V}) / 25 \sim 75 \mathrm{HP}(400 \mathrm{~V})$ as build-in brake transistor, the mark of P1 will change to PR.

For the up to 400 V 40 HP , there are small terminals, | S0 | 380 V | 415 V | 440 V | 460 V | 480 V |
| :--- | :--- | :--- | :--- | :--- | :--- | on the right side of RST, UVW, which are connected to the wire of cooling fan and contactor. Be sure connect to the correct required voltage. (Ex. when power is 380 V , then must be connect 0 and 380 V . In case the power change to 460 V , please connect to 0 and 460 V )


B. Descriptions of terminals
a. Terminals of main circuit

|  | Terminals | Symbols | Name | Descriptions |
| :---: | :---: | :---: | :---: | :---: |
|  | Power source | $\begin{gathered} \text { R,S,T } \\ (\mathrm{L} 1, \mathrm{~L} 2, \mathrm{~L} 3) \end{gathered}$ | Input AC voltage | 3-phase power source (for $1 \Phi, 220 \mathrm{~V}$, use R and S only) |
|  | Motor | $\begin{gathered} \text { U,V,W } \\ (\mathrm{T} 1, \mathrm{~T} 2, \mathrm{~T} 3) \end{gathered}$ | Inverter output voltage | 3 -phase variable voltage and frequency output motor |
|  | Power and braking | P,N | Dynamic brake terminals | Connect to the dynamic brake unit |
|  |  | PR | $\begin{aligned} & \text { External braking } \\ & \text { resistor } \\ & \hline \end{aligned}$ | $P$ and PR terminals connect to an external braking resistor(option) |
|  |  | P1 | External reactor | P and PI terminals are short-circuit or connect to an external reactor for improving power factor. The factory sefting is short-circuit. |
|  | Grounding | PE | Grounding | Less than $100 \Omega$ for the third grounding method |

b. Main circuit(Terminals subject to change without notice)
(1) $1 / 2 \sim 3 \mathrm{HP}$ (Built-in brake transistor)
(2) 5 HP ( 200 V class) $/ 5 \mathrm{HP}$ ( 400 V class)
(Built-in brake transistor)

(3) $7.5 \sim 15 \mathrm{HP}(200 \mathrm{~V}$ class) and $7.5 \sim 20 \mathrm{HP}(400 \mathrm{~V}$ class) (Built-in brake transistor)

(4) $20 \sim 30 \mathrm{HP}(200 \mathrm{~V}$ class)/25~40HP(400V class) (Brake type)

※The polarities of P and N terminals should be wired correctly.
(5) $40 \sim 100 \mathrm{HP}(200 \mathrm{~V}) / 50 \sim 150 \mathrm{HP}(400 \mathrm{~V})$ (connect dynamic braking unit)

※The polarities of P and N terminals should be wired correctly.
(6) $125 \sim 150 \mathrm{HP}(200 \mathrm{~V}$ class)/175 $\sim 420 \mathrm{HP}(400 \mathrm{~V}$ class)(connect dynamic braking unit)

※The polarities of P and N terminals should be wired correctly. ※Connect dynamic braking unit, set the F_093(AVR)=0.
※ 20~60HP (200V Class) / 25~75HP (400V Class) The P1 terminal will be revised to PR, when brake transistor built in.(Brake type)
c. Terminals of control circuit

|  | Terminals | Symbols | Name | Descriptions |
| :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { y } \\ & 0.0 \\ & 0.0 \\ & 0 \\ & 0 \\ & 0 \\ & 0 \end{aligned}$ | Inputterminals | FWD | Forward operation | FWD-COM is short-circuit for forward operation |
|  |  | REV | Reverse operation | REV-COM is short-circuit for reverse operation |
|  |  | X1 | Multiple function input terminal 1 | Function is determined by F_052 |
|  |  | X2 | Multiple function input terminal 2 | Function is determined by F_053 |
|  |  | X3 | Multiple function input terminal 3 | Function is determined by F_054 |
|  |  | X4 | Multiple function input terminal 4 | Function is determined by F_055 |
|  |  | X5 | Multiple function input terminal 5 | Function is determined by F_056 |
|  |  | X6 | Multiple function input terminal 6 | Function is determined by F_057 |
|  |  | COM | Common of input terminals | Common of input terminal signals |
|  |  | Vin | Voltage type of frequency command input | Input range $0 \sim 10 \mathrm{~V}$ |
|  |  | Iin | Current type of frequency command input DSW1-> I side (current input) DSW1-> V side (voltage input) | Input range <br> DC4~20 mA (2~10V) <br> $/ 0 \sim 20 \mathrm{~mA}(0 \sim 10 \mathrm{~V})$ <br> The range determined by F_126 |
|  |  | +12V | Reference voltage of control signals | 12 V reference voltage with maximum current 20 mA |
|  |  | GND | Ground of control signals | Ground of control signals |


|  | Terminals | Svmbols | Name | Descriptions |
| :---: | :---: | :---: | :---: | :---: |
| -気 | Output terminals | $\begin{aligned} & \mathrm{FM}+ \\ & \mathrm{AM}+ \end{aligned}$ | Analog output | 1.Use a 10 V full scale meter (impedance: $10 \mathrm{~K} \Omega$ or higher) 2.The maximum output current is 1 mA . |
|  |  | $\begin{gathered} \text { M- } \\ \text { GND } \end{gathered}$ | Ground of analog output signals | Ground of analog output signals |
|  |  | Ta1 |  | The function of contact a (normal open) is determined by F_060. <br> (The capacity of contact is $250 \mathrm{VAC}, 0.5 \mathrm{~A}$ and $\operatorname{Cos} \varphi=0.3$ ) |
|  |  | Tb1 | Multiple function output | The function of contact $b$ (normal close) is determined by F_060. <br> (The capacity of contact is $250 \mathrm{VAC}, 0.5 \mathrm{~A}$ and $\operatorname{Cos} \varphi=0.3$ ) |
|  |  | Tc1 | (Relay outputs) | Common terminals of Ta1 and Tb1 |
|  |  | Ta2 |  | The function of contact a (normal open) is determined by $\mathrm{F}_{-} 131$. <br> (The capacity of contact is $250 \mathrm{VAC}, 0.5 \mathrm{~A}$ and $\operatorname{Cos} \varphi=0.3$ ) |
|  |  | Tc2 |  | Common terminals of Ta2 |
|  |  | Y1 | Multiple <br> function output | Function is determined by F 058/F 059 |
|  |  | Y2 | terminals (Open-collector | (The maximum capacity is DC48V,50mA) |
|  |  | CME |  | Common terminals of Y1 and Y2 |

C. The notes and specifications of wiring
a. The leakage current between ground and the wires that are connected between inverter and motor, is not the same for different rated power. The setting of carry frequency ( $\mathrm{F} \_81$ ) relate to the rated power and wire distance. Referred to the figure shown below.

| Rated <br> Power | 10 m | 25 m | 50 m | 100 m | Above <br> 100 m |
| :--- | :---: | :---: | :---: | :---: | :---: |
| $1 / 2 \sim 5 \mathrm{HP}$ | 12.5 KHz <br> or less | 10 KHz <br> or less | 7.5 KHz <br> or less | 5 KHz or less | 2.5 KHz |
| $7.5 \sim 10 \mathrm{HP}$ | 10 KHz <br> or less | 7.5 KHz <br> or less | 5 KHz <br> or less | 2.5 KHz | 2.5 KHz |
| $15 \sim 30 \mathrm{HP}$ | 7.5 KHz <br> or less | 5 KHz <br> or less | 2.5 KHz | 2.5 KHz | 2.5 KHz |
| $40 \sim 75 \mathrm{HP}$ | 5 KHz <br> or less | 2.5 KHz | 2.5 KHz | 2.5 KHz | 2.5 KHz |
| $100 \sim 420 \mathrm{HP}$ | 2.5 KHz | 2.5 KHz | 2.5 KHz | 2.5 KHz | 2.5 KHz |

P.S. The carry frequency is determined by F_081.
b. If the inverter is used where the altitude is greater than 1000 m , the relationship between current and altitude should be mentioned and referred to the figure shown below.


## c. Precautions

## DANGER

1. Do not connect or disconnect wiring, or perform signal check while the power supply is turned ON.
2. R, S and T terminals connected to power source are power input terminals of inverter. $\mathrm{U}, \mathrm{V}$ and W terminals connected to motor are power output terminals of inverter. Never connect them to terminals P, N, P1 and PR .
3. After turn off power source, please don't touch the inverter and change the wiring when indicator is light.
4. The terminals of main power circuit and control circuit can not be connected to PE terminal.
5. After wiring is completed, please put on the inverter cover for avoiding the other people's touch.
6. For 200 V class, $346 / 380 / 415 / 440 / 460 / 480$ V power source can not be used.
7. In the restart after instantaneous power interruption, running is resumed and the people around motor and machinery should be controlled for avoiding danger and damage.
8. The wiring of main circuit and control circuit should be separated for avoiding interference.
9. Only experienced people can perform installation, wiring, operation and trouble-shooting.
10. The RM5G/5P series are not designed against explosion and then should be kept away from gas, oil and explosion etc.
!! CAUTION
11. The RM5G/5P series should be kept away from corrosive gas, oil, dust or metallic particles in the air, high temperature, high humidity and explosion etc.
12. If inverter is installed in an enclosure, the ambient temperature can not exceed $+50^{\circ} \mathrm{C}$.
13. Use shielded wire when inputting the control signals externally. Noise and grounding have to be considered for avoiding interference.
14. Wiring terminals and installation:
(1) Wiring should be made according to the symbols of terminals. Tighten the screw on the main circuit and control circuit terminals.
(2) Appropriate wiring size should be used. Connect $R, S$ and $T$ terminals to power source (In the case of single phase power source connect $R$ and $S$ terminals to power source).
(3) Use no-fuse brake (NFB), magnetic contact or fuse at power source input terminals, and use a thermal relay (TH-RY) to protect motor if the motor capacity is smaller than inverter.
(4) After U, V and W terminals of motor have been disconnected, the insulation of motor can be then tested. Note that testing motor and inverter can be performed only by experienced peoples.
d. Recommended wiring size (for reference only)

| $\begin{gathered} \hline \text { MOTOR } \\ \text { (HP) } \\ \hline \end{gathered}$ | 200V Series ( $\mathrm{mm}^{2}$ ) |  |  | 400 V Series ( $\mathrm{mm}^{2}$ ) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Main circuit | Control circuit | Grounding wire | Main circuit | Control circuit | Grounding wire |
| 1 | 2 | $\begin{gathered} 0.75 \\ \sim 1.25 \end{gathered}$ | The same as main circuit | 2 | $\begin{gathered} 0.75 \\ \sim 1.25 \end{gathered}$ | The same as main circuit |
| 2 | 2 |  |  | 2 |  |  |
| 3 | 2 |  |  | 2 |  |  |
| 5 | 3.5 |  |  | 3.5 |  |  |
| 7.5 | 5.5 |  |  | 3.5 |  |  |
| 10 | 8 |  |  | 5.5 |  |  |
| 15 | 14 |  |  | 8 |  |  |
| 20 | 22 |  |  | 8 |  |  |
| 25 | 30 |  |  | 14 |  |  |
| 30 | 38 |  |  | 22 |  |  |
| 40 | 60 |  |  | 30 |  |  |
| 50 | 80 |  |  | 30 |  |  |
| 60 | 100 |  |  | 38 |  |  |
| 75 | 60X2 |  |  | 60 |  |  |
| 100 | 100X2 |  |  | 80 |  |  |
| 125 | 150X2 |  |  | 100 |  |  |
| 150 | 200X2 |  |  | 60X2 |  |  |
| 175 | - |  |  | 100X2 |  |  |
| 200 | - |  |  | 100X2 |  |  |
| 250 | - |  |  | 150X2 |  |  |
| 300 | - |  |  | 200X2 |  |  |
| 420 | - |  |  | 250X2 |  |  |

## (1) Digital keypad (KP-201C)



## (2) Analog keypad (KP-202C)

1.If LED is light, speed is command by keypad.
2.If LED is not light,speed is


Note: Keypad KP-201B andKP-202B still can be used in the RM5G/5P inverter.

## CHAPTER 4 OPERATIONS OF KEYPADS

(1) Settings of digital keypad(KP-201C)
A. Digital keypad has three modes and displays for fault conditions.

The switching among these is shown in the setting diagram below.


Fault message
P.S. Keypad connection wire have two types, one is 8Pin telephone cable, it can use within the 5 M ; the other is net connect cable (AMP), it can use above the 5 M . The maximum distance is 25 M .
B. In the monitor mode, there are 8 displays, 1 main display and 7 auxiliary displays, used to indicate the status of inverter. The most left digit indicates the number of auxiliary display ( $2 \sim 8$ ), and the most left digit is turned off for indicating main display.

Enter monitor mode

Output frequency


Line velocity(MPM)

Monitor mode


Frequency setting


PN voltage


Output current
a. Any display can be set to be the main display by F_006.
b . The function that the user defines own main display is convenient to choose the most important status of inverter as main display for certain applications. If the keypad has not been operated and the auxiliary display has been displayed for about 3 minutes, the main display is shown automatically for user to monitor the most important status of inverter.
C. In the function code setting mode, there are 135 function codes (F_000~F_134) to be set and the setting diagram is shown in the figure below.

Enter function code setting mode

D. In the parameter setting mode, the range of setting is defined in function code and the setting diagram is shown in the figure below.


The max. setting

The range of parameter setting of F_009 is $0.00 \sim 400.00 \mathrm{~Hz}$.
E. In the monitor mode, the frequency command, speed (RPM) and line velocity (MPM) can be changed. For example, the setting diagram of changing speed is shown in the figure below.

Speed(RPM)
Change the setting of speed to 2400RPM


Flashing LED denotes that the function of key is valid

Store the new setting of speed in EEPROM of inverter
a. In the monitor mode, $\boldsymbol{\Delta}$ and $\boldsymbol{\nabla}$ on keypad are used to increase and decrease speed, respectively.
b. After speed setting, the LED of keypad is flashing with the value of setting, press $\frac{\text { FUN }}{\text { DATA }}$ within 5 seconds to store speed setting.
F. Only in the monitor mode, the frequency output can be controlled by pressing RuN and $\frac{\text { stop }}{\text { RRSET }}$.



The frequency is outputted when this key is pressed

Main display
(output frequency)


G．Copy and resume factory settings
a．The function of copy is defined to store settings in digital keypad （KP－201C）or write settings from digital keypad to inverter．
（1）Store settings in digital keypad（KP－201C）
To disconnect digital keypad and press until that digital keypad is connected to inverter，the LED of keypad will display＇$-\mathbf{d}_{-} E E$＇to indicate that the setting is storing in digital keypad（KP－201C）．
（2）Write setting from digital keypad（KP－201C）to inverter To disconnect digital keypad and press $\nabla$ until that digital keypad is connected to inverter，the LED of keypad will display＇LHA－EE＇to indicate that the setting is writing from digital keypad（KP－201C）to inverter．
（3）If the inverters have different software versions，they can not read／write setting to inverter each other．The digital keypad （KP－201C）display will show the＇Litir＿F＇．
b．Resume factory settings
（1）To disconnect digital keypad（KP－201C）and press PROG until that digital keypad is connected to inverter，the LED of keypad will display＇$A E F G$＇to indicate that resume the factory settings of 60 HZ ．
（2）To disconnect digital keypad（KP－201C）and press $\frac{\text { FUN }}{\text { DATA }}$ until that digital keypad is connected to inverter，the LED of keypad will display＇ dEFG＇to indicate that resume the factory settings of 50 HZ ．
c．Resume last settings
To disconnect digital keypad（KP－201C）and press $\frac{\text { STop }}{\text { RESET }}$ until that digital keypad is connected to inverter，the LED of keypad will display＇ーにら＇to indicate that the last settings have been resumed．
(2) Settings of analog keypad (KP-202C)
A. Descriptions of RSW functions

| RSW | Functions | Corresponding VR | Range | Factory setting |
| :---: | :---: | :---: | :---: | :---: |
|  | Output frequency | ---- | ---- | ---- |
|  | Boost voltage |  | $0.1 \sim 127.5 \mathrm{~V}$ | $8.0 \mathrm{~V}(200 \mathrm{~V}$ class $)$ $12.0 \mathrm{~V}(400 \mathrm{~V}$ class $)$ |
|  | Primary acceleration time | $=$ | $0.0 \sim 165.0 \mathrm{sec}$ | $\begin{array}{\|l\|} \hline 0.5 \sim 5 \mathrm{HP}: 5.0 \mathrm{sec} \\ 7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec} \\ \text { above 40HP:30.0 sec } \\ \hline \end{array}$ |
|  | Primary deceleration time | $=$ | $0.0 \sim 165.0 \mathrm{sec}$ | $0.5 \sim 5 \mathrm{HP}: 5.0 \mathrm{sec}$ $7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec}$ above $40 \mathrm{HP}: 30.0 \mathrm{sec}$ |
|  | Speed level 1 | $=$ | 0.0~120.0Hz | 10.0 Hz |
|  | Max. output frequency |  | 0.0~120.0Hz | 60.0 Hz |
|  | Secondary Acc/Dec time | $=$ | $0.0 \sim 165.0 \mathrm{sec}$ | $\begin{array}{\|l\|} \hline 0.5 \sim 5 \mathrm{HP}: 5.0 \mathrm{sec} \\ 7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec} \\ \text { above 40HP:30 sec } \end{array}$ |
|  | Primary setting |  | 0.0~120.0Hz | ---- |
|  | Indicate frequency setting | -- | ---- | ---- |
|  | Indicate output voltage | ---- | ---- | ---- |

~ OPERATIONS OF KEYPADS ~

| RSW | Functions | Corresponding VR | Range | Factory setting |
| :---: | :---: | :---: | :---: | :---: |
|  | Indicate DC voltage | ---- | ---- | ---- |
|  | Indicate output current | ---- | ---- | - |
|  | Indicate speed Of motor | ---- | ---- | ---- |
|  | Indicate line velocity | ---- | ---- | ---- |
|  | Indicate status of terminals | ---- | ---- | ---- |
|  | Indicate status of DIP | ---- | ---- | ---- |

a. The function code associated with VR can be changed, besides the ADJ1~ADJ3.
b. The status of terminals and DIP are shown as the figure below.


B．Descriptions of DIP functions

| $\underset{\text { Switch }}{\mathrm{NO}}$ | DIP | Functions | Descriptions | Remark |
| :---: | :---: | :---: | :---: | :---: |
| 1 |  | Carry frequency | ON ：Carry frequency is 2.5 KHz OFF：use KP－201C set the carry Frequency（Factory setting） | Refer <br> to P． 70 |
| 2 |  | Selections of base frequency | ON：Base frequency at 50.00 Hz OFF：Base frequency at 60.00 Hz | Refer <br> to P． 70 |
| 3 |  | Selections of speed setting | ON：frequency set by terminal OFF：frequency set by KP－201C primary speed or KP－202C setting（Factory setting） | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 70 \end{aligned}$ |
| 4 |  | Selections of start command | ON：start with the FWD／REV terminal <br> OFF：use the KP－202C start （Factory setting） | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 70 \end{aligned}$ |

C．Descriptions of ADJ functions

| ADJ | Functions | Range | Factory setting | Remark |
| :---: | :---: | :---: | :---: | :---: |
| =要察 | Boost voltage | $0.1 \sim 127.5 \mathrm{~V}$ | $\begin{aligned} & 8.0 \mathrm{~V}(200 \mathrm{~V} \text { class) } \\ & 12.0 \mathrm{~V}(400 \mathrm{~V} \text { class }) \end{aligned}$ | Refer to P． 71 |
| $=$ | Primary acceleration time | $0.0 \sim 165.0 \mathrm{sec}$ | $\begin{gathered} 0.5 \sim 5 \mathrm{HP}: 5.0 \mathrm{sec} \\ 7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec} \\ \text { above } 40 \mathrm{HP}: 30.0 \mathrm{sec} \end{gathered}$ | Refer to P． 71 |
|  | Primary deceleration time | $0.0 \sim 165.0 \mathrm{sec}$ | $\begin{gathered} 0.5 \sim 5 \mathrm{HP}: 5.0 \mathrm{sec} \\ 7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec} \\ \text { above } 40 \mathrm{HP}: 30.0 \mathrm{sec} \end{gathered}$ | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 71 \end{aligned}$ |
| =这点 | Speed level 1 | $0.0 \sim 120.0 \mathrm{~Hz}$ | 10.0 Hz | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 71 \end{aligned}$ |
| 㴔会 | Max．output frequency | $0.0 \sim 120.0 \mathrm{~Hz}$ | 60.0 Hz | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 71 \end{aligned}$ |
|  | Secondary Acc／Dec time | $0.0 \sim 165.0 \mathrm{sec}$ | 0．5～5HP ： 5.0 sec $7.5 \sim 30 \mathrm{HP}: 15.0 \mathrm{sec}$ above 40HP：30 sec | $\begin{aligned} & \text { Refer } \\ & \text { to P. } 71 \end{aligned}$ |
|  | Primary setting | $0.0 \sim 120.0 \mathrm{~Hz}$ | －－－－ | Refer to P． 71 |

## CHAPTER5 LIST OF FUNCTION CODE SETTING

| Function | Name | Descriptions |  |  |  | Range of setting | $\begin{gathered} \text { Resolu- } \\ \text { tion } \end{gathered}$ | $\begin{gathered} \hline \begin{array}{c} \text { Factory } \\ \text { setting } \end{array} \\ \hline \end{gathered}$ | $\begin{aligned} & \text { No. page } \\ & \text { refererence } \\ & \text { for detail } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_000 | Version of software | Display the version of software |  |  |  | - | - | P5103d | 33 |
| F_001 | Selections of start command |  Start command Direction command <br> $0:$ FWD and REV terminal  <br>  FWD  |  |  |  | $0 \sim 3$ | - | 3 | 33 |
|  |  |  |  |  |  |  |  |  |  |
|  |  | 1: FWD terminal <br> 2: Start signal is <br> 3: generated by <br> keypad  |  | REV terminal |  |  |  |  |  |
|  |  |  |  | $\begin{array}{\|l} \hline \text { FWD and REV terminals } \\ \hline \text { FWD and REV } \\ \text { terminals are useless } \\ \hline \end{array}$ |  |  |  |  |  |
| F_002 | Select source of speed setting | 0:Indicate the frequency is set by terminals |  |  |  |  |  |  |  |
|  |  | 1:Indicate the frequency is set by keypad |  |  |  |  |  |  |  |
|  |  | 2:RPM set by keypad |  |  |  | 0~4 | - | 1 | 34 |
|  |  | 3:MPM set by keypad |  |  |  |  |  |  |  |
|  |  | 4:Indicate the frequency is set by UP/DOWN terminals |  |  |  |  |  |  |  |
| F_003 | $\begin{aligned} & \text { Selection of } \\ & \text { validity of } \\ & \text { STOP on } \\ & \text { keypad } \\ & \hline \end{aligned}$ | 0:Indicate terminals generate start signal then STOP on keypad is invalid |  |  |  |  |  |  |  |
|  |  | 1:Indicate terminals generate start signal then STOP on keypad is valid |  |  |  | 0,1 |  | 1 | 35 |
| F_004 | Selection function of changing frequency for KP-201C | 0:Indicate KP-201C is in monitor mode and the frequency setting can not be changed |  |  |  | 0,1 | - | 1 | 35 |
|  |  | 1:Indicate KP-201C is in monitor mode and the frequency setting can be changed |  |  |  |  |  |  |  |
| F_005 | Selection function of storing frequency for KP-201C | 0:Indicate KP-201C is in monitor mode and the frequency setting can not be stored automatically |  |  |  | 0,1 | - | 1 | 35 |
| F_006 | Select main display of KP-201C of KP-201C | Select one of 8 display as main display |  |  |  | 1~8 | - | 1 | 35 |
| F_007 | $\begin{aligned} & \text { Speed } \\ & \text { constant } \end{aligned}$ | Set the value of MPM displayed on keypad |  |  |  | $0.00 \sim 500.00$ | 0.01 | 20.00 | 36 |
| F_008 | No. decimal of speed display | Set the no. decimal of speed displayed on keypad |  |  |  | 0~3 | - | 0 | 36 |
| F_009 | Main speed | Jog | X3 | X2 | X1 | $0.00 \sim 400.00$ | 0.01HZ | 50.00 <br> (Re.1) | 37 |
|  |  | OFF | OFF | OFF | OFF |  |  | $\begin{aligned} & \hline 60.00 \\ & (\operatorname{Re} .2) \end{aligned}$ |  |
| F_010 | Speed level 1 | OFF | OFF | OFF | ON | 0.00~400.00 | 0.01HZ | 10.00 | 37 |
| F_011 | Speed level 2 | OFF | OFF | ON | OFF | $0.00 \sim 400.00$ | 0.01HZ | 20.00 | 37 |
| F_012 | Speed level 3 | OFF | OFF | ON | ON | $0.00 \sim 400.00$ | 0.01HZ | 30.00 | 37 |
| F_013 | Speed level 4 | OFF | ON | OFF | OFF | $0.00 \sim 400.00$ | 0.01HZ | 0.00 | 37 |
| F_014 | Speed level 5 | OFF | ON | OFF | ON | $0.00 \sim 400.00$ | 0.01HZ | 0.00 | 37 |
| F_015 | Speed level 6 | OFF | ON | ON | OFF | 0.00~400.00 | 0.01HZ | 0.00 | 37 |
| F_016 | Speed level 7 | OFF | ON | ON | ON | 0.00~400.00 | 0.01HZ | 0.00 | 37 |
| F_017 | Jog speed | ON | X | X | X | 0.00~400.00 | 0.01 HZ | 6.00 | 37 |
| F_018 | Base freq. of acc./dec. | The frequency is correspond to acc./dec. time |  |  |  | 0.01~400.00 | 0.01 HZ | 50.00 <br> (Re.1) <br> 60.00 <br> (R.2) <br> 15.0 | 39 |
| F_019 | Primary acceleration time | The acceleration time of main speed, speedlevel 4~7, and jog speed |  |  |  | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ (\operatorname{Re} .5) \end{array}$ | 39 |
| F_020 | Primary deceleration time | The deceleration time of main speed, speed level 4~7, and jog speed |  |  |  | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ (\operatorname{Re} .5) \\ \hline \end{array}$ | 39 |
| F_021 | Acceleration time of speed level 1 | Acceleration time of speed level 1 |  |  |  | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |

[^0]The color as
means which can be set during peration.

## ~LIST OF FUNCTION CODE SETTING~

| Function | Name | Descriptions | Range of setting | Resolution | Factory setting | No. page reference for detai |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_022 | Deceleration time of speed level 1 | Deceleration time of speed level 1 | 0.0~3200.0 | 0.1S | $\begin{array}{\|c} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |
| F_023 | Acceleration time of speed level 2 | Acceleration time of speed level 2 | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |
| F_024 | Deceleration time of speed level 2 | Deceleration time of speed level 2 | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |
| F_025 | Acceleration time of speed level 3 | Acceleration time of speed level 3 | 0.0~3200.0 | 0.1S | $\begin{array}{\|c} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |
| F_026 | Deceleration time of speed level 3 | Deceleration time of speed level 3 | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ \text { (Re.5) } \\ \hline \end{array}$ | 39 |
| F_027 | Secondary acceleration time | Multiple function-input terminals control the situation of the determination of secondary acceleration time | 0.0~3200.0 | 0.1S | $\begin{array}{\|c\|} \hline 15.0 \\ \text { (Re.5) } \end{array}$ | 39 |
| F_028 | Secondary deceleration time | Multiple function-input terminals control the situation of the determination of secondary deceleration time | 0.0~3200.0 | 0.1S | $\begin{gathered} 15.0 \\ (\operatorname{Re} .5) \end{gathered}$ | 39 |
| F_029 | Setting of S-curve acc./dec. time | Setting of acceleration/deceleration time of S-curve acceleration/deceleration | 0.0~5.0 | 0.1S | 0.0 | 39 |
| F_030 | Limitation of output voltage | 0:Output voltage of V/F pattern is not limited <br> 1:Output voltage of V/F pattern is limited | 0,1 | - | 0 | 41 |
| F_031 | Max. output frequency | Operational maximum output frequency by inverter | 0.1~400.0 | 0.1HZ | 50.0 <br> $($ Re.1 $)$$\|$60.0 <br> (Re.2) | 41 |
| F_032 | Start frequency | Start frequency of inverter output frequency | 0.1~10.0 | 0.1HZ | 0.5 | 41 |
| F_033 | Boost voltage | Output voltage associated with output start frequency | $0.1 \sim 50.0$ <br> $0.1 \sim 100.0$ | 0.1 V | 8.0 <br> $(\operatorname{Re} .3)$ <br> 12.0 <br> (Re.4) <br> 50.0 | 41 |
| F_034 | Base frequency | The frequency associated with base voltage in V/F pattern | 0.1~400.0 | 0.1HZ | 50.0 <br> (Re.1) <br> 60.0 <br> (Re.2) <br> 220.0 | 41 |
| F_035 | Base voltage | The voltage associated with base frequency in V/F pattern | $0.1 \sim 255.0$ <br> $0.1 \sim 510.0$ | 0.1 V | 220.0 <br> (Re.3) <br> 380.0 <br> (Re.4) | 41 |
| F_036 | Frequency at the changing point 1 | Frequency at the changing point 1 of V/F pattern | 0.0~399.9 | 0.1 HZ | 0.0 | 41 |
| F_037 | Voltage at the changing point 1 | Voltage at the changing point 1 of V/F pattern | $\begin{aligned} & 0.0 \sim 255.0 \\ & \hline 0.0 \sim 510.0 \end{aligned}$ | 0.1 V | 0.0 | 41 |
| F_038 | Frequency at the changing point 2 | Frequency at the changing point 2 of $\mathrm{V} / \mathrm{F}$ pattern | 0.0~399.9 | 0.1HZ | 0.0 | 41 |
| F_039 | Voltage at the changing point 2 | Voltage at the changing point 2 of V/F pattern | $\begin{aligned} & \hline 0.0 \sim 255.0 \\ & \hline 0.0 \sim 510.0 \\ & \hline \end{aligned}$ | 0.1 V | 0.0 | 41 |
| F_040 | Vin frequency command gain | Proportional gain between Vin analog frequency command and output frequency | 0.00~2.00 | 0.01 | 1.00 | 43 |
| F_041 | Vin frequency command bias | Gain of Vin analog bias frequency | -1.00~1.00 | 0.01 | 0.00 | 43 |
| F_042 | Ratio of upper bound of output frequency | The upper bound of output voltage is defined as the percentage of the maximum output frequency ( 1.00 denotes the maximum frequency) | 0.00~1.00 | 0.01 | 1.00 | 45 |
| F_043 | Ratio of lower bound of output frequency | The lower bound of output voltage is defined as the percentage of the maximum output frequency ( 1.00 denotes the maximum frequency) | 0.00~1.00 | 0.01 | 0.00 | 45 |

The color as $\square$ means which can be set during operation.

| Functio | Name | Descriptions | Range of setting | $\begin{gathered} \hline \text { Resolu } \\ \text { tion } \end{gathered}$ | Factory setting | $\begin{array}{\|l\|} \begin{array}{l} \text { No. page } \\ \text { eference } \\ \text { for detail } \end{array} \\ \hline \end{array}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_044 | Selection of FM+ analog output signal | 0:Analog signal indicates output frequency 1:Analog signal indicates frequency command 2:Analog signal indicates output current 3:Analog signal indicates Vin frequency command 4:Analog signal indicates lin frequency command | 0~4 | - | 0 | 46 |
| F_045 | FM+ analog output gain | Gain=max output frequency/output frequency. Or Gain=rated current of inverter/output current | 0.00~2.00 | 0.01 | 1.00 | 46 |
| F_046 | Overload protection selection | 0:No overload protection for motor 1:Overload protection for motor <br> 2:Overload protection for motor with independence heat fan | 0~2 | - | 1 | 47 |
| F_047 | Reserved | Reserved | - | - | 0 | 47 |
| F_048 | Rated current of motor | According to the spec. of motor | $10 \sim 150 \%$ by the inverter rated current | 0.1A | According to the spec. of motor | 47 |
| F_049 | No-load current of motor | According to the spec. of motor | 0~motor rated current | 0.1A | $\begin{array}{\|c\|} \hline 1 / 3 \text { motor } \\ \text { rated } \\ \text { current } \end{array}$ | 47 |
| F_050 | Slip compensation | According to the load condition, slip is compensation for constant speed | -9.9~10.0 | 0.1HZ | 0.0 | 47 |
| F_051 | No. poles of motor | Setting of poles of motor for conversion of RPM | 2~10 | 2P | 4P | 47 |
| F_052 | Input terminal <br> X 1 setting |  $\pm 1$ :jog command  <br> X1=0:UP/DOWN  <br> command enter key switch between the <br> secondary acceleration and  <br> deceleration  |  |  | 3 |  |
| F_053 | Input terminal X 2 setting |  $\pm 3$ :multiple speed level 1 <br> $\quad$ Command  <br> X2=0: DC braking $\pm 4$ multiple speed level 2 <br> enable (stop) command |  |  | 4 |  |
| F_054 | Input terminal <br> X3 setting | X3= $=$ :current limit $\pm 5:$ multiple speed level 3 <br> enable $\pm 6$ remmand <br>  $\pm 7:$ external fault command |  |  | 1 |  |
| F_055 | Input terminal X4 setting | X4=0:primary and $\pm 8$ :inhibition command for <br> output  <br> secondary speed $\pm 9$ stop in free running <br> select $\pm 10:$ speed search from the | (Re.9) | - | 2 | 48 |
| F_056 | Input terminal X5 setting | maximum frequency <br> X5 $=0$ : stop command $\pm 11$ :speed search from the set with 3-line sustaining frequency <br> $\pm 12$ :inhibition command for |  |  | 7 |  |
| F_057 | Input terminal X6 setting | circuit (contact a) acceleration and deceleration <br>  <br>  <br>  <br> X6=0 : stop command <br> $\pm 13:$ up command <br> with 3-line sustaining command <br> wis:clear up/down frequency <br> circuit (contact b) <br> $16:$ select andalog input source  |  |  | 6 |  |
| F_058 | Output terminal Y1 setting | O: useless $\pm 7$ :under voltage detection <br> $\pm 1$ 1:running detection $\pm 8:$ detection of braking <br> $\pm 2$ :constant  |  |  | 3 |  |
| F_059 | Output terminal Y2 setting | speed detection $\pm 9$ :detection of restart after <br> $\pm 3$ :zero speed detection instantaneous <br>  power interruption | $-11 \sim+11$ | - | 2 | 54 |
| F_060 | Settings of output terminals Ta1 and Tb1 | $\pm 5:$ overload detection $\pm 10$ : detection of restar <br> after fault conditions  <br> prevention detection $\pm 11$ : detectionof fault conditions | (Re.9) |  | 11 |  |
| F_061 | Frequency range for constant speed detection | Frequency range for constant speed detection | 0.0~10.0 | 0.1HZ | 2.0 | 59 |
| F_062 | Frequency detection range | Frequency detection range | $0.0 \sim 10.0$ | 0.1HZ | 2.0 | 59 |
| F_063 | Level of frequency detection | Level of frequency detection for multiple function output terminal | 0.0~400.0 | 0.1HZ | 0.0 | 59 |

## ~LIST OF FUNCTION CODE SETTING~

| Function | Name | Descriptions | Range of setting | $\begin{gathered} \hline \begin{array}{c} \text { Resolu- } \\ \text { tion } \end{array} \\ \hline \end{gathered}$ | $\begin{array}{\|c\|} \hline \text { Factory } \\ \text { setting } \end{array}$ | $\begin{aligned} & \text { No. page } \\ & \text { reference } \\ & \text { for detaii } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_064 | Gain of the automatic torque boost | According to the load condition, adjust the output voltage of the certain V/F pattern | 0.0~25.5 | 0.1 | 1.0 | 59 |
|  | Selection of | 0 :There is no output for overload detection |  |  |  |  |
| F_065 | $\begin{array}{\|l} \begin{array}{l} \text { overload } \\ \text { detection(OLO) } \end{array} \\ \hline \end{array}$ | 1:There is output for overload detection (Re.6) | 0,1 | - | 0 | 60 |
| F_066 | Status of overload detection(OLO) | 0 :There is output for the condition of constant frequency only <br> 1:There is output for any frequency | 0,1 | - | 0 | 60 |
| F_067 | Output setting for overload(OLO) | 0:Inverter is still running after overload has <br> been detected <br> 1:Output of inverter is inhibited after overload <br> has been detected | 0,1 | - | 0 | 60 |
| F_068 | Level of overload setting(OLO) | The setting of level of current for overload detection | $\begin{array}{\|c\|} \hline 30 \% \sim 200 \% \\ \text { by the inverter } \\ \text { rated current } \end{array}$ | 1\% | 160 | 60 |
| F_069 | Time interval for overload detection | The time interval, in which the output current is larger than the setting of $\mathrm{F}_{-} 068$, required for overload detection | 0.1~10.0 | 0.1S | 0.1 | 60 |
| F_070 | Level of stall prevention during acceleration | If stall is occurred during acceleration, motor is kept at constant speed | $\left\|\begin{array}{c} 30 \% \sim 200 \% \\ \text { by the inverter } \\ \text { rated current } \end{array}\right\|$ | 1\% | 170 | 61 |
| F_071 | Level of stall prevention at the constant speed | If stall is occurred at the constant-speed running, the motor speed is decreased | $\begin{array}{\|c\|} \hline 30 \% \sim 200 \% \\ \text { by the inverter } \\ \text { rated current } \\ \hline \end{array}$ | 1\% | 160 | 61 |
| F_072 | $\begin{array}{\|l} \hline \text { Acceleration time } \\ \text { of recovery after } \\ \text { stall prevention at } \\ \text { the constant speed } \end{array}$ | Setting of acceleration time of recovery after stall prevention at the constant speed | 0.1~3200.0 | 0.1S | $\left\|\begin{array}{c} 15.0 \\ (\operatorname{Re} .5) \end{array}\right\|$ | 61 |
| F_073 | Deceleration time of recovery after stall prevention at the constant speed | Setting of deceleration time of recovery after stall prevention at the constant speed | 0.1~3200.0 | 0.1S | $\left\|\begin{array}{c} 15.0 \\ (\operatorname{Re} .5) \end{array}\right\|$ | 61 |
| F_074 | Select function of stall prevention during dec. | $0:$ There is no stall prevention during <br> deceleration <br> 1:There is stall prevention during deceleration | 0,1 | - | 1 | 61 |
| F_075 | Current of DC braking | Setting of level of current for DC braking setting | $\begin{array}{\|c\|} \hline 0 \sim 150 \% \\ \text { by the inverter } \\ \text { rated current } \\ \hline \end{array}$ | 1\% | 50 | 62 |
| F_076 | Time interval of DC braking in stop | In stop the required time interval for DC braking setting | 0.0~20.0 | 0.15 | 0.5 | 62 |
| F_077 | $\begin{aligned} & \text { Time interval of DC } \\ & \text { braking in start } \\ & \hline \end{aligned}$ | In start the required time interval for DC braking setting | 0.0~20.0 | 0.1 S | 0.0 | 62 |
| F_078 | Selection of resumption | 0:Inverter can not be restarted after <br> instantaneous power interruption$\left\|\begin{array}{\|l\|}\hline \text { 1:Inverter will be restarted after instantaneous } \\ \text { power interruption }\end{array}\right\|$2:Shutdown <br> 3:Enable controlled deceleration stop <br> (F_103,F_104,F_105,F_106) | 0~3 | - | 0 | 63 |
| F_079 | Level of power source for shutdown | Level of power source for shutdown | 150.0~192.0 | 0.1 V | $\begin{array}{\|c\|} \hline 175.0 \\ (\operatorname{Re} .3) \\ \hline 320.0 \\ (\operatorname{Re} .4) \\ \hline \end{array}$ | 63 |
| F_080 | Number of restart | Number of restart for fault conditions | 0~16 | 1 | 0 | 67 |
| F_081 | Carry frequency setting | The setting value is higher then the noise is lower. <br> The carry frequency is inversely proportional to the distance between inverter and motor | 1~6 | - | $\left.\left\lvert\, \begin{array}{c} 4 \\ (R e .10) \end{array}\right.\right)$ | 67 |

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## ~LIST OF FUNCTION CODE SETTING~

| Function | Name | Descriptions | $\begin{array}{c}\text { Range of } \\ \text { setting }\end{array}$ | $\begin{array}{c}\text { Resolu- } \\ \text { tion }\end{array}$ | $\begin{array}{c}\text { Factory } \\ \text { setting }\end{array}$ | $\begin{array}{l}\text { No. page } \\ \text { refrence } \\ \text { for detail }\end{array}$ |
| :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| F_082 | Types of stop |  |  |  |  |  | \(\left.\begin{array}{l}0: Indicate stop by deceleration <br>

1: Indicate stop by free running\end{array}\right)\)

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| Function | Name | Descriptions | Range of setting | $\begin{gathered} \text { Resolu- } \\ \text { tion } \end{gathered}$ | $\begin{array}{\|c\|} \hline \text { Factory } \\ \text { setting } \end{array}$ | $\begin{aligned} & \begin{array}{l} \text { No. page } \\ \text { reference } \\ \text { for detail } \end{array} \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_105 | Deceleration time 2 of power source for shutdown | Deceleration time when output frequency smaller than switch frequency (F_106) | 0.0~3200.0 | 0.1 S | $\begin{gathered} 15.0 \\ (\operatorname{Re} .5) \\ \hline \end{gathered}$ | 63 |
| F_106 | Switch frequency of power source for shutdown | Frequency setting value of switch the deceleration time of speed level 2. | 0.0~400.0 | 0.1HZ | 0.0 | 63 |
| F_107 | ADJ1 parameter setting | ADJ1 of KP-202C function is boost voltage , it can't be changed | - | - | 0 | 69 |
| F_108 | ADJ2 parameter setting | ADJ2 of KP-202C function is primary acc. time, it can't be changed. | - | - | 0 | 69 |
| F_109 | ADJ3 parameter setting | ADJ3 of KP-202C function is primary dec. time, it can't be changed | - | - | 0 | 69 |
| F_110 | Selection of parameter of ADJ4 | Selecting parameter of ADJ4 of KP-202C | 0~49 | - | 1 | 69 |
| F_111 | Selection of parameter of ADJ5 | Selecting parameter of ADJ5 of KP-202C | 0~49 | - | 20 | 69 |
| F_112 | Selection of parameter of ADJ6 | Selecting parameter of ADJ6 of KP-202C | 0~49 | - | 17 | 69 |
| F_113 | Selection of parameter of DIP1 | Selecting parameter of DIP1 of KP-202C | 0~15 | - | 8 | 69 |
| F_114 | $\begin{array}{\|l} \hline \begin{array}{l} \text { Selection of } \\ \text { parameter of DIP2 } \end{array} \\ \hline \end{array}$ | Selecting parameter of DIP2 of KP-202C | 0~15 | - | 5 | 69 |
| F_115 | Selection of parameter of DIP3 | Selecting parameter of DIP3 of KP-202C | 0~15 | - | 3 | 69 |
| F_116 | Selection of <br> parameter of DIP4 | Selecting parameter of DIP4 of KP-202C | 0~15 | - | 1 | 69 |
| F_117 | Setting potentiometer of KP-202C | Selecting parameter of setting potentiometer of KP-202C | 0~49 | - | 0 | 69 |
| F_118 | Selection of UP/DOWN memory control | 0:Clear UP/DOWN frequency for shutdown power 1:Store UP/DOWN frequency for shutdown power | 0,1 | - | 0 | 51 |
| F_119 | UP/DOWN adjust frequency | $\begin{aligned} & 0: 0.01 \mathrm{~Hz}, 1 \sim 8: * 0.05 \mathrm{~Hz}, 9: 0.5 \mathrm{~Hz}, \\ & 10 \sim 250: * 0.1 \mathrm{~Hz} \end{aligned}$ | $0 \sim 250$ | - | 0 | 51 |
| F_120 | UP/DOWN adjust Time | 1~5:Terminal adjust response time, continuous acceleration (deceleration) when over setting time 6:Edge trigger | 1~6 | - | 1 | 51 |
| F_121 | UP/DOWN frequency adjust | Adjust UP/DOWN frequency from KEYPAD directly | 0.00~400.00 | 0.01HZ | 0.00 | 52 |
| F_122 | Selection of secondary speed | 0:Indicate the frequency is set by terminals 1:Indicate the frequency is set by keypad 2:Indicate the frequency is set by UP/DOWN terminals | 0~2 | - | 0 | 53 |
| F_123 | Select source of analog input | 0: Vin+Iin 1:Vin - Iin 2:Iin-Vin <br> 3: Vin or lin (switch by multi-function input terminal) | 0~3 | - | 0 | 44 |
| F_124 | Selection of Vin analog input | 0: Analog input gain 1: Frequency command 2: Current limit fevel 3: Output voltage adjustment of V/F pattern | 0~3 | - | 1 | 44 |
| F_125 | Selection of Iin analog input | 0: Analog input gain I: Frequency command 2: Current limit level 3: Output voltage adjustment of V/F pattern | 0~3 | - | 1 | 44 |
| F_126 | Selection of Iin analog input range | 0: 4~20mA (2~10V) $\quad 1: 0 \sim 20 \mathrm{~mA}(0 \sim 10 \mathrm{~V})$ | 0,1 | - | 0 | 44 |
| F_127 | lin frequency command gain | Proportional gain between Iin analog frequency command and output frequency | 0.00~2.00 | 0.01 | 1.00 | 43 |
| F_128 | lin frequency command bias | Gain of Iin analog bias frequency | -1.00~1.00 | 0.01 | 0.00 | 43 |

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## ~LIST OF FUNCTION CODE SETTING~

| Function | Name | Descriptions | Range of setting | $\begin{gathered} \text { Resolu- } \\ \text { tion } \end{gathered}$ | Factory setting |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F_129 | Selection of AM+ analog output signal | 0:Analog signal indicates output frequency 1:Analog signal indicates frequency command 2:Analog signal indicates output current 3:Analog signal indicates Vin frequency command 4:Analog signal indicates Iin frequency command | 0~4 | - | 2 | 46 |
| F_130 | AM+ analog output gain | Gain=max output frequency/output frequency. Or Gain=rated current of inverter/output current | 0.00~2.00 | 0.01 | 1.00 | 46 |
| F_131 | Setting of output terminals Ta2 and Tc2 | Refer the setting of multiple function outputs | $\begin{gathered} \hline-11 \sim 11 \\ (\operatorname{Re} .9) \\ \hline \end{gathered}$ | - | 1 | 54 |
| F_132 | Frequency of DC braking in stop | Start frequency of DC braking in stop | 0.1~60.0 | 0.1HZ | 0.5 | 62 |
| F_133 | Current <br> limit level | Monitor the current limit level setting | - | - | - | 53 |
| F_134 | Selections of resumption of factory setting | 0 : Useless | - | - | 0 | 36 |
|  |  | CLF : Clear fault records |  |  |  |  |
|  |  | dEF60 : Resume the factory setting of 60 Hz |  |  |  |  |
|  |  | dEF50 : Resume the factory setting of 50 Hz |  |  |  |  |
|  |  | SAv : Store setting |  |  |  |  |
|  |  | rES : Resume setting |  |  |  |  |
|  |  | rd-EE : Digital keypad (KP-201C) inverter parameters |  |  |  |  |
|  |  | Wr-EE : Digital keypad (KP-201C) $\rightarrow$ inverter parameters |  |  |  |  |

Remark:
(1) Factory settings for 50 Hz (6) Display 'OLO '
(2) Factory settings for 60 Hz (7) The dynamic braking unit is installed.
(3) Specifications of 200 V
(8) The setting is zero to denote that there is no display.
(4) Specifications of 400 V class .
(5) $0.5 \sim 5 \mathrm{HP}: 5 \mathrm{sec}$
(9) + : represents contact a (normally open) - : represents contact b (normally close)
$7.5 \sim 30 \mathrm{HP}: 15 \mathrm{sec}$ above 40 HP: 30 sec

UP/DOWN control wiring must be less than 20M.
(10) Above 125HP for RM5P series, the factory setting of F_081=3
$\square$ means which can be set during operation

## 6.DESCRIPTIONS OF FUNCTION CODE SETTINGS

(1) Settings of keypad
A. F_000 : Version of software

This manual has to be incorporated with software version P5103d. If the inverters have different software versions, they can not read /write setting to inverter each other. The KP-201C keypad display will show the "Lill _ F".
B. F_001: Select start and direction commands
a. F_001 =0
(1) FWD and REV control both start and direction commands
(2) FWD and REV are either open or closed simultaneously to stop running.

b. $F \_001=1$

Start control by FWD terminal, Rotation control by REV terminal.

c. $F \_001=2$
(1) Keypad generates start command, and FWD and REV generate direction command.
(2) FWD and REV are either open or closed simultaneously to stop running.

d. F_001 = 3

Start signal is generated by keypad, FWD and REV terminals are useless, and the running is in the positive direction.
Note : that for F_001=0, 2, if FWD-COM and REV-COM are open simultaneously, the frequency display in the monitor mode will display flashed ' ------ ', and if FWD-COM and REV-COM are closed simultaneously, the frequency display in the monitor mode will display flashed ' dEF '
C. F_002 : Select source of speed setting
a. $F \_002=0$

Indicate the frequency is set by terminals (select Vin, Iin analog input by F_123)
(1) Vin-GND: range of input is $0 \sim 10 \mathrm{~V}$

Note: The gain and bias of analog signals refer the setting in F_040 and F_041.
(2) Iin-GND: switch the DIP switch DSW1 on the control board.
" I" side: inputting cu rrent reference range $4 \sim 20 \mathrm{~mA}$ or $0 \sim 20 \mathrm{~mA}$ (select by F_126)
"V" side: inputting voltage reference range $2 \sim 10 \mathrm{~V}$ or $0 \sim 10 \mathrm{~V}$ (select by F_126)
Note : The gain and bias of analog signals refer the setting in F_127 and F_128.
b. $F$ _002 $=1$

Indicate the speed is set by keypad.
(1) For KP-201C, main speed and the multiple level speeds can be set, besides, the frequency can be set in the monitor mode.
(2) For KP-202C, using setting potentiometer knob on the panel to set speed
c. F_002 $=2$

RPM set by keypad.
d. $F$ _002 $=3$

MPM set by keypad.
e. F_002 $=4$

Indicate the frequency is set by UP/DOWN terminals
By multi-function input terminals set UP command / DOWN command / UP/DOWN frequency command clear/enter functions.
Note : When F_002=1~3, in the monitor mode to change the frequency command, push the $\Delta$ and $\nabla$ key one time, the frequency command will blink but the value doesn't changed, push the key again then can start to change the value.
D. F_003 : Selection of validity of STOP on keypad
a. $\bar{F} \_003=0$

Indicate terminals generate start signal and STOP on keypad is invalid.
b. F_003 = 1

Indicate terminals generate start signal and STOP on keypad is valid.

Indicate terminals generate start signal and STOP on keypad is valid.
c.The usage of "STOP" key
(I) When "STOP" key use as urgent stop like following:

When Inverter start and running control by input terminal (F_001=0 or1), it needs to push "STOP" key during Inverter working, then output frequency will down to 0.00 HZ , the KP-201C will show "000". The usage of restart action is, to release the FWD or REV terminal between COM first, then to do restart action.
(II) "STOP" key use as common stop:

When F_001=2 or 3, the start action is control by KP-201C
"RUN" Key, then stop action is control by KP-201C "STOP" key.
E. F_004 : Select function of changing frequency for KP-201C
a. $\bar{F} \_004=0$

Indicate KP-201C is in monitor mode and the frequency setting can not be changed.
b. F_004 = 1

Indicate KP-201 is in monitor mode and the frequency setting can be changed.
F. F_005 : Select function of storing frequency for KP-201C
a. F_005 $=0$

Indicate KP-201C is in monitor mode, the main speed setting value can not be stored automatically.
b. F_005 = 1

Indicate KP-201C is in monitor mode, the main speed setting value can be stored automatically after 3 minutes later.
G. F_006: Select main display of KP-201C

This function is designed for KP-201C. In the monitor mode, there are 8 displays as followings.

1. Output frequency
2. Frequency setting
3. Output voltage
4. PN voltage
5. Output current
6. Motor speed (RPM)
7. Line velocity (MPM)
8. Status of terminals

Note : that any display can be set to be the main display, and that if the keypad has not been operated and the auxiliary display has been displayed for about 3 minutes, the main display is shown.
H. F_007: Speed constant

The range of setting is $0.00 \sim 500.00$ to set the value of MPM displayed on keypad Line velocity $=$ speed constant $($ F_007 $) \times$ output frequency, which is the value of MPM, displayed in the monitor mode.
I. F_008: No. decimal of speed display

Increasing the no. decimal to display the monitored signal more precisely. The range of $F_{-} 008$ is $0 \sim 3$.
J. F_134: Selections of resumption of factory setting

This function is used to resume the factory settings and store/write settings between inverter and KP-201C. This is the last item of the function.

$$
\begin{aligned}
& 1] \text { : Useless } \\
& \text { [L_F: Clear fault records } \\
& \text { HEFSO : Resume the factory settings of } 60 \mathrm{~Hz} \text {. } \\
& \text { dEF50 : Resume the factory settings of } 50 \mathrm{~Hz} \text {. } \\
& \text { 5R1 J : Store settings } \\
& \text { rES : Resume last settings } \\
& \text { Fロ_EE : Digital keypad (KP-201C) } \leftarrow \text { inverter parameters } \\
& \text { LHLH _ EE : Digital keypad (KP-201C) } \rightarrow \text { inverter parameters }
\end{aligned}
$$

Note: The codes roteE and LHL _ EE are copy function to be used for the case of several inverters with the same settings.(Ref.Page22)
(2) Multiple speed level settings
A. F_009 : Main speed with range $0.00 \sim 400.00 \mathrm{~Hz}$
B. F_010 : Speed level 1 with range $0.00 \sim 400.00 \mathrm{~Hz}$
C. F_011 : Speed level 2 with range $0.00 \sim 400.00 \mathrm{~Hz}$
D. F_012 : Speed level 3 with range $0.00 \sim 400.00 \mathrm{~Hz}$
E. F_013 : Speed level 4 with range $0.00 \sim 400.00 \mathrm{~Hz}$
F. F_014 : Speed level 5 with range $0.00 \sim 400.00 \mathrm{~Hz}$
G. F_015 : Speed level 6 with range $0.00 \sim 400.00 \mathrm{~Hz}$
H. F_016 : Speed level 7 with range $0.00 \sim 400.00 \mathrm{~Hz}$
I. F_017: Jog speed with range $0.00 \sim 400.00 \mathrm{~Hz}$
a. The corresponding function codes
(1) Acceleration and deceleration time for multiple speed level (F_018~F_019)
(2) Multiple function input terminal settings (F_052~F_057)
b. Production of multiple speed level

| Jog <br> command | Multiple level <br> Command 3 | Multiple level <br> Command 2 | Multiple level <br> Command 1 |  |
| :---: | :---: | :---: | :---: | :---: |
| ON | X | X | X | Jog speed |
| OFF | OFF | OFF | OFF | Main speed |
| OFF | OFF | OFF | ON | Speed level 1 |
| OFF | OFF | ON | OFF | Speed level 2 |
| OFF | OFF | ON | ON | Speed level 3 |
| OFF | ON | OFF | OFF | Speed level 4 |
| OFF | ON | OFF | ON | Speed level 5 |
| OFF | ON | ON | OFF | Speed level 6 |
| OFF | ON | ON | ON | Speed level 7 |

Note:
(1) ' X ' denotes " don't care ".
(2) Jog speed has the highest priority.
(3) Jog speed and multiple speed levels are determined by the status, ON or OFF, of multiple function input terminals which are programmed by the settings of the multiple function inputs (F_052~F_057).
(4) ' ON ' denotes that the contact a (normally open) is short circuit and contact b (normally close) is open. 'OFF' denotes that the contact a (normally open) is open and contact b (normally close) is short circuit.
c. Multiple speed level and the associated acc/dec time.


Note:
(1) The acceleration/deceleration times of jog speed and speed level $4 \sim 7$ are primary acceleration / deceleration time.
(2) In stop if the jog speed command is generated, motor will be running without start command.
(3) Except main speed, the analog inputs (Vin and Iin) are useless in multiple speed levels.
(4) Acceleration and deceleration times are set in F_018~F_029.

## (3) Acc./dec. time of multiple speed level

A. F_018 : Base frequency of acc./dec. with range $0.01 \sim 400.00 \mathrm{~Hz}$
B. F_019 : Primary acceleration time with range $0.0 \sim 3200.0$ seconds
C. F_020 : Primary deceleration time with range $0.0 \sim 3200.0$ seconds
D. F_021 : Acceleration time of speed level 1 with range 0.0~3200.0 seconds
E. F_022 : Deceleration time of speed level 1 with range 0.0~3200.0 seconds
F. F_023 : Acceleration time of speed level 2 with range 0.0~3200.0 seconds
G. F_024 : Deceleration time of speed level 2 with range 0.0~3200.0 seconds
H. F_025 : Acceleration time of speed level 3 with range 0.0~3200.0 seconds
I. F_026 : Deceleration time of speed level 3 with range 0.0~3200.0 seconds
J. F_027 : Secondary acceleration time with range 0.0~3200.0 seconds
K. F_028 : Secondary deceleration time with range 0.0~3200.0 seconds
L. F_029 : S-curve acceleration/deceleration time with range 0.0~5.0 seconds
a. Multiple acc./dec. times are the time duration in which output frequency is form 0 to base frequency (F_018).Multiple level command can control the multiple speed level and acc./dec. time of multiple speed level.
b. The acceleration/deceleration times of jog speed and speed level 4~7 are the same as those of main speed
c. Secondary acc./dec. times have the higher priority. Multiple function input terminals can be programmed to enable secondary acc/dec. The timing chart is shown in figure below.

> Secondary acc./dec. and the inhibition command for acc. and dec. chart

d. If the stop signal is generated, the command of inhibiting acc./dec. is useless.
Note: that there are 4 types of STOP signal described as followings:
(1) If $\mathrm{F} \_001=0$ or 2 , FWD and REV are either open or close simultaneously.
(2) If $F \_001=1$, FWD is open.
(3) If F_003=1, press STOP.
(4) If start command is generated by keypad, press STOP.
e. The acceleration/deceleration times of S curve acceleration/ deceleration are set for smooth running, for example, to avoid the drop of object in transmission line or shock of elevator.

S-curve acc./dec. time chart


## (4) V/F pattern settings

A. F_030 : Limitation of output voltage
a. $F \_030=0$

Output voltage is not limited
b. F_030 = 1

Output voltage is limited and can not be greater than the limited voltage of V/F pattern. ( 200 V class max. limited voltage $=$ $250.0 \mathrm{~V}, 400 \mathrm{~V}$ class max. limited voltage $=500.0 \mathrm{~V}$ )

B.F_031 : Max. output frequency

RM5G series: Max. output frequency range $0.1 \sim 400.0 \mathrm{~Hz}$
RM5P series: Max. output frequency range $0.1 \sim 120.0 \mathrm{~Hz}$
C.F_032 : Start frequency with range $0.1 \sim 10.0 \mathrm{~Hz}$.
D.F_033 : Boost voltage. (Range $0.1 \sim 50.0 \mathrm{~V}$ for 200 V class, and $0.1 ~ 100.0 \mathrm{~V}$ for 400 V class)
E.F_034 : Base frequency with range $0.1 \sim 400.0 \mathrm{~Hz}$
F. F_035 : Base voltage. (Range 0.1~255.0 V for 200V class, and $0.1 \sim 510.0 \mathrm{~V}$ for 400 V class)
G. F_036 : Frequency at the changing point 1 with range $0.0 \sim 399.9 \mathrm{~Hz}$
H. F_037 : Voltage at the changing point 1 . (Range $0.0 \sim 255.0 \mathrm{~V}$ for 200 V class, and $0.0 \sim 510.0 \mathrm{~V}$ for 400 V class)
I. F_038: Frequency at the changing point 2 with range 0.0~399.9 Hz
J. F_039 : Voltage at the changing point 2. (Range 0.0~255.0 V for 200 V class, and $0.0 \sim 510.0 \mathrm{~V}$ for 400 V class)

The relationship among the settings of $\mathrm{F}_{-} 031 \sim \mathrm{~F} \_039$ is shown in the following figure.


Note:
(1) Base frequency $>$ frequency at changing point $2>$ frequency at changing point $1>$ start frequency.
(2) If frequency at changing point $2<$ frequency at changing point 1 , frequency at changing point 2 is useless.
(3) If frequencies at changing point 1 and $2<$ start frequency, frequency at changing point 1 and 2 are useless.
(4) The F_033, F_035, F_037, F_039 is not confined each other.

## (5) Analog input commands

A. F_040: Vin frequency command gain with range $0.00 \sim 2.00$.

F_127: Iin frequency command gain with range $0.00 \sim 2.00$.
a. Analog input terminals are Vin range $0 \sim 10 \mathrm{~V}$; Iin range $4 \sim 20 \mathrm{~mA}(2 \sim 10 \mathrm{~V})$ or $0 \sim 20 \mathrm{~mA}(0 \sim 10 \mathrm{~V})$.
b. The maximum frequency setting = max. output freq. (F_031) analog command gain ( F_040/F_127)

Analog freq. command bias $=0.00$
Max. output freq. $=60.0 \mathrm{~Hz}$
Frequency command gain $=1.20$

Outpu


Max. output freq. $=60.0 \mathrm{~Hz}$
Frequency command gain $=0.80$

Output

B. F_041: Vin frequency command bias with range $-1.00 \sim 1.00$.
$\bar{F}_{-}$128: In frequency command bias with range $-1.00 \sim 1.00$.
a. Bias frequency $=$ max. output freq. $\left(\mathrm{F} \_031\right) \times$ analog command bias ( F_041/F_128).

Analog freq.command gain=1.00
Max. output freq. $=60.0 \mathrm{~Hz} \quad$ Max. output freq. $=60.0 \mathrm{~Hz}$
Frequency command bias $=0.05 \quad$ Frequency command bias= $=0.05$

b. Frequency setting $=$
$\frac{\text { (Max. frequency setting }- \text { bias frequency) }}{10 \mathrm{~V}(20 \mathrm{~mA})} \times$ analog command input + bias frequency
C. Reverse command example:

Output
frequency $\begin{aligned} & \text { Max. output freq. }=60.0 \mathrm{~Hz} \\ & \text { Frequency command gain }=0.00 \\ & \text { Frequency command bias }=1.00\end{aligned}$
D. F_123: Select source of analog input
$0:$ Vin+Iin
1:Vin-Iin

2:Iin-Vin
3:Vin or Iin (switch by multi-function input terminal)
E. F_126: Selection of Iin analog input range
$0: 4 \sim 20 \mathrm{~mA}(2 \sim 10 \mathrm{~V}) \quad 1: 0 \sim 20 \mathrm{~mA}(0 \sim 10 \mathrm{~V})$
F. F_124: Selection of Vin analog input
G. F_125: Selection of Iin analog input

0 : analog input gain 1: frequency command
2: current limit level 3: output voltage adjustment of the V/F pattern


(6) Upper and lower bound of output frequency
A. F_042 : Ratio of upper bound of output frequency (range 0.00~1.00)
B. F_043 : Ratio of lower bound of output frequency (range 0.00~1.00)

For example: Max. output freq. $=60.0 \mathrm{~Hz}$
Ratio of upper bound of output freq. $=0.90$
Ratio of lower bound of output freq. $=0.10$

a. Upper bound of output freq. =Ratio of upper bound of output freq. (F_042) x Max. output freq. (F_031)
b. Lower bound of output freq. $=$ Ratio of lower bound of output freq. (F_043) x Max. output freq. (F_031)

## (7) Analog outputs

> A. F_044: $\mathrm{FM}+$ analog output signal
> F_129: AM+ analog output signal
> 0: output frequency (when inverter is in the running)
> 1: frequency setting (when inverter is either in the running or stop)

2: output current
3: Vin frequency command
4: Iin frequency command
(when inverter is either in the running or stop, there is no output when $\mathrm{F}_{-} 124$ and $\mathrm{F}_{-} 125=0,2,3$.)
B. F_045: FM+ analog output gain (range 0.00~2.00)

F_130: AM+ analog output gain (range 0.00~2.00)
a. Analog output terminal FM+(AM+) ~M- (0~10V)
(1/2HP~5HP Analog output terminal FM+(AM+)~ GND )
b. F_044,F_129 determine what kind of signal is outputted
c. Gain $=\frac{\text { max. output frequency }}{\text { output frequency(frequency command) }}$
output frequency(frequency command) output current
d. Analog output curves


max. output freq. $=60.0 \mathrm{~Hz}$
analog output signal $=3$
analog output gain=1.20

rated current of inverter

## (8) Settings for motor protection

## A. F_046 : Selection of overload protection

Prevent motor running in the overload condition for a long time.
0 : No overload protection for motor
1 : Overload protection for motor
2 : Overload protection for motor with independence heat fan.
B. F_047 : Reserved
C. F_048 : Rated current of motor (range 10~150\% of inverter rated current)
D. F_049 : No load current of motor (range 0~motor rated current)
E. F_050 : Slip compensation with range -9.9~10.0 Hz

The slip of motor is changed due to the change of load. For the constant speed, the slip compensation is needed and calculated as following

Compensation frequency $=\frac{\text { loaded current }- \text { no_load current }\left(F_{-} \text {_049) }\right.}{\text { rated } \operatorname{current}\left(F_{-} 048\right)-\text { no_load } \operatorname{current}\left(F_{-} 049\right)}$ X slip compensation(F_050)

## F. F_051 : No. poles of motor

Setting of poles of motor for conversion of RPM.

Motor speed $($ RPM $)=\frac{120}{F_{-} 051 \text { no. poles of motor }} \times$ output frequency

## (9) Multiple function input terminals

A. F_052 : Multiple function input terminal X1 setting
B. F_053 : Multiple function input terminal X2 setting
C. F_054 : Multiple function input terminal X3 setting
D. F_055 : Multiple function input terminal X4 setting
E. F_056 : Multiple function input terminal X5 setting
F. F_057 : Multiple function input terminal X6 setting
a. ' + ' represents contact a (normally open) and ' - ' represents contact b (normally close)
b. Multiple function input terminals mean that the input terminals X1~X6 can be programmed as followings:
$\pm 1$ : jog command (refer to the descriptions of multiple speed level)
$\pm 2$ : switching between the secondary acceleration and deceleration (refer to the descriptions of multiple level acc/dec time)
$\pm 3$ : multiple speed levels 1 command (refer to the descriptions of multiple speed level)
$\pm 4$ : multiple speed levels 2 command (refer to the descriptions of multiple speed level)
$\pm 5$ : multiple speed levels 3 command (refer to the descriptions of multiple speed level)
$\pm 6$ : reset command (in the fault conditions, reset command is used to reset the inverter)
$\pm 7$ : external fault command (in the running, this command enables inverter to be shutdown, and in stop, this command is useless)
$\pm 8$ : inhibition command for output (inhibit voltage output of inverter)

Inhibition command for input (F_054=8)

$\pm 9$ : stop in free running (motor is disconnected electrically to inverter)

Stop in free running (F_055=9)

$\pm 10$ : speed search from the maximum frequency
Speed search command by input terminals (F_052 = 10)


## $\pm 11$ : speed search from the set frequency

Speed search command by input terminals $($ F_053 = 11)

$\pm 12$ : inhibition command for acceleration and deceleration (refer to the descriptions of multiple level acc/dec time)
c. UP/DOWN command
$\pm 13$ : UP command
$\pm 14$ : DOWN command
$\pm 15$ : clear UP/DOWN frequency command (frequency command clear to 0.00 Hz )

Time chart at UP/DOWN command Input


U=UP (accelerating) status
$\mathrm{D}=\mathrm{DOWN}$ (decelerating) status
$\mathrm{H}=\mathrm{HOLD}$ (constant speed) status
U1=UP status, clamping at upper limit speed
U2=UP status, clamping at the lower limit speed
D1=DOWN status, clamping at lower limit speed
D2=DOWN status, clamping at lower upper speed
F_118: Selection of UP/DOWN memory control
0: clear UP/DOWN frequency for shutdown power
(The resumption of frequency command $=0.00$ )
1: store UP/DOWN frequency for shutdown power
(The resumption of frequency command=store value<same as $\mathrm{F}_{1} 121>$ before shutdown power)

## F_119: UP/DOWN adjust frequency

Setting value mean the frequency range of UP/DOWN command trigger per step.

0: 0.01 HZ
$1 \sim 8$ : ${ }^{*} 0.05 \mathrm{HZ}$ setting value $=8$, means frequency change value $=8 * 0.05 \mathrm{HZ}=0.4 \mathrm{HZ}$
9: 0.5 HZ
10~250: *0.1HZ setting value $=250$, means frequency change value $=250 * 0.1 \mathrm{HZ}=25 \mathrm{HZ}$
F_120: UP/DOWN adjust time
1~5: Terminals adjust response time, continuous acceleration /deceleration when over response time, (Unit: second)
Terminal ON/OFF over response time, continuous accelerating (decelerating) to maximum output frequency (zero speed).
6: edge trigger
Adjust response time get out of control, edge trigger by input signal, signal response time $=30 \mathrm{~ms}$

F_121: UP/DOWN frequency adjust
Adjust UP/DOWN frequency setting from KEYPAD directly
UP/DOWN instruction changes frequency setting
(Store automatically to F_121 after 5 seconds)
$\pm 16$ : select analog input source
F_123=3: Vin or Iin (by multi-function input switch)
Input terminal setting equal $=+16$, contact $\mathrm{a}($ open $)$, select Vin contact b(close), select Iin
Input terminal setting equal=-16, contact a(close), select Iin contact b(open), select Vin
d. Multiple function input terminals X1~X6 programmed to 0 , the function as followings:
(1) F_052:Input terminal X1 setting

0:UP/DOWN command enter key
X1 and COM open $\rightarrow$ UP/DOWN command set the frequency value, but output frequency did not change. X 1 and COM close $\rightarrow$ output frequency acc./ dec. until frequency setting command.
(2) F_053:Input terminal X2 setting

0:DC braking enable(stop status)


When inverter is stop, terminal $\mathrm{X} 2 \mathrm{ON}(\mathrm{DC}$ braking enable), it product the DC braking status .The output current follow the F_075 current of the DC braking.
When the run command or jog command enable, the DC braking status stop then motor start run to the frequency setting value.
When the run command or jog command disable, the output frequency decelerate to F_132 DC braking stop frequency, then DC braking enable.
(3) F_054: Input terminal X3 setting

F_133: current limit level
F_054=0 current limit enable
Use KP-201C digital keypad
X3 and COM close $\rightarrow$ F_124 or F_125 $=2 \rightarrow$ the current limit
enable $\rightarrow$ monitor F_133(range 1~150\% inverter rated current)
X 3 and COM open $\rightarrow$ monitor $\mathrm{F}_{-} 133 \rightarrow$ the value is the same as the $\mathrm{F}_{-} 071$.
Use KP-202C analog keypad
X3 and COM close $\rightarrow$ current limit enable $\rightarrow$ the setting potentiometer of KP-202C function is current limit(range
$1 \sim 150 \%$ monitor the RSW 7)
EX:F_054=0 , X3 and COM close , F_124=2, F_125=1, the Vin input $0 \sim 10 \mathrm{~V} \rightarrow 1 \sim 150 \%$ inverter rated current.
(4) F_055: Input terminal $X 4$ setting

0 : primary and secondary speed select
F_122: Selection of secondary speed
0 : indicate that the frequency is set by terminals
1: indicate that the frequency is set by keypad
2: indicate that the frequency is set by UP/DOWN terminals
(5) F_056: Input terminal X5 setting
(6) F_057: Input terminal X6 setting

0 : STOP command with 3line sustaining circuit in which X5 is contact $\mathrm{a}, \mathrm{X} 6$ is contact b , and other terminals are useless.

(10) Settings of multiple function outputs
A. F_058: Output terminal Y1 setting
B. F_059 : Output terminal Y2 setting
C. F_060 : Settings of output terminals Ta1 and Tb1
D. F_131: Settings of output terminals Ta2 and Tc2
a. The outputs of the terminals Y1 and Y2 are open collector with maximum ratings DC $48 \mathrm{~V} / 50 \mathrm{~mA}$.
b. Ta (normally open) and Tb (normally close) contacts, with maximum ratings of $\mathrm{AC} 250 \mathrm{~V} / 0.5 \mathrm{~A} \cos \theta=0.3$.
c. ' + ' represent a contact (normally open), ' - ' represent b contact (normally close)
d. The functions of output terminals Y1, Y2, Ta and Tb can be programmed as followings.

## 0: Terminals are useless

$\pm 1$ : running detection (there is output once inverter is in the running)
$\pm 2$ : constant speed detection (there is output once inverter is running at constant speed.)

Constant speed detection (F_058=2)

$\pm 3$ : zero speed detection running (there is output once inverter does not output, but in the DC braking, there is no output.)
$\pm 4$ : frequency detection
Frequency detection (F_059=4)

$\pm 5$ : overload detection
Overload detection (F_060=5)


Note : that in the condition of overload detected, contact a is short circuit and contact $b$ is open.
$\pm 6$ : stall prevention detection

> Stall prevention detection (F_058=6)

$\pm 7$ : under voltage detection

## Under voltage detection (F_058=7)

Power source


Signal of undervoltage detection
output terminal (Y1)

$\pm 8$ : detection of braking (there is output once the voltage level of PN terminal is greater than that of dynamic braking.)
$\pm 9$ : detection of restart after instantaneous power interruption (F_078=1)

Detection of restart after instantaneous power interrruption
(F_058=9)


## $\pm 10$ : detection of restart after fault conditions

Detection of restart after fault conditions (F_058=10)

$\pm 11$ : detection of fault conditions

Detection of fault conditions (F_059=11)

Fault condition


Output terminal

(Y2)
(11) Frequency detection
A. F_061 : Frequency range for constant speed detection with range $0.0 \sim 10.0 \mathrm{~Hz}$
Refer to the constant speed detection of multiple function output terminals (Ref.Page54).
B. F_062 : Frequency detection range with range $0.0 \sim 10.0 \mathrm{~Hz}$ Refer to the frequency detection of multiple function output terminals (Ref.Page55).
C. F_063 : Level of frequency detection with range $0.0 \sim 400.0 \mathrm{~Hz}$ Refer to the frequency detection of multiple function output terminals (Ref.Page55).

## (12) Gain of the torque boost

A. F_064 : Gain of the automatic torque boost with range $0.0 \sim 25.5$
a. This function is designed by using the automatically dynamic voltage compensation for heavy load.
b. According to the load condition, adjust the output voltage of the certain V/F curve for minimum current and optimal power factor.
(13) Settings of overload detection
A. F_065 : Selection of overload detection (OLO)

0 : There is no output for overload detection.
$1:$ There is output for overload detection.
B. F_066 : Status of overload detection (OLO)

0 : There is output for the condition of constant frequency only.
1 : There is output for inverter running.
C. F_067 : Output setting for overload (OLO)

0 : Inverter is still running after that overload has been detected.
1: Output of inverter is inhibited after that overload has been detected.
D. F_068 : Level of overload setting (OLO)

The range of setting is $30 \sim 200 \%$ of rated current of inverter.
E. F_069 : Time interval for overload detection

The time interval, in which the output current is greater than the setting of F_068, is required for overload detection. The range of setting is $0.1 \sim 10.0$ seconds.
a. The function of overload detection is shown in the timing chart

b. The time interval in which the overload is occurred greater than time interval for overload detection, the overload is then detected and keypad displays ' 1712 '
c. In the running, the overload is detected during the running interval.
d. After overload, the inverter does output or not in according with the F_067 setting.
e. The primary purpose of overload detection is to protect system from damage so that the level and time interval of overload detection are determined by application.
(14) Settings of stall prevention
A. F_070 : Level of stall prevention during acceleration with range $30 \sim 200 \%$ of rated current of inverter.
B. F_071 : Level of stall prevention at the constant speed with range $30 \sim 200 \%$ of rated current of inverter.
C. F_072 : Acceleration time of recovery after stall prevention at the constant speed with range $0.1 \sim 3200.0$ seconds.
D. F_073 : Deceleration time of recovery after stall prevention at the Constant speed with range $0.1 \sim 3200.0$ seconds.
E. F_074 : Select function of stall prevention during deceleration.

0 : There is no stall prevention during deceleration
1 : There is stall prevention during deceleration.
a. The function of stall prevent is shown in the timing chart:

Stall prevent during acceleration Stall prevent at the constant speed


Note:
b. The function of stall prevention during deceleration is to maintain a constant speed in the stall condition.
c. If the dynamic braking device is installed, the F_074 function of stall prevention during deceleration may be disabled.
d. When the inverter is stop and the DC bus voltage is higher than the DC braking level, the display show the db.(the RUN key is useless now); when the DC bus voltage is lower than the DC braking level, recover to the main display automatically.
(15) DC braking
A.F_075:Current of DC braking

Setting of level of current for DC braking setting with range $0 \sim 150 \%$ of rated current of inverter.
B. F_076 : Time interval of DC braking in stop with range 0.0~20.0 seconds.
C. F_077 : Time interval of DC braking in start with range 0.0~20.0 seconds.
D. F_132: DC braking frequency in stop

Start frequency of DC braking in stop
a. The function of DC braking in stop can prevent the motor from rotation in stop.
b. The function of DC braking in start can prevent the motor from free running in undetermined direction , caused by load, in start.


If start/stop inverter by change frequency command, DC braking enable when frequency command adjust down to F_032 start frequency, and F_132 no effect.
(16) Resumption after instantaneous power interruption
A. F_078 : Selection of resumption

0 : Inverter can not be restarted after instantaneous power interruption.
1 : Inverter will be restarted after instantaneous power interruption. (Refer to detection of restart after instantaneous power interruption)
2 : Shutdown
3 : Inverter will decelerate at the moment then restart after the instantaneous power interruption.
B. F_079 : Level of power source for shutdown

The ranges of the level of power source for shutdown are 150.0 $\sim 192.0 \mathrm{~V}$ for 200 V class and $300.0 \sim 384.0 \mathrm{~V}$ for 400 V class.
C. F_ 103 : Decrease frequency of shutdown with range $0.0 \sim 20.0 \mathrm{~Hz}$.
D. F_104: Deceleration time 1 of shutdown with range $0.0 \sim 3200.0$ seconds.
E. F_ 105 : Deceleration time 2 of shutdown with range $0.0 \sim 3200.0$ seconds.
F. F_ 106 : Switch frequency of shutdown with range $0.0 \sim 400.0 \mathrm{~Hz}$.


Note : This shutdown function is proper to inertial load.

## (17) Jump of frequency

A. F_084 : Jumping frequency 1

The range of jumping frequency 1 is $0.0 \sim 400.0 \mathrm{~Hz}$.
B. F_085 : Jumping frequency 2 The range of jumping frequency 2 is $0.0 \sim 400.0 \mathrm{~Hz}$.
C. F_086 : Jumping frequency 3

The range of jumping frequency 3 is $0.0 \sim 400.0 \mathrm{~Hz}$.
D. F_087: Jumping frequency range

The jump of frequency command in frequency 1,2 and 3.
The range of jump of frequency is $0.0 \sim 25.5 \mathrm{~Hz}$.
a. The jump of frequency is to avoid the resonance of machinery.
b. There are 3 jumping frequencies and 1 jumping frequency range.


Frequency setting
(18) Speed tracking
A. F_088 :Current for speed tracking

The range of level of current for speed tracking is $0 \sim 200 \%$ of the rated current of inverter.
B. F_089:Time interval for speed tracking The range of time interval for speed tracking is $0.5 \sim 5.0$ seconds.
C. F_090 : V/F pattern of speed tracking

The range of this function is $0 \sim 100 \%$ of voltage of the V/F pattern
a. The function of speed tracking is primarily used to resume speed after instantaneous power interruption, fault conditions and search speed commanded by external input terminals.
b. Refer to the speed search programmed by multiple function input terminals.

## (19) Settings of creep

A. F_096 : Creeping frequency setting The range of creeping frequency setting is $0.0 \sim 400.0 \mathrm{~Hz}$.
B. F_097 : Time duration of creep

The range of time duration of creep is $0.0 \sim 25.5$ seconds. The function of creep is to avoid the higher slip in acceleration.


## (20) External indicators

A. F_098 : Reserved
B. F_099 : Selection of display of external indicator 1 (0~8)
C. F_100 : Selection of display of external indicator $2(0 \sim 8)$
D. F_101 : Selection of display of external indicator 3 (0~8)
a. The settings of $\mathrm{F}_{-} 099 \sim \mathrm{~F}_{-} 101$ are the same as those of $\mathrm{F}_{-} 006$.
b. The example of connecting diagram for external indicators is shown in the following figure.

Indictor 1 (DM-501)


Indictor 2 (DM-501)

c. Position of external indicator :


## (21) Miscellaneous

A. F_080 : Number of restart

Number of restart for fault conditions is $0 \sim 16$.
B. F_081 : Carry frequency setting, The range of setting is $1 \sim 6$.

The carry frequency $=\mathrm{F} \_081 \times 2.5 \mathrm{kHz}$.
The higher the setting is, the lower the noise is.
The carry frequency is inversely proportional to the distance between inverter and motor.
Note: the carry frequency maximum value
RM5G TYPE 1/2HP~75HP-->Max. 15 KHz
Above $100 \mathrm{HP}-->$ Max. 10 KHz
RM5P TYPE 10HP~30HP-->Max. 15 KHz
$40 \mathrm{HP} \sim 100 \mathrm{HP}-->$ Max. 10 KHz
Above 125HP -->Max.7.5KHz
C. F_082 : Types of stop

0 : Indicate stop by deceleration.
1 : Indicate stop by free running.
D. F_083 : Inhibition of reversal rotation

0 : Indicate that reversal rotation is allowed.
1 : Indicate that reversal rotation is not allowed.
E. F_091 : Fault records

Display the last 5 records of faults.
F. F_092 : Lock of parameters

0 : Parameters are changeable. Max. frequency can not over 120.0 Hz .

1 : Parameters are locked. Max. frequency can not over 120.0 Hz .

2 : Parameters are changeable. Max. frequency can over 120.0 Hz .

3 : Parameters are locked. Max. frequency can over 120.0 Hz .
G. F_093 : Selection of automatic voltage regulation

0 : Indicate that voltage is not regulated automatically.
1 : Indicate that voltage is regulated automatically.
Note: Connect dynamic braking unit, set the F_093(AVR)=0.
H.F_094 : Selection of the overload protection of inverter (OL1)

0 : Indicate that there is no overload protection.
$1:$ Indicate that there is overload protection.
The overload protection of inverter
RM5G type - the time duration for $150 \%$ rated current over 1 minute.
RM5P type - the time duration for $120 \%$ rated current over 1 minute.
I. F_095 : Voltage level of power source

The ranges of setting are $190.0 \sim 240.0 \mathrm{~V}$ for 200 V class and $340.0 \sim 480.0 \mathrm{~V}$ for 400 V class.
Please according the power source voltage set the values, It influence the LE voltage level and V/F output.
J. F_ 102 : Selection of energy saving device

0 : Do not equip energy saving device
1 : Equip energy saving device


Note: that in the condition of fan, pump or light load, this function can save electricity.
(22) Settings of KP-202C analog keypad
A. F_107: ADJ1 function is boost voltage, it can not be changed.
B. F_108: ADJ2 function is primary acc. time, it can not be changed.
C. F_109 : ADJ3 function is primary dec. time, it can not be changed.
D. F_110 : Selection of parameter of ADJ4 (0~49)
E. F_111 : Selection of parameter of ADJ5 (0~49)
F. F_112 : Selection of parameter of ADJ6 (0~49)
G. F_113 : Selection of parameter of DIP1 (0~15)
H. F_114 : Selection of parameter of DIP2 (0~15)
I. F_115 : Selection of parameter of DIP3 (0~15)
J. F_116 : Selection of parameter of DIP4 (0~15)
K. F_117 : Selection potentiometer of KP-202C (0~49)
a. Although the functions of ADJ4~ADJ6, setting potentiometer of KP-202C and DIP switches of analog keypad KP-202C have been defined in the factory settings, they can be redefined by using the digital keypad KP-201C to change the settings of F_110~F_117.
b. The contents of the settings of $\mathrm{F}_{-} 113 \sim$ F_116 are listed in the following table.
~DESCRIPTIONS OF FUNCTION CODE SETTINGS~

| Settings | Function code be affected | Descriptions of DIP functions functions | Settings | Function code be affected | Descriptions of DIP functions |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | none | Useless | 8 | F_081 | ON: Carry frequency at 2.5 KHz <br> OFF: use KP-201C set the carry Frequency |
| 1 | F_001 | ON: start with the FWD/REV terminal | 9 | F_078 | ON: restart after instantaneous power interruption OFF: use KP-201C set the restart after instantaneous power interruption |
|  |  | OFF: use the KP-202C start |  |  |  |
| 2 | F_001 | ON: start with the FWD terminal | 10 | F_082 | ON: Free run stop |
|  |  | OFF: use the KP-202C start |  |  | OFF: use KP-201C set stop |
| 3 | F_002 | ON: frequency set by terminal | 11 | F_083 | ON: Reversal rotation inhibit |
|  |  | OFF: frequency set by KP-201C primary speed or KP-202C setting (Re.A) |  |  | OFF: use KP-201C set the reversal rotation |
| 4 | F_003 | ON: STOP key unavailable | 12 | F_093 | ON: Non AVR function |
|  |  | OFF: use the KP-201C set STOP |  |  | OFF: use KP-201C set AVR function |
| 5 | F_034 | $\begin{aligned} & \text { ON: Base frequency } \\ & \text { at } 50.00 \end{aligned}$ | 13 | F_046 | ON: motor over load protection unavailable |
|  |  | OFF: Base frequency at 60.00 |  |  | OFF: use KP-201C set the motor over load protection |
|  |  | ON: unavailable for stall prevention during deceleration |  |  | ON : inverter over load protection unavailable |
| 6 | F_074 | OFF: use KP-201C set the stall prevention during deceleration | 14 | F_094 | OFF: use KP-201C set inverter over load protection |
| 7 | none | ON: Non DC braking | 15 | F_102 | ON: energy saving device available |
|  |  | OFF: DC braking |  |  | OFF: use KP-201Cset the energy saving device |

(Re.A) When none of the $\mathrm{F}_{-} 110 \sim \mathrm{~F}_{-} 112, ~ \mathrm{~F}_{-} 117$ set to 0 , then the frequency command set by the KP-201C primary speed; when one of the F_110~F_112, F_117 set to 0, then frequency command set by KP-202C ADJ4~ADJ6 or setting potentiometer.

## c. The contents of the settings of F_110~F_112 \& F_117 are listed in the following table.

| Settings | Functions | Range of ADJ | Settings | Function | Range of ADJ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | Primary speed | 0.0~120.0 | 25 | Voltage at the changing point 2 | $\begin{gathered} 0.0 \sim \text { setting } \\ \text { of F_035 } \end{gathered}$ |
| 1 | Multiple speed level 1 | 0.0~120.0 | 26 | Vin Frequency command gain | 0.00~2.00 |
| 2 | Multiple speed level 2 | 0.0~120.0 | 27 | Vin frequency Command bias | -1.00~1.00 |
| 3 | Multiple speed level 3 | 0.0~120.0 | 28 | Ratio of upper bound of output frequency | 0.00~1.00 |
| 4 | Multiple speed level 4 | 0.0~120.0 | 29 | Ratio of lower bound of output frequency | 0.00~1.00 |
| 5 | Multiple speed level 5 | 0.0~120.0 | 30 | FM+ analog output gain | 0.00~2.00 |
| 6 | Multiple speed level 6 | 0.0~120.0 | 31 | Slip compensation | -9.9~10.0 |
| 7 | Multiple speed level 7 | 0.0~120.0 | 32 | Level of freq. Detection | $\begin{gathered} 0.0 \sim \text { setting } \\ \text { of F_031 } \end{gathered}$ |
| 8 | Jog speed | 0.0~120.0 | 33 | Gain of the automatic torque boost | 0.0~25.5 |
| 9 | Primary acc. Time | 0.0~165.0 | 34 | Level of overload setting | 30~200 |
| 10 | Primary dec. Time | 0.0~165.0 | 35 | Level of stall prevention during acc. | 30~200 |
| 11 | Acc. time of speed level 1 | 0.0~165.0 | 36 | Level of stall prevention in the running. | 1~150 |
| 12 | Dec. time of speed level 1 | 0.0~165.0 | 37 | Acceleration time of recovery after stall prevention in the running. | 0.0~165.0 |
| 13 | Acc. time of speed level 2 | 0.0~165.0 | 38 | Deceleration time of recovery after stall prevention in the running. | 0.0~165.0 |
| 14 | Dec. time of speed level 2 | 0.0~165.0 | 39 | Current of DC braking | 0~150 |
| 15 | Acc. time of speed level 3 | 0.0~165.0 | 40 | Jumping frequency 1 | $\begin{aligned} & \text { 0.0~setting } \\ & \text { of F_031 } \end{aligned}$ |
| 16 | Dec. time of speed level 3 | 0.0~165.0 | 41 | Jumping frequency 2 | $\begin{aligned} & \text { 0.0~setting } \\ & \text { of F_031 } \end{aligned}$ |
| 17 | Secondary acc/dec time | 0.0~165.0 | 42 | Jumping frequency 3 | $\begin{aligned} & \hline 0.0 \sim \text { setting } \\ & \text { of F } 031 \end{aligned}$ |
| 18 | Start freq. | 0.1~10.0 | 43 | Jump of frequency | 0.0~25.5 |
| 19 | Boost voltage | 0.0~127.5 | 44 | Creeping frequency setting | $\begin{gathered} \hline 0.0 \sim \text { setting } \\ \text { of F_031 } \\ \hline \end{gathered}$ |
| 20 | Max. output frequency | 0.0~120.0 | 45 | Time duration of creep | 0.0~25.5 |
| 21 | Base voltage | $0.0 \sim 255.0$ for 200 V class $0.0 \sim 510.0$ for 400 V class $0.0 \sim 2$ | 46 | Proportional factor for line velocity | 0.01~100.00 |
| 22 | Frequency at the changing point 1 | $\begin{aligned} & \text { 0.0~setting } \\ & \text { of F_034 } \\ & \hline \end{aligned}$ | 47 | Iin frequency command gain | 0.00~2.00 |
| 23 | Voltage at the changing point 1 | $\begin{aligned} & 0.0 \sim \text { setting } \\ & \text { of F_035 } \end{aligned}$ | 48 | Iin frequency command bias | -1.00~1.00 |
| 24 | Frequency at the changing point 2 | $\begin{gathered} \hline \text { 0.0~setting } \\ \text { of F_034 } \\ \hline \end{gathered}$ | 49 | AM+ analog output gain | 0.00~2.00 |

## 7. OPERATIONAL PROCEDURES, MAINTENANCE, AND TROUBLE SHOOTING

## (1) Operational procedure and operations

## DANGER

1. After turn off power source, please don't touch the inverter and change the wiring when indicator is light.

## CAUTION

1. After wiring, double check is absolutely necessary.
2. Keep terminal connected tightly with wire.
A. Be sure that the voltages of power source, motor and inverter are matched.
B. Connect power source lines to $\mathrm{R}, \mathrm{S}$ and T terminals of inverter.
C. Turn on the power source, set the function codes and parameters, and check that the voltages of $\mathrm{U}, \mathrm{V}$ and W terminals are correct or not. Then, turn off the power source.
D. Turn off the power source and wait until that the LED is off, motor lines are connected to $\mathrm{U}, \mathrm{V}$ and W terminals of inverter.
E. Turn on the power source and check the rotating direction of motor with low speed.
F. User has to use the ON/OFF switch on keypad to start/stop inverter. If the switch of power source is used to start/stop inverter, the lifetime of inverter will be reduced.
G. It is not permitted that use of a magnetic contact installed between an inverter and the motor to start/stop motor. In general, the start current of motor is about 5 to 8 times of its rated current.
H. How to properly size an inverter for a single-phase power supply with a three-phase motor.
Determine motor horsepower required for particular application. Divide the motors full load amperage by 0.5 the result of that calculation is the basis of sizing the inverter. Select an inverter with continuous amperage rating that is equal to or greater than the result.
Formula: FLA of motor / $0.5=$ Inverter Amps
EXAMPLE:
a. Invert selection: $230 \mathrm{Vac}, 3 \mathrm{HP}$ motor $=9.6 \mathrm{~A} \quad 9.6 \mathrm{~A} / 0.5=19.2 \mathrm{~A}$ $230 \mathrm{Vac}, 3 \mathrm{HP}$ inverter $=11 \mathrm{~A}$ continuous $230 \mathrm{Vac}, 7.5 \mathrm{HP}$ inverter $=25 \mathrm{~A}$ continuous
You would select the 7.5 HP inverter for this application.
b. Parameters setting: Without doing this setup could result in drive and/or motor failure
F_048 motor rated current $=9.6 \mathrm{~A}$ (according to the spec. of motor)
F_068 Level of overload setting $=80$ (The half of original setting $160 \%$ )
F_071Level of stall prevention at the constant speed $=80$ (The half of original setting $160 \%$ )

## (2) Fault, maintenance and trouble shooting

## A. Descriptions

The inverter equips with complete protective functions. If protective function is activated, power transistors will be turned off and display will show what fault is. After proper trouble shooting, to short RST and COM, or press $\frac{\text { STOP }}{\text { RESET }}$ in keypad, inverter will operate.
B. Protections and trouble shooting:

| Protections and display | Functions | Trouble Shooting |
| :---: | :---: | :---: |
| Over current for loss speed (acceleration) | During acceleration, if output current exceeds the stall prevention limit during acceleration (F_070), acceleration will be terminated. Until output current less than the setting value, acceleration will be continuous. | Increase acceleration time or use the higher capacity inverter. |
| Over voltage for loss speed (deceleration) | During deceleration, too high regenerative voltage will cause termination of deceleration. Until the regenerative voltage is not too high, deceleration will be continuous. | Increase deceleration time or use dynamic brake unit. |
| Over current O.C. | Output current exceeds $220 \%$ of rated current of inverter. Inverter is shutdown. | Output terminals(U.V.W.) is short-circuited, overload,acceleration time too small, start at free running, or mismatched characteristics of motor. |
| Over voltage O.E. | Due to the higher regenerative voltage or voltage of power source, the main circuit DC voltage exceeded the over voltage detection level. <br> 200V series: Approx. DC410V <br> 400 V series: Approx. DC820V | Increase deceleration time, or use high braking torque and dynamic brake unit. Decrease input voltage. |
| Over load O.L. | Motor overload protection operates by build-in electronic thermal overload relay. | Decrease motor load. |
| $\begin{aligned} & \text { Over load } \\ & \text { OL1 } \end{aligned}$ | RM5G series $150 \%$ inverter rated output current for one minute. RM5P series $120 \%$ inverter rated output current for one minute. | Use high-capacity inverter |
| Over heat O.H. | When the temperature of heat sink is too high or external thermal relay to be activated, inverter is shutdown | Improve the cooling system or clear heat sink. |
| Under voltage L.E. | the main circuit DC voltage is decreased $33 \%$ of rated value, inverter will display "LE". | Increase the capacity of power source for avoiding line voltage of power source to be decreased significantly. |


| Protections and display | Functions | Trouble Shooting |
| :---: | :---: | :---: |
| " - - - - " and the set frequency display alternately | Forward/Reverse operation error (When F_001=0) | Check the wiring of FWD and REV terminals. |
| GF protection | Protection for unbalanced output current. <br> Break of fuse inside the inverter | Check the leakage current of motor. Change inverter |
| EEr | EEPROM error | Change inverter |
| Err_00, Err_01 | Disconnection of operating keypad, KP-201C or KP-202C. | Check keypad and inverter connections |
| S.C. | Break of fuse inside the inverter Break of IGBT module | Change inverter |
| PAdF | KP-202C is removed in running. | Resume KP-202C |
| Ad_Err | AD converter fault | Change inverter |
| OLO | Overload detection | Lower the motor load |
| thr | External fault detection | Check the external fault input terminal |
| db. | When the inverter is stop, the main circuit DC voltage exceed the voltage detection level. <br> 200V series : Approx. DC385V <br> 400V series : Approx. DC785V | Check the power supply voltage . |

(1) Outline drawings

Fig. 1


Screw M4-4


RM5G - 2001/2, 2001,2002,2003
RM5G - 4001, 4002,4003

Unit:(mm)
Fig. 2


RM5G-2005
RM5G-4005

Fig. 3
Internal cooling type


RM5G-2007,2010,2015,4007,4010,4015,4020

Fig. 4
Keypad size


KP-201C


KP-202C

Unit:(mm)
Keypad hole size

RM5G/5P Keypad

Fig. 5
Internal cooling type


RM5G-2020, 2025, 2030, 2040, 4025, 4030, 4040, 4050

Fig. 6

Internal cooling type


External cooling type

※Specifications subject to change without notice.
RM5G -200V Series

| $\begin{gathered} \text { Motor } \\ (H P / K W) \end{gathered}$ | Size (mm) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Screw |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | W | W1 | W3 | W4 | H | H1 | H2 | H3 | H4 | h1 | h2 | h3 | D0 | D1 | D2 | d | d1 | Ref | (mm) |
| 50/37 | 380 | 361 | 275 | 365 | 547 | 527 | 503 | 529 | 509 | 11 | 25 | 8.5 | 290 | 160 | 217 | 10 | 3 | Fig. 6 | M8 |
| 75/55 | 440 | 419 | 275 | 427 | 685 | 660 | 630 | 661 | 636 | 15 | 30 | 10 | 310 | 170 | 205 | 12 | 2 |  | M10 |
| 100/75 | 502 | 479 | 275 | 487 | 818 | 786 | 750 | 788 | 758 | 18 | 35 | 12 | 317 | 200 | 237 | 15 | 3 |  | M12 |
| 125/90 | 540 | 514 | 275 | 520 | 1000 | 971 | 930 | 973 | 936 | 17 | 37 | 16.5 | 362 | 244 | 296 | 15 | 3 |  | M12 |

RM5G -400V Series


## (2) Auxiliary control equipment (ACE series)

Descriptions of items and their functions:

| ACE-01 <br> series | DYNAMIC <br> BRAKING <br> UNIT | To improve the breaking capacity of inverter, <br> apply to the fast deceleration or regenerative <br> voltage situation. |
| :--- | :--- | :--- |
| ACE-02 | DEVIATION <br> DETECTOR | Converse the angular displacement, tensile, <br> weight and both motors angular displacement <br> error detected by synchro into DC voltage <br> signal. This can be used for synchronous motion <br> control and constant tensile control. |
| ACE-03 | SOFTSTARTER | This is a low pass filter for frequency command <br> to reduce the mechanical impact. It may also <br> control equilibrate running, stop and paralleled <br> running for the group of inverters. |
| ACE-04 | RATIO SETTER | A ratio setter may connect with 5 inverters to <br> control their frequency ratio. |
| ACE-05A | PRE - AMPLIFIER | To adjust and convert the current output signal <br> of detector into voltage signal as inverter's <br> frequency setting. Besides, there are voltage <br> input for frequency setting and output frequency <br> limit setting. |
| ACE-06 | LEVEL SHIFT <br> SETTER | Set the difference of speed for several <br> motors operated simultaneously. |
| ACE-07 | COMBINATION <br> CONTROLLER | Select the source of frequency command from <br> several inverters operated simultaneously. |
| ACE-08 | SPEED <br> COMBINATION <br> SETTER | Convert the signal from tach generator or <br> photo-interrupter into the DC voltage, <br> proportional to the speed. By using speed <br> combination setter, the speed feedback signal <br> can be obtained which can be used as the <br> frequency setting. |
| ACE-11 | SPEED FEED <br> REMOTE SPEED <br> SETTER | It can be used with tach generator, for example, <br> to control the linear speed and tensile of the <br> winding plastic or cloth. |
| RACK |  |  |
| REQULATOR |  |  |

## (3) Dynamic brake and resistor

A. Braking transistor can be installed inside the following inverters:

Standard: RM5G-2001/2~2010 and RM5G-4001~4015
RM5P-2007~2010 and RM5P-4007~4015
Option: RM5G/P-2015~2030 and RM5G/P-4020~4040.
B. The size of Braking Resistor (option parts)


| Type | Size | Size (mm) |  |  |  |  | Max.Weight |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | L1 | L2 | W | H | D | (g) |
| MHL100-100 | $100 \mathrm{~W} / 100 \Omega$ | 165 | 150 | 40 | 20 | 5.3 | 200 |
| MHL100-400 | $100 \mathrm{~W} / 400 \Omega$ | 165 | 150 | 40 | 20 | 5.3 | 200 |
| MHL500-40 | $500 \mathrm{~W} / 40 \Omega$ | 335 | 320 | 60 | 30 | 5.3 | 1100 |

Note: The wire length of Braking Resistor is 35 cm .
C. About external Dynamic Brake unit, please refer to ACE-01(DBU5) series.
D. Reference of standard Braking Resistor :

| 220V |  |  | 380V/440V |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Inverter <br> Type | Min. Requested Resistance | Available <br> Braking <br> Resistance | Inverter Type | Min. <br> Requested Resistance | Available Braking Resistance |
| 2001/2 | $100 \Omega$ | MHL100-100*1 | 4001 | $400 \Omega$ | MHL100-400*1 |
| 2001 | $100 \Omega$ | MHL100-100*1 | 4002 | $200 \Omega$ | MHL100-400*2 in parallel |
| 2002 | $100 \Omega$ | MHL100-100*1 | 4003 | $133 \Omega$ | MHL100-400*3 in parallel |
| 2003 | 40~50 | MHL500- 40*1 | 4005 | $100 \Omega$ | MHL100- 400*4 in parallel |
| 2005 | 40~50 $\Omega$ | MHL500- 40*1 | 4007 | $80 \Omega$ | MHL500-40*2 in serial |
| 2007 | $20 \sim 40 \Omega$ | MHL500-40*1 | 4010 | $80 \Omega$ | MHL500-40*2 in serial |
| 2010 | 20~40 $\Omega$ | MHL500- 40*1 | 4015 | $40 \Omega$ | 2 sets of MHL500-40*2 pcs in parallel first, then to serial these two sets together. |
| 2015 | $13.3 \Omega$ | MHL500-40*3 in parallel | 4020 | $40 \Omega$ | 2 sets of MHL500-40*2 pcs in parallel first, then to serial these two sets together. |
| 2020 | $10 \Omega$ | MHL500-40*4 in parallel | 4025 | $27 \Omega$ | 2 sets of MHL500-40*3 pcs in parallel first, then to serial these two sets together. |
| 2025 | $8 \Omega$ | MHL500- 40*5 in parallel | 4030 |  | 2 sets of MHL500- 40*4 pcs in parallel first, then to |
| 2030 | $6.6 \Omega$ | MHL500-40*6 in parallel | 4040 |  | serial these two sets together. |
| 2040 | $3.3 \Omega$ | MHL500- 40*12 in parallel | 4050 | $13.3 \Omega$ | 2 sets of MHL500-40*6 pcs in parallel first, then to serial these two sets together. |
| 2050 | $2.5 \Omega$ | MHL500- $40 * 16$ in parallel | 4060 | $10 \Omega$ | 2 sets of MHL500-40*8 pcs in parallel first, then to serial these two sets together. |
| 2060 | $3.3 \Omega$ | MHL500-40*16 in parallel | 4075 | $6.6 \Omega$ | 2 sets of MHL500-40*12 pcs in parallel first, then to serial these two sets together. |

Note: 1.Upgrade the braking resistor size when in heavy load or frequent braking operations.
2. The Aluminum Housed wire wound resistor have high heat dissipation, if use the wound resistor should be $600 \mathrm{~W} 50 \Omega$.

## (4) Selections of motor

A. Standard motors
a. The load should be a standard three phase induction motor.
b. Motor can not be operated at low speed for a long time, because that the low speed of cooling fan will result high temperature. This is improved by using the motor with independence fan.
c. The characteristics of the standard three phase induction motor (NEMA B) are shown as followings.

## 




Percentage of synchronous speed
d. As the speed of motor is greater than 60 Hz , the torque is decrease drastically.
e. Is the insulation of motor good or not? The minimum requirement is $100 \mathrm{M} \Omega$ at 500 V .
B. Special motors
a. Synchronous motor: Starting current is greater than that of standard induction motor. V/F ratio is lower than that of standard induction motor. The ratings of inverter should be increased.
b. Waterproof motor: The rated current is greater than that of standard induction motor. And the V/F pattern and the limitation of minimum speed should be mentioned. Sometimes, the insulation may be poor due to the sand and the other objects.
c. Explosion proof motor: RM5G series is not designed against explosion. In installation, operation and maintenance, care must be made for safety considerations.

## (5) Selections of AC reactor (ACL)

A. If the capacity of the power source is greater than that of inverter, an ACL has to be installed in the R, S and T terminals.
B. If the source power, supplying for inverter, is also for SCR, high rated power motor or welding machine, ACL is needed.
C. In the case of several inverters are used simultaneously, ACL is needed to avoid interference and improve the quality of electricity for harmonics.
D. The specifications, determined according to the rated power of motor used, are shown in following table.

| $\begin{array}{\|c\|} \hline \text { Continuous } \\ \text { rated power } \\ \hline \end{array}$ | 200 V series |  |  |  | Continuous rated power | 400V series |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | INPUT(RST) |  | OUTPUT(UVW) |  |  | INPUT(RST) |  | OUTPUT(UVW) |  |
| (HP/KW/KVA) | (mH) | (A) | (mH) | (A) | (HP/KW/KVA) | (mH) | (A) | (mH) | (A) |
| 0.5/0.4/1.3 | 0.4 | 15 | 0.4 | 15 | 1/0.75/1.9 | 0.4 | 15 | 0.4 | 15 |
| 1/0.75/2 | 0.4 | 15 | 0.4 | 15 | 2/1.5/3.3 | 0.4 | 15 | 0.4 | 15 |
| 2/1.5/3 | 0.4 | 15 | 0.4 | 15 | 3/2.2/4 | 0.4 | 15 | 0.4 | 15 |
| 3/2.2/4 | 0.4 | 15 | 0.3 | 30 | 5/3.7/7 | 0.4 | 15 | 0.55 | 22 |
| 5/3.7/6 | 0.3 | 30 | 0.26 | 40 | 7.5/5.5/10 | 0.55 | 22 | 0.55 | 22 |
| 7.5/5.5/9 | 0.26 | 40 | 0.26 | 40 | 10/7.5/14 | 0.55 | 22 | 0.26 | 40 |
| 10/7.5/13 | 0.26 | 40 | 0.16 | 75 | 15/11/18 | 0.26 | 40 | 0.26 | 40 |
| 15/11/18 | 0.16 | 75 | 0.16 | 75 | 20/15/23 | 0.26 | 40 | 0.16 | 75 |
| 20/15/22 | 0.16 | 75 | 0.09 | 110 | 25/18.5/30 | 0.16 | 75 | 0.16 | 75 |
| 25/18.5/28 | 0.09 | 110 | 0.06 | 180 | 30/22/34 | 0.16 | 75 | 0.09 | 110 |
| 30/22/33 | 0.06 | 180 | 0.06 | 180 | 40/30/46 | 0.09 | 110 | 0.09 | 110 |
| 40/30/44 | 0.06 | 180 | 0.04 | 300 | 50/37/56 | 0.09 | 110 | 0.09 | 110 |
| 50/37/55 | 0.04 | 300 | 0.04 | 300 | 60/45/66 | 0.09 | 110 | 0.06 | 180 |
| 60/45/67 | 0.04 | 300 | 0.04 | 300 | 75/55/84 | 0.06 | 180 | 0.06 | 180 |
| 75/55/84 | 0.04 | 300 | 0.02 | 560 | 100/75/104 | 0.06 | 180 | 0.04 | 300 |
| 100/75/115 | 0.02 | 560 | 0.02 | 560 | 125/90/134 | 0.04 | 300 | 0.04 | 300 |
| 125/90/132 | 0.02 | 560 | 0.02 | 560 | 150/110/165 | 0.04 | 300 | 0.04 | 300 |
| 150/110/160 | 0.02 | 560 | 0.01 | 850 | 175/132/193 | 0.04 | 300 | 0.02 | 560 |
| - | - | - | - |  | 200/160/232 | 0.02 | 560 | 0.02 | 560 |
| - | - | - | - | - | 250/200/287 | 0.02 | 560 | 0.02 | 560 |
| - | - | - | - | - | 300/220/316 | 0.02 | 560 | 0.01 | 850 |
| - | - | - | - | - | 420/315/445 | 0.01 | 850 | 0.01 | 850 |

## (1) Remote controllers

A. Remote controllers

There are two types, one is inverter mount type and the other is stand alone type. Their appearances and functions are the same as those of KP-201C or KP-202C.
a. Dimensions of the inverter mount type (Assembled by A-01,KP-201C)

b. Dimensions of the stand alone type (Assembled by A-01,A-02,KP-201C)


## B. Remote controller RAC-01

a. RAC-01 assembled by A-01 and A-02
b. RAC-01 is applied to remote control or panel control box.
c. Pointer meter. $1 \mathrm{~K} \Omega(1 / 2 \mathrm{~W})$ with accuracy 10 turn VR, use this VR to adjust frequency. ON/OFF switch for start and stop.

d. Dimension and wires name.


## C. Remote controller RAC-02

a. RAC-02 assembled by A-01 and A-03
b. RAC-02 is applied to remote control or panel control box.
c. Pointer meter. $1 \mathrm{~K} \Omega(1 / 2 \mathrm{~W})$ VR, use this VR to adjust frequency. The left of ON/ OFF is forward and reverse switch, the right one is for start and stop switch.

d. Dimension and wires name.


## (2) Remote indicators DM-501

## A. Dimensions

DM-501 is specially designed for above RM5 V2.0 version, which does not need extra power, just connect from inverter. This display can be separately display voltage, current, frequency, line velocity etc. (Ref.Page66)


Unit : mm
B. DM-501 display

C. The cable connector is $2.54-5$ Pins, the length are 1.5 M and 1.8 M , Don't use over these length.

## APPENDIX C

(1)Connect Braking Resistor
 install thermal relay for protection. The wire diagram are as above diagram 1, diagram 2.

Diagram 1: Using thermal real y to control magnetic contactor indirectly, when braking resistor is over heat, inhibit the magnetic contactor.

Diagram 2: When the power source of inverter is controlled by magnetic contactor indirectly, Using thermal relay to control magnetic contactor indirectly, when braking resistor is over heat, inhibit the magnetic contactor.

## APPENDIX C

(2)Connect D.B. unit


To avoid braking resistor over heat causing accident, strongly recommand to install thermal relay for protection.
The wire diagram are as above diagram3, diagram4.

Diagram 3: Using thermal realy to control magnetic contactor indirectly, when braking resistor is over heat, inhibit the magnetic contactor.

Diagram4: When the power source of inverter is controlled by magnetic contactor indirectly, Using thermal relay to control magnetic contactor indirectly, when braking resistor is over heat, inhibit the magnetic contactor.

APPENDIX 1:<br>DIMENSIONS OF OPENING OF KP-201C AND KP-202C



Scale: 1:1 Unit:mm

| Function code | Descriptions | Factory Setting | Setting | Function code | Descriptions | Factory Setting | Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F． |  | P5103d |  | F－ |  | 15.0 |  |
| F＿nol |  | 3 |  | F＿OE： |  | 15.0 |  |
| F ROE |  | 1 |  |  |  | 15.0 |  |
| F＿ROJ |  | 1 |  | F＿ワロコ |  | 15.0 |  |
| F＿「101 |  | 1 |  | F－ |  | 15.0 |  |
| F． 0105 |  | 1 |  | F，「ごご |  | 15.0 |  |
| F 2106 |  | 1 |  | $F$－ 06 |  | 15.0 |  |
| F＿P\％ |  | 20.00 |  | F－ $\mathrm{CO}_{\text {ar }}$ |  | 15.0 |  |
| F． 01015 |  | 0 |  | F， 0 |  | 15.0 |  |
| F ， 810 |  | $\begin{array}{\|c} 60.00 \\ (50.00) \end{array}$ |  | F，「ごリ |  | 0.0 |  |
| F， O |  | 10.00 |  | F， |  | 0 |  |
| F＿D11 |  | 20.00 |  | F－成 1 |  | $\begin{gathered} 60.0 \\ (50.0) \end{gathered}$ |  |
| F＿EGO |  | 30.00 |  | F＿ワコニ゙ |  | 0.5 |  |
| F．E13 |  | 0.00 |  | F＿ロココ |  | 200V：8．0 <br> $400 \mathrm{~V}: 12.0$ |  |
| F＿O |  | 0.00 |  |  |  | $\begin{gathered} \hline 60.0 \\ (50.0) \\ \hline \end{gathered}$ |  |
| F－Bi5 |  | 0.00 |  | F－ロゴ |  | $\begin{gathered} 220.0 \\ (380.0) \\ \hline \end{gathered}$ |  |
| F－HIE |  | 0.00 |  | F－M36 |  | 0.0 |  |
| F， |  | 6.00 |  | F．国ご |  | 0.0 |  |
| F，回成 |  | $\begin{gathered} 60.00 \\ (50.00) \\ \hline \end{gathered}$ |  | F－ 230 |  | 0.0 |  |
| F，Oig |  | 15.0 |  |  |  | 0.0 |  |

～SETTING MEMO～

| Function code | Descriptions | Factory Setting | Setting | Function code | Descriptions | Factory Setting | Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F，\％ |  | 1.00 |  | F＿RET |  | 11 |  |
| F＿成： |  | 0.00 |  | F＿LIE |  | 2.0 |  |
|  |  | 1.00 |  | F－ |  | 2.0 |  |
| F＿DH3 |  | 0.00 |  | F－ 115 |  | 0.0 |  |
|  |  | 0 |  | F＿REM |  | 1.0 |  |
| F＿D45 |  | 1.00 |  | F 10165 |  | 0 |  |
| F＿THE |  | 1 |  | F＿ 016 |  | 0 |  |
| F＿EH7 |  | 0 |  | F． 215 |  | 0 |  |
| F－74E |  | $\begin{array}{\|c\|} \text { Rated } \\ \text { current of } \\ \text { motor } \end{array}$ |  | F ， 168 |  | 160 |  |
| F＿\％MG |  | $\underset{c}{1 / 3 \text { rated }}$ current of motor |  | F 1065 |  | 0.1 |  |
| F＿MSIC |  | 0.0 |  | F， $\mathrm{O}^{7}$ |  | 170 |  |
| F＿051 |  | 4P |  | F．071 |  | 160 |  |
|  |  | 3 |  | F－ロ7に |  | 15.0 |  |
| F＿153 |  | 4 |  | F．073 |  | 15.0 |  |
| F＿OE－ |  | 1 |  |  |  | 1 |  |
| F． 115 |  | 2 |  | F－ 175 |  | 50 |  |
| F．056 |  | 7 |  | F－676 |  | 0.5 |  |
| F．057 |  | 6 |  | F．07\％ |  | 0.0 |  |
| F． |  | 3 |  | F－ 176 |  | 0 |  |
| F－n59 |  | 2 |  | F－079 |  | $\begin{array}{\|c\|} \hline 200 \mathrm{~V}: 175.0 \\ 400 \mathrm{~V}: 320.0 \end{array}$ |  |

～SETTING MEMO～

| Function code | Descriptions | Factory Setting | Setting | Function code | Descriptions | Factory Setting | Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F． |  | 0 |  | F＿ 105 |  | 2 |  |
| F． 1081 |  | 4 |  | F＿ITI |  | 3 |  |
| F－Dige |  | 0 |  | $F$－HET |  | 0 |  |
| F． 1085 |  | 0 |  | F＿H3 |  | 3.0 |  |
| F． 108 |  | 0.0 |  | F＿H104 |  | 15.0 |  |
| F． 1085 |  | 0.0 |  | F＿ 115 |  | 15.0 |  |
| F． 1186 |  | 0.0 |  | F＿ 105 |  | 0.0 |  |
| F． $\mathrm{OL日}$ |  | 0.0 |  | F＿ 107 |  | 0 |  |
| F． 11818 |  | 150 |  | $F$－ 106 |  | 0 |  |
| F． 1089 |  | 0.5 |  | F＿ 1015 |  | 0 |  |
| F－n90 |  | 100 |  | F＿IH10 |  | 1 |  |
| F－ngi |  | no＿Err |  | F＿111 |  | 20 |  |
| F－ロGE |  | 0 |  | F＿ 112 |  | 17 |  |
| F＿ワ93 |  | 1 |  | F＿113 |  | 8 |  |
| F． |  | 1 |  | F＿I 1H1 |  | 5 |  |
| F－nG5 |  | $\begin{array}{\|l\|} \hline 200 \mathrm{~V}: 220.0 \\ 400 \mathrm{~V}: 380.0 \end{array}$ |  | F＿ 115 |  | 3 |  |
| F． 8196 |  | 0.5 |  | F＿ 115 |  | 1 |  |
| F． 17 |  | 0.0 |  | F＿ 117 |  | 0 |  |
| $F .1096$ |  | 0 |  | F＿ 118 |  | 0 |  |
| F－ 109 |  | 1 |  | F＿ 119 |  | 0 |  |


| Function code | Descriptions | Factory Setting | Setting | Function code | Descriptions | Factory Setting | Setting |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $F$－ $10 \square$ |  | 1 |  | $F$－10゙ロ |  | 0.00 |  |
| $F$ ，に1 |  | 0.00 |  | F．にーゴ |  | 2 |  |
| $F$－に日 |  | 0 |  | F． |  | 1.00 |  |
| $F$－にココ |  | 0 |  | F．İき |  | 1 |  |
| F－ロニ゙ー |  | 1 |  | F．$\underbrace{}_{\text {EIE }}$ |  | 0.5 |  |
| F－バごす |  | 1 |  | F＿は日コ |  | Monitor |  |
| $F$－10\％ |  | 0 |  | F＿İH |  | 0 |  |
| $F$－ $1:=9$ |  | 1.00 |  |  |  |  |  |

## APPENDIX 3: FAULT DISPLAY

| RM 5G/5P Error Trip |  |  |
| :---: | :---: | :---: |
| EEPROM error | AD Converter error | Over current |
|  | Under voltage during operation |  |
|  |  |  |
|  | External thermal relay protection | PAdF |
|  |  |  |


| RM5G/5P Warning Display |  |  |
| :---: | :---: | :---: |
|  |  |  |
| Keypad interrupt | Keypad interrupt during operation | Main power source under level |
| 0L0 | bb | Fr |
|  |  |  |
| 0 ver load detect | Inhibition output | Free running |
| dtF | db | Wr_F |
|  |  |  |
| Direction terminal error | Over voltage in stop | Write to inverter fault |


[^0]:    X: means don't care

