

INSTRUCTION MANUAL

GENERAL-PURPOSE INVERTER

MS2 / MS4



THANK YOU VERY MUCH FOR YOUR PURCHASE
OF ADLEE INVERTER MS SERIES.
PLEASE READ THIS INSTRUCTION MANUAL
BEFORE INSTALLATION OF THE INVERTER.

PREFACE

This general-purpose inverter made by ADLEE Powertronic., Ltd.

Read this instruction manual throughly before operation.

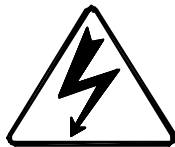
This manual will be helpful in the installation, parameter setting, trouble-shooting, and daily maintenance of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC drives. Keep this operating manual handy and distribute to all users for reference.

A. General Precaution

1. There are some covers and shields on this inverter.
Make sure all covers and shields are replaced befor operating this product.
2. This manual may be modified when necessary because of improvement of the product or changes in specification.
3. Contact your ADLEE representative to order a copy of this manual, if your manual has been damaged or lost.
4. ADLEE is not responsible for any modification of the product made by the user, since that will void your guarantee.

B. Safety symbols

Symbols which may appear on the manual



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury to personnel and damage to equipment.

RECEIVING

CAUTION

- * Do not install or operate the driver which is damaged or has missing parts.
Failure to observe this caution may result in personal injury or equipment damage.

INSTALLATION



CAUTION

- * Lift the cabinet by the base. When moving the unit, never lift by the front cover.
Otherwise, the main unit may be dropped causing damage to the unit.
- * Mount the driver on nonflammable material. (i.e. metal)
Failure to observe this caution can result a fire.
- * When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 45 °C.
Overheating may cause a fire or damage to the unit.

INSTALLATION

WARNING

- * Only commence wiring after verifying that the power supply is turned OFF.
Failure to observe this warning can result in an electrical shock or a fire.
- * Wiring should be performed only by qualified personnel.
Failure to observe this warning can result in an electrical shock or a fire.
- * Make sure to ground the ground terminal.
Ground resistance : 100 Ohm or less.
Failure to observe this warning can result in an electrical shock or a fire.

CAUTION

- * Verify that the driver rated voltage coincides with the AC power supply voltage.
Failure to observe this caution can result in personal injury or a fire.
- * Do not perform a withstand voltage test of the driver.
It may cause semi-conductor elements to be damaged.
- * To connect a braking resistor, follow in APPENDIX A.
Improper connection may cause the unit damaged or a fire.
- * Tighten terminal screws.
Failure to observe this caution can result a fire.
- * Never connect the AC main circuit power supply to output terminals W, V and U.
The inverter will be damaged and invalidate the guarantee.

OPERATION



WARNING

- * Only turn ON the input power supply after replacing the front cover.
Do not remove the cover while current is flowing.
Failure to observe this warning can result in an electrical shock.



CAUTION

- * Since it is easy to change. operation speed from low to high speed, verify the safe working range of the motor and machine before operation.

Failure to observe this caution can result in personal injury and machine damage.

- * Do not change signals during operation.

The machine or the inverter may be damaged.

- * All the constants of the inverter have been preset at the factory.

Do not change the settings unnecessary.

MAINTENANCE AND INSPECTION

WARNING

- * Never touch high-voltage terminals in the driver.

Failure to observe this warning can result in an electrical shock.

- * Replace all protective covers before powering up the inverter.

To remove the cover, make sure to shut OFF the molded-case circuit breaker.

Failure to observe this warning can result in an electrical shock.

- * Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF.

The capacitors are still charged and can be dangerous.

- * Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.

Failure to observe this warning can result in an electrical shock.

CAUTION

- * The control PC board employs CMOS ICs. Do not touch the CMOS elements by hand.
They are easily damaged by static electricity.
- * Do not connect or disconnect wires or connectors while power is applied to the circuit.
Failure to observe this caution can result in personal injury.

OTHERS



WARNING

- * Never modify the product.
Failure to observe this warning can result in an electrical shock or personal injury and will invalidate the guarantee.

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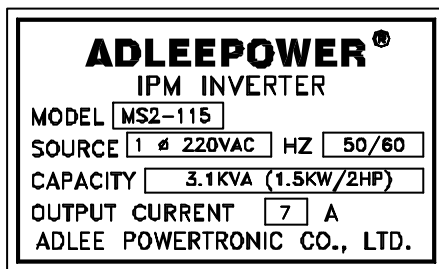
1. RECEIVING

This MS series AC drive has gone through rigorous quality control tests at the factory before shipment. After receiving the AC drive, please check for the following :

- (1) No damage is found on each product after shipping.
- (2) The product is as ordered (check the nameplate, voltage and frequency).
- (3) A set of inverter unit and instruction manual is contained in the package.

For any irregularity, contact the sales shop where you purchased immediately.

- (4) Description of name plate



MODEL : MS 2 - 115

MS series

Voltage class :

1 : 110V

2 : 220V

4 : 380/440V

Max Applicable motor(4 pole)

Single Phase :

102 : 0.2KW 104 : 0.4KW 107 : 0.75KW

115 : 1.5KW 122 : 2.2KW 137 : 3.7KW

3 Phase :

307 : 0.75KW 315 : 1.5KW 322 : 2.2KW

337 : 3.7KW

2. SPECIFICATIONS

Model		MS1	MS2					
Voltage		1 ψ 110VAC ±10%	1 ψ 220VAC ± 10%					
Model No		MS1-104	MS2-102	MS2-104	MS2-107	MS2-115	MS2-122	MS2-137
Input Frequency		50HZ ~ 60HZ ± 10%						
Output Voltage		3 ψ 110VAC	3 ψ 220VAC					
Output Frequency		0.5 ~ 1200HZ						
Output Rated current (A)		4.1 A	1.4 A	2.5 A	4.1 A	7 A	10 A	16 A
Capacity (KVA)		0.8 KVA	0.6 KVA	1.0 KVA	1.6 KVA	2.7 KVA	3.8 KVA	6.1 KVA
Largest motor KW (4 poles)		0.4 KW	0.2KW	0.4KW	0.75KW	1.5KW	2.2KW	3.7KW
Control		Sine wave pulse width modulation						
Braking		Regenerative discharge braking						
Over current Capacity		150% of rated current (1 minute)						
Acceleration time		0.1 ~ 6000 SEC						
Deceleration time		0.1 ~ 6000 SEC						
Frequency setting	Digital	Use keyboard    for setting and confirm by 						
	Analog	By frequency knob						
Display type		LED Digits						
Cooling Method		Self-cooled	Self-cooled	Self-cooled	Self-cooled	Air-cooled	Air-cooled	Air-cooled
Dimension drawing		Fig 1	Fig1	Fig 1	Fig 1	Fig 2	Fig 2	Fig 3
Weight (NW . KG)		1.2KG	1.2KG	1.2KG	1.3KG	1.3KG	1.4KG	4.0 KG

Model		MS4			
Voltage		3 ψ 380/440VAC ± 10%			
Model No		MS4-307	MS4-315	MS4-322	MS4-337
Input Frequency		50HZ~ 60HZ ± 10%			
Output Voltage		3 ψ 380/440VAC			
Output Frequency		0.5 ~ 1200HZ			
Output Rated current (A)		2.5 A	4 A	6 A	9 A
Capacity (KVA)		1.9 KVA	3.1 KVA	4.2 KVA	6.9 KVA
Largest motor KW (4 poles)		0.75 KW	1.5KW	2.2KW	3.7KW
Control		Sine wave pulse width modulation			
Braking		Regenerative discharge braking			
Over current Capacity		150% of rated current (1 minute)			
Acceleration time		0.1 ~ 6000 SEC			
Deceleration time		0.1 ~ 6000 SEC			
Frequency setting	Digital	Use keyboard    for setting and confirm by 			
	Analog	By frequency knob			
Display type		LED Digits			
Cooling Method		Air-cooled	Air-cooled	Air-cooled	Air-cooled
Dimension drawing		Fig 4	Fig 4	Fig 4	Fig 3
Weight (NW . KG)		1.3KG	1.3KG	1.4KG	4.0 KG

3. DIMENSION DRAWINGS

Unit : mm

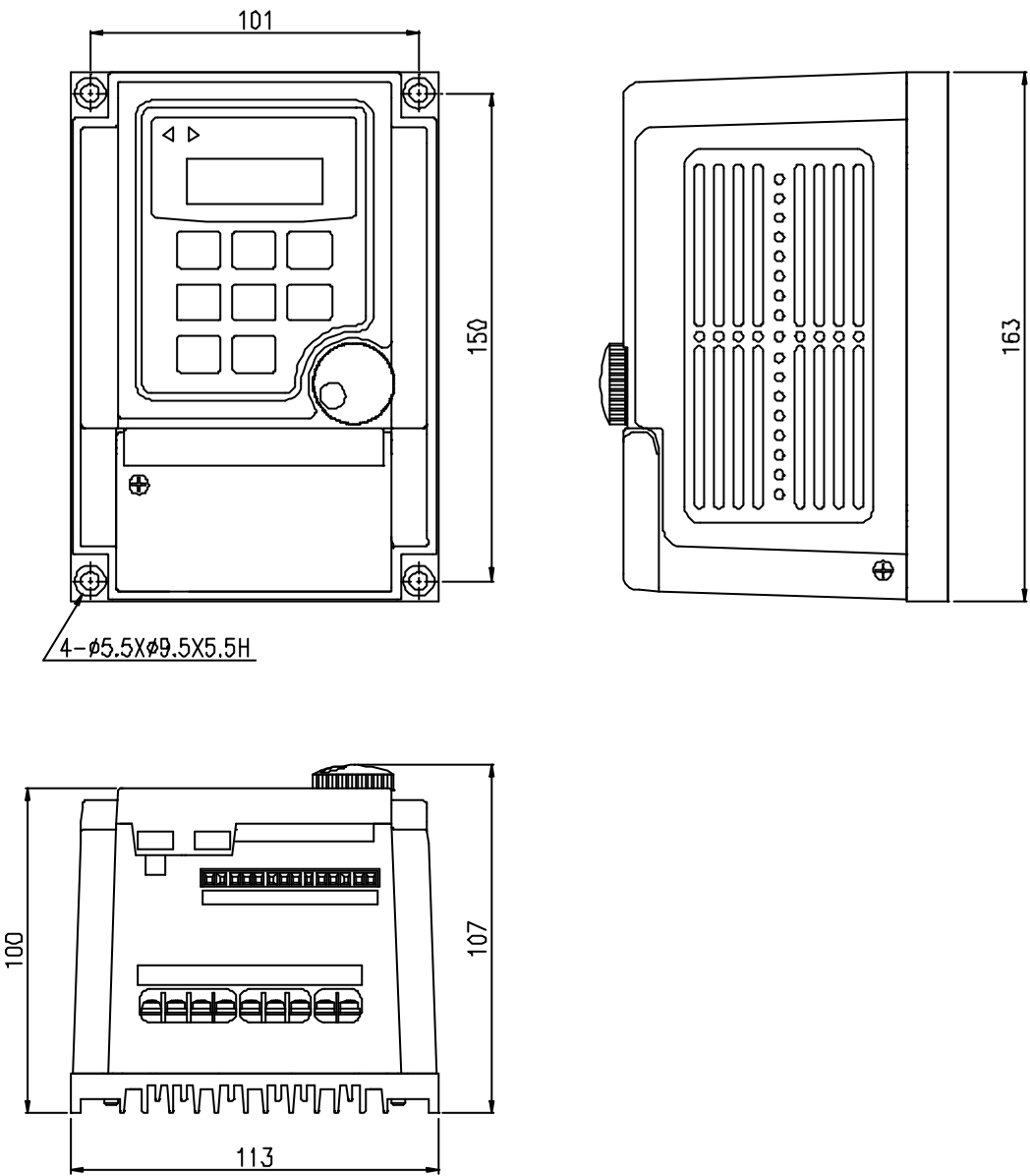


Fig 1

Unit : mm

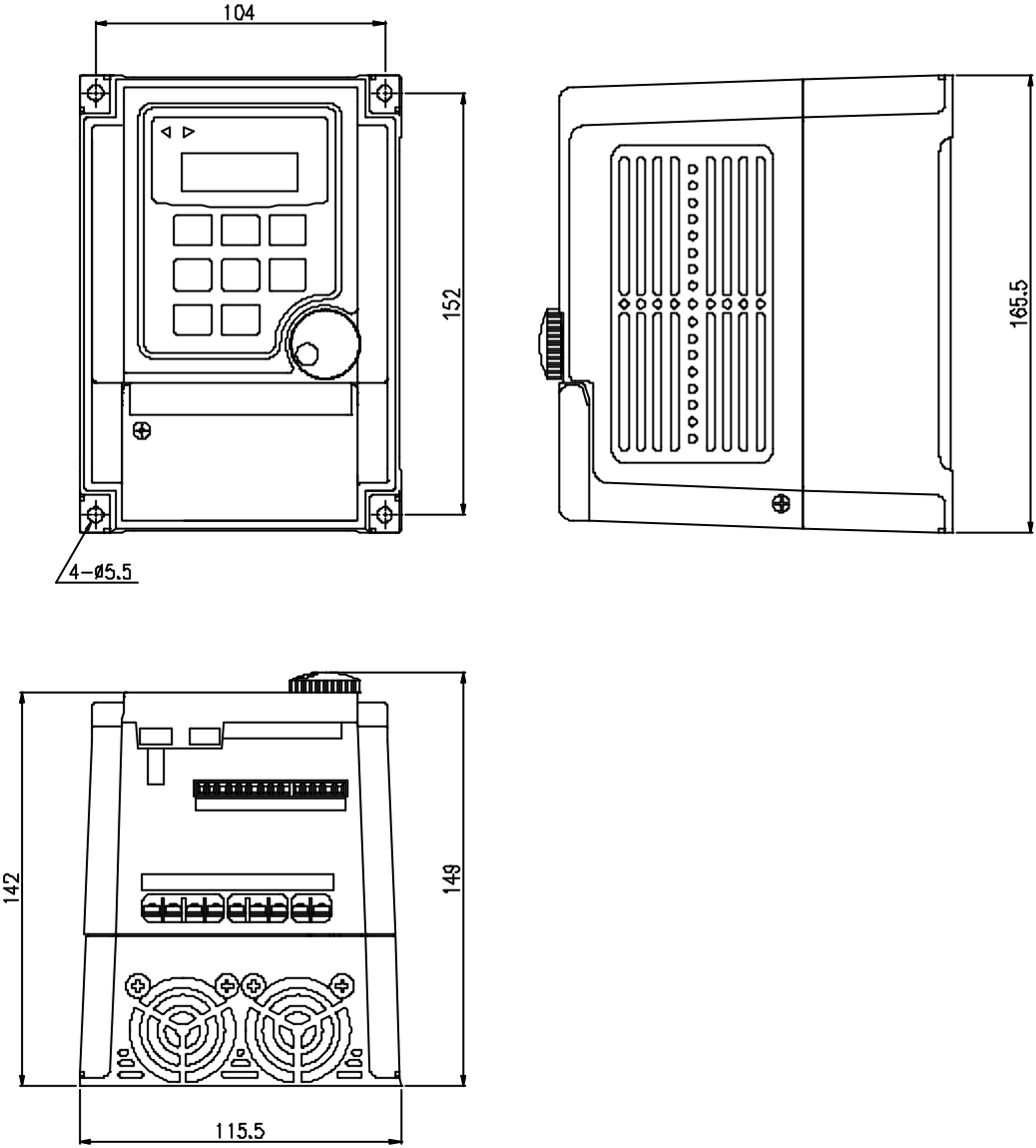


Fig 2

Unit : mm

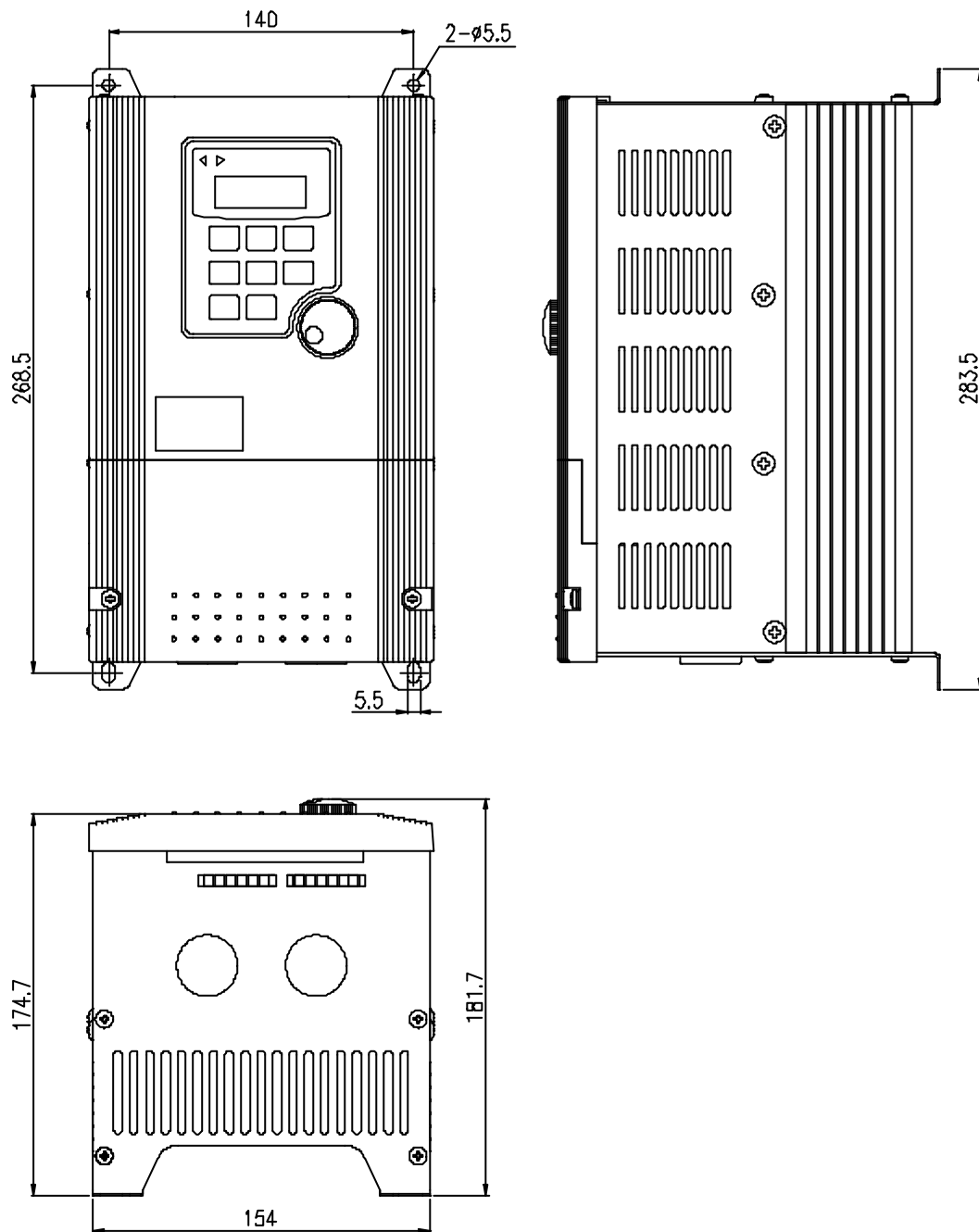


Fig 3

Unit : mm

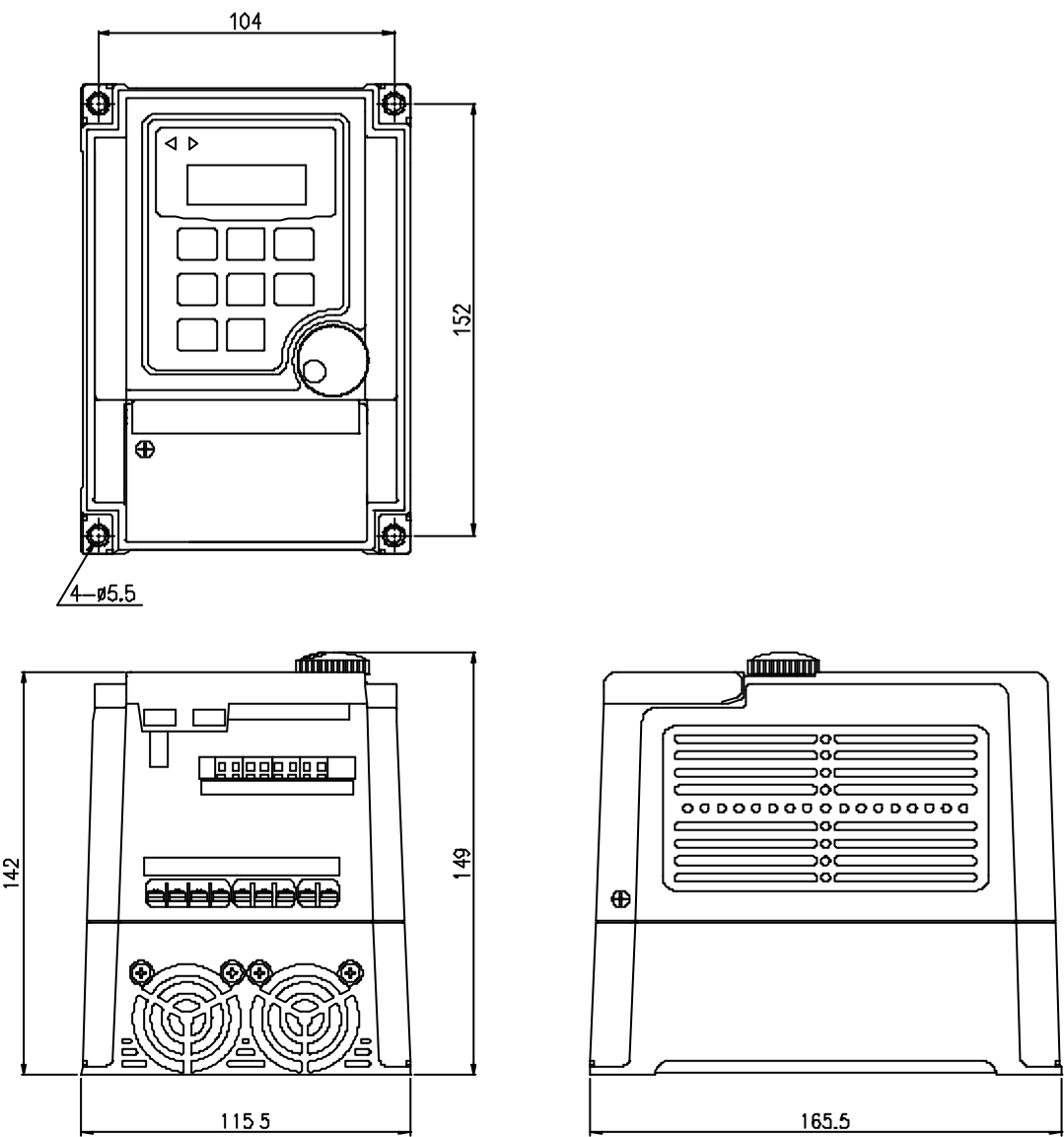


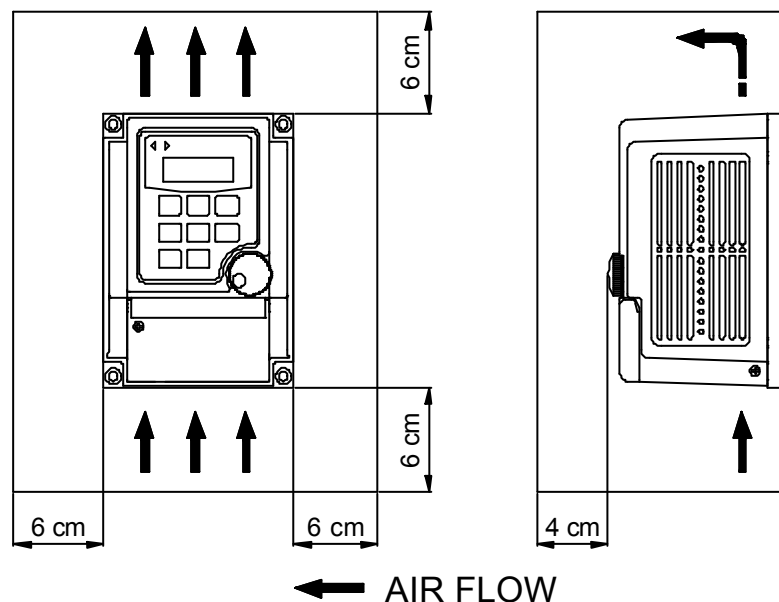
Fig 4

4. INSTALLATION

Inadequate environment around installation site and installation surface can result in damage to the inverter.

Before operating the MS series inverter, please check the following points :

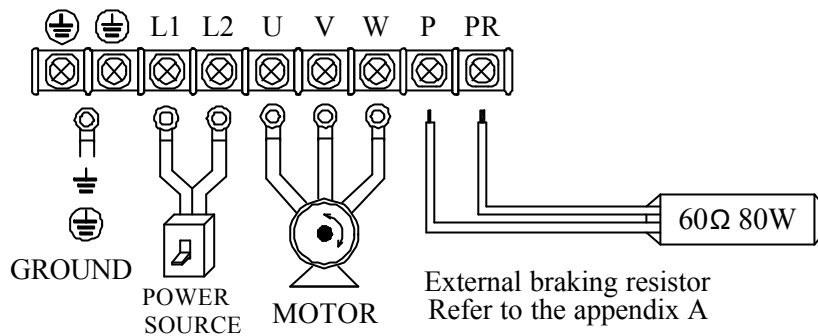
- (1) Avoid high temperature, high humidity, easy-to-dew ambient environment. Don't expose to dust or dirt, corrosive gas, and coolant mist, and direct sunlight. Place the unit in a well-ventilated room.
- (2) Avoid a place subjected to substantial vibration.
- (3) When installing the unit within the cabinet. Please pay attention to ventilation and limit the ambient temperature in between $-10 \sim 45$. ($14 \sim 113$).
- (4) Use a nonflammable material, such a steel sheet on the wall for installation. (The rear side will generate heat)
- (5) Install the unit always vertically with a marginal spacing around.



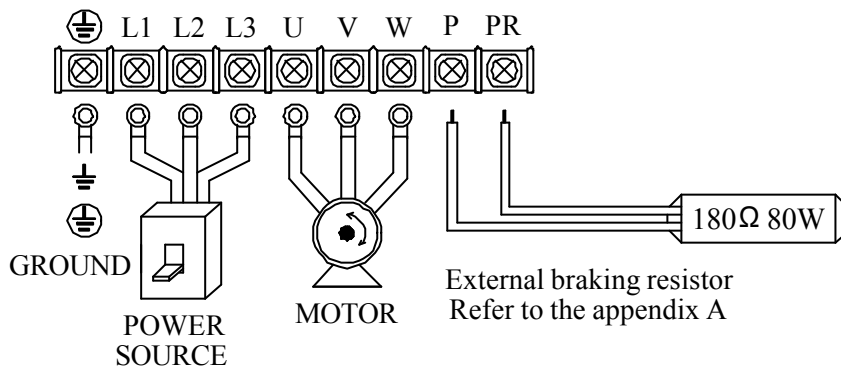
5. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram

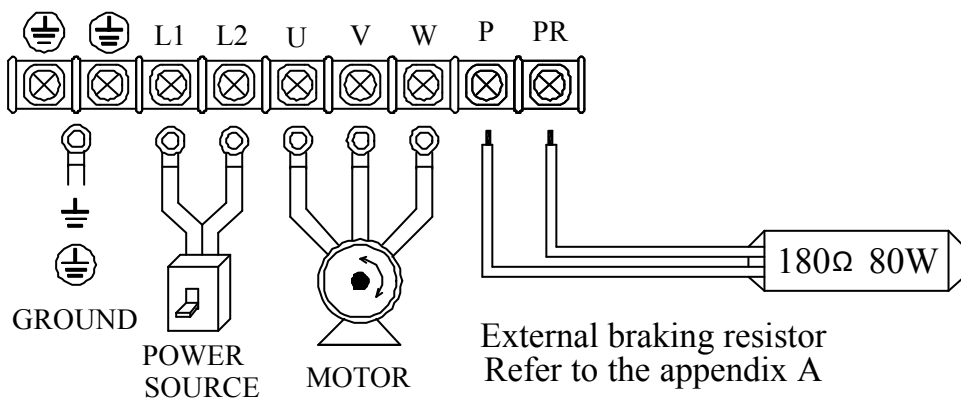
MS1-104, MS2-102~122



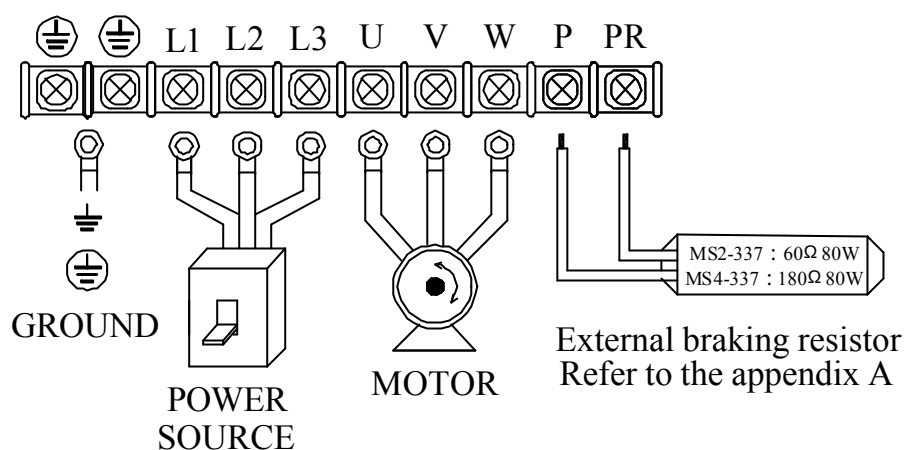
MS2-307~322, MS4-307~322



MS2-137



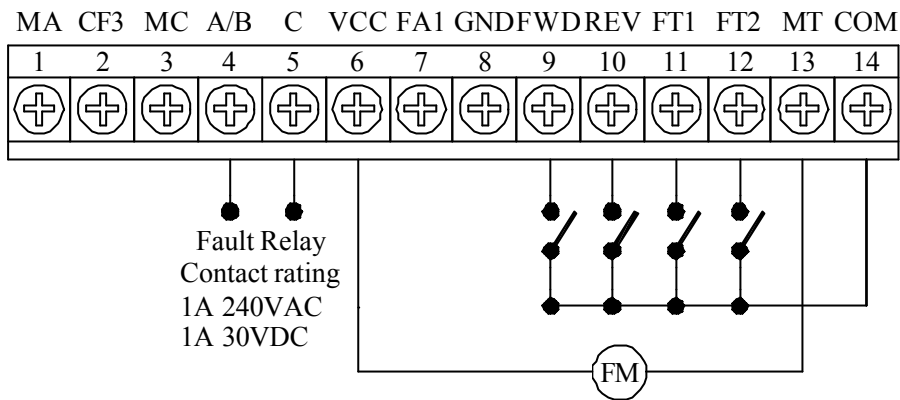
MS2(4)-337



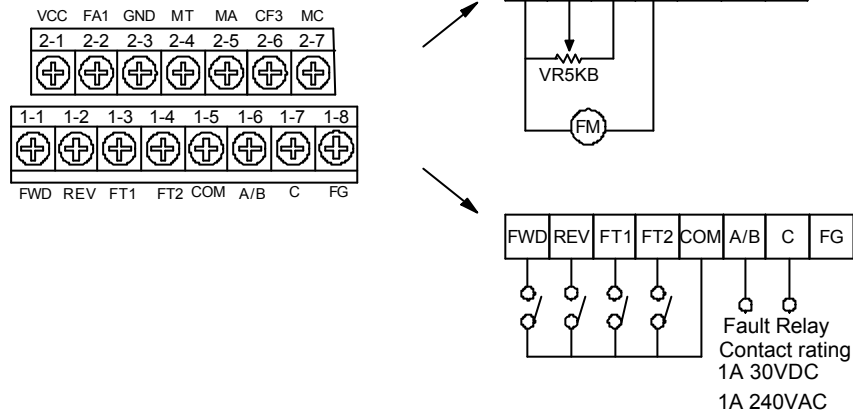
Main circuit terminal			
No.	Symbol	Description	Terminal name
1		Ground	Ground(Earth) Terminal
2	L1	Connect power supply	(L1,L2) Single Phase (L1,L2,L3) Three Phase 110VAC± 10% 220VAC± 10% 380/440VAC± 10% 50/60HZ± 10%
3	L2		
4	L3		
5	W	Inverter output	Terminals connected to motor
6	V		
7	U		
8	P	Dynamic brake	Terminals connected to braking Resistor
9	PR		

(2) Control circuit terminal

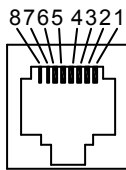
MS1-104, MS2-102~137, MS4-337



MS4-307~322



(3) RS485 connector



NO	8	7	6	5	4	3	2	1
Color	Black	Red	Orange	Yellow	Green	Blue	Purple	Brown
Symbol	EXG	5V	GND	A	RFA0	B	VCC	
Connect to F306 or RS485								

Symbol	Description
VCC	Analog source for F306
B	Communication signal (S-)
RFA0	Analog input for F306
A	Communication signal (S+)
GND	Analog common for F306
5V	Communication source
EXV	Communication common

This connector is for both F306 and RS485. Set CD13 for selection.

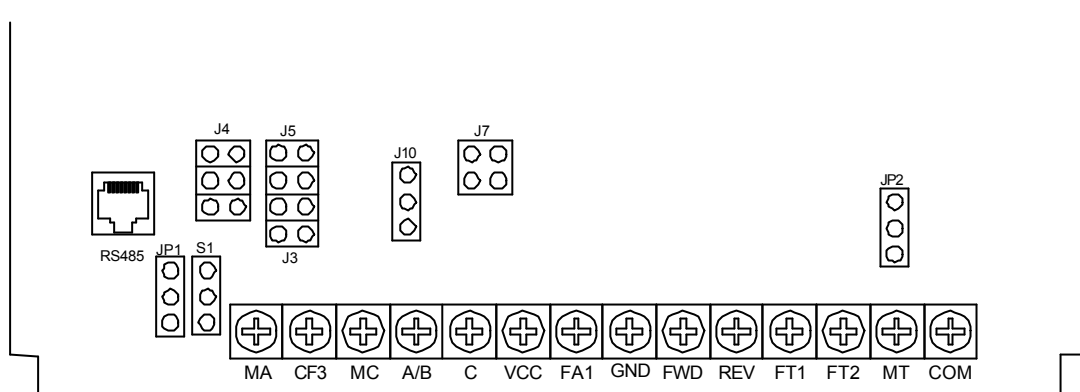
Running relay terminal			
No	Symbol	Terminal name	Description
1	MA	Running signal A	Running contact (normal open)
2	CF3	Running signal B / multi-function terminal	Running contact (normal close) / 5-8th speed terminal
3	MC	Running signal C	Running contact (common)

Alarm terminal			
No	Symbol	Terminal name	Description
4	A/B	Alarm output B	Fault alarm contact A(normal open) / B(normal close)
5	C	Alarm output C	Fault alarm contact (common)

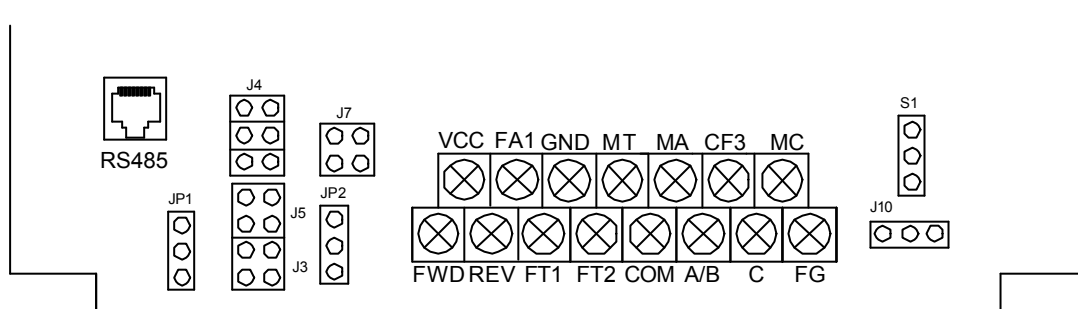
Multi function analog terminal			
No	Symbol	Terminal name	Description
6	VCC	Analog source	Power source +10V of analog terminals
7	FA1	Free analog terminal 1	See CD44 & jumper setup J7
8	GND	Analog common terminal	Common terminal of free analog terminals

Control circuit terminal			
No	Symbol	Terminal name	Description
9	FWD	Forward operation	Forward operation / stop terminal
10	REV	Reverse operation	Reverse operation / stop terminal
11	FT1	Multi function terminal 1	See functions description (CD42)
12	FT2	Multi function terminal 2	See functions description (CD43)
13	MT	Multi function output terminal	Open collector output 50mA MAX RUN : Operating indicator, refer to CD46 description MET : Connect to frequency meter, refer to CD07 description ARR : Frequency arrived indicator, refer to CD55 description
14	COM	Common terminal	Common terminal of control terminals
15	FG	Ground(Earth) terminal	

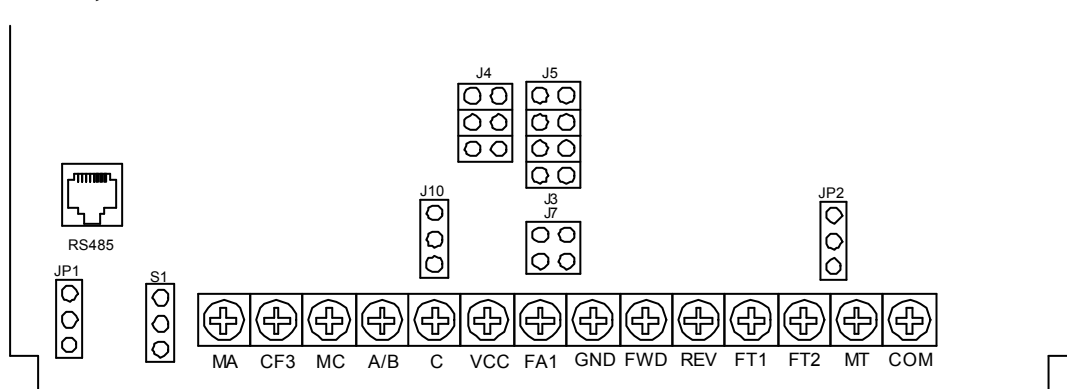
(4) Description of Hardware setting MS1-104, MS2-102~122



MS4-307~322



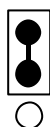
MS2-137, MS4-337



4-1 Jumper setup-MS1-104, MS2-102~122

1. JP1 : VR on panel / VR on F306

VR on panel



VR on F306



2. S1 : MB / CF3 selection

2 and 3 short CF3 →
Running relay MB

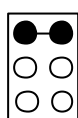


1 and 2 short CF3 →
5-8th speed terminal
(Refer Example 04)

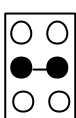


3. J4 : RST / FT2 / CF2 selection

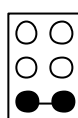
RST



FT2



CF2



4. J5 : FT1 / CF1 selection

FT1



CF1



5. J3 : ARR / MET selection

ARR



MET

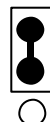


6. J10 : Fault A / Fault B terminal

Fault A



Fault B



7. J7

0~10V



0~5V

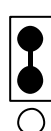


4~20mA



8. JP2 : MET output signal selection

Meter



Analog
0~10VDC



Meter : Connect meter + to terminal H and meter - to terminal MT.

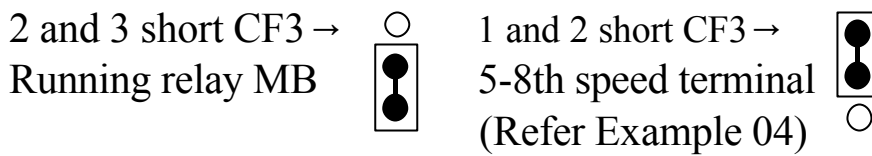
0~10VDC : Terminal MT is + and Terminal GND is -.

Jumper setup-MS4-307~322

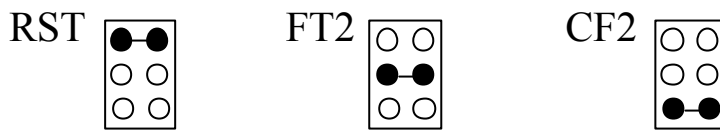
1. JP1 : VR on panel / VR on F306



2. S1 : MB / CF3 selection



3. J4 : RST / FT2 / CF2 selection



4. J5 : FT1 / CF1 selection



5. J3 : ARR / MET selection



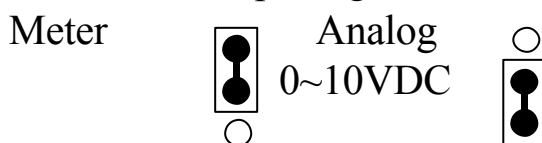
6. J10 : Fault A / Fault B terminal



7. J7



8. JP2 : MET output signal selection



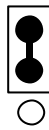
Meter : Connect meter + to terminal H and meter - to terminal MT.

0~10VDC : Terminal MT is + and Terminal GND is -.

Jumper setup-MS2-137, MS4-337

1. JP1 : VR on panel / VR on F306

VR on panel

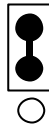


VR on F306



2. S1 : MB / CF3 selection

2 and 3 short CF3 →
Running relay MB

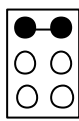


1 and 2 short CF3 →
5-8th speed terminal
(Refer Example 04)

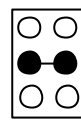


3. J4 : RST / FT2 / CF2 selection

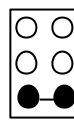
RST



FT2



CF2



4. J5 : FT1 / CF1 selection

FT1



CF1



5. J3 : ARR / MET selection

ARR



MET

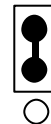


6. J10 : Fault A / Fault B terminal

Fault A



Fault B



7. J7

0~10V



0~5V

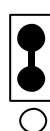


4~20mA



8. JP2 : MET output signal selection

Meter



Analog
0~10VDC

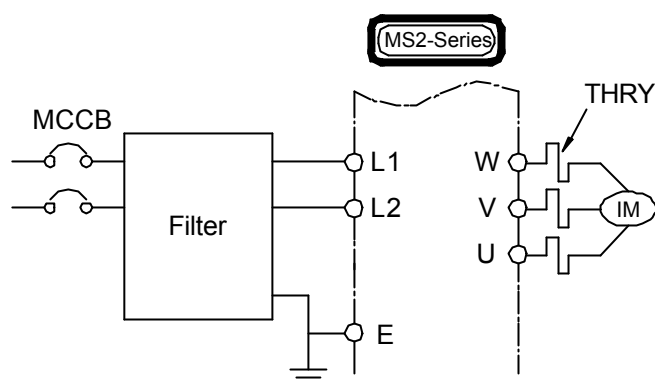


Meter : Connect meter + to terminal H and meter - to terminal MT.

0~10VDC : Terminal MT is + and Terminal GND is -.

(5) WIRING

5-1 Wiring of main circuit



5-2 Wiring equipments

Select the wiring equipment and wiring size, refer to the table below.

1. On the input power side, a molded case circuit breaker (MCCB) to protect inverter primary wiring should be installed.
2. A leakage current breaker threshold of 200mA and above, or of inverter use is recommended.
3. Use of input side magnetic contactor. An input MC can be used to prevent an automatic restart after recovery from an external power loss during remote control operation. However, do not use the MC reduced reliability.
4. In general, magnetic contactors on the output of the inverter, Should not be used for motor control. Starting a motor with the inverter running will cause large surge currents and the inverter overcurrent protector to trigger.

Model	MS1	MS2						MS4			
Model No	04	02	04	07	15	22	37	07	15	22	37
Capacity (KVA)	1.0	0.6	1.0	1.6	2.7	3.8	6.1	1.9	3.1	4.2	6.5
Current (A)	2.5	1.4	2.5	4.1	7	10	16	2.5	4	6	9
Circuit Breaker (MCCB) (A)	15	6	10	10	15	20	20	10	10	10	15
Electro-Magnetic Contactor (A)	12	8	12	12	12	12	18	12	12	12	12
Thermal relay RC value (A)	4.8	1.2	2.4	3.8	6.8	9	15	1.9	3.4	3.8	6.8

5-3 Surge absorber

In order to prevent malfunction, provide the surge absorber on the coils of the electromagnetic contactors, relays and other devices which are to be used adjacent of the inverter.

5-4 Cable size and length

If the inverter is connected to a distant motor (especially when low frequency is output), motor torque decreases because of voltage drop in the cable. Use sufficiently heavy wire.

Changing the carrier frequency reduce RF1 noise and leakage current. (Refere to the table below)

Distance INVERTER → MOTOR	under 25M	under 50M	under 100M	above 100M
MS2 SERIES	under 16KHZ	under 10KHZ	under 5KHZ	under 2.5KHZ

5-5 Wiring and cautionary points

A. Main circuit

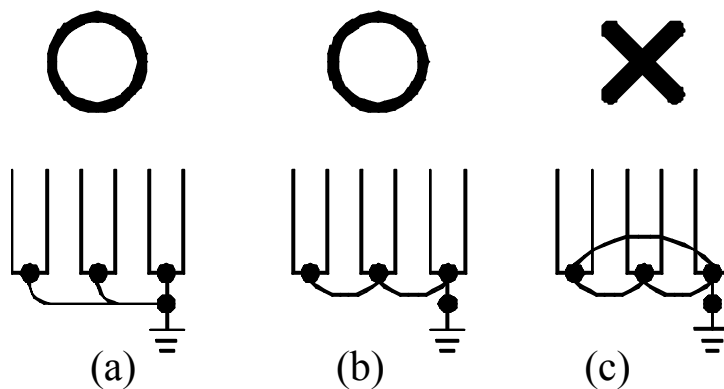
1. Don't connect the cables of the power supply side to the W, V and U output terminals for the motor.
2. Don't connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
3. Don't put the advance phase capacitor between the inverter and motor.
4. Put MCCB in the input power supply.

B. Control signal circuit

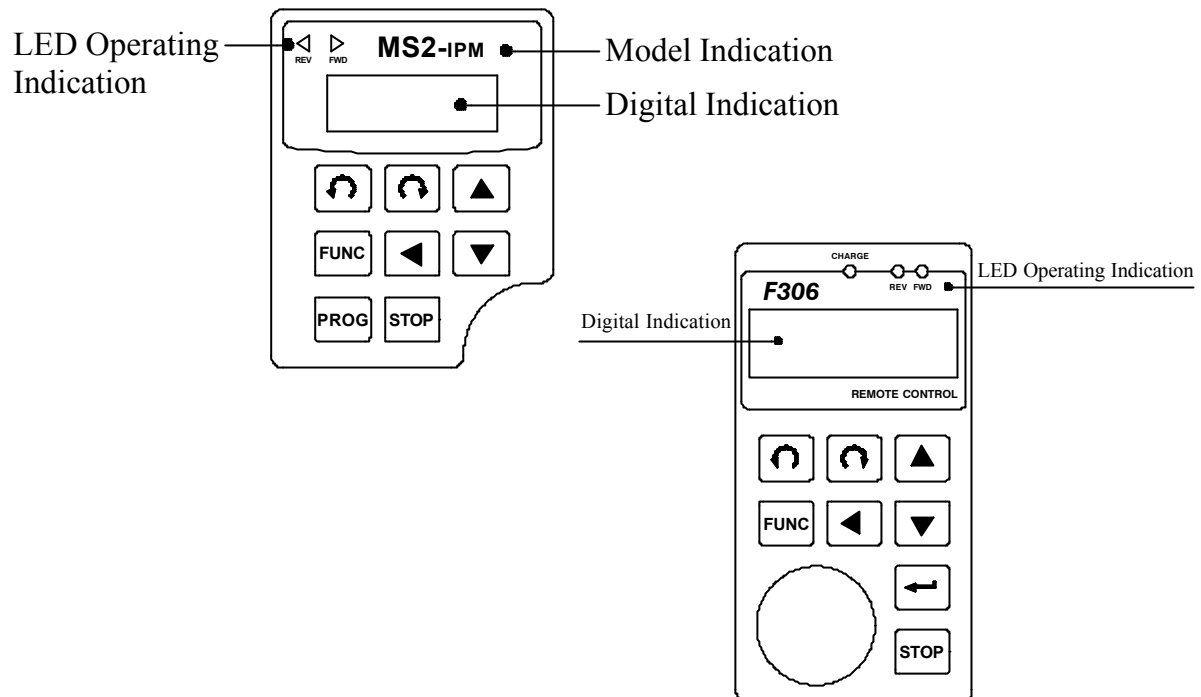
1. Separate the power cables of main circuit etc. from the control cables of the sequence and analog signals by passing the cables through the different ducts.
2. Use twisted pair shielded wire for control signal and connect the shield to earth terminal at one end, COMMON terminal of control board. Leave the other end of shielding open.
3. Avoid common Ground leads between high and low level voltage equipment.

C. Grounding

1. Be sure ground both the inverter and motor.
2. Keep grounded leads as short as possible.
3. Shield cables used to protect low-level signal leads should be grounded at one end point.
4. Provide class 3 grounding ($0.1\ \Omega$ or less) for a terminal.
5. When grounding several inverters, make connections as shown below, no loop is produced as shown in FIG "a", FIG "b".



6. DIGITAL OPERATION PANEL



Operation key		Key function	Description
	FWD RUN	Forward run	Commands forward run
	REV RUN	Reverse run	Commands reverse run
	SHIFT	Cursor movement	Select the digit
	DOWN	Down	Decrease the parameter value
	UP	Up	Increase the parameter value
	PROG	Memory storage	Saves the setting vaule
	FUNC	Function	Press once to select function CDxx and press again to change its content
	STOP	Stop	Stop operation / Escape to standby mode

7. FUNCTIONS DESCRIPTION

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD00	First speed setting	60.0HZ
		50.0HZ
CD01	Parameter lock	0
CD02	Acceleration time 1	10.0Sec
CD03	Deceleration time 1	10.0Sec
CD04	Jogging frequency	5.0HZ
CD05	Start frequency	0.5HZ
CD06	Jog mode	0
CD07	Analog output gain	120.0HZ
		100.0HZ
CD08	CW or CCW or CW / CCW	0
CD09	Reserved	
CD10	Analog / digital frequency input	1
CD11	Dynamic brake / Free running	0
CD12	Terminal / Keypad command	0
		1
CD13	Source operation command	0
CD14	Maximum frequency limit	120.0HZ
		50.0HZ
CD15	Minimum frequency limit	0.0
CD16	Frequency display Scale	1.0
		30.0
CD17	1st Maximum voltage frequency	60.0HZ
		50.0HZ

ADJUST RANGE	UNIT	USER SETTING	REMARK
0.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0 or 1			0 = lock 1 = Unlock
0.1 ~ 6000.0Sec	0.1Sec		
0.1 ~ 6000.0Sec	0.1Sec		
0.0 ~ 1200HZ	0.1HZ		
0.5 ~ 30.0HZ	0.1HZ		
0 or 1			0 = Normal 1 = Jog
30.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0 or 1 or 2			0 = CW/CCW 1 = CW 2 = CCW
0 or 1			0 = Digital 1 = Analog
0 or 1			0 = Dynamic brake 1 = Free running
0 or 1			60HZ region : Keypad
			50HZ region : Terminal
0 ~ 2			0 = Normal 1 = F306 2 = RS485 communication
0.5 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region
0.0 ~ 1200HZ	0.1HZ		
0.01 ~ 500.0	0.01		60HZ region
			50HZ region
25.0 ~ 1200HZ	0.1HZ		60HZ region
			50HZ region

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD18	V/F pattern setting	0
CD19	DC braking time	1.0Sec
CD20	DC braking power	10
CD21	Torque boost	0.0%
CD22	Second speed setting	20.0HZ
CD23	Third speed setting	30.0HZ
CD24	Fourth speed setting	40.0HZ
CD25	Acceleration time 2	10.0Sec
CD26	Deceleration time 2	10.0Sec
CD27	Carrier frequency	15.0K
CD28	Output voltage gain	100.0%
CD29	Frequency jump 1	0.0
CD30	Frequency jump 2	0.0
CD31	Frequency jump 3	0.0
CD32	Jump range	0.5HZ
CD33	Frequency reference bias	0.0
CD34	Frequency reference bias direction	0
CD35	Frequency gain	100.0%
CD36	The latest error record	NONE
CD37	Errors record 1	NONE

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~ 2			0 : Constant torque 1 : (Frequency) 2.0 2 : (Frequency) 3.0
0.0 ~ 25.0Sec	0.1Sec		
0 ~ 250	1		
0.0 ~ 25.0%	0.1%		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.1 ~ 6000.0Sec	0.1Sec		
0.1 ~ 6000.0Sec	0.1Sec		
1.0K ~ 15.0K	0.1 K		
50.0 ~ 100.0%	0.1%		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.5 ~ 3.0HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0 or 1			0 = Positive 1 = Negative
40.0 ~ 200.0%	1%		

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD38	Errors record 2	NONE
CD39	Errors record 3	NONE
CD40	Clear errors record	0
CD41	HZ / RPM Display	0
CD42	FT1 Multi-Function Terminal 1	0
CD43	FT2 Multi-Function Terminal 2	0
CD44	FA1 Free Analog Terminal 1	0
CD45	Reserved	
CD46	Run frequency setting	60.0HZ
CD47	5th speed setting	25.0HZ
CD48	6th speed setting	35.0HZ
CD49	7th speed setting	45.0HZ
CD50	8th speed setting	55.0HZ
CD51	Dynamic Braking Energy Limit	100
CD52	Version selector	F60.0
CD53	S curve	0
CD54	4 ~ 20mA speed command	0
CD55	Frequency arrive signal range	10.0%
CD56	2nd Maximum voltage frequency	60.0HZ
CD57	Timer FWD/REV setting	0
CD58	Auto running mode (Timer)	0
CD59	1st step timer	0.01

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 or 1			1 = Clear
0 ~ 1			0 = HZ Display 1 = RPM Display
0 ~ 15			
0 ~ 15			
0 ~ 15			
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0.0 ~ 1200HZ	0.1HZ		
0 ~ 300%	1%		0 = Auto turning
F60.0/F50.0			60HZ region
			50HZ region
0 ~ 10			
0 ~ 3			
0.0 ~ 100.0%	0.1%		
25.0 ~ 1200HZ	0.1HZ		
0 ~ 31			
0 ~ 4			
0 ~ 15Hr	hr.min		

DISPLAY CODE	FUNCTION	DEFAULT VALUE
CD60	2st step timer	0.00
CD61	3st step timer	0.00
CD62	4st step timer	0.00
CD63	5st step timer	0.00
CD64	Timer unit selector	0
CD65~ CD71	Reserved	
CD72	Communication loss time	0.5SEC
CD73	Communication error counter	3
CD74	Address setting	1
CD75	Transmission speed	3
CD76	Transmission fault treatment	3
CD77	Reserved	
CD78	Communicator protocol	4
CD79~ CD90	Reserved	
CD91	RUN terminal	0
CD92	ARR terminal	1
CD93	Reserved	
CD94	CD00 memory mode for communication speed command	0
CD95	Reserved	
CD98~ CD99	Reserved	

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 ~ 15Hr	hr.min		
0 or 1			
0.1 ~ 100.0SEC	SEC		
0 ~ 10			
1 ~ 255			
0 ~ 3			
0 ~ 3			
0 ~ 7			
0 ~ 3			
0 ~ 3			
0 or 1			

Communication address description

CODE	FUNCTION	DEFAULT VALUE
CD96	Model code	
CD97	Version of program	
100	Speed command for RS485	3
101	Frequency data output for RS485	
102	Reserved	
103	Fault code for RS485	

To change version see description of CD52.

This function provides different standard setting values for 50/60HZ power region.

F50.0 : 50HZ power region.

F60.0 : 60HZ power region.

CD13 after finished parameter setting, please repower “ON” .

ADJUST RANGE	UNIT	USER SETTING	REMARK
0 ~4			
	0.1HZ		

7-1. Function setting

Before starting test run, check carefully the following points :

- (1) Be sure to connect the power supply to L1, L2, L3 (input terminals) and the motor to W.V.U. (output terminals). (Wrong connections will damage the inverter.)
- (2) Check that the input power supply coincide with input voltage and input phase of the inverter.
- (3) Check the signal lines for correct wiring.
- (4) Be sure to ground an earth terminal for personnel safety.
- (5) Check that other terminals other than earth terminal are not grounded.
- (6) Check that the inverter is mounted on the wall on non-flammable material.
- (7) For operation start and stop, use    and FWD / REV terminals. Never use input power supply to switch ON/OFF.

Operating

1-1. Pannel

Action : (a) Press   for forward / reverse operation.

Speed : (a) Using   to change motor speed with 1HZ increment step. or  to select the digit for quick setting and confirm by 

Standby : (a) Press  back to standby mode after trip or function setting mode.

1-2. F306

Set CD13=1 and repower "ON" , operation same as 1-1 pannel.

1-3. RS485 communication control

Set CD13=2 and set CD74~CD78. (Refer to CD74~CD78).

Using 06H function write command to address 100(64H).

1 : CW, 2 : CCW, 3 : Stop, 4 : Clear fault.

1-4. Terminal control

Set CD12=1, writing refer to control circuit terminal wiring digaram.

First speed setting
CD00

Setting Range	0.0 ~ 1200HZ
60HZ region	60.0HZ
50HZ region	50.0HZ

Press   key for increase or decrease the speed.

Press  key to select the digit for quick setting.

Press  to save the setting value.

Parameter lock
CD01

Setting Range	0 or 1
Default value	0

0 : Lock 1 : Unlock

Function to prevent inadequate setting.

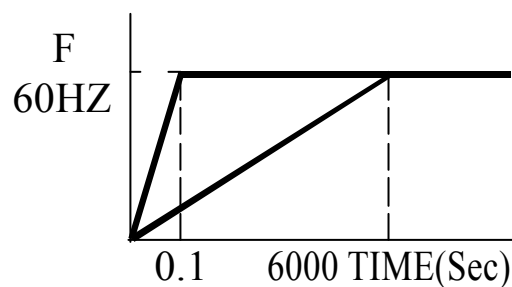
To change the contents CD, set CD01=1 and press  first.

To lock the data set CD01=0 and press .

Acceleration time 1
CD02

Setting Range	0.1 ~ 6000.0Sec
Default value	10.0Sec

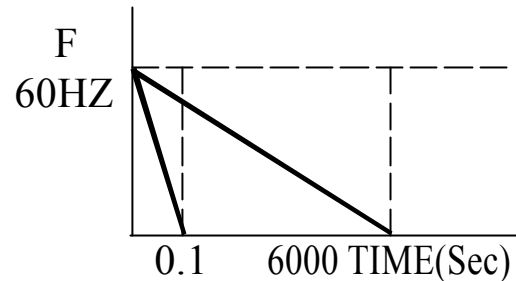
CD02 value corresponds to the time of acceleration from 0 to 60HZ.(For 120Hz. setting, the arrival time to 120Hz is double.)



Deceleration time 1
CD03

Setting Range	0.1 ~ 6000.0Sec
Default value	10.0Sec

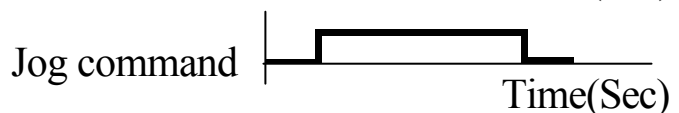
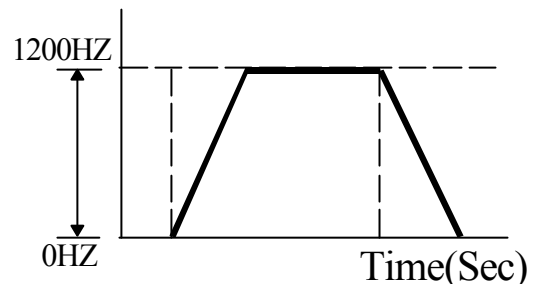
CD03 value corresponds to the time of deceleration from 50/60HZ to 0.



Jogging frequency
CD04

Setting Range	0.0 ~ 1200HZ
Default value	5.0HZ

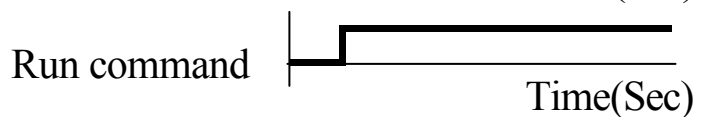
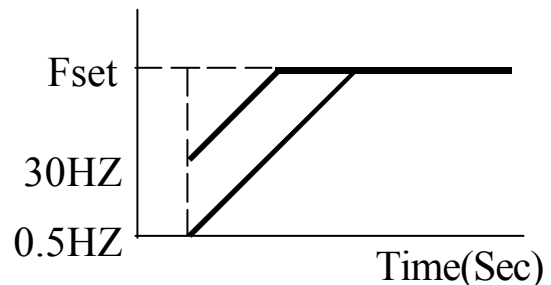
Use terminal control refer to CD12 and CD42 setting, keyboard control refer to CD06.



Start frequency
CD05

Setting Range	0.5 ~ 30.0HZ
Default value	0.5HZ

When setting this value, pay attention to the starting current.



Jog mode
CD06

Setting Range	0 or 1
Default value	0

0 : Normal 1 : Jog Mode

1. Set jogging operation from key panel  & .
2.   LED blinking in JOG mode.

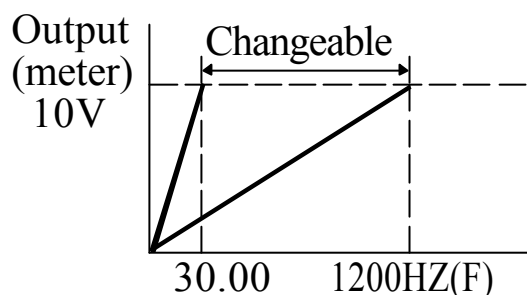
Note : Refer to CD12 & CD42 for using jog mode by terminal control.

Frequency meter correspond
CD07

Setting Range	30.0 ~ 1200HZ
60HZ region	120.0HZ
50HZ region	100.0HZ

The specification of the output meter is 10V(i.e. 1mA) full scale rating.

Set by CD07 the value will be correspond to maximum correspond of MET terminal output meter.



CW or CCW or CW/CCW
CD08

Setting Range	0 ~ 2
Default value	0

0 : CW/CCW operation

1 : CW only

2 : CCW only

If inadequate operation, the “OPE2“ warning message will be indicated.

Analog / Digital frequency input
CD10

Setting Range	0 or 1
Default value	1

0 : Operation frequency change by using  or  key and confirm by 

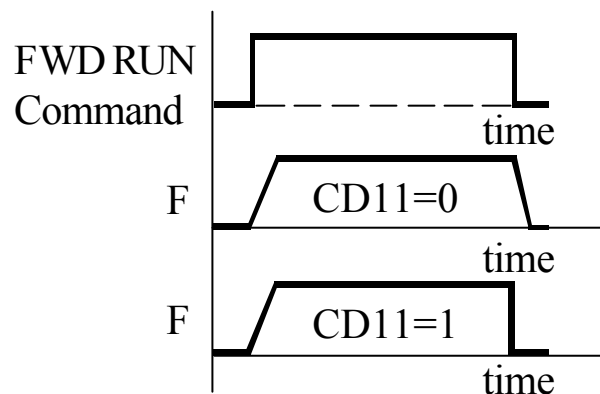
1 : Operation frequency depends on the analog signal.

Note : Using   key to change motor speed when CD01=1, the “OPE3” warning message will be indicated.

Dynamic brake / Free running
CD11

Setting Range	0 or 1
Default value	0

0 : Activates dynamic brake function when deceleration.
1 : Output cut off when accept a stop command to be free running.



Terminal / Keypad command
CD12

Setting Range	0 or 1
60HZ region	0
50HZ region	1

0 : RUN/STOP Command from operation panel.

1 : RUN/STOP Command from control terminal.

Note : If inadequate operation, the “OPE4” warning message will be indicated.

Source operation command
CD13

Setting Range	0 ~ 2
Default value	0

0 : Normal

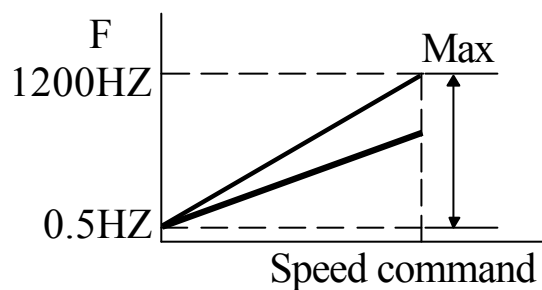
1 : F306

2 : RS485 communication

Note : After finished this parameter setting, please repower “ON” .

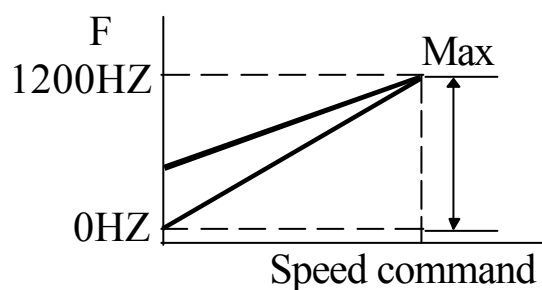
Maximum frequency limit
CD14

Setting Range	0.5 ~ 1200HZ
60HZ region	120.0HZ
50HZ region	50.0HZ



Minimum frequency limit
CD15

Setting Range	0.0 ~ 1200HZ
Default value	0.0



Frequency display scale
CD16

Setting Range	0.01 ~ 500.0
60HZ region	1.0
50HZ region	30.0

Use the following equation to calculate the mechanical shaft speed in rpm.

$$\text{RPM} = \text{HZ} \times \text{Scale setting}$$

When $\text{RPM} > 9999$ display **— — E —** for over range warning in this condition.

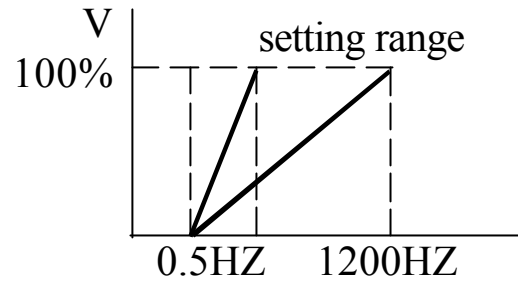
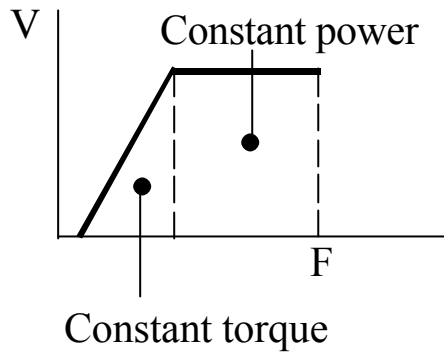
Setting CD41=1 for display shown RPM.

Pole	Synchronous speed		Scale setting
	50HZ	60HZ	
2	3000	3600	60
4	1500	1800	30
6	1000	1200	20
8	750	900	15
10	600	720	12
12	500	600	10

1st Maximum voltage frequency
CD17

Setting Range	25.0 ~ 1200HZ
60HZ region	60.0HZ
50HZ region	50.0HZ

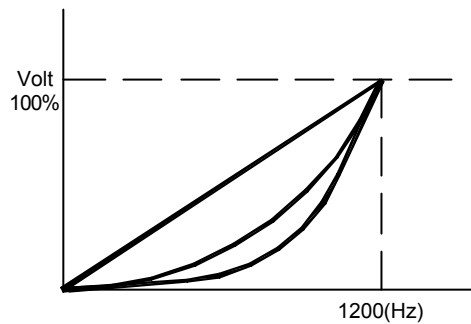
Use 2nd V/F to set CD42(43)=7 and terminal FT1(2) close. 2nd V/F setting is at CD56.



V/F pattern setting
CD18

Setting Range	0 ~ 2
Default value	0

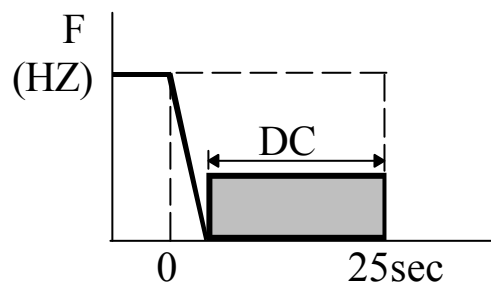
- 0 = Constant torque curve
 1 = Reduce torque curve $F^{2.0}$
 2 = Reduce torque curve $F^{3.0}$



DC braking time
CD19

Setting Range	0.0 ~ 25.0Sec
Default value	1.0Sec

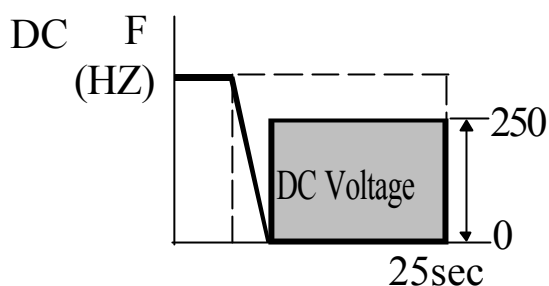
DC brake starting at frequency under 0.5HZ.



DC braking power
CD20

CD20 setting DC voltage gain various braking power.

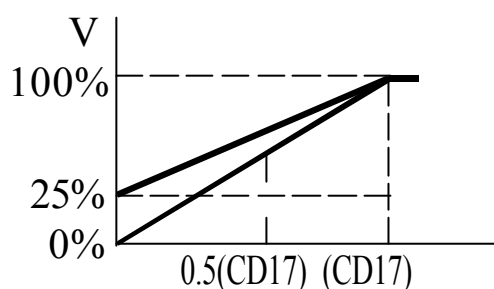
Setting Range	0 ~ 250
Default value	10



Torque boost
CD21

Torque boosting is used to compensate the torque lost due to stator resistance. Over boosting will cause over current and high acoustic noise.

Setting Range	0.0 ~ 25.0%
Default value	0.0%



Second speed setting
CD22

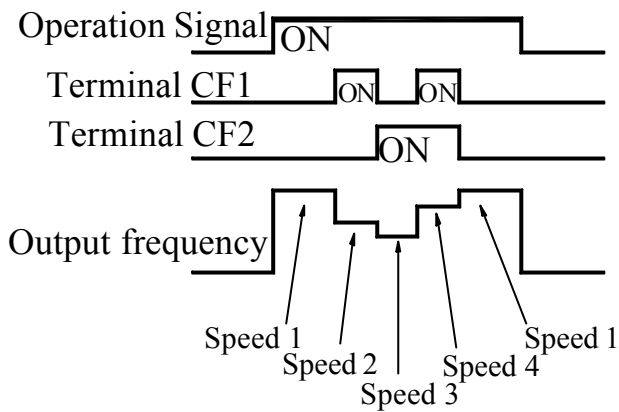
Setting Range	0.0 ~ 1200HZ
Default value	20.0HZ

Third speed setting
CD23

Setting Range	0.0 ~ 1200HZ
Default value	30.0HZ

Fourth speed setting
CD24

Setting Range	0.0 ~ 1200HZ
Default value	40.0HZ



Terminal order	CF1	CF2
SPEED		
SPEED - 1	OFF	OFF
SPEED - 2	ON	OFF
SPEED - 3	OFF	ON
SPEED - 4	ON	ON

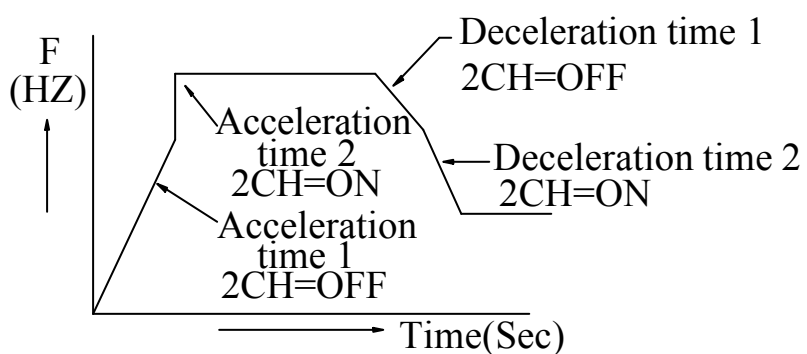
Acceleration time 2
CD25

Setting Range	0.1 ~ 6000.0Sec
Default value	10.0Sec

CD42 or CD43 setting FT1 or FT2=3, then CD25 or CD26 can be used.

Deceleration time 2
CD26

Setting Range	0.1 ~ 6000.0Sec
Default value	10.0Sec



Description	2CH
Acceleration time 1	OFF
Deceleration time 1	
Acceleration time 2	ON
Deceleration time 2	

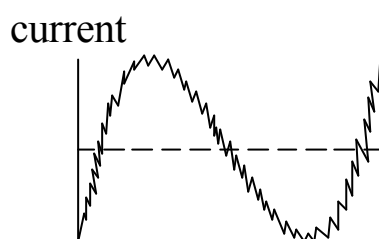
To operate inverter with 2CH function, check to see CD42 or CD43=3.
2CH command inputs from FT1 or FT2 terminal.

Carrier frequency
CD27

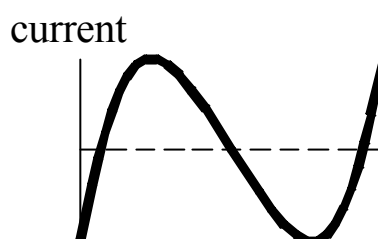
Setting Range	1.0 ~ 15.0K
Default value	15.0K

Increase the carrier frequency would reduce motor noise but efficiency might be decreased.

Reduce the carrier frequency would increase noise and reduce motor current, and gain better efficiency.



Low carrier frequency



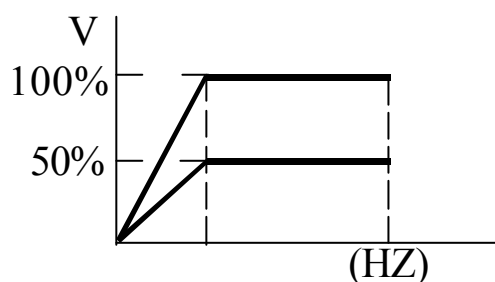
High carrier frequency

Output voltage gain
CD28

Setting Range	50.0 ~ 100.0%
Default value	100.0%

Reduce output voltage for energy saving operation.

Setting CD44=12 for FA1 terminal control.



Frequency jump 1
CD29

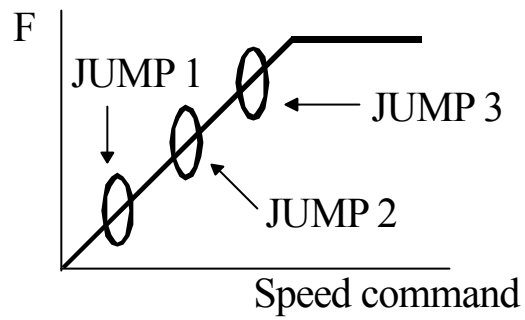
Setting Range	0.0 ~ 1200HZ
Default value	0.0HZ

Frequency jump 2
CD30

Setting Range	0.0 ~ 1200HZ
Default value	0.0HZ

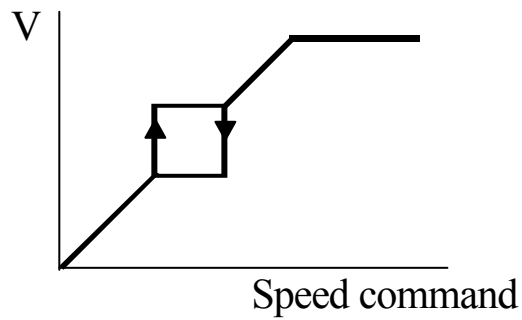
Frequency jump 3
CD31

Setting Range	0.0 ~ 1200HZ
Default value	0.0HZ



Jump range
CD32

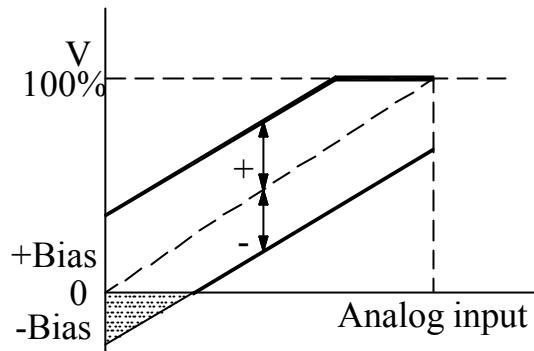
Setting Range	0.5 ~ 3.0HZ
Default value	0.5HZ



Frequency reference bias
CD33

Setting Range	0.0 ~ 1200HZ
Default value	0.0

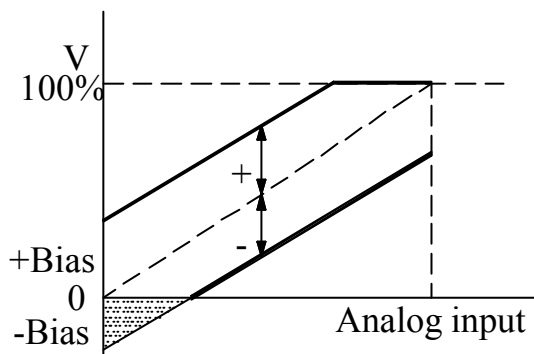
Move Frequency bias with same gradient.
Frequency in the range of “-” bias, motor is stop.



Freq. ref. bias direction
CD34

Setting Range	0 or 1
Default value	0

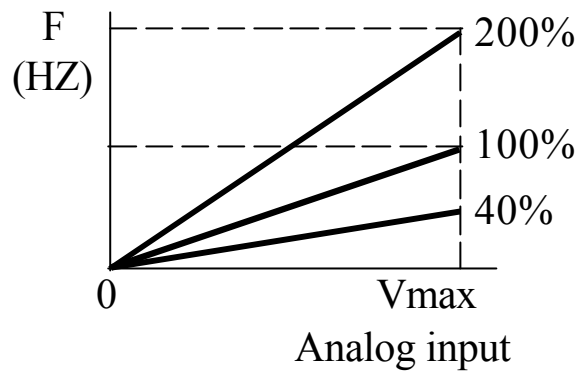
0 = Positive “+”
1 = Negative “-”
Polarity setting for (CD33) frequency reference bias.



Frequency gain
CD35

Setting Range	40.0 ~ 200.0%
Default value	100.0%

FA1 analog input gain, refer to application example.



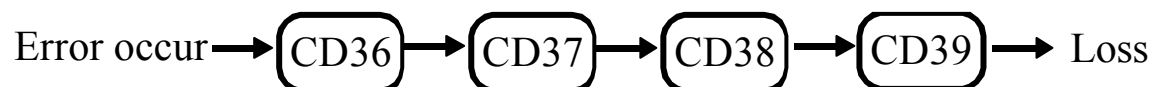
The latest error record
CD36

Error record 1
CD37

Error record 2
CD38

Error record 3
CD39

Errors record flow-chart when Error occur. The new content will shift the other contents to one higher CD code and the highest one will be dropped.



Clear errors record
CD40

Setting Range	0 or 1
Default value	0

Set CD40=1 and PROG clear CD36 ~ CD39 Error record the contents in CD36 ~ CD39 are “ NONE “

HZ/RPM Display
CD41

Setting Range	0 ~ 1
Default value	0

0 = HZ Display 1 = RPM Display

Setting current scale CD16 for R.P.M display shown.

FT1 Multi-Function Terminal 1
CD42

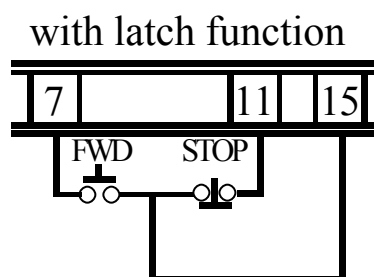
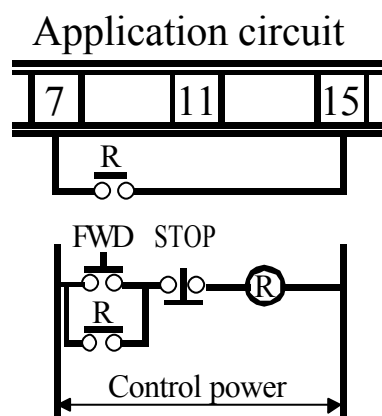
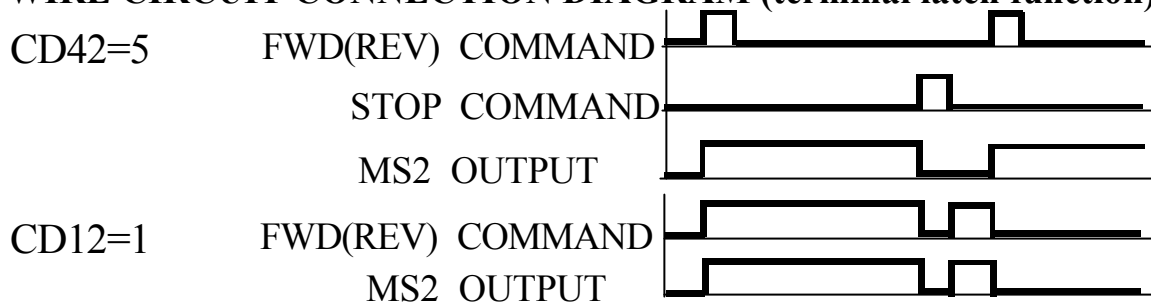
Setting Range	0 ~ 15
Default value	0

FT1 FT2	Symbol	Function description
0	-----	-----
1	JOGF	Jog operation FWD command
2	JOGR	Jog operation REV command
3	2CH	ACC/DEC time 2 command
4	FRS	Free running command
5	3 - WIRE	3 - wire sequence mode
6	CF3	5 - 8 Speed Setting Terminal
7	VF2	2nd V/F curve setting (CD56)
8		Reserved
9	OH	External over temperature command
10	Timer	Timer RUN trigger
11~15		Reserved

Note :

1. Set jumper J4 and J5 to appropriate location before using FT1/FT2 functions.
2. To operate at 8 speeds function, all FT1/FT2/CF3 terminals set as FT1=CF1, FT2=CF2 and CF3=CF3.

3 - WIRE CIRCUIT CONNECTION DIAGRAM (terminal latch function)



Ⓜ and CONTROL POWER not necessary
 Remark: STOP command entry from control terminal ⑪ FT1 or ⑫ FT2, and set CD42(FT1)=5 or CD43(FT2)=5 before operation.

FT2 Multi-Function Terminal 2
CD43

Setting Range	0 ~ 15
Default value	0

Refer to CD42 description.

Free analog terminal 1
CD44

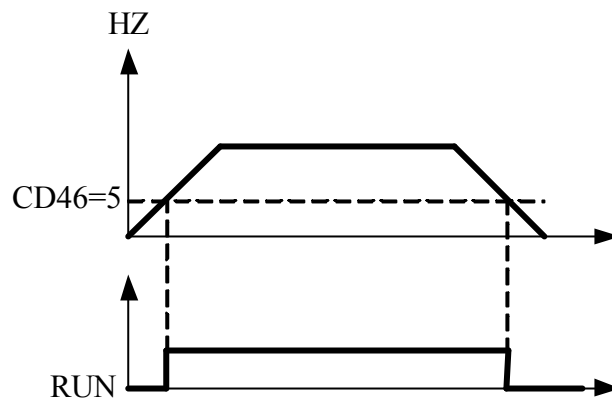
Setting Range	0 ~ 15
Default value	0

FA1	Function	Setting Range Min-----Max
0	-----	-----
1	Acceleration time 1	0 ~ CD02 Content
2	Deceleration time 1	0 ~ CD03 Content
3	Acceleration time 2	0 ~ CD25 Content
4	Deceleration time 2	0 ~ CD26 Content
5	Boost setting	0.0 ~ 25%
6	DC Brake time	0 ~ 25Sec
7	DC Brake Energy	0 ~ 250
8	Speed 2	F-min ~ CD22 Content
9	Speed 3	F-min ~ CD23 Content
10	Speed 4	F-min ~ CD24 Content
11	Fmax	F-min ~ CD14 content
12	Output voltage gain	50% ~ 100%
13	Speed 1	F-min ~ CD14 Content
14	Reserved	
15	Reserved	

Run frequency setting
CD46

Setting Range	0.5 ~ 1200HZ
Default value	60.0HZ

Run terminal output signal if frequency reaches setting value.



5th speed setting
CD47

6th speed setting
CD48

7th speed setting
CD49

8th speed setting
CD50

SPEED	CF3	CF2	CF1
1th speed setting	OFF	OFF	OFF
2th speed setting	OFF	OFF	ON
3th speed setting	OFF	ON	OFF
4th speed setting	OFF	ON	ON
5th speed setting	ON	OFF	OFF
6th speed setting	ON	OFF	ON
7th speed setting	ON	ON	OFF
8th speed setting	ON	ON	ON

For example, set 8th speed as follows :

1. CD12=1 (Terminal function)
2. CD42 or CD43=6 (Function command)
(FT1 or FT2 → CF3)

Dynamic braking energy limit
CD51

Setting Range	0 ~ 300%
Default value	100

The higher the percentage, the more braking energy.

The lower the percentage, the lower braking energy.

Description of regenerative discharge braking active period.

0 : Auto-adjust

1 ~ 100% Deceleration period

101 ~ 200% Braking active period of
(Decel/accel/constant frequency)

201 ~ 300% Braking active period of
(Decel/accel/constant frequency/stand-by)

Remark : No. 1, 2, 3 are different working situations, but their braking energy ranges are 1~100%.

Version selector
CD52

Setting Range	F50.0 / F60.0
60HZ region	F60.0
50HZ region	F50.0

Select function CD52, then use UP/Down key to select F50.0/F60.0

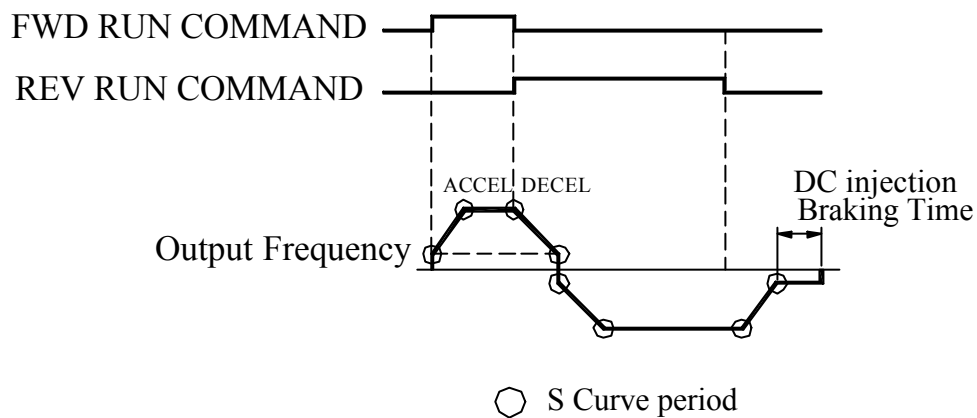
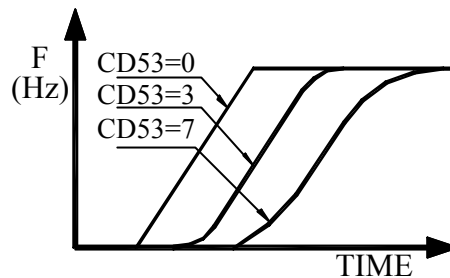
Version. Press  to save it. System will return to the factory setting and go into standby mode.

S curve
CD53

Setting Range	0 ~ 10
Default value	0

Setting S curve non-Linear Accel/Decel Operation from 1 to 10.

Setting 0 is normal operation without S curve.



4 ~ 20 mA speed command
CD54

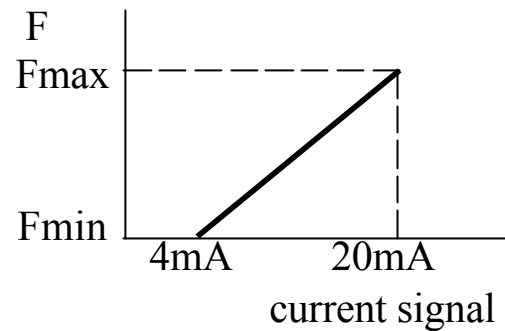
Setting Range	0 ~ 3
Default value	0

Set FA1 for current signal (4 ~ 20mA). This function only effects in CD44=8,9,10,13

0 : NO current signal application

1 : Current signal in terminal FA1

2~3 : Reserved

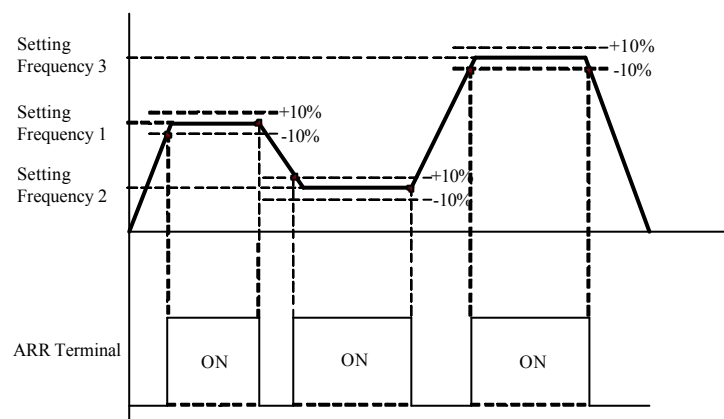


Note : Refer to FA1 terminal setting for 4-20mA signal.

Frequency arrive signal range
CD55

Setting Range	0.0 ~ 100.0%
Default value	10.0%

- 1.Signal output at running F. setting $F \times (1 - \text{CD55}\%)$ for acceleration.
- 2.Signal output at running F. setting $F \times (1 + \text{CD55}\%)$ for deceleration.



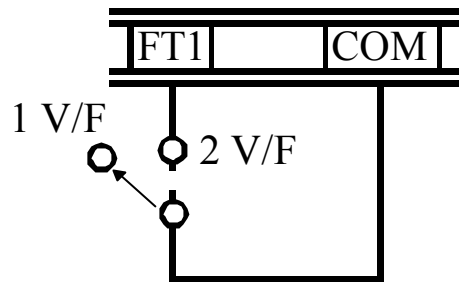
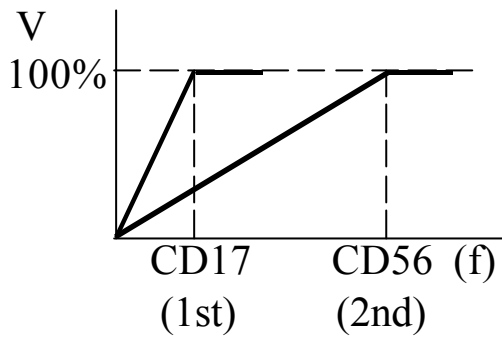
2nd Maximum Voltage frequency
CD56

Setting Range	25.0 ~ 1200HZ
Default value	60.0HZ

Set CD42(CD43)=7 define FT1(FT2) terminal for hardware V/F curve switcher.

Open : select the 1st V/F curve preset in CD17

Close : select the 2nd V/F curve preset in CD56



Timer FWD/REV setting
CD57

Setting Range	0 ~ 31
Default value	0

CD57 setting value	Binary	CD47	CD48	CD49	CD50	CD00
31	11111	REV	REV	REV	REV	REV
30	11110	FWD	REV	REV	REV	REV
29	11101	REV	FWD	REV	REV	REV
28	11100	FWD	FWD	REV	REV	REV
27	11011	REV	REV	FWD	REV	REV
26	11010	FWD	REV	FWD	REV	REV
25	11001	REV	FWD	FWD	REV	REV
24	11000	FWD	FWD	FWD	REV	REV
23	10111	REV	REV	REV	FWD	REV
22	10110	FWD	REV	REV	FWD	REV
21	10101	REV	FWD	REV	FWD	REV
20	10100	FWD	FWD	REV	FWD	REV
19	10011	REV	REV	FWD	FWD	REV
18	10010	FWD	REV	FWD	FWD	REV
17	10001	REV	FWD	FWD	FWD	REV

CD57 setting value	Binary	CD47	CD48	CD49	CD50	CD00
16	10000	FWD	FWD	FWD	FWD	REV
15	01111	REV	REV	REV	REV	FWD
14	01110	FWD	REV	REV	REV	FWD
13	01101	REV	FWD	REV	REV	FWD
12	01100	FWD	REV	REV	REV	FWD
11	01011	REV	REV	FWD	REV	FWD
10	01010	FWD	REV	FWD	REV	FWD
9	01001	REV	FWD	FWD	REV	FWD
8	01000	FWD	FWD	FWD	REV	FWD
7	00111	REV	REV	REV	FWD	FWD
6	00110	FWD	REV	REV	FWD	FWD
5	00101	REV	FWD	REV	FWD	FWD
4	00100	FWD	FWD	REV	FWD	FWD
3	00011	REV	REV	FWD	FWD	FWD
2	00010	FWD	REV	FWD	FWD	FWD
1	00001	REV	FWD	FWD	FWD	FWD
0	00000	FWD	FWD	FWD	FWD	FWD

Note : This parameter effects in timer mode only.

Auto running mode (Timer)
CD58

Setting Range	0 ~ 4
Default value	0

SPEED	1st	2nd	3rd	4th	5th	VALUE RANGE	UNIT
SPEED SETTING	CD47	CD48	CD49	CD50	CD00	0 ~ 1200	Hz
TIMER SETTING	CD59	CD60	CD61	CD62	CD63	0 ~ 15.00	hr.min

CD12=0, use keypad to control timer

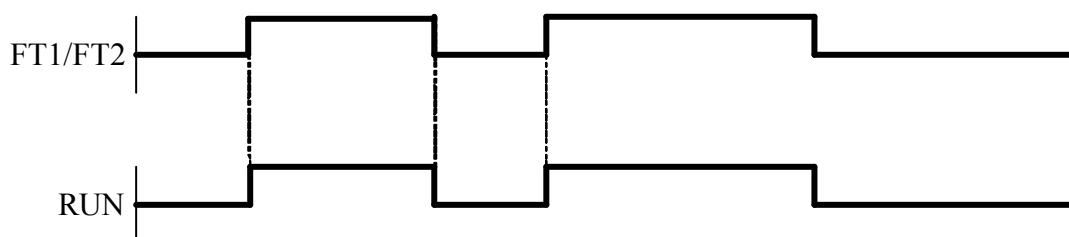
CD12=0 and CD13=2, use RS485 to control timer

CD12=1, CD42 or CD43=10, use FT1 or FT2 terminal to control timer

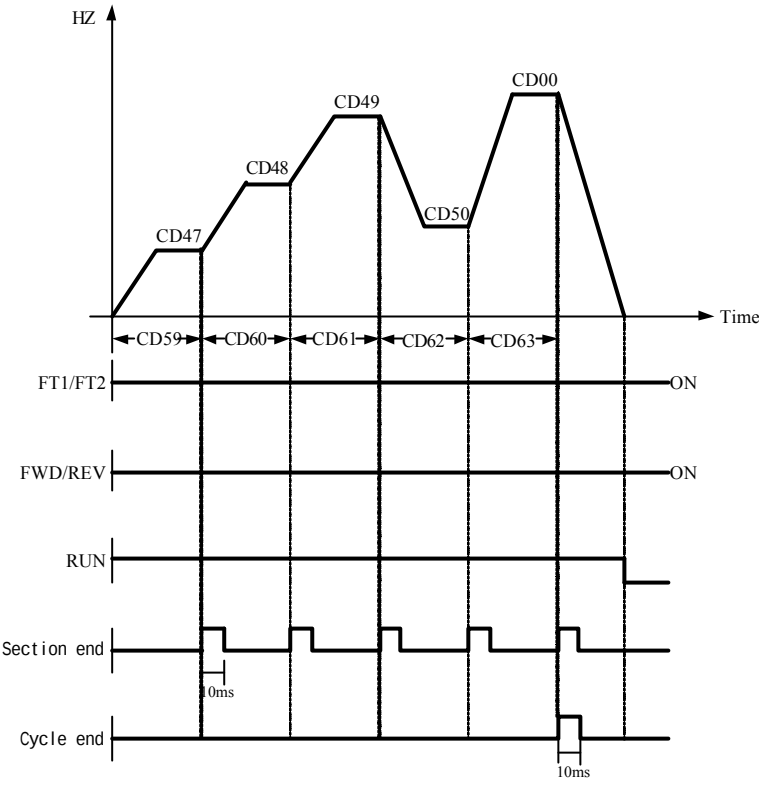
Value	Description
0	Timer disable
1	Speeds with timer for one cycle then stop
2	Speeds with timer for running continually until receive stop command
3	Speeds with timer for one cycle then stop. There is a stop between each speed.
4	Speeds with timer for running continually until receive stop command. There is a stop between each speed.

FT1/FT2 “ON”, for timer RUN.

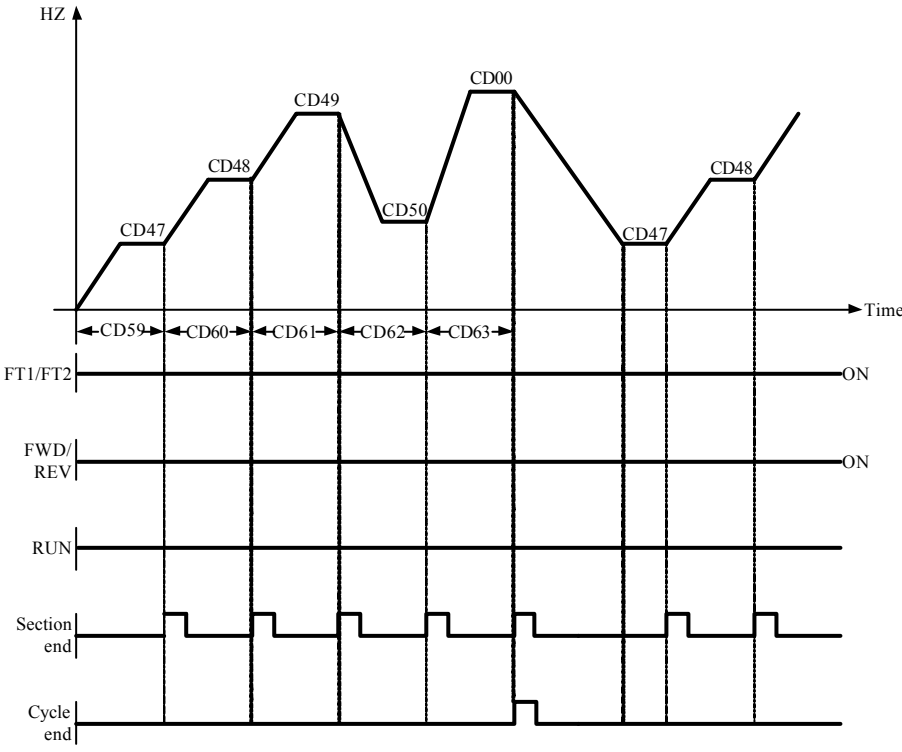
FT1/FT2 “OFF”, for timer STOP.



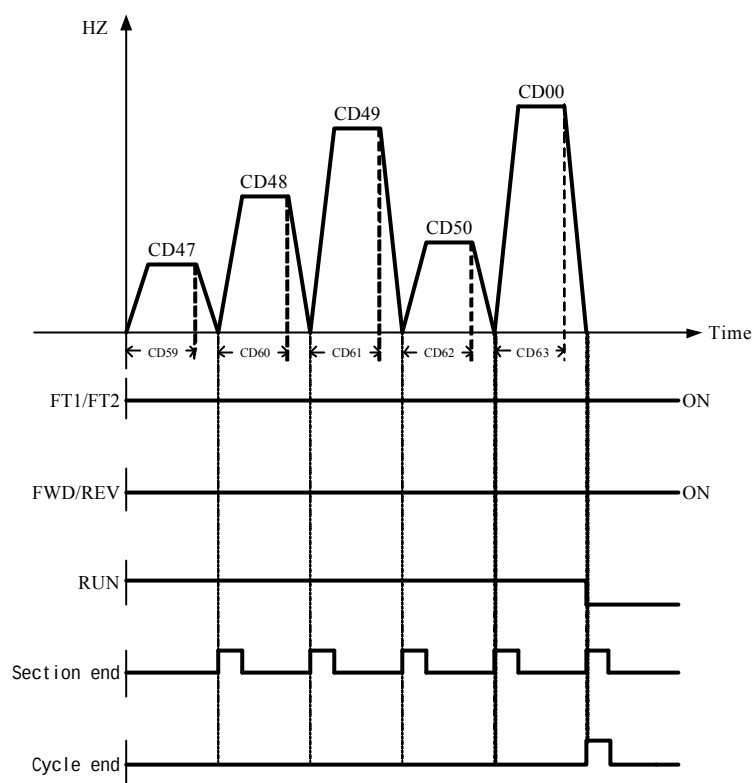
CD58=1



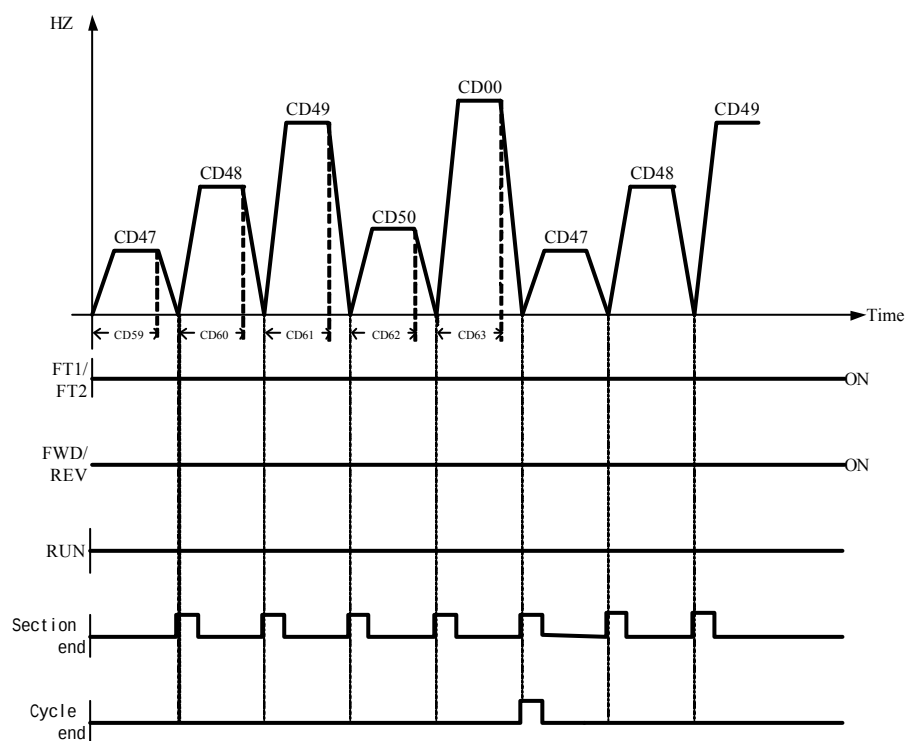
CD58=2



CD58=3



CD58=4



1st step timer
CD59

Setting Range	0 ~ 15 Hr
Default value	0.01 Hr.min

Setting running time for 1th speed.(CD47)

2st step timer
CD60

Setting Range	0 ~ 15Hr
Default value	0.00Hr.min

Setting running time for 2th speed.(CD48)

3st step timer
CD61

Setting Range	0 ~ 15Hr
Default value	0.00Hr.min

Setting running time for 3th speed.(CD49)

4st step timer
CD62

Setting Range	0 ~ 15Hr
Default value	0.00Hr.min

Setting running time for 4th speed.(CD50)

5st step timer
CD63

Setting Range	0 ~ 15Hr
Default value	0.00Hr.min

Setting running time for 5th speed.(CD00)

Timer unit selector
CD64

Setting Range	0 ~ 1
Default value	0

0 : hr.min

1 : min.sec

Note 1 : CD64 cannot be reset to default value by CD52. Set CD64 as needs separately.

Note 2 : In RS485 communication input, CD59~CD63 need to transfer minimum unit. Ex CD64=0, CD59=2.3 CD59 constant for RS485 communication is $2 \times 60 + 30 = 150$ (0096H)

Communication loss time
CD72

Setting Range	0.1 ~ 100.0SEC
Default value	0.5SEC

Set communication loss time. When communication loss time over CD72 setting, Inverter will active as CD76 selected.

Note : This function does not effect in standby condition.

Communication error counter
CD73

Setting Range	0 ~ 10
Default value	3

When communication error continuous time more than CD73 setting. Inverter will active as CD76 selected.

Address setting
CD74

Setting Range	1 ~ 255
Default Value	1

Each drive must have unique identified address if they are controlled by RS485 communication. Each address cannot be duplicated.

0 : broadcast to all inverter.

Transmission speed
CD75

Setting Range	0 ~ 3
Default Value	3

Setting the transmission speed between computer and drive.

0 : 2400 bits/second.

1 : 4800 bits/second.

2 : 9600 bits/second.

3 : 19200 bits/second.

Transmission fault treatment
CD76

Setting Range	0 ~ 3
Default Value	3

0 : Alarm and keep operation.

1 : Alarm and decelerate to stop.

2 : Alarm and free to stop.

3 : No alarm and keep operation.

Communicator protocol
CD78

Setting Range	0 ~ 7
Default Value	4

A. Date format

0 : 8,N,1 RTU (1 start bit+8 data bits+1 stop bit)

8,N,1 RTU (10-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit
-----------	---	---	---	---	---	---	---	---	----------

1 : 8,N,2 RTU (1 start bit+8 data bits+2 stop bit)

8,N,2 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit
-----------	---	---	---	---	---	---	---	---	----------	----------

2 : 8,E,1 RTU (1 start bit+8data bits+1 Even bit+1 stop bit)
 8,E,1 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Even Parity	Stop bit
--------------	---	---	---	---	---	---	---	---	----------------	-------------

3 : 8,O,1 RTU (1 start bit+8data bits+1 Odd bit+1 stop bit)
 8,O,1 RTU (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Odd Parity	Stop bit
--------------	---	---	---	---	---	---	---	---	---------------	-------------

4 : 8,N,1 ASCII (1 start bit+8data bits+1 stop bit)
 8,N,1 ASCII (10-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit
--------------	---	---	---	---	---	---	---	---	-------------

5 : 8,N,2 ASCII (1 start bit+8data bits+2 stop bit)
 8,N,2 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit
--------------	---	---	---	---	---	---	---	---	-------------	-------------

6 : 8,E,1 ASCII (1 start bit+8data bits+1 Even bit+1 stop bit)
 8,E,1 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Even Parity	Stop bit
--------------	---	---	---	---	---	---	---	---	----------------	-------------

7 : 8,O,1 ASCII (1 start bit+8data bits+1 Odd bit+1 stop bit)
 8,O,1 ASCII (11-bit)(character frame in hexadecimal)

Start bit	0	1	2	3	4	5	6	7	Odd Parity	Stop bit
--------------	---	---	---	---	---	---	---	---	---------------	-------------

B. Communication protocol

Data contents are in hexadecimal with positive and negative format.

1. RTU

Start	A silent interval of more than 10ms
Address	8-bit address
Function	8-bit command
Data (n-1)	Contents of data : n*8-bit data, n = 16
...	
Data 0	
CRC CHK Low	Check sum (CRCL)
CRC CHK High	Check sum (CRCH)
End	A silent interval of more than 10ms

2. ASCII

STX	Start character=' ' (3AH)
Address Hi	Communication address : 8-bit address consists of 2 ASCII codes.
Address Lo	
Function Hi	Command code : 8-bit command consists of 2 ASCII codes.
Function Lo	
Data (n-1)	Contents of data : n*8-bit data consist of 2n ASCII codes.
...	
Data 0	
LRC CHK High	LRC check sum : 8-bit check sum consists of 2 ASCII codes.
LRC CHK Low	
END Hi	End characters : END Hi=CR(0DH) END Lo=LF(0AH)
END Lo	

C. ASCII code description

Character	"0"	"1"	"2"	"3"	"4"	"5"	"6"	"7"
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	"8"	"9"	"A"	"B"	"C"	"D"	"E"	"F"
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

D. Function code

1. 03H : Read AC drive' s setting
2. 06H : Write parameter setting into AC drive
3. 08H : Communication loop detection

(1) 03H : Read AC drive's setting	
Computer command message	
D1 : Communication address	(00~FFh)
D2 : Function code	(03h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~67h)
D5 : Quantity of parameter (H) (word count)	(00h)
D6 : Quantity of parameter (L) (word count)	(00~10h)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)
AC drive response message	
D1 : Communication address	(01~FFh)
D2 : Function code	(03h)
D3 : Quantity of parameter (byte count)	(00~20h)
D4 : Content of data (H)	(0~FFh)
D5 : Content of data (L)	(0~FFh)
...	
Dn-1 : CRCL	(0~FFh)
Dn : CRCH	(0~FFh)

Example : Read two parameters of AC drive address 52(34H) from CD22. CD22=20.00(07D0H) CD23=30.00(0BB8H).

1. RTU

Computer command message			AC drive response message		
D1	Address	34H	D1	Address	34H
D2	Function	03H	D2	Function	03H
D3	Start address (H)	00H	D3	Quantity of data (count by byte)	04H
D4	Start address (L)	16H	D4	CD22 content (H)	07H
D5	# of data (H)	00H	D5	CD22 content (L)	D0H
D6	# of data (L)	02H	D6	CD23 content (H)	0BH
D7	CRCL	CRCL	D7	CD23 content (L)	B8H
D8	CRCH	CRCH	D8	CRCL	CRCL
			D9	CRCH	CRCH

2. ASCII

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3' Address '4'	33	D1	Address '3' Address '4'	33
		34			34
D2	Function '0' Function '3'	30	D2	Function '0' Function '3'	30
		33			33
D3	Start address '0' Start address '0'	30	D3	# of data '0' count by byte '4'	30
		30			34
D4	Start address '1' Start address '6'	31	D4	CD22 content '0' CD22 content '7'	30
		36			37
D5	# of data '0' # of data '0'	30	D5	CD22 content 'D' CD22 content '0'	44
		30			30

Computer command message			AC drive response message		
D6	# of data '0'	30	D6	CD23 content '0'	30
	# of data '2'	32		CD23 content 'B'	42
	count by word '2'		D7	CD23 content 'B'	42
D7	LRC HI	LRC HI		CD23 content '8'	38
D8	LRC LO	LRC LO	D8	LRC HI	LRC HI
	END HI	0D	D9	LRC LO	LRC LO
	END LO	0A		END HI	0D
				END LO	0A

Note 1 : The parameter values can be in integer and decimal. Each value has different process to read and write.

Refer to 8-1 lists to find out the minimum unit and value range for each parameter.

The following value processing description (Note2~3), each hexadecimal value has 4 numbers. First two numbers are D4, last two numbers are D5.

Note 2 : Processing integer number

Transfer value into hexadecimal value. The first two numbers is D4 and the last two numbers is D5.

Ex. Speed=1710 rpm

1710(decimal)=06AE(hexadecimal)

D4=06H

D5=AEH

Note 3 : Processing decimal number

Using following methods to process if the minimum parameter value is decimal number.

Minimum unit by 1st decimal number : The original value times 10 to be a new number.

Minimum unit by 2nd decimal number : The original value times 100 to be a new number.

Then,

Use this new number to transfer value into hexadecimal value.

Returning numbers to original value, the numbers need to divide by 10 or 100 if they have been timed by 10 or 100.

The first two numbers is D4 and the last two numbers is D5.

Ex. Acc. time 1 CD02=60.0 sec

$60.0 \times 10 = 600(\text{decimal}) = 0258(\text{hexadecimal})$

D4=02H

D5=58H

The value needs to divide by 10 when it returns to original shape.

(2) 06H : Write parameter setting into AC drive	
Computer command message	
D1 : Communication address	(00~FFh)
D2 : Function code	(06h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~4Eh)
D5 : Content of data (H)	(0~FFh)
D6 : Content of data (L)	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)
AC drive response message	
D1 : Communication address	(01~FFh)
D2 : Function code	(06h)
D3 : Parameter number (H)	(00h)
D4 : Parameter number (L)	(0~4Eh)
D5 : Content of data (H)	(0~FFh)
D6 : Content of data (L)	(0~FFh)
D7 : CRCL	(0~FFh)
D8 : CRCH	(0~FFh)

Computer write CD00 content (60.00HZ) to inverter address=52

1. RTU

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

2. ASCII

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '6'	36		Function '6'	36
D3	Number of parameter '0'	30	D3	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D4	Number of parameter '0'	30	D4	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D5	CD00 content '1'	31	D5	CD00 content '1'	31
	CD00 content '7'	37		CD00 content '7'	37
D6	CD00 content '7'	37	D6	CD00 content '7'	37
	CD00 content '0'	30		CD00 content '0'	30
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

Computer command message inverter address=52 forward run at 60.00HZ

1. RTU

Step 1. Write CD00=60.00HZ (6000=1770H) to AC drive address=52

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	00H	17H	70H	CRCL	CRCH

Step 2. Write address 100 (64H)=1

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	64H	00H	01H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5	D6	D7	D8
34H	06H	00H	64H	00H	01H	CRCL	CRCH

Note : When address 100=1, speed is depended on terminal setting (CF1, CF2, CF3)

2. ASCII

Step 1. Write CD00(60.00HZ) to inverter address=52

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3' Address '4'	33	D1	Address '3' Address '4'	33
		34			34
D2	Function '0' Function '6'	30	D2	Function '0' Function '6'	30
		36			36

Computer command message			AC drive response message		
D3	Number of parameter '0'	30	D3	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D4	Number of parameter '0'	30	D4	Number of parameter '0'	30
	Number of parameter '0'	30		Number of parameter '0'	30
D5	CD79 content '1'	31	D5	CD79 content '1'	31
	CD79 content '7'	37		CD79 content '7'	37
D6	CD79 content '7'	37	D6	CD79 content '7'	37
	CD79 content '0'	30		CD79 content '0'	30
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

Step 2. Write address 100 (64H)=1

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '6'	36		Function '6'	36
D3	Content of data '0'	30	D3	Content of data '0'	30
	Content of data '0'	30		Content of data '0'	30
D4	Content of data '6'	36	D4	Content of data '6'	36
	Content of data '4'	34		Content of data '4'	34
D5	CD31 content '0'	30	D5	CD31 content '0'	30
	CD31 content '0'	30		CD31 content '0'	30

Computer command message			AC drive response message		
D6	CD31 content '0' CD31 content '1'	30	D6	CD31 content '0' CD31 content '1'	30
		31			31
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

(3) 08H : Communication loop detection	
Computer command message D1 : Communication address D2 : Function code D3 : Data 1 D4 : Data 2 D5 : Data 3 D6 : Data 4 D7 : CRCL D8 : CRCH	(0~FFh) (08h) (0~FFh) (0~FFh) (0~FFh) (0~FFh) (0~FFh) (0~FFh)
AC drive response message D1 : Communication address D2 : Function code D3 : Data 1 D4 : Data 2 D5 : Data 3 D6 : Data 4 D7 : CRCL D8 : CRCH	(0~FFh) (08h) (0~FFh) (0~FFh) (0~FFh) (0~FFh) (0~FFh) (0~FFh)

AC drive response messages need to be same as command message when do communication loop detection.

Ex. Write data data 1=11, data 2=22, data 3=33 and data 4=44 to AC drive address 52(34H)

1. RTU

Computer command message			AC drive response message		
D1	Address	34H	D1	Address	34H
D2	Function	08H	D2	Function	08H
D3	Data 1	11H	D3	Data 1	11H
D4	Data 2	22H	D4	Data 2	22H
D5	Data 3	33H	D5	Data 3	33H
D6	Data 4	44H	D6	Data 4	44H
D7	CRCL	CRCL	D7	CRCL	CRCL
D8	CRCH	CRCH	D8	CRCH	CRCH

2. ASCII

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '3'	33	D1	Address '3'	33
	Address '4'	34		Address '4'	34
D2	Function '0'	30	D2	Function '0'	30
	Function '8'	38		Function '8'	38
D3	Content1 '1'	31	D3	Content1 '1'	31
	Content1 '1'	31		Content1 '1'	31
D4	Content2 '2'	32	D4	Content2 '2'	32
	Content2 '2'	32		Content2 '2'	32
D5	Content3 '3'	33	D5	Content3 '3'	33
	Content3 '3'	33		Content3 '3'	33
D6	Content4 '4'	34	D6	Content4 '4'	34
	Content4 '4'	34		Content4 '4'	34

Computer command message			AC drive response message		
D7	LRC HI	LRC HI	D7	LRC HI	LRC HI
D8	LRC LO	LRC LO	D8	LRC LO	LRC LO
	END HI	0D		END HI	0D
	END LO	0A		END LO	0A

CRC(Cyclical Redundancy Check) is calculated by the following steps:

Step 1. Load a 16-bit register (called CRC register) with FFFFH.

Step 2. Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.

Step 3. Shift the CRC registers one bit to the right with MSB zero filling. Extract and examine the LSB.

Step 4. If the LSB of CRC register is 0, repeat step 3, else Exclusive OR the CRC register with the polynomial value A001H.

Step 5. Repeat step 3 and 4 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed.

Step 6. Repeat steps 2 to 5 for the next 8-bit byte of the command message. Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value.

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from Address to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, refer to 06H at CD00=60.00HZ

$$34+06+00+00+17+70=C1H$$

the 2's-complement negation of C1H is 3FH

E. Communication error respond

Once communication error happened, inverter will respond “Function code and 80H” and communication error code to master system.

Communication error code definition

Error code	Description
01H	Function code error, only 03/06/08 available
02H	Illegal data value (data value outside limit value)
03H	Illegal data address (data address is not available)
04H	Illegal operation command
05H	Check sum error
06H	Drive busy (Interval time between two data structures are too short)
07H	Drive fault, check AC drive
0BH	Data structure too short
0CH	Data structure too long
0DH	No start code or end code in ASCII communication

1. RTU

Once communication error happend, AC drive respond as follow.

D1	D2	D3	D4	D5
Address	Function code & 80H	Error code	CRCL	CRCH

2. ASCII

Start code	3A
Address (01)	30 31
Function code & 80H (86)	38 36
Error code (02)	30 32
LRC (77)	37 37
End code H	0D
End code L	0A

Ex. Write CD00=1500HZ(3A98H), but maximum value of CD00 is 1200HZ.

1. RTU

Computer command message

D1	D2	D3	D4	D5	D6	D7	D8
01H	06H	00H	00H	3AH	98H	CRCL	CRCH

AC drive response message

D1	D2	D3	D4	D5
01H	86H	02H	CRCL(C3H)	CRCH(A1H)

2. ASCII

Computer command message			AC drive response message		
	STX	3A		STX	3A
D1	Address '0' Address '1'	30	D1	Address '0' Address '1'	30
		31			31
D2	Function '0' Function '6'	30	D2	Function '8' Function '6'	38
		36			36
D3	Address content '0' Address content '0'	30	D3	Error code '0' Error code '2'	30
		30			32
D4	Address content '0' Address content '0'	30	D4	LRC HI '7' LRC LO '7'	37
		30			37
D5	CD00 content '3' CD00 content 'A'	33		END HI	0D
		41		END LO	0A
D6	CD00 content '9' CD00 content '8'	39			
		38			
D7	LRC HI	LRC HI			
D8	LRC LO	LRC LO			
	END HI	0D			
	END LO	0A			

RUN terminal
CD91

Setting Range	0 ~ 3
Default value	0

ARR terminal
CD92

Setting Range	0 ~ 3
Default value	1

0 : RUN(CD46).

1 : ARR(CD55).

2 : Section ending signal : Terminal output 10ms long signal if each speed is finished.

3 : Cycle ending signal : Terminal output 10ms long signal if each cycle is finished.

CD00 memory mode for communication speed command
CD94

Setting Range	0 or 1
Default value	0

CD94=0

Modified CD00 at stand by mode, the data write to EEPROM.

Modified CD00 at running mode, the data don' t write to EEPROM.

CD94=1

Modified CD00 at stand by mode or running mode, the data don' t write to EEPROM.

Communication address description

Model code
CD96

To know model code, using function 03H to read address 96(06H) content.

Version of program
CD97

To know version of program, using function 03H to read address 97(61H) content.

Speed command of RS485
100

Setting Range	0 ~ 4
Default Value	3

0 : Normal

1 : Forward run

2 : Reverse run

3 : Stop

4 : Fail mode reset

Note : 1.Fail mode reset by writting address 100 content=4.

2. Speed command is CD00, or using CF1/CF2/CF3 terminal to select 2nd~8th speed (CD22~CD24, CD47~CD50).

Frequency data output for RS485
101

Unit	0.1HZ
-------------	--------------

To know output frequency, using function 03H to read address 101 content.

Fault code for RS485
103

Using 03H function to read address 103(67H) content to know the cause of fault if fault occurred.

01H : EP0

02H : PF01

03H : PF02

04H : PF03

05H : PF04

07H : OH

08H : OL

09H : EEP1

0AH : EEP2

31H : OPE1

32H : OPE2

34H : OPE4

35H : OPE5

36H : OPE6

37H : OPE7

38H : OPE8

39H : OPE9

7-2. Operation key-in sequence

EXAMPLE : CHANGE acceleration time from 10sec to 12.3sec.

Setting sequence	Display indicator	Description
		In waiting mode, the display is blinking
		Enter function mode
		Select function number 1 (parameter lock)
		Press "FUNC" again to change the parameter value
		Enable to change parameter
		Press "PROG" to save the parameter and back to standby mode
		Enter function mode
		Select function number 2 (acceleration time)
		Press "FUNC" again to change the parameter value
		Select the first digit
		Increase the value to 3
		Select the second digit
		Increase the value to 2
		Press "PROG" to save CD02=12.3 and back to standby mode.

CHANGE maximum frequency limit from 120HZ to 90HZ.

Setting sequence	Display indicator	Description
		Enter function mode
 		Increase the value to 4
 		Select the second digit
		Increase the value to 1
		Press "FUNC" again to change the Maximum frequency limit
  		Select the second digit
  		Decrease the value to 90HZ
		Press "PROG" to save CD14=90HZ and back to standby mode

8. DISPLAY ERROR CODES

A. Inverter self-checking errors

Internal protection
CPU

Noise protection.

Self test failure protection

Program check sum error
EP0

EEPROM access error
EEP1

EEPROM check-sum error
EEP2

Power device failure 1
PF01

Power device failure during acceleration

Power device failure 2
PF02

Power device failure during constant frequency

Power device failure 3
PF03

Power device failure during deceleration (stopping)

Power device failure 4
PF04

Power device failure during stand-by

B. Operation errors

Parameter Locked
OPE1

To change the contents of CD02~CD52 set CD01=press  first

FWD or REV only
OPE2

Motor direction limiter.

See function description CD08

Analog signal input only
OPE3

Motor speed command from control terminal only.

Input analog signal by Frequency knob.

See function description CD10

Terminal command only
OPE4

Accept run command from control terminal only.
 Not operation panel.
 See function description CD12

Over range error
OPE5

Operating error message ~ over range.

Logic error warning
OPE6

Logic error when setting.
 EXAMPLE : Setting F-min > F-max will result an error.

Only changed in standby
OPE7

The parameter can only be changed in standby mode.

Read only parameter
OPE8

The parameter created by system. Unable to be changed by user.

Communication error
OPE9

Over heat
OH

Over temperature for external indicator.
Refer to CD42(FT1) or CD43(FT2).

Over load
OL

9. PRECAUTIONS

9-1 Prior to maintenance, check the following :

- (1) Before maintenance, be sure to turn the power off and wait until the LED digits vanish in the display. However, approx. 50 VDC still remains immediately after the display disappears, so wait a little bit longer.**
- (2) When removing or re-installing a connector, do not pull the cable.**
- (3) Take special care not to misplace the connector. Carefully note any disconnecting or poor contact. Be sure to tighten the terminals and connectors securely.**

9-2 Application precautions

- (1) Before you start operation, thoroughly check for erroneous wiring or short circuits in the motor or in the wiring between your motor and the inverter. Do not ground the neutral point of the motor with a star connection.**
- (2) An inverter-driven run generates a certain amount of electromagnetic noise, as compared with that of driven directly by a commercial power supply. Thus you should be aware of such limitation when using an inverter-driven motor at a noise-sensitive site.**
- (3) Before setting the maximum frequency at 60HZ or higher, confirm that this operation range is acceptable with that of your motor.**
- (4) When you determine an appropriate inverter capacity, ensure that the rated current of the motor does not exceed the inverter's rated current.**
- (5) Install a mold-case circuit breaker (MCCB) at the inverter's power supply end to protect the wiring.**

10. TROUBLESHOOTING

Display symbol	Cause of fault message contents	Check point	Suggested remedy
No display	Discharge LED extinguished	Review the power system. Check that MCCB has been turned on or no poor contact.	Turned on or Replace MCCB
PF01	Power device failure during acceleration	The acceleration time is too short.	Increase the acceleration time
		Boost voltage too high	Reduce CD21 contents
		Check the motor is locked or the load is too heavy	Reduce the load factor
		Disconnecting the output wiring W.V.U. Restart (Run) the inverter check for the same message	Repair
PF02	Power device failure during constant frequency operation	Check for sudden change in load	Eliminate sudden change in load
		Check that the ambient temperature is too high	Reduce the ambient temperature
PF03	Power device failure during deceleration	The load inertia is excessive	Increase the deceleration time
		Over voltage	Connect braking resistor
PF04	Power device failure during stand-by	Check around the noise source	Remove the cause
		Power supply voltage is too high	Reduce the voltage
EEP1	EEPROM access error	Communication reset error	Refer to address 100 description
		Rework with previous process, if same message happen again.	Repair
EEP2	EEPROM check-sum error	Rework with previous process, if same message happen again.	Repair

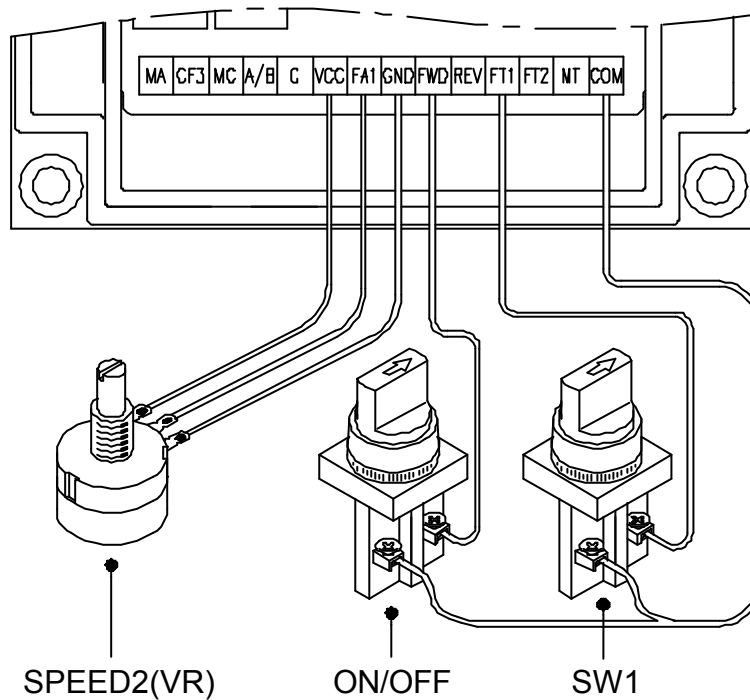
11. APPLICATION

EXAMPLE 01 : Using rheostat for 2stage speed setting

DESCRIPTION :

CD12 = 1 ; Terminal command (For External)
CD44 = 8 ; 2nd speed singnal enter from FA1
 Set FT1 jumper at CF1, see 4-1 description.

SPEED	TERMINAL	SPEED COMMAND ENTRY
	SW1	
1	OFF	FREQUENCY KNOB
2	ON	VR2



EXAMPLE 02 : Normal / Jog operation

DESCRIPTION :

CD00 = Normal speed ; User setting

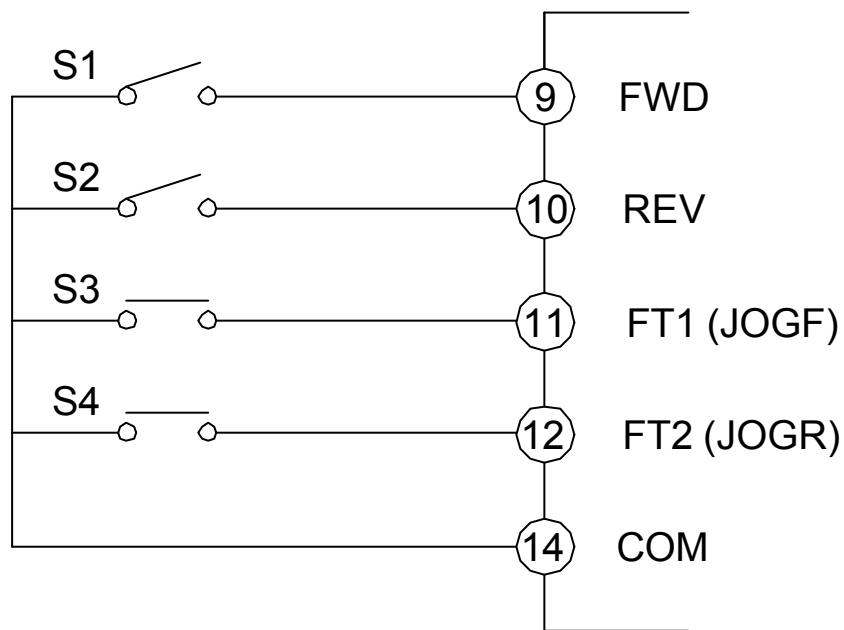
CD04 = Jog speed ; User setting

CD12 = 1 ; Terminal command (For External)

CD42 = 1 ; Define FT1 Terminal = JOGF function

CD43 = 2 ; Define FT2 Terminal = JOGR function

Set FT1 jumper at FT1 and FT2 jumper at FT2, see 4-1 description on page 14.



NORMAL / JOG

S1 = FWD SW

S2 = REV SW

S3 = FWD JOG SW

S4 = REV JOG SW

EXAMPLE 03 : Auto multi-speed and time programing

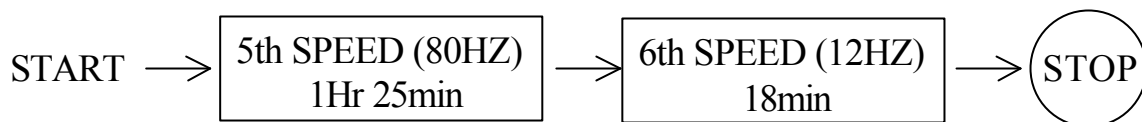
DESCRIPTION :

Speed :CD47=80 (High speed)

Speed:CD48=12 (Low speed)

Time:CD59=1.25

Time:CD60=0.18



Value	Description
0	Timer disable
1	Speeds with timer for one cycle then stop
2	Speeds with timer for running continually until receive stop command
3	Speeds with timer for one cycle then stop. There is a stop between each speed.
4	Speeds with timer for running continually until receive stop command. There is a stop between each speed.

Function setting:

- | | |
|------------|---------------|
| 1. CD01=1 | 8. CD21=8 |
| 2. CD58=1 | 9. CD27=1 |
| 3. CD47=80 | 10. CD59=1.25 |
| 4. CD48=12 | 11. CD60=0.18 |
| 5. CD49=0 | 12. CD61=0 |
| 6. CD50=0 | 13. CD62=0 |
| 7. CD00=0 | 14. CD63=0 |

Remark:

1. Setting CD27=16, if noise is much.
2. Setting CD21, if start torque is not enough.

EXAMPLE 04 : 8th speed from terminal control

DESCRIPTION :

CD12=1

CD42=6

CD58=0

CD00 : 1st speed

CD22 : 2nd speed

CD23 : 3rd speed

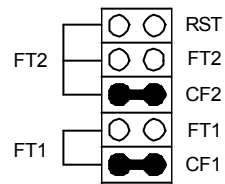
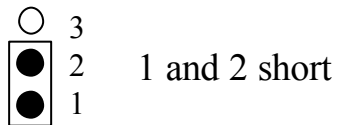
CD24 : 4th speed

CD47 : 5th speed

CD48 : 6th speed

CD49 : 7th speed

CD50 : 8th speed



Terminal Speed	FT1 (CF1)	FT2 (CF2)	CF3
1st speed	OFF	OFF	OFF
2nd speed	ON	OFF	OFF
3rd speed	OFF	ON	OFF
4th speed	ON	ON	OFF
5th speed	OFF	OFF	ON
6th speed	ON	OFF	ON
7th speed	OFF	ON	ON
8th speed	ON	ON	ON

12. Inverter Selection

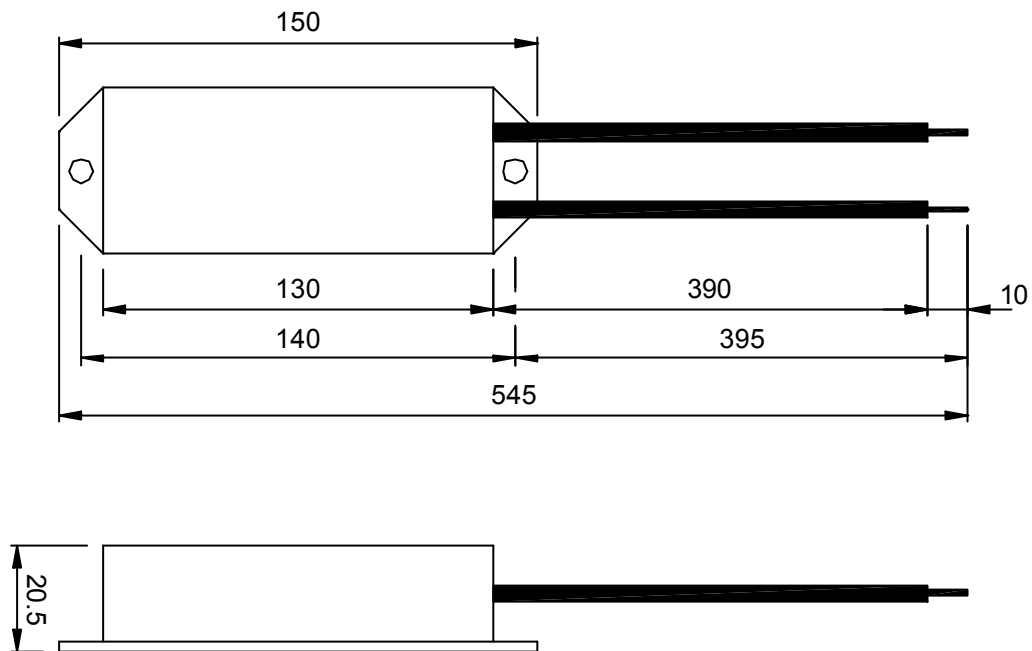
Inverter Capacity Check Method

Description		Related factor
Load characteristics	Load type	Friction load and weight load Liquid(viscous) load inertia load Load with power transmission and accumulation
	Load speed and torque characteristics	Constant torque Constant power Decreasing torque
	Load characteristics	Motoring Braking or overhanging load Constant load Shock load Repetitive load High-start torque Low-start torque
Operation	Continuous operation Long-time operation at medium or low speeds Short-time operation	
Rated output	Maximum required output(instantaneous) Constant output(continuous)	
Rated rpm	Maximum rpm Rated rpm	
Power supply	Power supply transformer capacity and percentage impedance Voltage fluctuations Number of phases, less phase protection Frequency	
Deterioration of load capacity due to age	Mechanical friction, losses in wiring	
	Duty cycle modification	

Speed and Torque Characteristics	Time Ratings	Overload Capacity	Starting torque

13. APPENDIX

A. Option braking resistor



Part no : E-MSAA-008000

Specification : 60Ω 80W

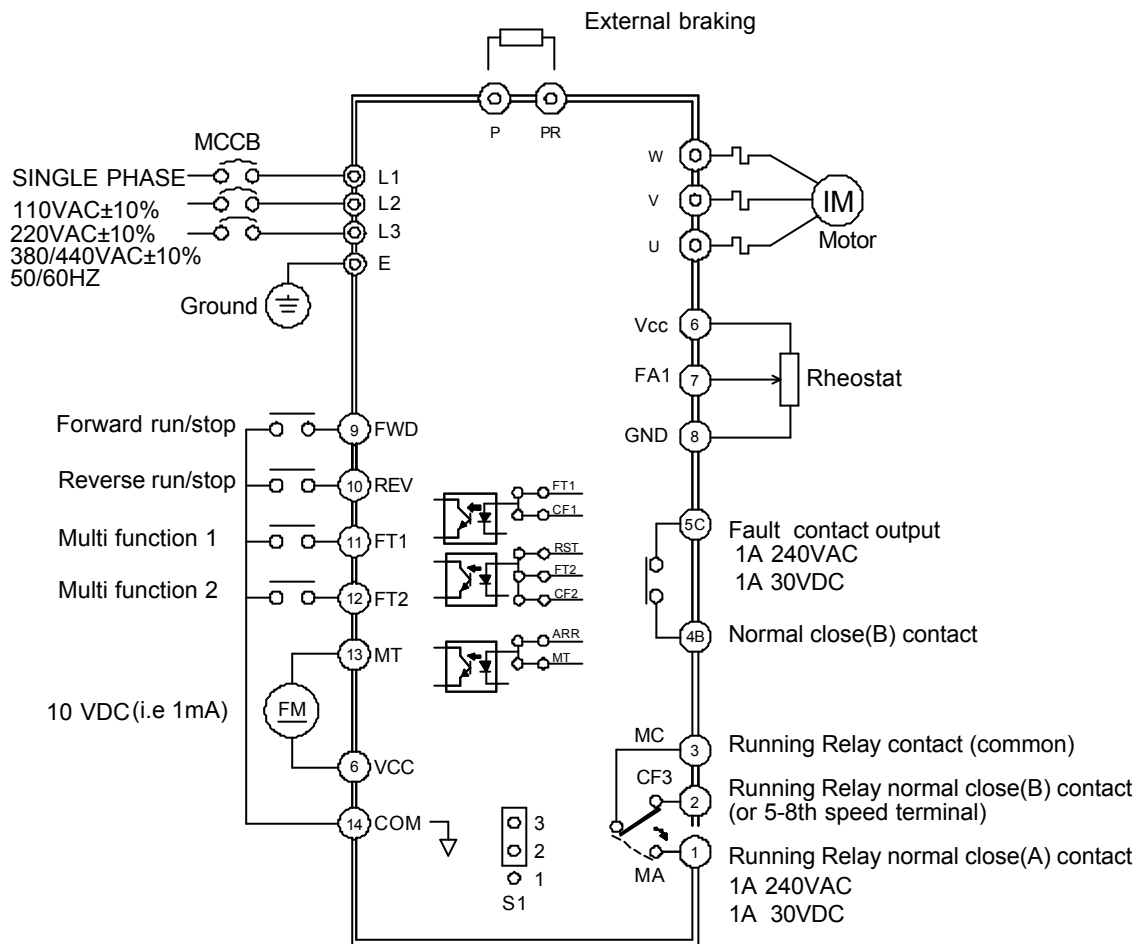
Remove build-in dynamic brake resistor.

Connect a larger capacity resistor, the value should be greater than the table below :

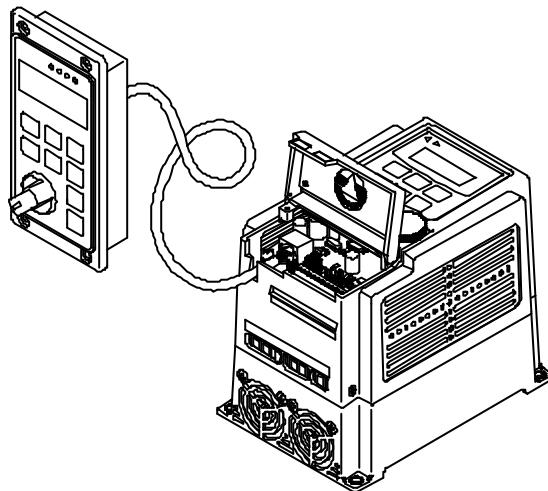
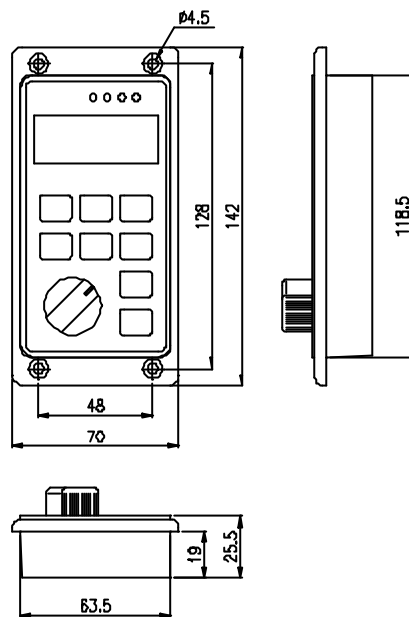
Unit : Ohm

Model No	02	04	07	15	22	37
MS1	--	60	--	--	--	--
MS2	60	60	60	60	60	60
MS4	--	--	180	180	180	180

B. Terminals wiring diagram



C. Remote operator



UNIT : M/M

A-0000-F306G3	F306 Remote operator
E-092A-010200	1 meter extension cable
E-092A-030200	3 meter extension cable
E-092A-050200	5 meter extension cable

D. MS4 EMC optional parts

Use EMI Filter and clip core to reduce EMC effects.

Dimension

Fig 1

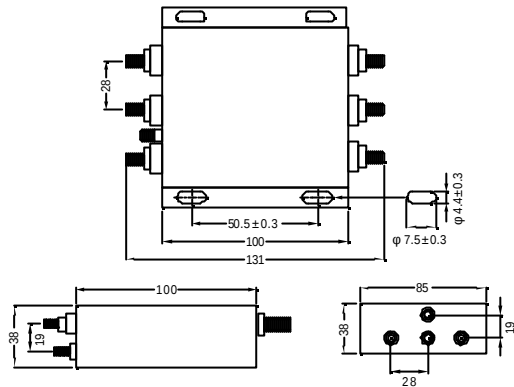
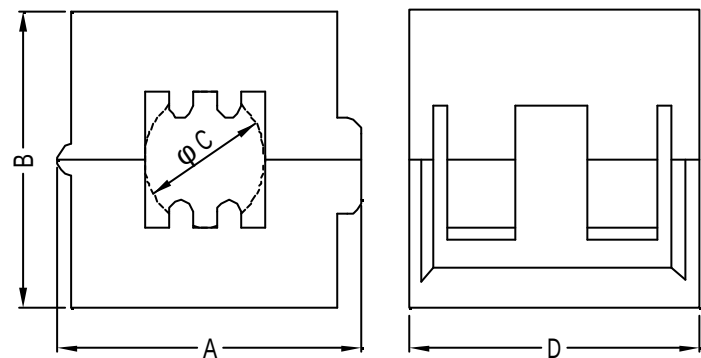
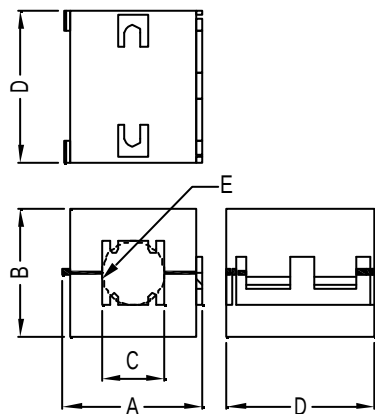


Fig 2



A	25.50± 1.00mm
B	23.50± 1.00mm
C	10.0± 0.30mm
D	33.00± 1.00mm

Fig 3



A	25.50± 1.00mm
B	23.50± 1.00mm
C	11.5± 1.00mm
D	32.50± 1.00mm
E	10.15± 0.4mm

Part number	Part name	Specification
E-EMIF-1044A1	CPD-1044A	EMI Filter 440/250V 10A
E-EMIF-2044A1	CPD-2044A	EMI Filter 440/250V 20A
E-EMIC-0100B1	CTNF-100B	Clip core (100B)
E-EMIC-0100B2	KCF-100B	Clip core (100B)

Models	Conduction Emission	Radiation Emission
MS4-307~315	CPD-1044A (Fig1)	CTNF-100B (Fig2)
		KCF-100B (Fig3)
MS4-322~337	CPD-2044A (Fig1)	CTNF-100B (Fig2)
		KCF-100B (Fig3)

MEMO

INSTRUCTION MANUAL

PART NO : E-PHAA-EMSA09

Model : MS series

SEP. 2012 9th edition

ISO 9001 



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