

Variable Frequency Drive AP4G3



CONTENTS

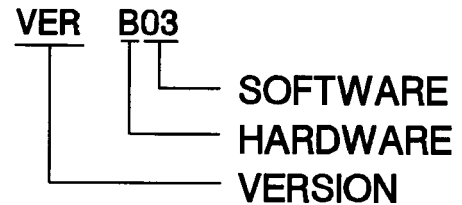
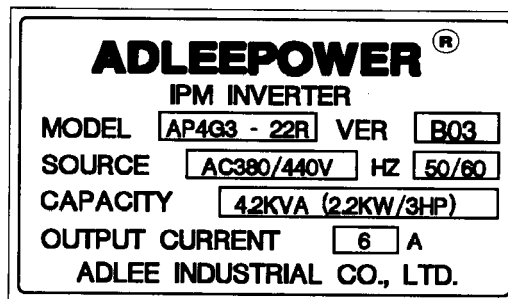
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0. PREFACE

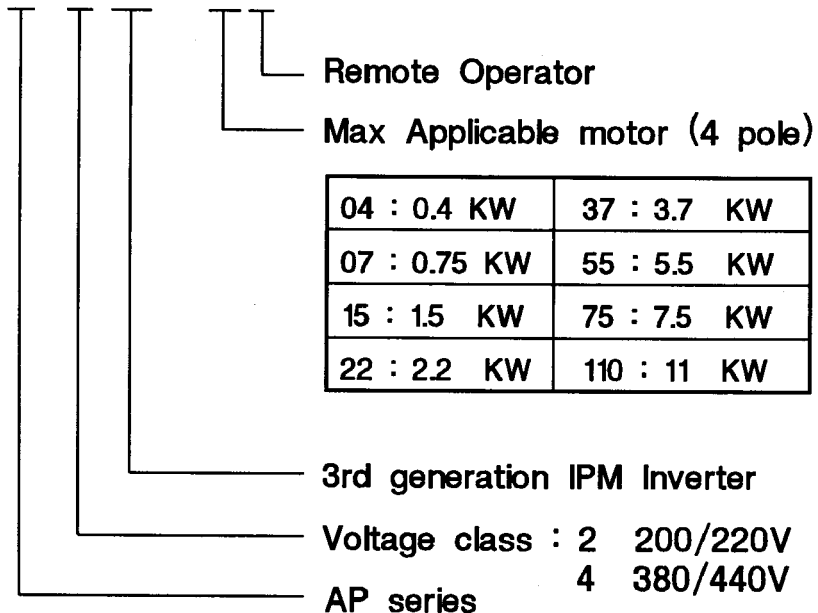
Before installation and wiring, check to see :

- (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.



MODEL : AP 4 G3 - 22R



1. SPECIFICATION

| Model | AP2G3 | | | | | | | AP4G3 | | | | | | |
|--------------------------------|------------------------------------|---|-----|-----|-------------------------|-----|------|--------------------------------|-----|-----|--------------|-----|------|-----|
| Voltage | 1 or 3 ϕ 220V \pm 10% | | | | 3 ϕ 220V \pm 10% | | | 3 ϕ 380V / 440V \pm 10% | | | | | | |
| Model no | 04 | 07 | 15 | 22 | 37 | 55 | 75 | 07 | 15 | 22 | 37 | 55 | 75 | 110 |
| Input Frequency | 50HZ ~ 60HZ \pm 5% | | | | | | | | | | | | | |
| Output Voltage | 3 ϕ 220V | | | | | | | 3 ϕ 380V~440V | | | | | | |
| Output Frequency | 0.50HZ - 400HZ | | | | | | | | | | | | | |
| Output Rated current(A) | 3 | 5 | 8 | 11 | 17 | 24 | 33 | 25 | 4 | 6 | 9 | 12 | 17 | 23 |
| Capacity(KVA) | 1.1 | 1.9 | 3.1 | 4.2 | 6.5 | 9.2 | 12.6 | 1.9 | 3.1 | 4.2 | 6.5 | 9.2 | 12.6 | 17 |
| Largest motor KW(2.4.6 poles) | 0.4 | 0.7 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 0.7 | 1.5 | 2.2 | 3.7 | 5.5 | 7.5 | 11 |
| Control | Sine wave pulse width modulation | | | | | | | | | | | | | |
| Braking | Regenerative discharge bracking | | | | | | | | | | | | | |
| Over current Capacity | 150% of rated current (1 minutes) | | | | | | | | | | | | | |
| Acceleration time | 0.1 ~ 6000 SEC | | | | | | | | | | | | | |
| Deceleration time | 0.1 ~ 6000 SEC | | | | | | | | | | | | | |
| Frequency setting | Digital | Use keyboard    for setting and confirm by  | | | | | | | | | | | | |
| | Anglog | Analog signal input 0 to +10VDC | | | | | | | | | | | | |
| Output signal | Open collector output 50V 50mA Max | | | | | | | | | | | | | |
| Cooling Method | Self - cooled | | | | Air - cooled | | | Self cooled | | | Air - cooled | | | |
| Dimension drawing | Fig 1 | | | | Fig 2 | | | Fig 1 | | | Fig 2 | | | |
| Weight (KG) | 3.2 | 3.2 | 3.2 | 3.3 | 5.5 | 6.2 | 6.6 | 3.2 | 3.2 | 3.3 | 5.4 | 6.2 | 6.6 | 6.7 |

2. DIMENSION DRAWINGS

(AP2G3-04 AP2G3-07 AP2G4-15 AP2G3-22)
(AP4G3-07 AP4G3-15 AP4G3-22)

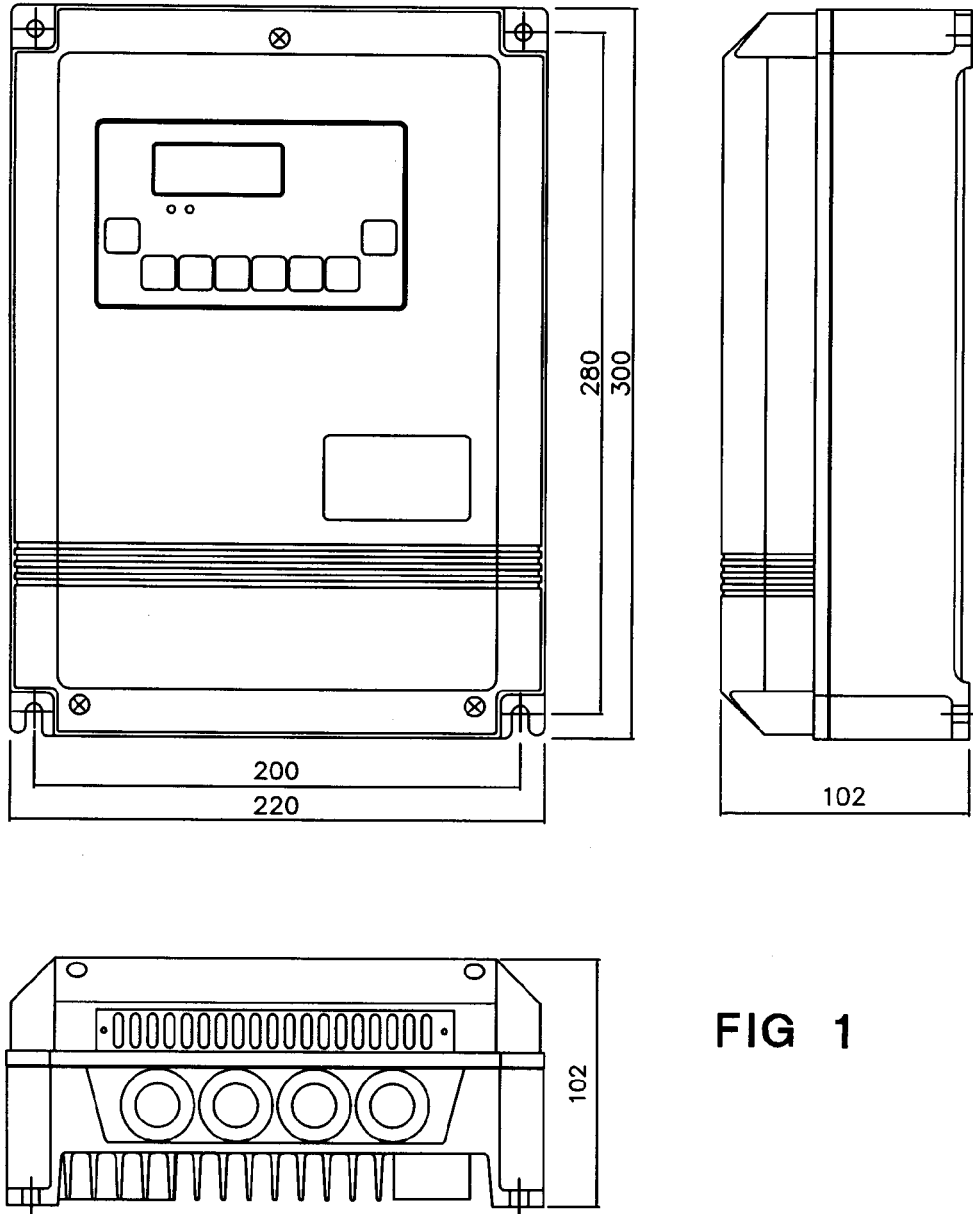


FIG 1

(AP2G3-37 AP2G3-55 AP2G3-75)
(AP4G3-37 AP4G3-55 AP4G3-75 AP4G3-110)

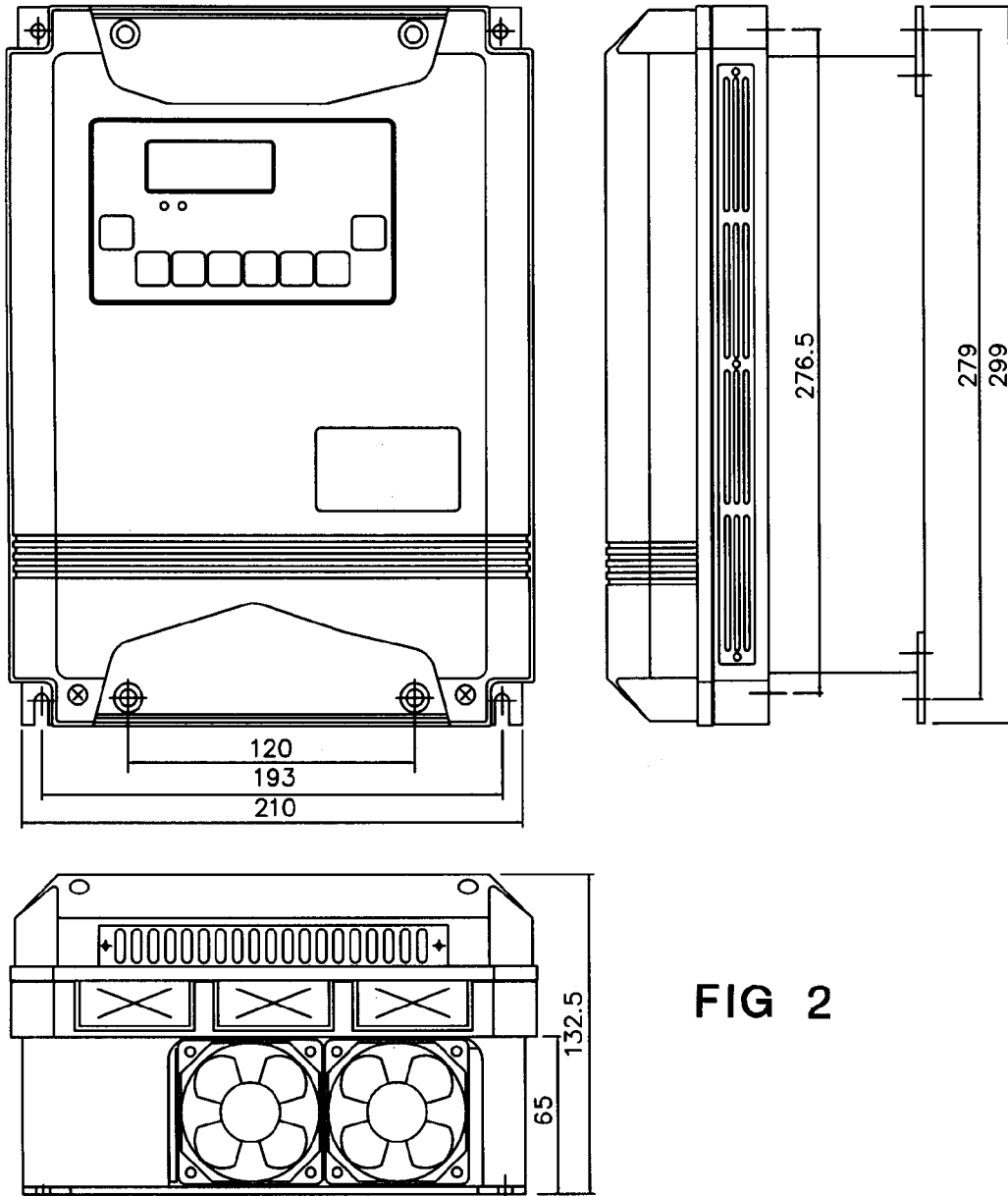


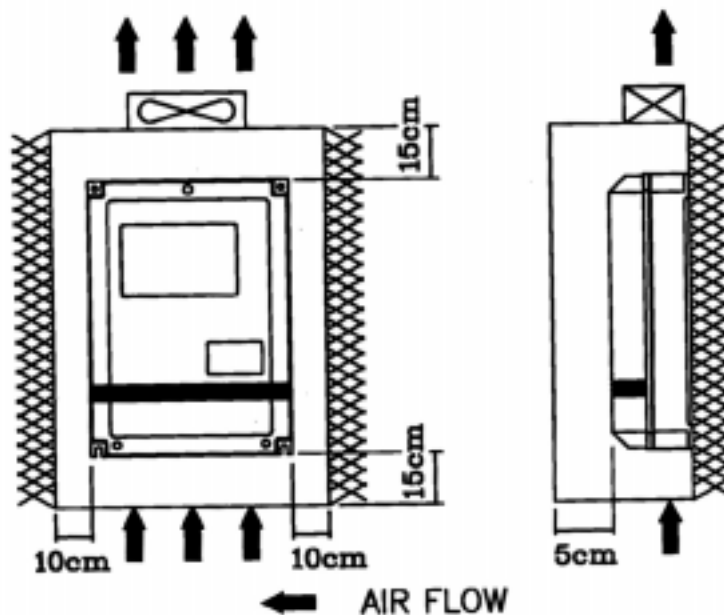
FIG 2

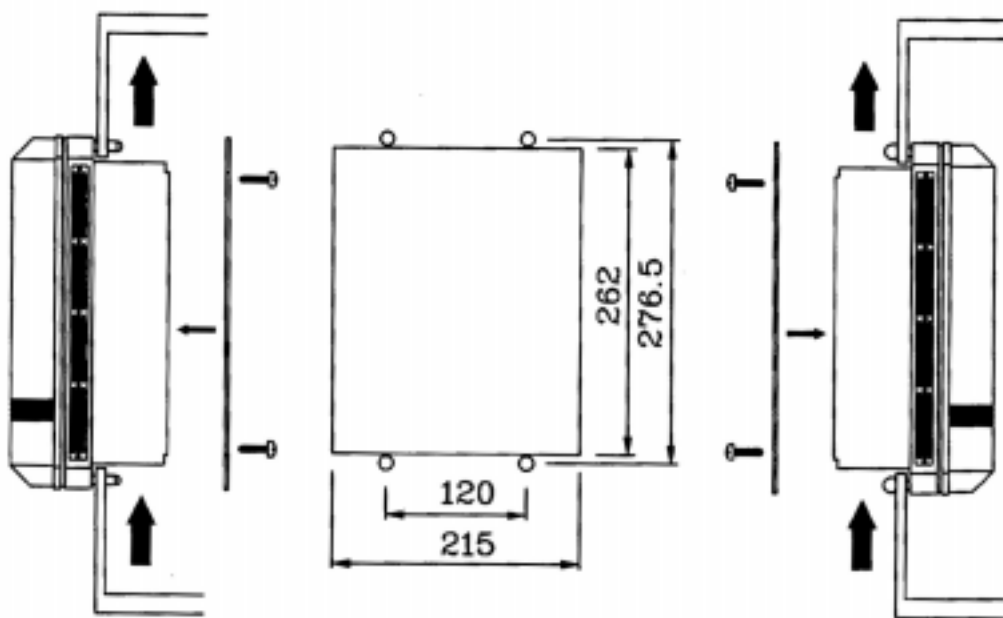
3. INSTALLATION

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

Before operating the APxG3 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 $-10^{\circ}\text{C} \sim 45^{\circ}\text{C}$. ($14^{\circ}\text{F} \sim 113^{\circ}\text{F}$).
- (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.

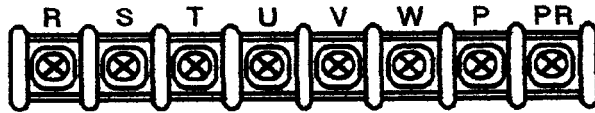




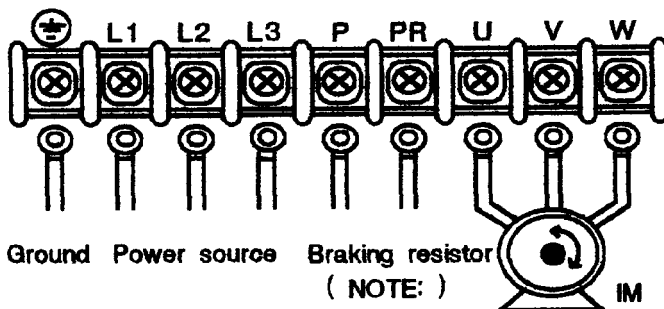
← AIR FLOW

4. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram



AP2(4)G3-37..110



AP2(4)G3-04..22

Ground Power source Braking resistor
(NOTE:)

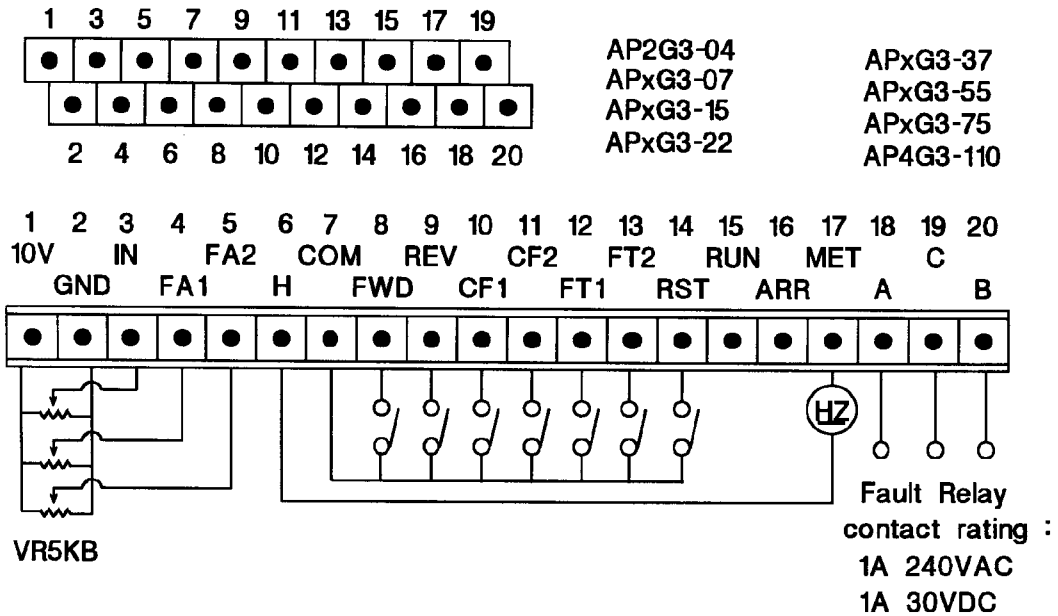
| Main circuit terminal | | | |
|-----------------------|--------|--------------------------|---|
| No | Symbol | Terminal name | Description |
| 1 | | Ground terminal | $\leq 5 \text{ OHM}$ |
| 2 | R | Inverter power source | Terminal connecting with power source |
| 3 | S | | |
| 4 | T | | |
| 5 | P | DC voltage terminal | Regenerative braking resistor connecting terminal |
| 6 | PR | | |
| 7 | U | Inverter output terminal | Terminal connecting with motor |
| 8 | V | | |
| 9 | W | | |

NOTE : Release the internal braking resistor when connect external braking resistor.

(2) Analog signal switch setting

| SIGNAL | IN | FA1 | FA2 |
|----------------------------|----|-----|-----|
| 0 - 10V | | | |
| 0 - 5V | | | |
| 4 - 20mA (★ NOTE 1 :) | | | |
| Error setting | | | |

(3) Control circuit terminal



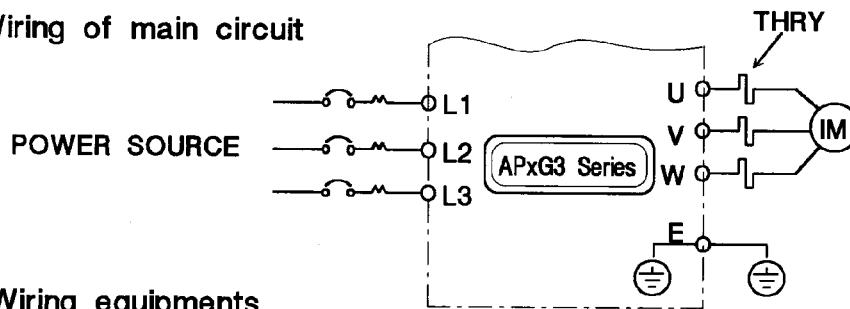
★ NOTE 1 : 4-20mA function description

| TERMINAL | FUNCTION CODES |
|----------|----------------|
| IN | CD33/CD34/CD35 |
| FA1, FA2 | CD44/CD45/CD54 |

| Control circuit terminal | | | | | | | | | | | | | | | | | | |
|--------------------------|--------|---------------------------|---|-------|-----|-------|-----|-----|-----------|----|-----|-----------|-----|----|-----------|----|----|-----------|
| No | Symbol | Terminal name | Description | | | | | | | | | | | | | | | |
| 1 | 10V | Analog source | Power source +10V of analog terminals | | | | | | | | | | | | | | | |
| 2 | GND | Analog common terminal | Common terminal of free analog terminals | | | | | | | | | | | | | | | |
| 3 | IN | Analog input | Terminal for frequency setting | | | | | | | | | | | | | | | |
| 4 | FA1 | Free analog terminal 1 | See function description CD44 | | | | | | | | | | | | | | | |
| 5 | FA2 | Free analog terminal 2 | See function description CD45 | | | | | | | | | | | | | | | |
| 6 | H | Ref. voltage | Basic source (+10V) terminal for frequency | | | | | | | | | | | | | | | |
| 7 | COM | Common terminal | Common terminal of control board | | | | | | | | | | | | | | | |
| 8 | FWD | Forward operation | Forward operation / stop terminal | | | | | | | | | | | | | | | |
| 9 | REV | Reverse operation | Reverse operation / stop terminal | | | | | | | | | | | | | | | |
| 10 | CF1 | Multistage speed terminal | <table border="1"> <thead> <tr> <th>CF1</th> <th>CF2</th> <th>SPEED</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>SPEED - 1</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>SPEED - 2</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>SPEED - 3</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>SPEED - 4</td> </tr> </tbody> </table> | CF1 | CF2 | SPEED | OFF | OFF | SPEED - 1 | ON | OFF | SPEED - 2 | OFF | ON | SPEED - 3 | ON | ON | SPEED - 4 |
| CF1 | CF2 | | | SPEED | | | | | | | | | | | | | | |
| OFF | OFF | SPEED - 1 | | | | | | | | | | | | | | | | |
| ON | OFF | SPEED - 2 | | | | | | | | | | | | | | | | |
| OFF | ON | SPEED - 3 | | | | | | | | | | | | | | | | |
| ON | ON | SPEED - 4 | | | | | | | | | | | | | | | | |
| 11 | CF2 | | | | | | | | | | | | | | | | | |
| 12 | FT1 | Multi function terminal 1 | See functions description of Cd42 | | | | | | | | | | | | | | | |
| 13 | FT2 | Multi function terminal 2 | See functions description of Cd43 | | | | | | | | | | | | | | | |
| 14 | RST | Reset | Reset | | | | | | | | | | | | | | | |
| 15 | RUN | Operation output terminal | Open collector output 50Vdc 50mA Max. | | | | | | | | | | | | | | | |
| 16 | ARR | Frequency arrival signal | | | | | | | | | | | | | | | | |
| 17 | MET | Frequency meter terminal | | | | | | | | | | | | | | | | |
| 18 | A | Alarm output A | Fault alarm contact (normal open) | | | | | | | | | | | | | | | |
| 19 | C | Alarm output C | Fault alarm contact (common) | | | | | | | | | | | | | | | |
| 20 | B | Alarm output B | Fault alarm contact (normal close) | | | | | | | | | | | | | | | |

(4) WIRING

(4-1) Wiring of main circuit



(4-2) 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 frequently for start/stop operation, or will lead to a 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 | AP2G3 | | | | | | | AP4G3 | | | | | | |
|--------------------------------|-------|-----|-----|-----|-----|-----|------|-------|-----|-----|-----|-----|------|-----|
| | 04 | 07 | 15 | 22 | 37 | 55 | 75 | 07 | 15 | 22 | 37 | 55 | 75 | 110 |
| Model No | 04 | 07 | 15 | 22 | 37 | 55 | 75 | 07 | 15 | 22 | 37 | 55 | 75 | 110 |
| Capacity (KVA) | 1.1 | 1.9 | 3.1 | 4.2 | 6.5 | 9.2 | 12.6 | 1.9 | 3.1 | 4.2 | 6.5 | 9.2 | 12.6 | 17 |
| Current (A) | 3 | 5 | 8 | 11 | 17 | 24 | 33 | 2.5 | 4 | 6 | 9 | 12 | 17 | 23 |
| Circuit Breaker (MCCB) (A) | 10 | 10 | 15 | 20 | 20 | 30 | 50 | 10 | 10 | 10 | 15 | 20 | 30 | 50 |
| Electro-Magnetic Contactor (A) | 12 | 12 | 12 | 12 | 18 | 35 | 50 | 12 | 12 | 12 | 12 | 18 | 18 | 35 |
| Thermal relay RC value (A) | 2.4 | 3.8 | 6.8 | 9 | 15 | 20 | 28 | 1.9 | 3.4 | 3.8 | 6.8 | 9 | 15 | 20 |

(4-3) 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.

(4-4) 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 RFI noise and leakage current. (Refere to the table below)

| Distance INVERTER ←→ MOTOR | under 25M | under 50M | under 100M | above 100M |
|-------------------------------|----------------|----------------|---------------|-----------------|
| APxG3 SERIES | under 16KHZ | under 10KHZ | under 5KHZ | under 2.5KHZ |

(4-5) Wiring and cautionary points

A. Main circuit

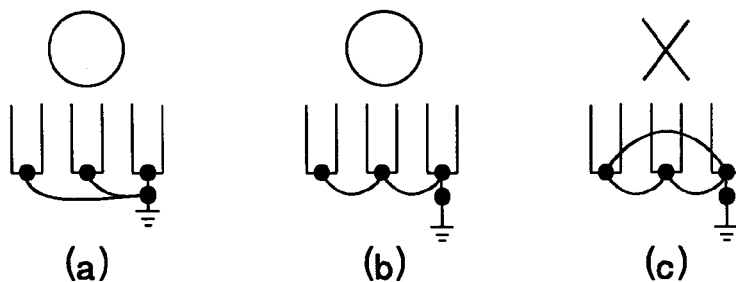
1. Don't Connect the cables of the power supply side (L1,L2,L3) to the U,V and W output terminals for the motor.
2. Don't connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
3. Don't put the advance phase capacitor between the inverter and motor.
4. Put MCCB in the input power supply.

B. Control signal circuit

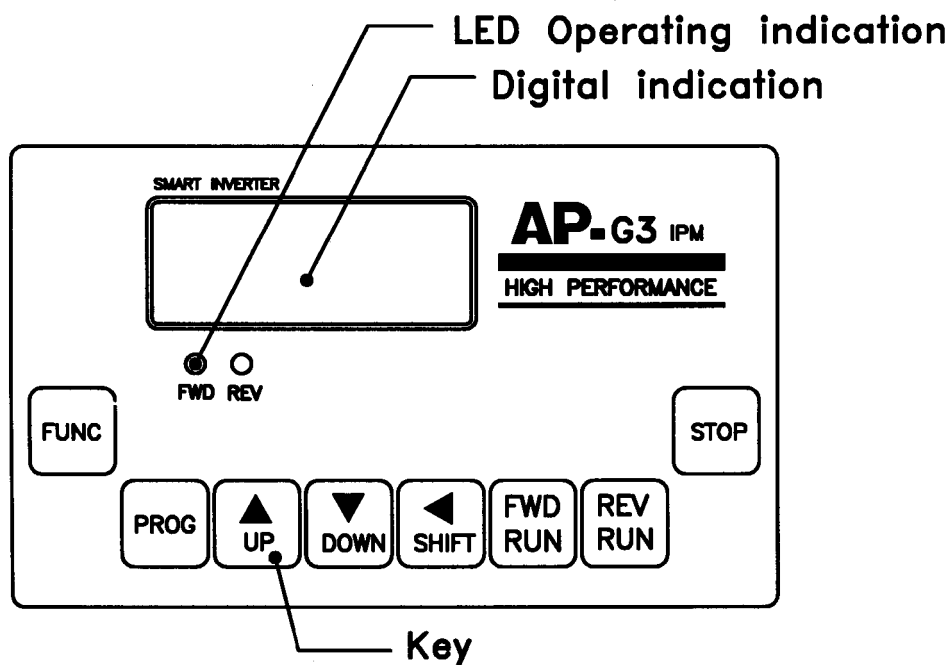
1. Separate the power cables of main circuit etc. from the control cables of the sequence and analog signals by passing the cables through the different ducts.
2. Use twisted pair shielded wire for control signal and connect the shield to earth terminal at on end, COMMON terminal of control board. Leave the other end of shielding 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. Shielded cables used to protect low-level signal leads should grounded at one end point.
4. Provide class 3 grounding (100Ω or less) for a terminal.
5. When grounding several inverters, make connections as shown below, no loop is produced as shown in FIG(a) and FIG(b).



5. 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 value |
| | FUNC | Function | Press once to select function CDxx and press again to change its content |
| | STOP | Stop | Stop operation / Escape to standby mode |

6. FUNCTIONS DESCRIPTION

| DISPLAY ORDER | FUNCTION NAME | STANDARD SETTING VALUE |
|---------------|---------------|-------------------------------|
| ☆ | CD00 | First speed setting |
| | | U : 60 HZ E : 50 HZ |
| | CD01 | Parameter lock |
| | CD02 | Acceleration time 1 |
| | CD03 | Deceleration time 1 |
| | CD04 | Jogging frequency |
| | CD05 | Start frequency |
| | CD06 | Jog mode |
| ☆ | CD07 | Analog output gain |
| | | U : 120Hz E : 100Hz |
| | CD08 | CW or CCW or CW/CCW |
| | CD09 | Search speed function |
| | CD10 | Keyboard / Frequency knob |
| | CD11 | Dynamic brake/Free running |
| ☆ | CD12 | Terminal/Key board command |
| | | U : 0 E : 1 |
| | CD13 | Reserved |
| ☆ | CD14 | Maximum frequency limit |
| | | U : 120 HZ E : 50 HZ |
| | CD15 | Minimum frequency limit |
| ☆ | CD16 | Frequency display Scale |
| | | U : 1 E : 30 |
| ☆ | CD17 | 1st Maximum voltage frequency |
| | | U : 60 HZ E : 50 HZ |
| | CD18 | V/F pattern setting |
| | CD19 | DC braking time |
| | CD20 | DC braking power |

☆ Different initial set value for E: European version and U: US version.
To change version see description of CD52.

| DISPLAY ORDER | FUNCTION NAME | STANDARD SETTING VALUE |
|---------------|------------------------------------|------------------------|
| CD21 | Torque boost | 0 % |
| CD22 | Second speed setting | 20 HZ |
| CD23 | Third speed setting | 30 HZ |
| CD24 | Fourth speed setting | 40 HZ |
| CD25 | Acceleration time 2 | 10 Sec |
| CD26 | Deceleration time 2 | 10 Sec |
| CD27 | Carrier frequency | 16 KHZ |
| CD28 | Output voltage gain | 100 % |
| CD29 | Frequency jump 1 | 0 HZ |
| CD30 | Frequency jump 2 | 0 HZ |
| CD31 | Frequency jump 3 | 0 HZ |
| CD32 | Jump range | 0.5 HZ |
| CD33 | Frequency reference bias | 0 |
| CD34 | Frequency reference bias direction | 0 |
| CD35 | Frequency gain | 100.0 % |
| CD36 | The latest errors record | NONE |
| CD37 | Errors record 1 | NONE |
| 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 | FA2 Free Analog Terminal 2 | 0 |
| CD46 | RESERVED | |
| CD47 | 5th speed setting | 25 HZ |
| CD48 | 6th speed setting | 35 HZ |

| DISPLAY ORDER | FUNCTION NAME | STANDARD SETTING VALUE |
|---------------|-------------------------------|------------------------|
| CD49 | 7th speed setting | 45 HZ |
| CD50 | 8th speed setting | 55 HZ |
| CD51 | Dynamic Braking Energy Limit | 100 |
| ☆ CD52 | Version selector | |
| CD53 | S curve | 0 |
| CD54 | 4-20mA speed command | 0 |
| CD55 | Frequency arrive signal range | 10 % |
| CD56 | 2nd Maximum voltage frequency | 120HZ |
| CD57 | NO.of auto restart attempt | 0 |




☆ This function provides different standard setting values for European and US Version.

U: US version for USA, CANADA etc.

E: European Version for Europe, Australia, Singapore etc.

6.1 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 U.V.W. (output terminals). (Wrong connections will damage the inverter.)
- (2) Check that the input power supply is $220\text{VAC} \pm 10\%$, $50/60\text{HZ} \pm 5\%$ for AP2G3 and $380 \sim 440\text{VAC} \pm 10\%$, $50/60\text{HZ} \pm 5\%$ for AP4G3 series.
- (3) Check the signal lines for wrong wiring.
- (4) Be sure to ground an earth terminal for personnel safety.
- (5) Check that other terminals than earth terminal are not grounded.
- (6) Check that the inverter is mounted on the wall. Also check that non-flammable material, U.V.W. (output terminals). (Wrong connection will damage the inverter.)
- (7) For operation start and stop, use , ,  and FWD/REV terminals. Never use input power supply to switch ON/OFF.

Operation

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



function: (a) Press    for function setting and confirm by .


Speed: (a) Using   to change motor speed with 1 HZ 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.

| |
|---------------------|
| First speed setting |
| CD00 |

| | |
|------------------|-------------|
| Setting Range | 0 -- 400 HZ |
| USA Version | 60 HZ |
| European Version | 50 HZ |

Press   key for increase or decrease the speed with 1 HZ increment.

Press  key to select the digit for quick setting.

Press  to save the setting value


| |
|----------------|
| Parameter lock |
| CD01 |

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

0 : Lock 1 : Unlock

Function to prevent inadequate setting.

To change the contents CD02 -- CD57, set

CD01=1 and press  first.

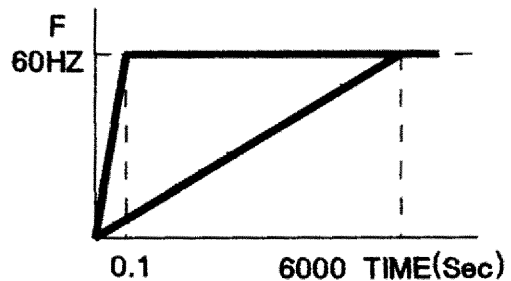
To lock the data set CD01=0 and press .

| |
|---------------------|
| Acceleration time 1 |
| CD02 |

| | |
|-----------------|-----------------|
| Setting Range | 0.1 -- 6000 sec |
| Factory Setting | 10 sec |

CD02 value corresponds to the time of acceleration from 0 to 50/60Hz.

(For 120Hz. setting, the arrival time to 120Hz is double.)

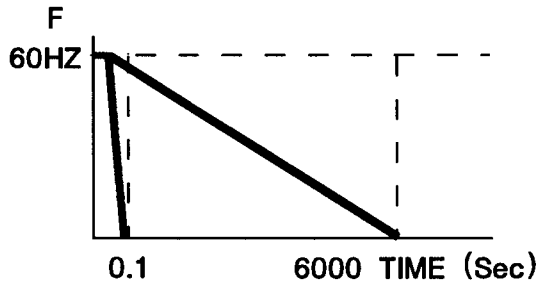


Deceleration time 1

CD03

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

| | |
|-----------------|-----------------|
| Setting Range | 0.1 -- 6000 sec |
| Factory Setting | 10 sec |

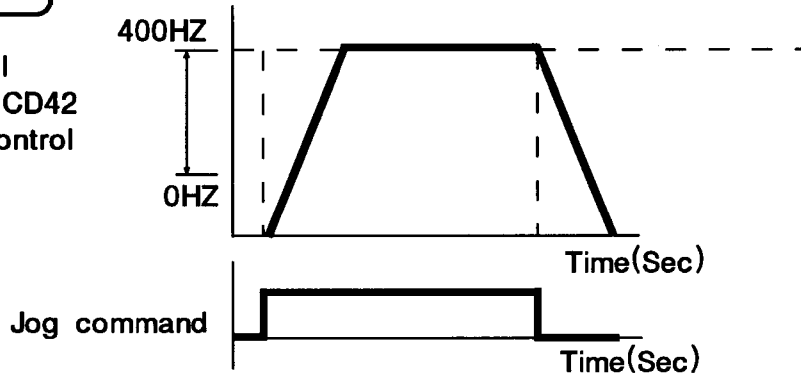


Jogging frequency

CD04

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

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 5 HZ |

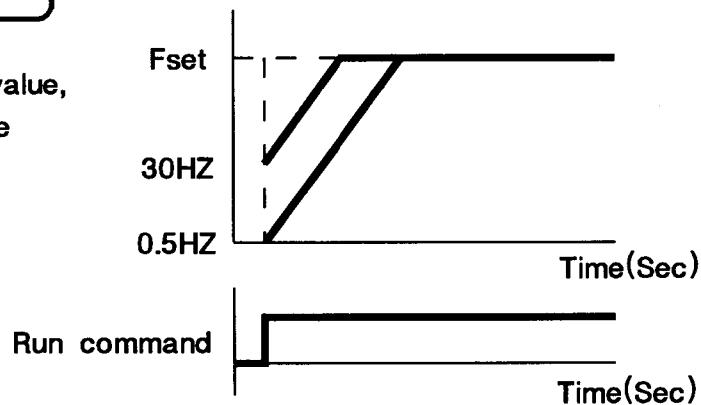


Start frequency

CD05

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

| | |
|-----------------|--------------|
| Setting Range | 0.5 -- 30 HZ |
| Factory Setting | 0.5 HZ |



| |
|-------------|
| Jog mode |
| CD06 |

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

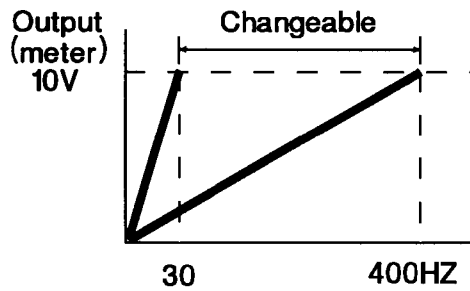
0 : Normal 1 :Jog Mode

- 1 . Set jogging operation from key panel **FWD RUN** & **REV RUN**
- 2 . **REV RUN** **FWD RUN** LED blinking in JOG mode.

| |
|--------------------|
| Analog output gain |
| CD07 |

| | |
|------------------|---------------|
| Setting Range | 30.00 - 400HZ |
| USA Version | 120.00HZ |
| European Version | 100.00HZ |

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 output meter.



| |
|---------------------|
| CW or CCW or CW/CCW |
| CD08 |

| | |
|-----------------|-------|
| Setting Range | 0 - 2 |
| Factory Setting | 0 |

- 0 : CW/CCW operation
- 1 : CW only
- 2 : CCW only

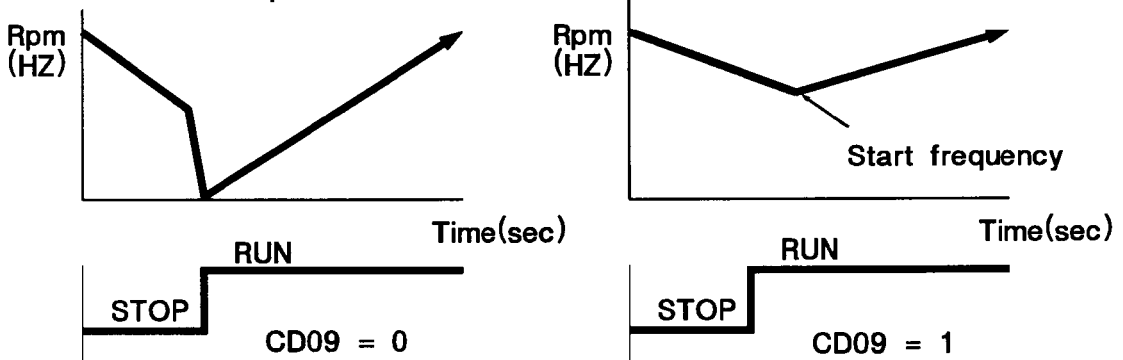
If inadequate operation, the "OPE2" warning message would be indicated.

Search speed function

CD09

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

- 0: Normal operation
- 1: Search Motor speed when start



Analog/Digital frequency

CD10

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

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

1 : Operation frequency depends on the angle of the knob

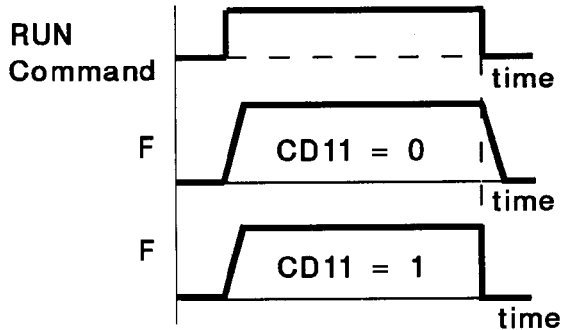
Note: Using key to change motor speed when CD01=0, the "OPE3" warning message would be indicated.

Dynamic brake/Free running

CD11

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

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



Terminal/Key board command

CD12

| | |
|------------------|--------|
| Setting Range | 0 or 1 |
| USA version | 0 |
| European version | 1 |

0 : RUN/STOP Command from operation panel

1 : RUN/STOP Command from control terminal

Note : If inadequate operation, the " OPE4 " warning message would be indicated.

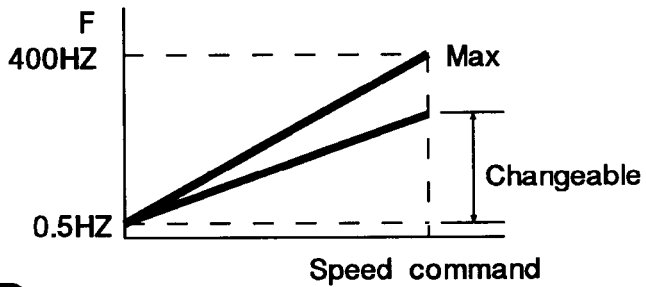
Reserved

CD13

Maximum frequency limit

CD14

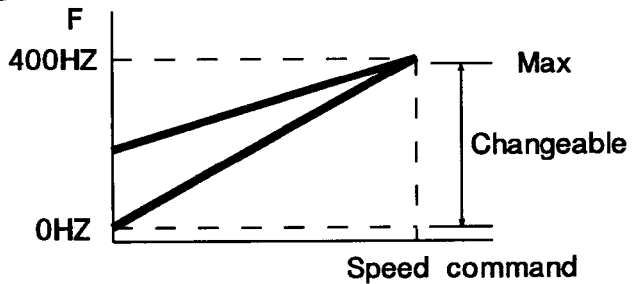
| | |
|------------------|---------------|
| Setting Range | 0.5 -- 400 HZ |
| USA version | 120 HZ |
| European version | 50 HZ |



Minimum frequency limit

CD15

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 0 |



Frequency display scale
CD16

| | |
|------------------|----------------|
| Setting Range | 0.01 -- 500 HZ |
| USA Version | 1 |
| European Version | 30 |

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

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

When RPM > 9999 display warning. On this condition.

— — **E** —

for over range

Setting CD41 = 1 for display show R.P.M.

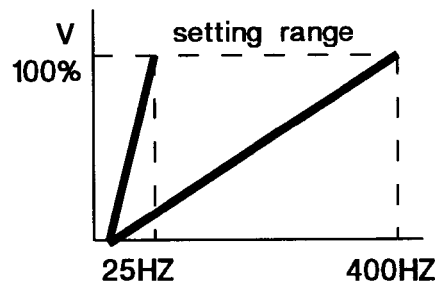
SCALE FOR VARIOUS MOTORS

| 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 -- 400 HZ |
| USA version | 60 HZ |
| European version | 50 HZ |

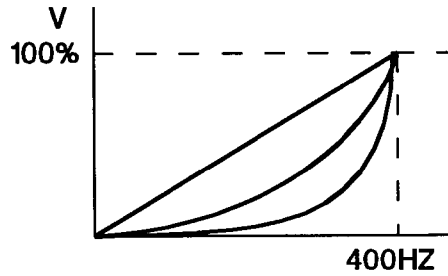
Use 2nd V/F to drive CD42(43) = 7 and terminal FT1(2) close.



| |
|-------------|
| V/F pattern |
| CD18 |

| | |
|-----------------|-------|
| Setting Range | 0 - 2 |
| Factory Setting | 0 |

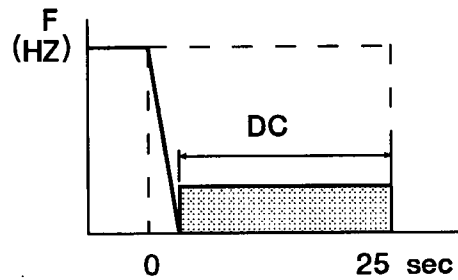
- 0 = Constant torque curve
- 1 = Reduce torque curve $F^{2.0}$
- 2 = Reduce torque curve $F^{3.0}$



| |
|-----------------|
| DC braking time |
| CD19 |

| | |
|-----------------|------------|
| Setting Range | 0-- 25 SEC |
| Factory Setting | 1 SEC |

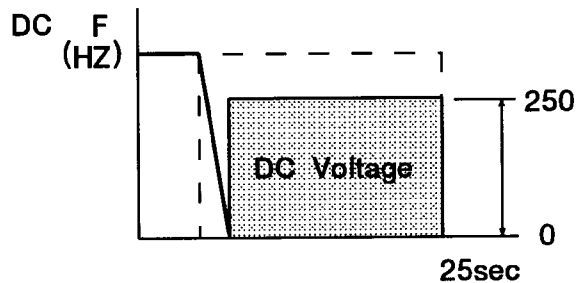
DC braking at frequency under 0.5HZ.



| |
|------------------|
| DC braking power |
| CD20 |

| | |
|-----------------|----------|
| Setting Range | 0 -- 250 |
| Factory Setting | 10 |

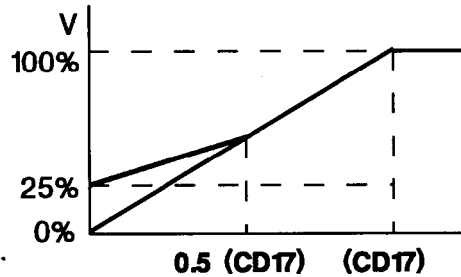
CD20 setting DC voltage gain various braking power.



Torque boost
CD21

| | |
|-----------------|----------|
| Setting Range | 0 -- 25% |
| Factory Setting | 0% |

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



Second speed setting
CD22

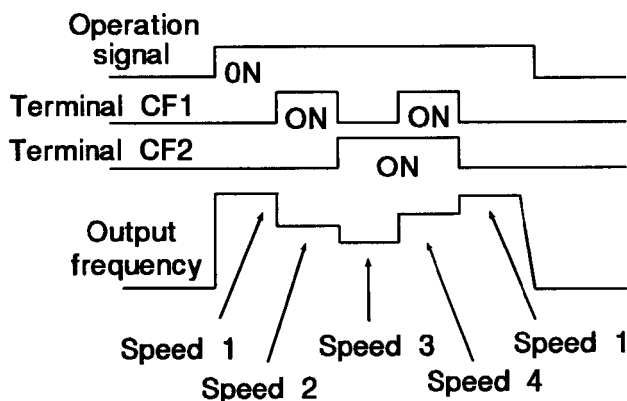
| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 20 HZ |

Third speed setting
CD23

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 30 HZ |

Fourth speed setting
CD24

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 40 HZ |



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

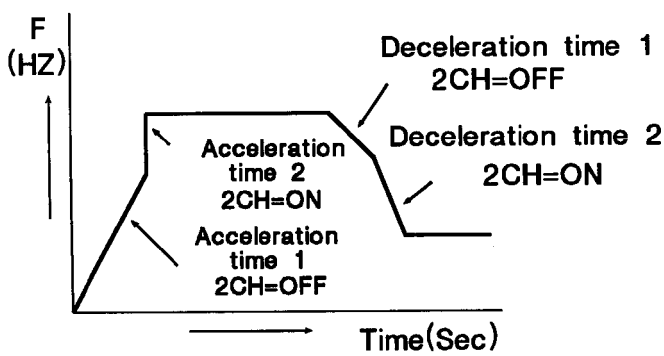
Acceleration time 2
CD25

| | |
|-----------------|-----------------|
| Setting Range | 0.1 -- 6000 SEC |
| Factory Setting | 10 SEC |

CD42 or 43 setting FT1 or FT2 = 3,
Then CD25 or CD26 can be setted.

Deceleration time 2
CD26

| | |
|-----------------|-----------------|
| Setting Range | 0.1 -- 6000 SEC |
| Factory Setting | 10 SEC |



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

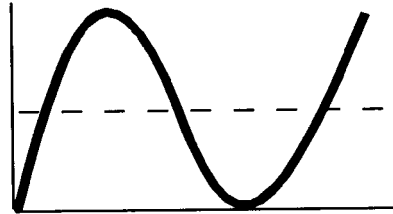
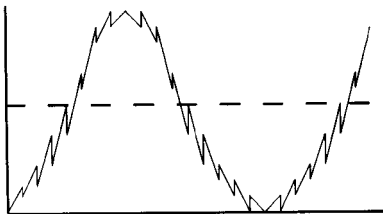
To operate inverter with 2CH function, check to see CD42 or CD43=3. 2CH command inputs from FT1 or FT2 terminal.

Carrier frequency
CD27

| | |
|-----------------|-----------|
| Setting Range | 1 -- 16 K |
| Factory Setting | 16 K |

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

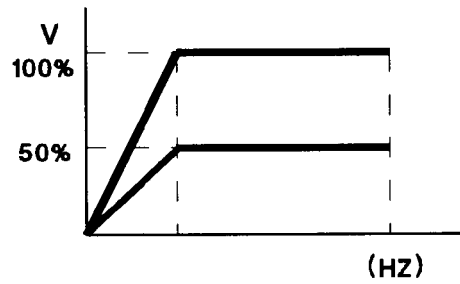
Reduce the carrier frequency would increase noise and reduce motor current, than gain better efficiency.



Output voltage gain
CD28

| | |
|-----------------|-------------|
| Setting Range | 50 -- 100 % |
| Factory Setting | 100 % |

Reduce output voltage for energy saving operation.
Setting CD44(45) = 12 for FA1 (FA2) terminal control.



Frequency jump 1
CD29

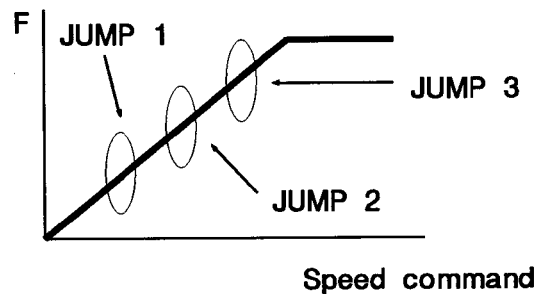
| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 0 HZ |

Frequency jump 2
CD30

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 0 HZ |

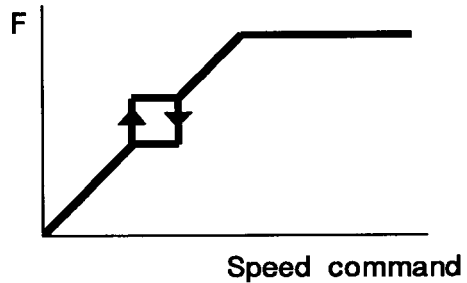
Frequency jump 3
CD31

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 0 HZ |



Jump range
CD32

| | |
|-----------------|-------------|
| Setting Range | 0.5 -- 3 HZ |
| Factory Setting | 0.5 HZ |

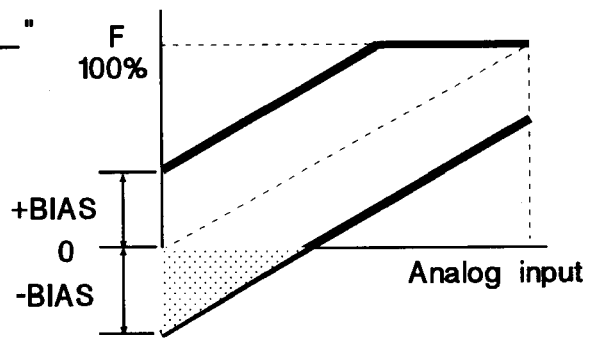


Frequency reference bias
CD33

| | |
|-----------------|-------------|
| Setting Range | 0 -- 400 HZ |
| Factory Setting | 0 |

Move Frequency bias with same gradient.

Frequency in the range of "—" bias, Motor can not start.



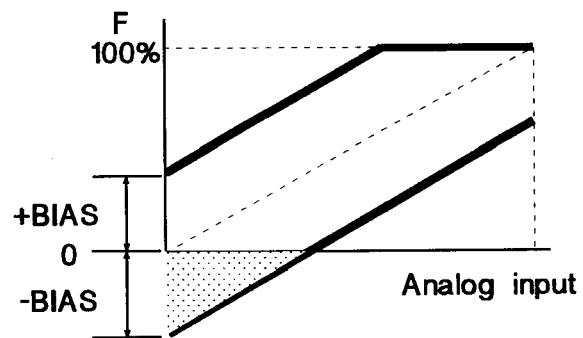
Freq. ref. bias direction
CD34

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

0 = Positive "+"

1 = Negative "-"

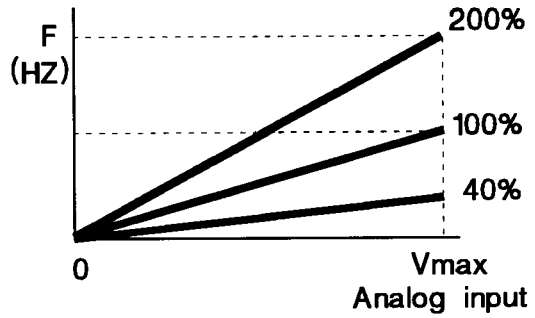
Polarity setting for (CD33) frequency reference bias.



Frequency gain
CD35

| | |
|-----------------|-------------|
| Setting Range | 40 -- 200 % |
| Factory Setting | 100% |

Refer to application
Example 03



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 |
| Factory Setting | 0 |

Set CD40=1 and **PROG** clear CD36 -- CD39 Error Record
the contents in CD36 -- CD 39 are "NONE"

HZ/RPM Display
CD41

| | |
|-----------------|--------|
| Setting Range | 0 or 1 |
| Factory Setting | 0 |

0 = HZ Display 1 = RPM Display
Setting correct scale CD16 for R.P.M. diaplay shown.

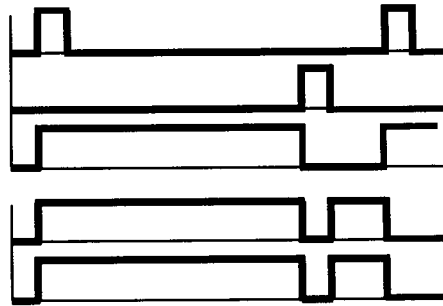
FT1 Multi-Function Terminal 1
CD42

| | |
|-----------------|--------|
| Setting Range | 0 - 15 |
| Factory Setting | 0 |

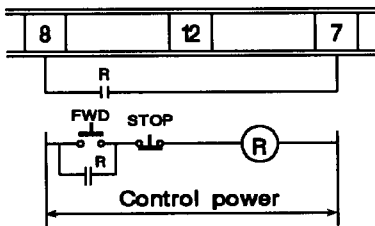
| FT1 FT2 | Symbol | Function description |
|------------|----------|-----------------------------------|
| 0 | —— | —— |
| 1 | JOGF | Jog operation FWD command |
| 2 | JOGR | Jog operation REV command |
| 3 | 2CH | ACC/DEC time 2 command |
| 4 | FRS | Free running command |
| 5 | 3 - WIRE | 3 - wire 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 |
| 15 | | Reserved |

3 - WIRE CIRCUIT CONNECTION DIAGRAM

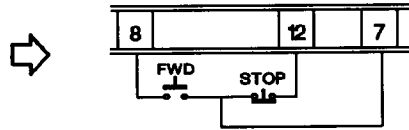
(TERMINAL LATCH FUNCTION)
 CD42=5 FWD(REV) COMMAND
 STOP COMMAND
 APxG3 OUTPUT
 CD12=1 FWD(REV) COMMAND
 APxG3 OUTPUT



Application circuit



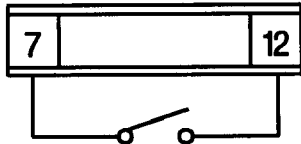
with latch function



Ⓡ and CONTROL POWER not necessary
 Remark: STOP command entry from control terminal ⑤ FT1 or ⑥ FT2, and set CD42(FT1)= 5 or CD43(FT2)= 5 before operation.

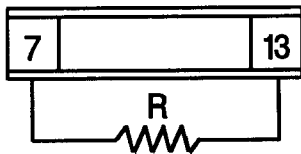
External over temperature command

① FT1 = 9 (Over temperature switch)



Non-latch trip protect and display "OH" when switch ON.

② FT2 = 9 (Thermistor)



NTC/PTC

JP1 (FT2)

○ L] Free run when R is less than 1KΩ
 ○ H] Free run when R is higher than 1KΩ

FT2 Multi-Function Terminal 2

CD43

| | |
|-----------------|--------|
| Setting Range | 0 - 15 |
| Factory Setting | 0 |

Refer to CD42 description

Free analog terminal 1

CD44

| | |
|-----------------|--------|
| Setting Range | 0 - 15 |
| Factory Setting | 0 |

Refer to CD45 table

Free analog terminal 2

CD45

| | |
|-----------------|--------|
| Setting Range | 0 - 15 |
| Factory Setting | 0 |

Setting No.11 to use application of example 03.

| FA1 FA2 | 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 ----- 25.0 % |
| 6 | DC Brake time | 0 ----- 25 Sec |
| 7 | DC Brake Energy | 0 ----- 250 |
| 8 | Speed 2 | F-min ----- CD22 |
| 9 | Speed 3 | F-min ----- CD23 |
| 10 | Speed 4 | F-min ----- CD24 |
| 11 | Fmax | F-min -- CD14 content |
| 12 | Output voltage gain | 50% -- 100% |
| 13 | Speed 1 | F-min -- Fmax (CD14) |
| 14 | Reserved | |
| 15 | Reserved | |

| |
|-------------|
| Reserved |
| CD46 |

| |
|-------------------|
| 5th speed setting |
| CD47 |

| |
|-------------------|
| 6th speed setting |
| CD48 |

| 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)

| |
|-------------------|
| 7th speed setting |
| CD49 |

| |
|-------------------|
| 8th speed setting |
| CD50 |

| |
|---------------------------------|
| Dynamic braking energy limit |
| CD51 |

| | |
|-----------------|----------|
| Setting Range | 0 - 300% |
| Factory Setting | 100 |

The higher the percentage, the more braking energy.
 The lower the percentage, the lower braking energy.
 Description of regenerative discharge braking active period.

1. 0 ~ 100% Decel only
2. 101 ~ 200% Braking active period of
 (Decel/accel/constant frequency)
3. 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 0 ~ 100%

| |
|------------------|
| Version selector |
| CD52 |

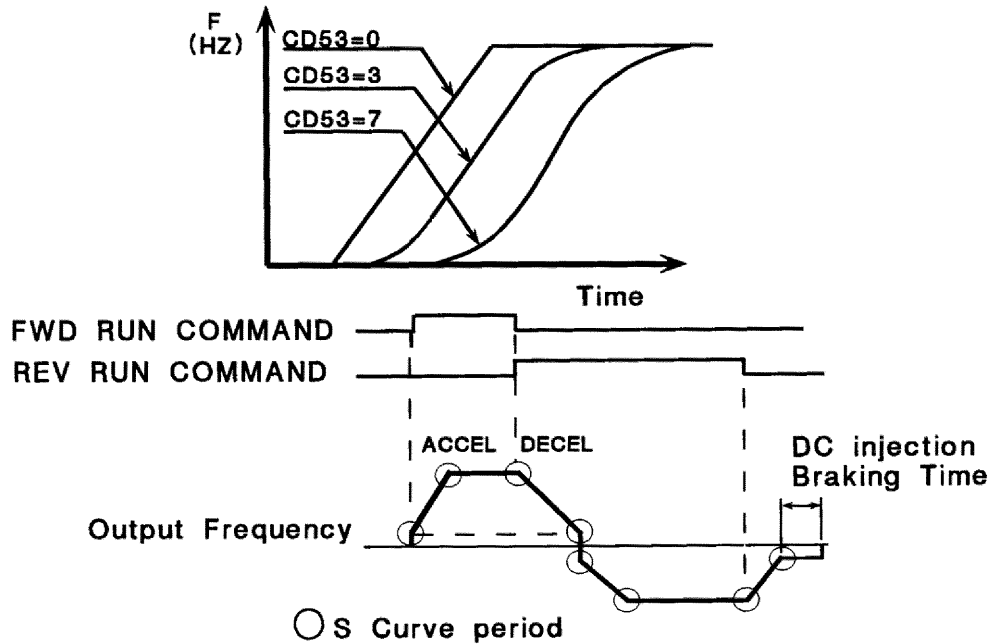
| | |
|-------|------------------|
| Eur → | European Version |
| USA → | US Version |

Select function CD52, then use Up/Down key to select
 Eur/USA Version. Press **PROG** to save it. system will return
 to the factory setting and go into waiting mode.

| |
|-------------|
| S curve |
| CD53 |

| | |
|-----------------|--------|
| Setting Range | 0 - 10 |
| Factory Setting | 0 |

Setting S curve non-Linear Accel/Decel Operation from 1 to 10.
Setting 0 is normal operation without S curve.



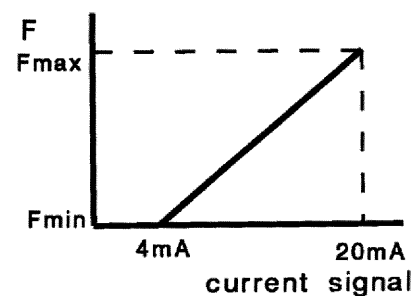
| |
|-------------|
| 4 - 20 mA |
| CD54 |

| | |
|-----------------|-------|
| Setting Range | 0 - 3 |
| Factory Setting | 0 |

This function only effects in CD44(CD45) = 8,9,10,13
Set FA1 (FA2) for current signal (4-20mA).

- 0 : NO Current Signal Application
- 1 : Current Signal in Terminal FA1
- 2 : Current Signal in Terminal FA2
- 3 : FA1 & FA2 Current Signal Terminal

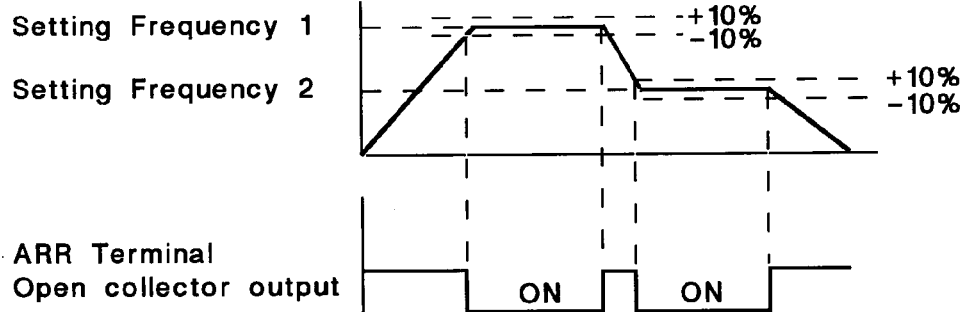
Note : reference to FA1(FA2) terminal setting
for 4-20mA signal.



| |
|----------------------------------|
| Frequency arrive signal range |
| CD55 |

| | |
|-----------------|-----------|
| Setting Range | 0% - 100% |
| Factory Setting | 10% |

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



Note : When setting cd15 , please follow the sequence .

- a. set cd 15 = 0
- b. set cd 55 = xx use ∇ \blacktriangle or **shift** key (xx cd55 value)
- c. set dc 15 = xx (if xx > 0)

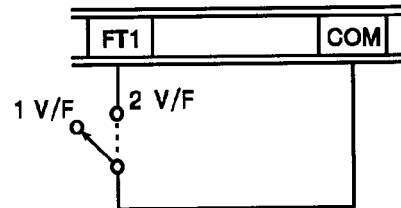
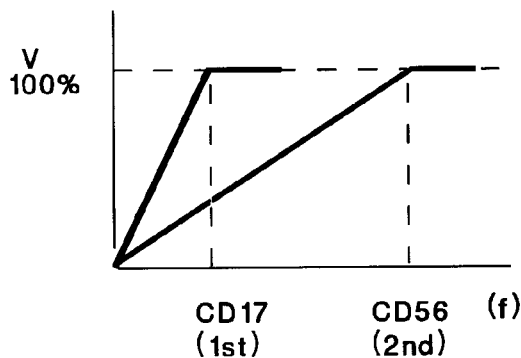
| |
|----------------------------------|
| 2nd Maximum Voltage frequency |
| CD56 |

| | |
|-----------------|--------|
| Setting Range | 25-400 |
| Factory Setting | 60 |

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



| |
|-----------------------------|
| No. of auto restart attempt |
| CD57 |

| | |
|-----------------|--------|
| Setting Range | 0 - 10 |
| Factory Setting | 0 |























Inverter auto restart if power device failure Max. auto restart times are 10 within 30 min.

6.2 Operation key-in sequence

EXAMPLE : Change acceleration time

| 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 waiting 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 waiting mode |

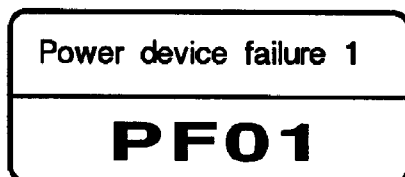
Change maximum frequency limiter

| 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 |
|    |  | Increase the value to 9 |
|  |  | Press "PROG" to save CD14=90HZ and back to waiting mode |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

7. PROTECTIVE FUNCTION



Noise protection.
Self test failure protection



Power device failure during acceleration



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

Parameter Locked

OPE1

To change the contents of CD02 -- CD56

set CD01=1 press **PROG** first

FWD or REV only

OPE2

Motor direction limiter.

See function description 6.1 : CD08

Analog signal input only

OPE3

Motor speed command from control terminal only.

Input analog signal by Frequency knob

see functions description 6.1 : CD10

Terminal command only

OPE4

Accept run command from control terminal only,

not operation panel.

See functions description 6.1 : 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.

| |
|-----------|
| Over heat |
| OH |

Over temperature for external indicator.

Refer to CD42 (FT1) or CD43 (FT2)

8. PRECAUTIONS

8-1 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.**
- (4) It should be noted that electronic equipment is not resistant to moisture and oil mist, and intrusion of dust or iron powder will damage the insulation, leading to an unexpected accident.**

8-2 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.**

9. TROUBLESHOOTING

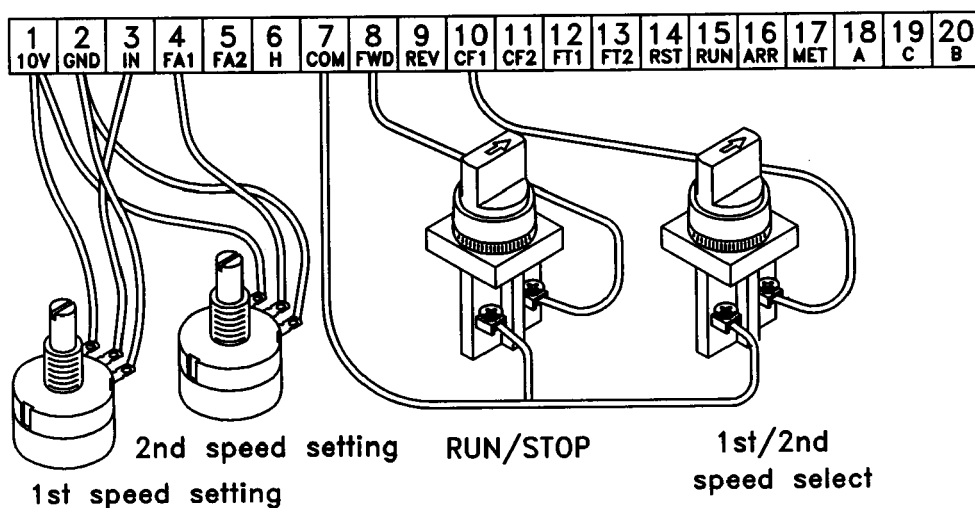
| Display symbol | Cause of fault message contents | Check point | Suggested remedy |
|----------------|--|--|--|
| No display | Discharge LED extinguished | Review the power system. Check that MCCB has been turned on or no poor contact. | Turned on or Replace MCCB |
| PF01 | Power device failure during 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 U.V.W. 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 GD^2 is excessive | Set the deceleration time suitable for load GD^2 . |
| | | Power supply voltage is too high. | Reduce the voltage within specified range |
| 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 | Rework with previous process. Check for the same message. | Repair |
| EEP2 | EEPROM check - sum error | | |

10. APPLICATION

EXAMPLE 01 : Use 2 external Variable resistor for Multistage speed command input.

DESCRIPTION:

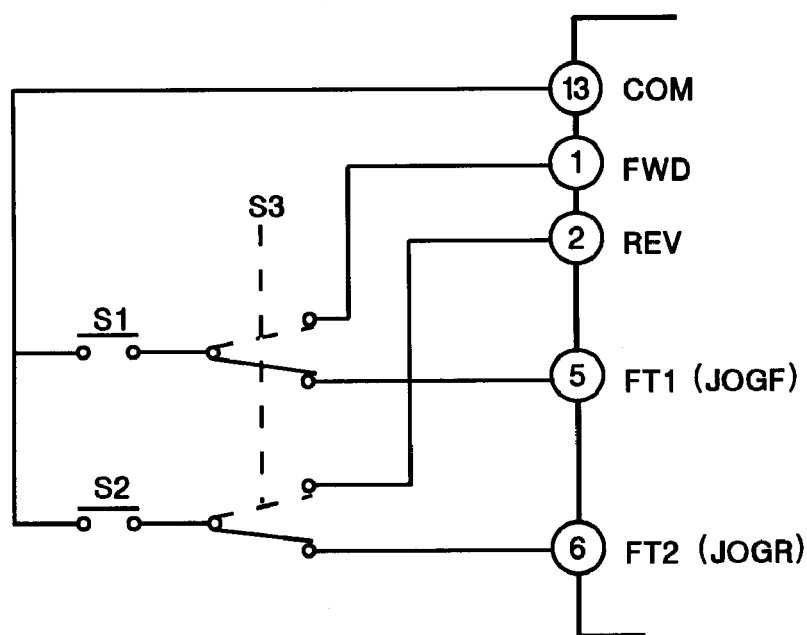
- CD10 = 1 (Use frequency knob for 1st speed setting)
- CD12 = 1 (External command)
- CD44 = 8 (2nd speed signal enter from FA1)
- SW1 = RUN/STOP
- SW2 = 1st / 2nd speed



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



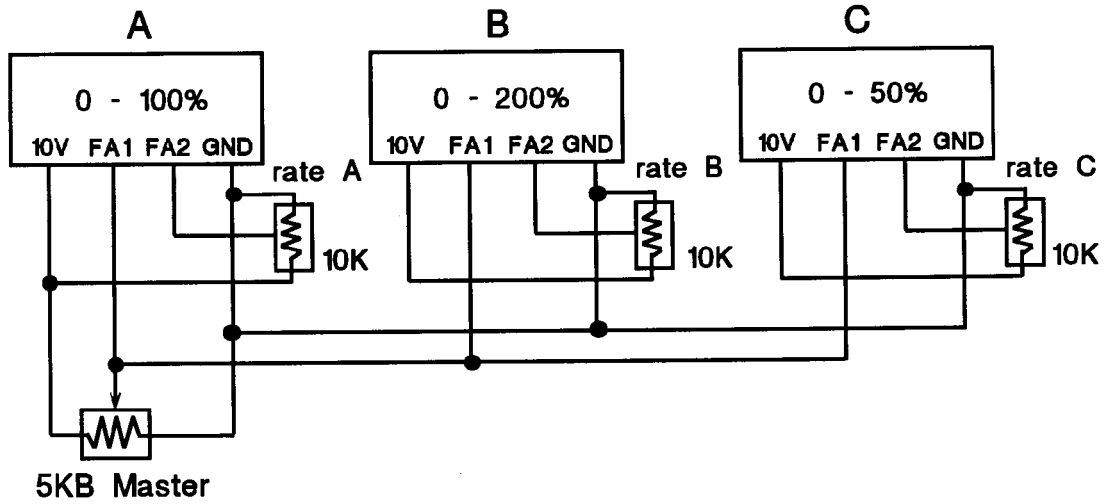
NORMAL/JOG

S1 = FWD SW
S2 = REV SW
S3 = Normal/JOG Select SW

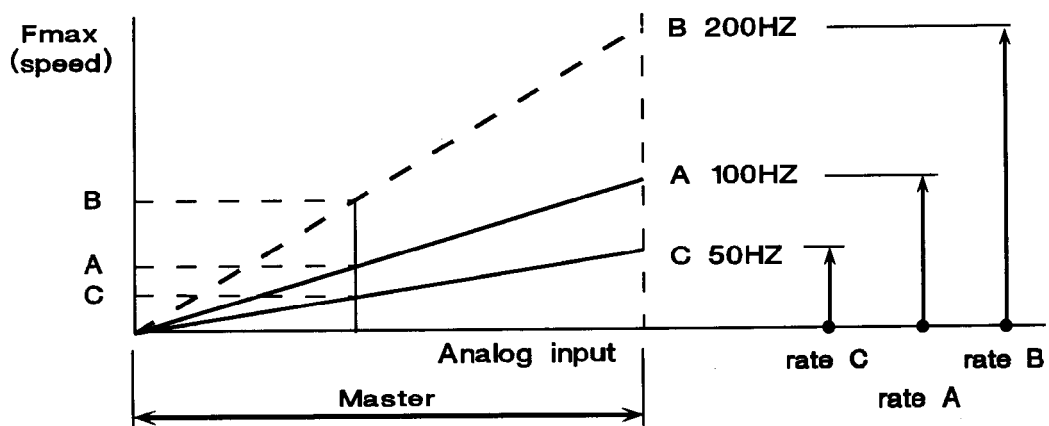
EXAMPLE 03: Master/slave driver system

DESCRIPTION: Set FA1 = 13 for 1st (Master) speed signal input terminal.

Set FA2 = 11 for Maximum speed setting



| Number | A | B | C |
|------------------|--|--|---|
| Speed rate | 1 | 2 | 0.5 |
| Function setting | CD12=1 CD14=100 CD44=13 CD45=11 | CD12=1 CD14=200 CD44=13 CD45=11 | CD12=1 CD14=50 CD44=13 CD45=11 |

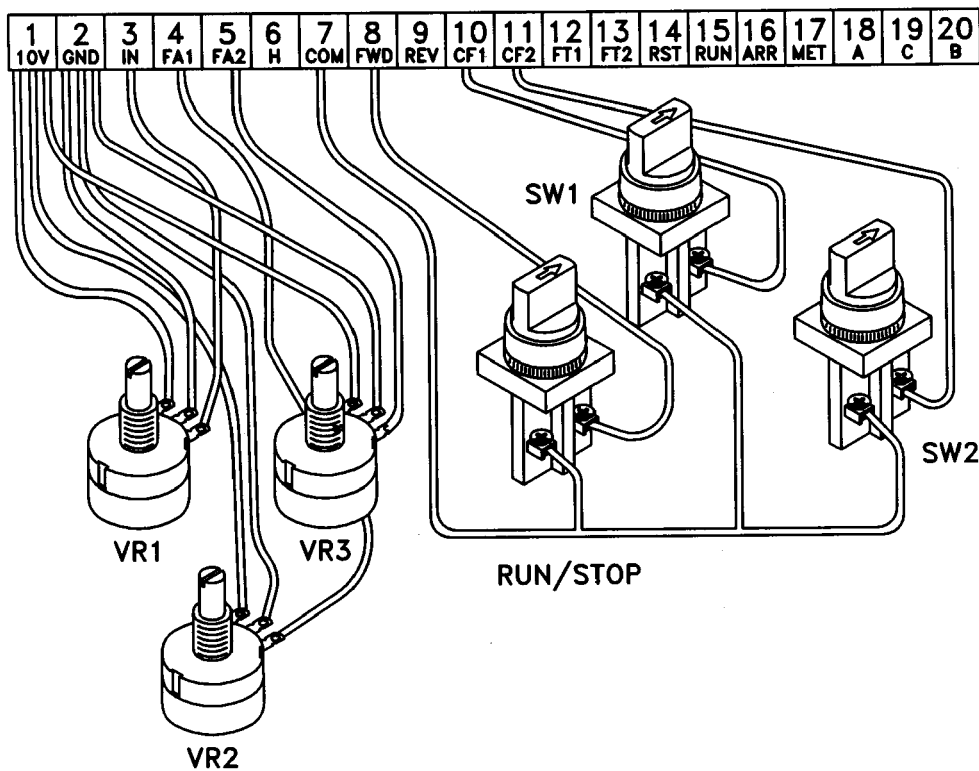


EXAMPLE 04 : Using rheostat for 3stage speed setting.

DESCRIPTION:

- CD10 = 1 ; 1 st speed single enter from terminal
- CD12 = 1 ; Terminal command (For External)
- CD44 = 8 ; 2nd speed single enter from FA1
- CD45 = 9 ; 3nd speed signal enter from FA2

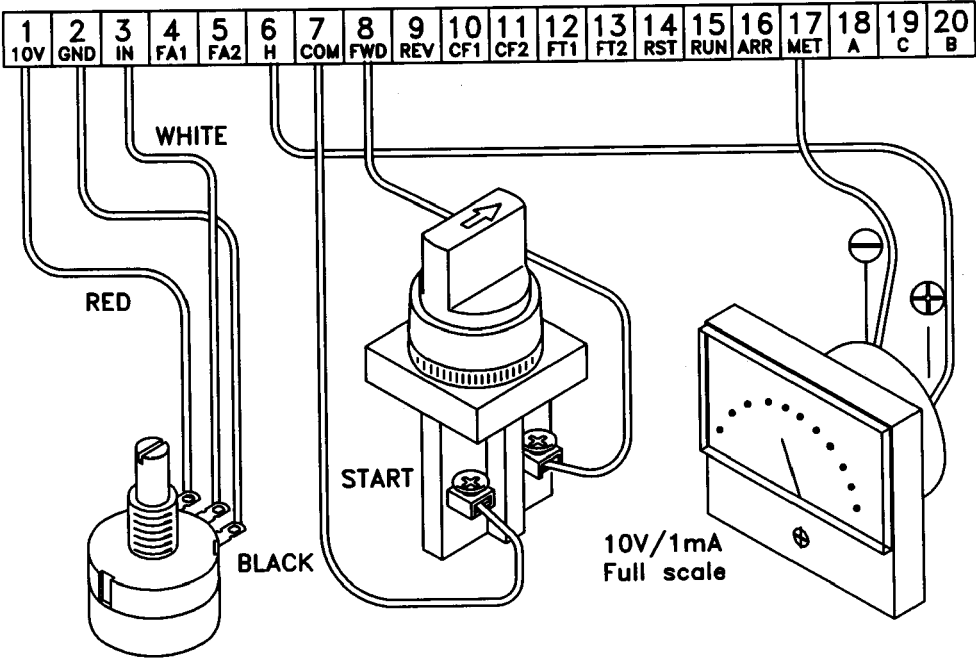
| SPEED | TERMINAL | | SPEED COMMAND ENTRY |
|-------|----------|-----|---------------------|
| | SW2 | SW1 | |
| 1 | OFF | OFF | VR1 |
| 2 | OFF | ON | VR2 |
| 3 | ON | OFF | VR3 |



EXAMPLE 05 : Basic external control setup.

DESCRIPTION:

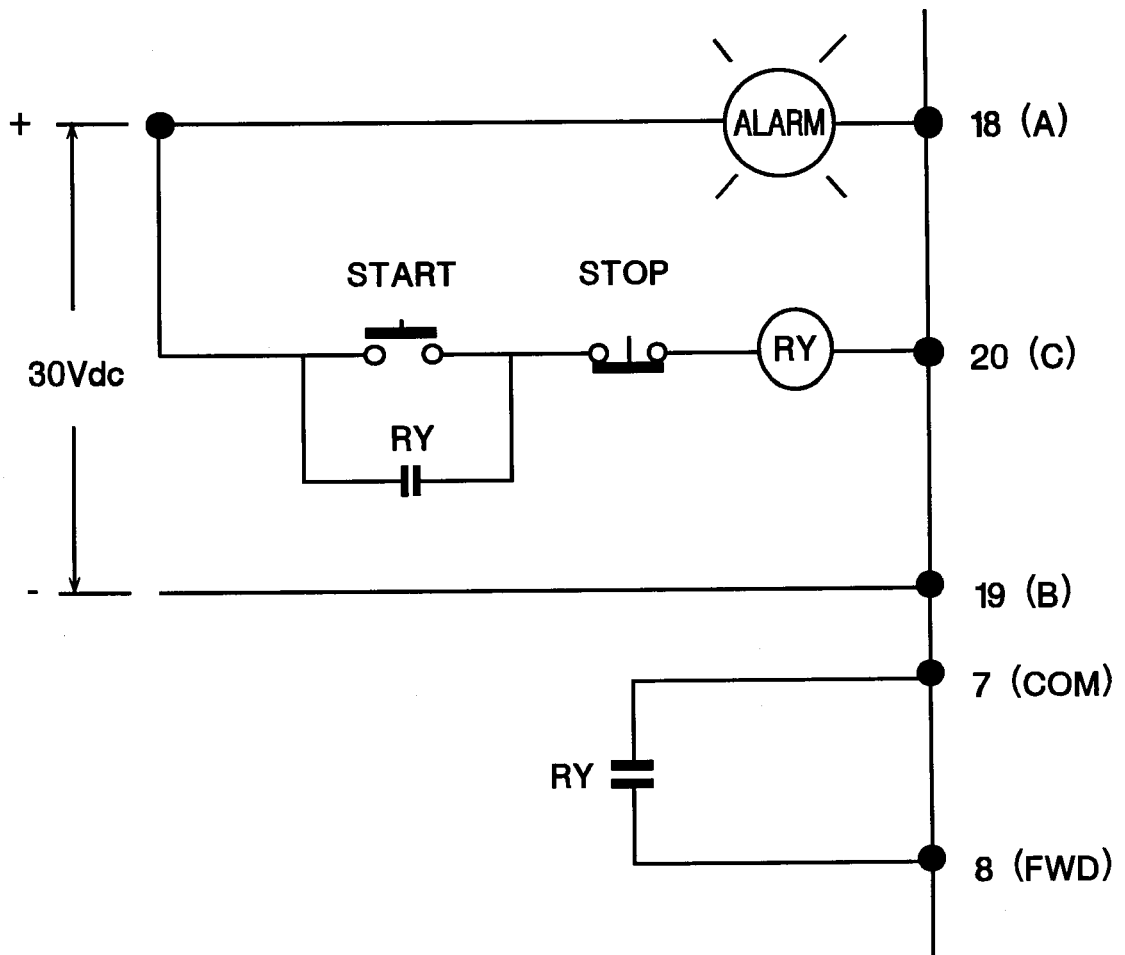
- CD07 = 120HZ ; See Maximum Value on the meter
- CD10 = 1 ; External analog signal 0-10V
- CD12 = 1 ; External command



EXAMPLE 06 : Alarm output

DESCRIPTION:

CD12 = 1 ; External command



11. Inverter Selection

Inverter Capacity Check Method

| Description | | Related factor |
|---|---|--|
| Load characteristics | Load type | Friction load and weight load Liquid(viscous)load inerita load Load with poer transmission and accumulation |
| | Load speed and torque charcteristics | Constant torque Constant output Decreasing torque |
| | Load charcteristics | Motoring Braking or overhauling load Constant load Shock load Repetitive load High-start torque low-start torque |
| Operastion | 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 percentage impednace Voltage fluctuations Number of phases, singla 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 |
|----------------------------------|--------------|-------------------|-----------------|
| ✖ | | | ✖ |
| ✖ | ✖ | | |
| ✖ | ✖ | ✖ | ✖ |
| | ✖ | ✖ | |
| ✖ | | ✖ | |
| ✖ | | | |
| | | ✖ | ✖ |
| | | ✖ | ✖ |
| | ✖ | | |

Inverter Capacity Required for Multidrivng

| Description | Calculated with overload |
|--|---|
| | Motor acceleration of 1 minute or less |
| Starting requirements are within the inverter capacity | $\frac{K P_m}{\eta \cos \phi} [n_T + n_S (k_S - 1)]$ $= P_{c1} [1 + (n_S / n_T)(k_S - 1)]$ $\leq 1.5 \text{ Inverter capacity [KVA]}$ |
| Current within the inverter capacity | $n_T I_m [1 + (n_S / n_T)(k_S - 1)]$ $\leq 1.5 \text{ Inverter capacity [A]}$ |

Inverter Capacity Required for Continuous Performance

| Description | Calculation method |
|---|--|
| Required output for the load within the allowable range | $K P_m / \eta \cos \phi \leq \text{Inverter capacity [KVA]}$ |
| Motor capacity within the inverter ratings | $\sqrt{3} K V_m I_m 10^{-3} \leq \text{Inverter capacity [KVA]}$ |
| Current within the inverter capacity | $K I_m \leq \text{Inverter capacity [A]}$ |

Inverter Capacity Required for Starting

| Description | Calculation formula [tA < 60 s] |
|--|---|
| Total starting capacity within the inverter capacity | $\frac{K N}{973 \eta \cos \phi} \left(t_L + \frac{GD^2 N}{375 t_A} \right) \leq 1.5 \times \text{Inverter capacity [KVA]}$ |

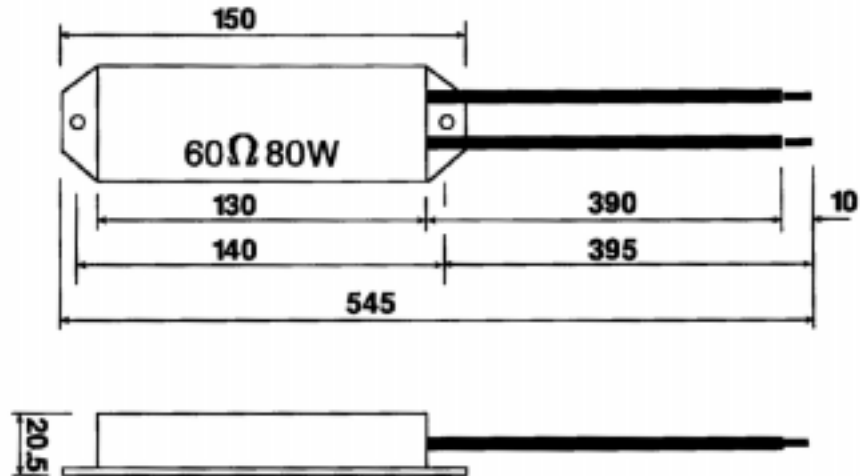
| |
|---|
| capacity of 150% for 1 minute |
| Motor acceleration of 1 minute or more |
| $\frac{K P_m}{\eta \cos\phi} [n_T + n_S (k_S - 1)]$ $= P_{c1} [1 + (n_S / n_T)(k_S - 1)]$ $\leq \text{Inverter capacity [KVA]}$ |
| $n_T I_m [1 + (n_S / n_T)(k_S - 1)]$ $\leq \text{Inverter capacity [A]}$ |

Symbol Description

| |
|---|
| P_m ; Motor shaft output required for the load[kw] |
| η ; Motor efficiency (normally, approx.0.85) |
| $\cos\phi$; Motor power factor (normally, approx.0.75) |
| V_m ; Motor voltage[V] |
| I_m ; Motor current[A](current with commercial power supply) |
| k ; Correction factor calculated from currentform factor (1.05 to 1.1,depending on the PWM method.) |
| P_{c1} ; Continuous capacity [KVA] |
| k_S ; Motor starting current/motor rated current |
| n_T ; Number of motors in parallel |
| n_S ; Number of simultaneously started motors |
| GD^2 ; Total (GD^2)converted into motor shaft ($kg\cdot m^2$) |
| t_L ; Load torque(kg-m) |
| t_A ; Motor acceleration time |

12. APPENDIX

A. Optional braking resistor



PART NO : E-MSAA-008000

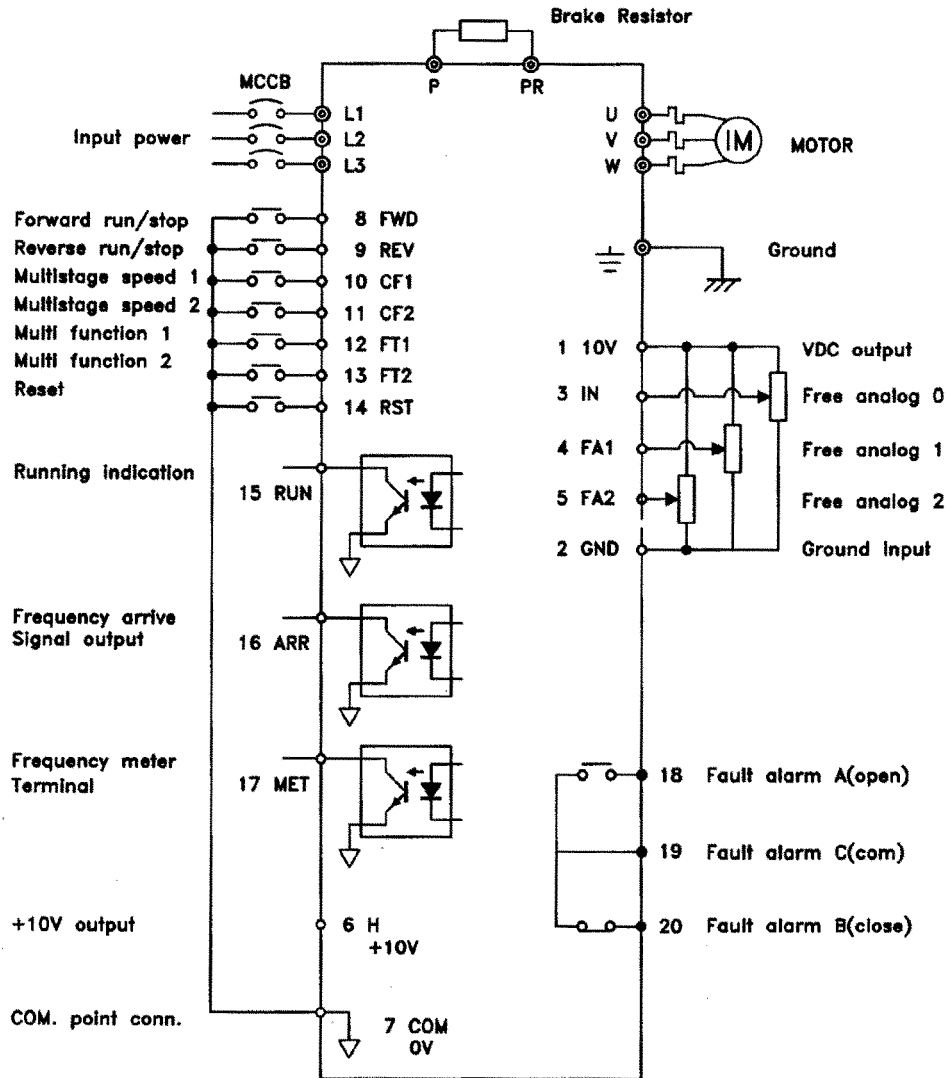
Remove build-in dynamic brake resistor

Connect a larger capacity resistor, The value bigger than the table below:

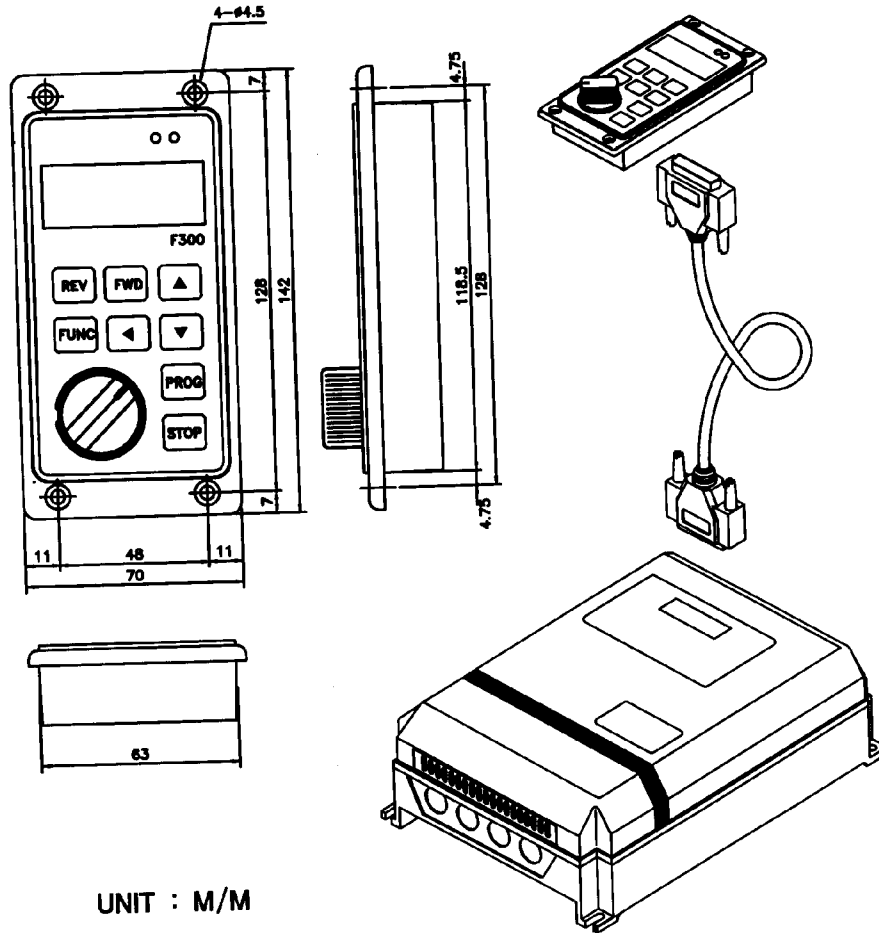
UNIT : Ω

| CAPACITY | 07 | 15 | 22 | 37 | 55 | 75 | 110 |
|----------|-----|-----|-----|-----|----|----|-----|
| AP2 | 45 | 45 | 45 | 40 | 20 | 15 | — |
| AP4 | 200 | 180 | 180 | 160 | 80 | 60 | 60 |

B. Terminals wiring diagram



C. Remote operator



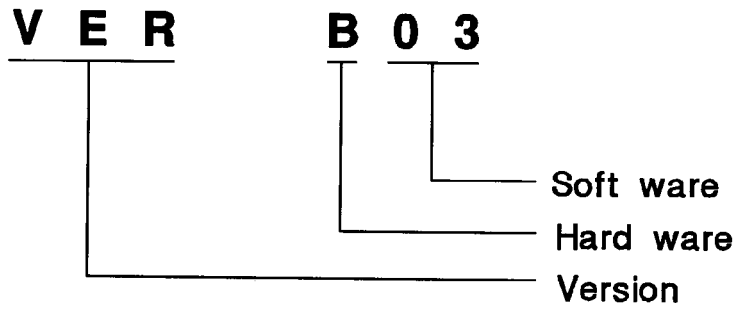
UNIT : M/M

Options

| | |
|---------------|----------------------|
| A-0000-KEY003 | Remote operator F300 |
| E-WIAA-000010 | Cable of 1M long |
| E-WIAA-000011 | Cable of 3M long |
| E-WIAA-000012 | Cable of 5M long |

Please order "R" models for remote control inverters as APxH3-07R, APxH3-15R and APxG3-37R ETC., and mark the extension cord length as above table shown.

D. Version



| HARDWARE | DATE | NEW FUNCTIONS |
|------------|----------|---------------|
| Bxx | 97.01.01 | |
| | | |
| | | |
| | | |

| SOFTWARE | DATE | NEW FUNCTIONS |
|------------|----------|---------------|
| x03 | 97.01.01 | |
| | | |
| | | |
| | | |