



Technical Manual



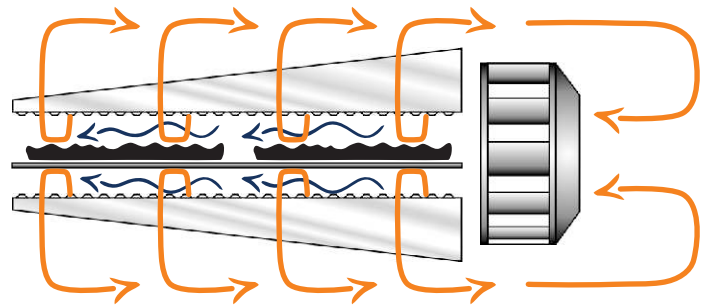
Contact: www.gnxindustry.com

Competitors ↓ Economy Version (CEV)



Principle

GNX Conveyor Oven take both faster and at a lower temperature than other ovens. Vertical columns of hot air move heat aerodynamically instead of using high temperatures. Moreover, metallurgy of the inner oven can sustain temperature for longer period of time. **GNX** Conveyor ovens are designed to cook a multitude of products including pizza and all other foods that needs chamber maintained temperature.



General Information

The **GNX** conveyor oven is ideally suited for economy version restaurant needs. The oven can cook a wide variety of food products, including pizza, seafood and bagels.

Cleanability

GNX Conveyor Ovens are designed for easy cleaning. Removable parts include: crumb pans, end panels, air fingers, exit tray, and a removable conveyor belt assembly.

Standard Features

1. Operatable on Standard UPS for 8 hours – save Energy
2. Gas Consumption is 20% of other US brands – Save Gas cost
3. Reversible conveyor
4. Very Competitive price as compared to other US brand

Easily Services

Control compartment is designed for quick and easy access.

Parts availability

- Original parts available for maintenance locally
- Local professional team member of providing services for **GNX** Oven

Warranty

One year warranty with replacements of parts as training held in Dubai for maintenance of the product.

Optional Features

20" belts with individually adjustable speed settings

Ventilation

Use of a ventilation hood is required



Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

**WARNING**

- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
 - If input/output or signal lines within the building are longer than 30 meters.
 - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- When high alarm with hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. PRODUCT CHECK

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		C900	(1)(2) (3) (4)(5) (6)(7) *

(1) Control action

F: PID action with autotuning (Reverse action)
 D: PID action with autotuning (Direct action)
 W: Heat/Cool PID action with autotuning (Water cooling)¹
 A: Heat/Cool PID action with autotuning (Air cooling)¹

(2) Input type, (3) Range code

Refer to "9. INPUT RANGE TABLE."

(4) First control output [OUT1] (Heat-side)

M: Relay contact G: Trigger for triac driving²
 V: Voltage pulse 8: Current (4 to 20 mA DC)

(5) Second control output [OUT2] (Cool-side)³

No symbol: When control action is F or D. M: Relay contact
 V: Voltage pulse 8: Current (4 to 20 mA DC)

(6) Alarm 1 [ALM1], (7) Alarm 2 [ALM2]

N: No alarm H: Process high alarm
 A: Deviation high alarm J: Process low alarm
 B: Deviation low alarm K: Process high alarm with hold action
 C: Deviation high/low alarm L: Process low alarm with hold action
 D: Band alarm P: Heater break alarm (HBA)[CTL-6]⁴
 E: Deviation high alarm with hold action S: Heater break alarm (HBA)[CTL-12]⁴
 F: Deviation low alarm with hold action R: Control loop break alarm (LBA)⁵
 G: Deviation high/low alarm with hold action

¹ C100 cannot be specified in Heat/Cool PID action.

² For the C100, when control output is trigger output for triac driving, only the ALM1 is available.

³ For the C100, there is no second control output.

⁴ Heater break alarm (HBA) cannot be specified in case of ALM1. Also, it isn't possible to specify when control output is current output.

⁵ As control loop break alarm (LBA), only either the ALM1 or ALM2 is selected.



Check that power supply voltage is also the same as that specified when ordering.

<Accessories>

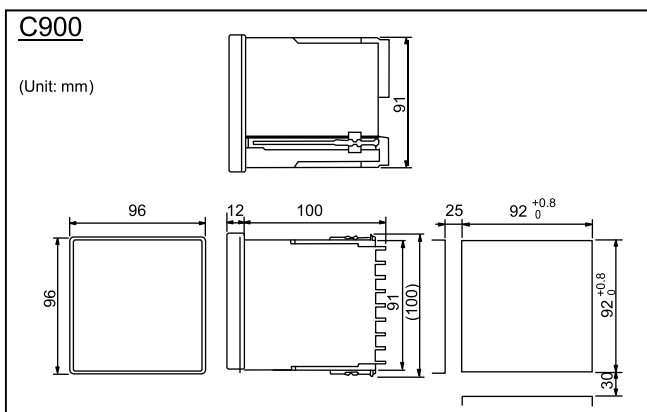
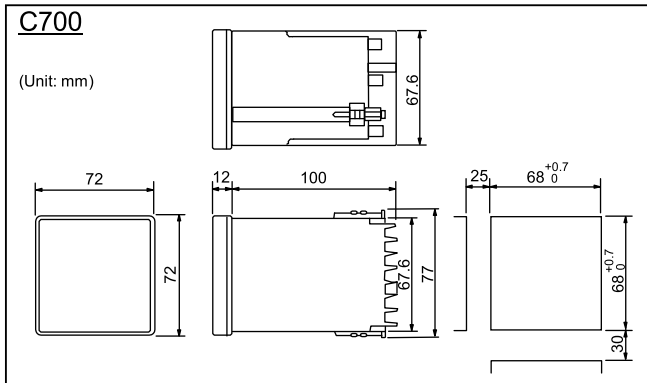
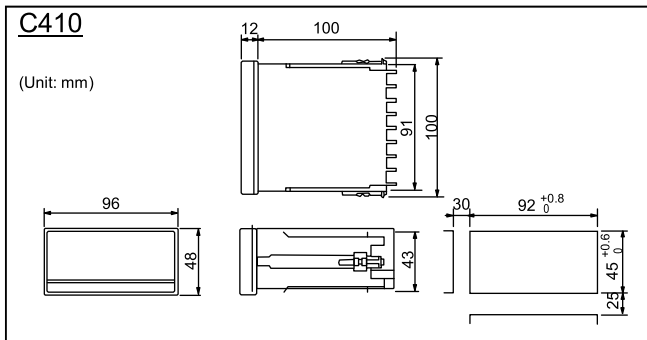
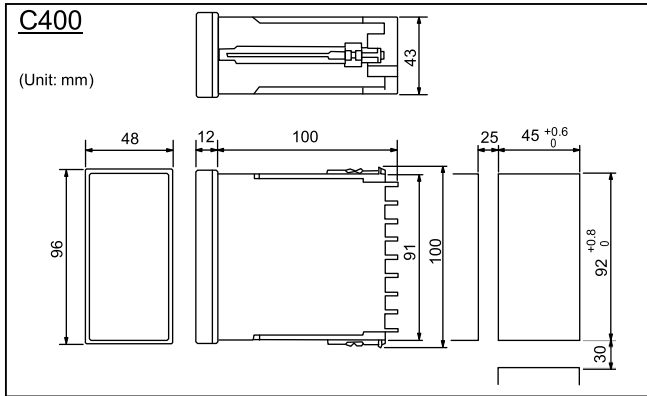
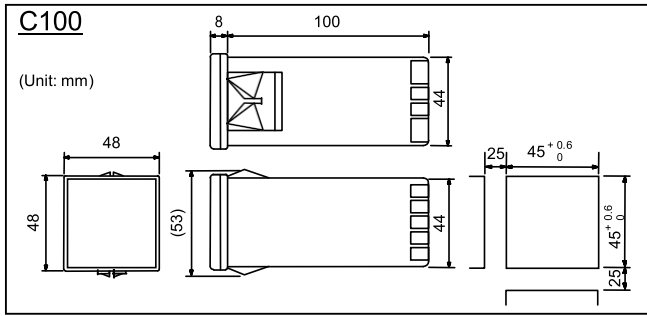
- Mounting brackets (C100/400/410/700/900): 2
- Instruction manual (IMNZC22-E1): 1

2. MOUNTING**2.1 Mounting Cautions**

- (1) This instrument is intended to be used under the following environmental conditions. (IEC61010-1)
 [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- (2) Use this instrument within the following environment conditions:
 - Allowable ambient temperature: 0 to 50 °C
 - Allowable ambient humidity: 45 to 85 % RH
 - Installation environment conditions: Indoor use, Altitude up to 2000 m
- (3) Avoid the following conditions when selecting the mounting location:
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the mainframe.
 - Water, oil, chemicals, vapor or steam splashes.
 - Excessive dust, salt or iron particles.
 - Excessive induction noise, static electricity, magnetic fields or noise.
 - Direct air flow from an air conditioner.
 - Exposure to direct sunlight.
 - Excessive heat accumulation.
- (4) Mount this instrument in the panel considering the following conditions:
 - Provide adequate ventilation space so that heat does not build up.
 - Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
 - If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
 - In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - Rotating machinery: Separate as far as possible.
 - For correct functioning mount this instrument in a horizontal position.
- (5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.



2.2 Dimensions



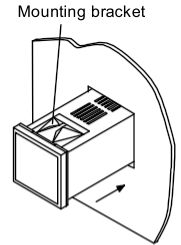
Panel thickness: 1 to 5 mm or 5 to 9 mm (C100)
1 to 8 mm (C400/410/700/900)

2.3 Mounting procedures

■ C100

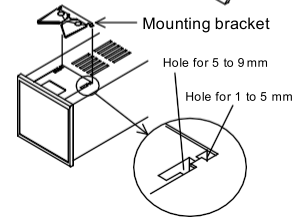
● When the controllers are mounted on panel with 1 to 5 mm in thickness

Since the mounting brackets are already installed on the controller, insert the controller into the panel front without removal of the brackets.



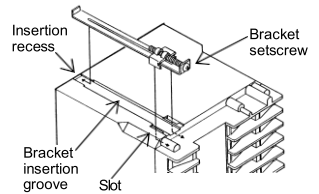
● When the controllers are mounted on panel with 5 to 9 mm in thickness

Remove the mounting brackets from the controller with a slotted screwdriver. Engage each mounting bracket with holes marked with 5-9 on the housing and then insert the controller into the panel from the panel front.



■ C400/410/700/900

1. Prepare the panel cutout as specified in **2.2 Dimensions**.
2. Insert the instrument through the panel cutout.
3. Insert an upper mounting bracket along the bracket insertion groove from the back, and then engage a projection at the bracket end with a recess at the groove front and also insert metal fitting legs into slots.
4. Tighten a bracket setscrew from the rear of the bracket with Phillips screwdriver. Do not overtighten the bracket setscrew.
5. The other mounting bracket should be installed the same way described in 3. and 4.



C900 is used in the above figures for explanation, but the same mounting procedures also apply to C400/410/700.

3. WIRING

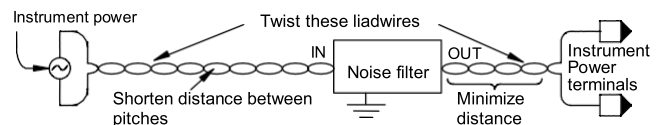


WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

3.1 Wiring Cautions

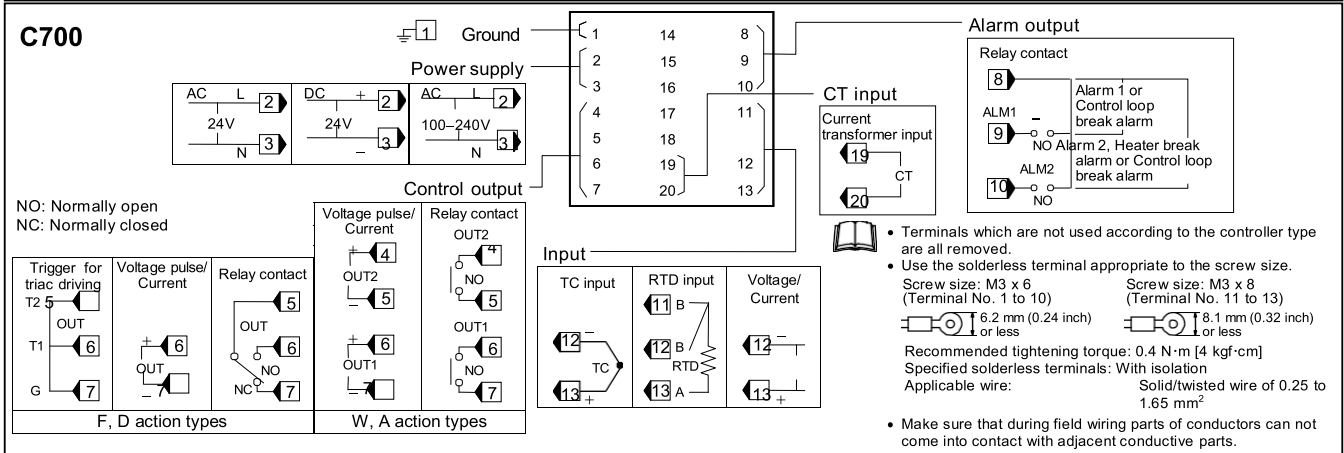
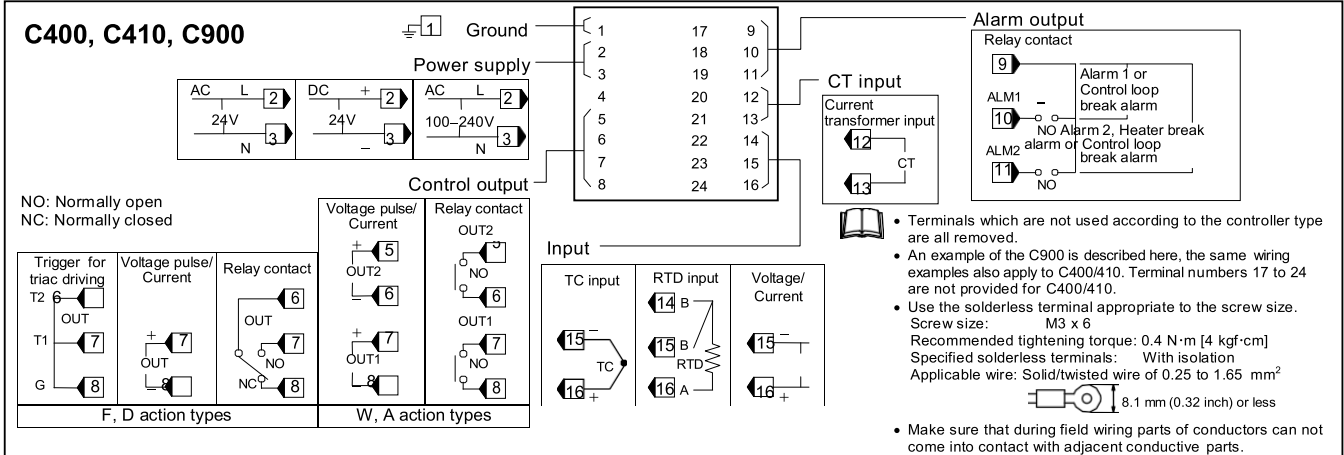
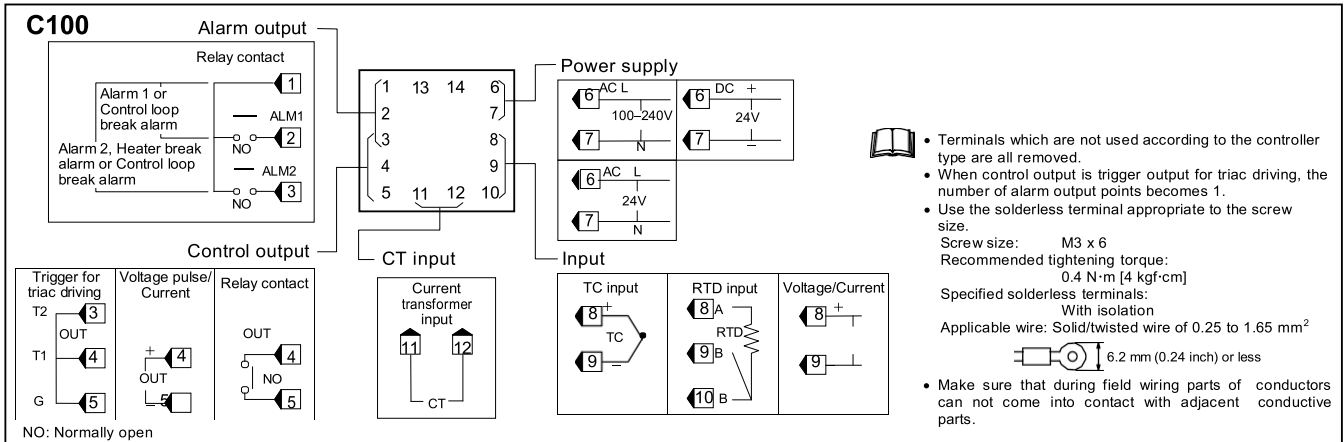
- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
 - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
 - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
 - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.



- Allow approximately 5 to 6 seconds for contact output when the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- This instrument with 24 V power supply is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as fuse) with adequate breaking capacity close to the instrument.
 - Fuse type: Time-lag fuse (Approved fuse according IEC60127-2 and/or UL248-14)
 - Fuse rating: Rated current: 0.5 A
- For an instrument with 24 V power supply input, supply power from "SELV" circuit defined as IEC 60950-1.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).



3.2 Terminal Configuration



Specifications

Input:

Input type:

Thermocouple: K, J, R, S, B, E, T, N, PLII, W5Re/W26Re, U, L
Input impedance: Approx. 1 M Ω

RTD: Pt100, JPt100
Voltage: 0 to 5 V DC, 1 to 5 V DC
Input impedance: 250 k Ω or more

Current: 0 to 20 mA DC, 4 to 20 mA DC
Input impedance: Approx. 250 Ω

Sampling cycle: 0.5 seconds

Input range: Refer to **Input range table**

Control method: PID control

ON/OFF, P, PI, or PD actions is available

Control output:

Relay contact output: 250 V AC, 3A (Resistive load)
Electrical life: 300,000 times or more (Rated load)

Voltage pulse output: 0/12 V DC
(Load resistance 600 Ω or more)

Current output: 4 to 20 mA DC
(Load resistance 600 Ω or less)

Trigger output for triac driving:
Zero cross method for medium capacity triac driving (100 A or less)
Load voltage used: 100 V AC line, 200 V AC line
Load used: Resistive load

Alarm output:

Relay contact output:

250 V AC, 1A (Resistive load)
Electrical life: 50,000 times or more (Rated load)

Heater break alarm function:

Measured current:
0 to 30 A (CTL-6-P-N)
0 to 100 A (CTL-12-S56-10L-N)
Input rating: Maximum current rating: 120 mA
Input impedance: Approx. 2.5 Ω

Performance:

Display accuracy (at the ambient temperature 23 °C \pm 2 °C):

Thermocouple (TC):
 \pm (0.5 % of display value + 1 digit) or \pm 3 °C [6 °F]
Whichever is greater
R and S input: 0 to 399.12 °F to 799 °F)

B input: 0 to 399 °C [0 to 799 °F]
Accuracy is not guaranteed.

RTD: \pm (0.5 % of display value + 1 digit) or \pm 0.8 °C [1.6 °F] whichever is greater

Voltage/Current: \pm (0.5 % of input span + 1 digit)

Memory backup:

Backed up by Nonvolatile Memory
Number of write times:
Approx. 100,000 times
Data storage period:
Approx. 10 years

Power:

Power supply voltage:

85 to 264 V AC (Power supply voltage range), 50/60 Hz
Rating: 100 to 240 V AC
21.6 to 26.4 V AC (Power supply voltage range), 50/60 Hz
Rating: 24 V AC
21.6 to 26.4 V DC (Power supply voltage range)
Rating: 24 V DC

Power consumption:

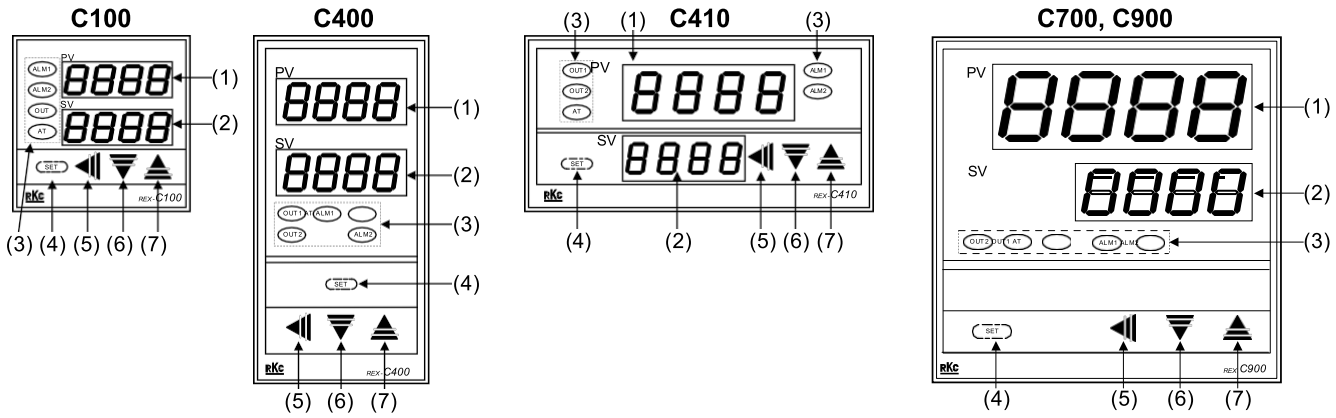
6 VA max. (at 100 V AC)
6 VA max. (at 240 V AC)
6 VA max. (at 24 V AC)
145 mA max. (at 24 V DC)

Weight:

C100: Approx. 170 g
C700: Approx. 250 g
C400/410: Approx. 260 g
C900: Approx. 340 g



4. PARTS DESCRIPTION



(1) Measured value (PV) display [Green]
Displays PV or various parameter symbols.

(2) Set value (SV) display [Orange]
Displays SV or various parameter set values (or CT input value).

(3) Indication lamps
Alarm output lamps (ALM1, ALM2) [Red]

ALM1: Lights when alarm 1 output is turned on.
ALM2: Lights when alarm 2 output is turned on.

Autotuning (AT) lamp [Green]
Flashes when autotuning is activated.
(After autotuning is completed: AT lamp will go out)

Control output lamps
(OUT1 [Yellow], OUT2 [Green])
OUT1: Lights when control output is turned on.*
OUT2: Lights when cool-side control output is turned on.

(4) (SET) (Set key)
Used for parameter calling up and set value registration.

(5) (Shift key)
Shift digits when settings are changed.

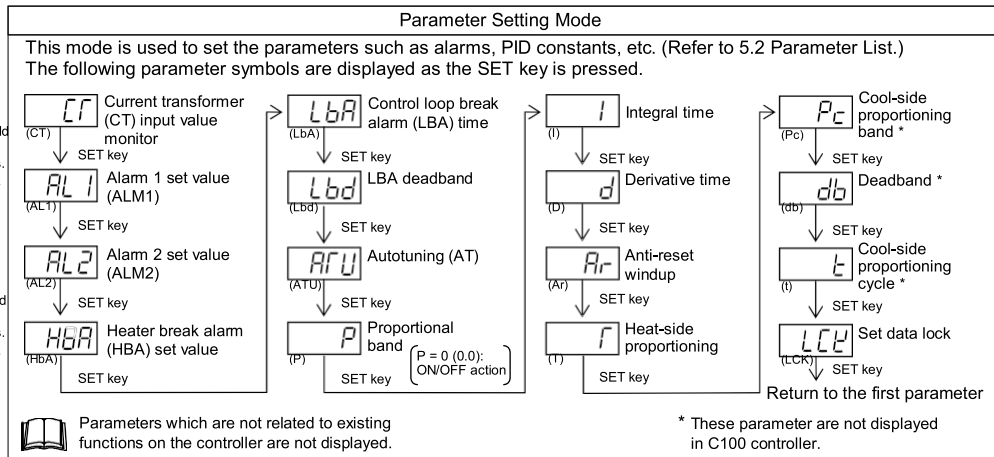
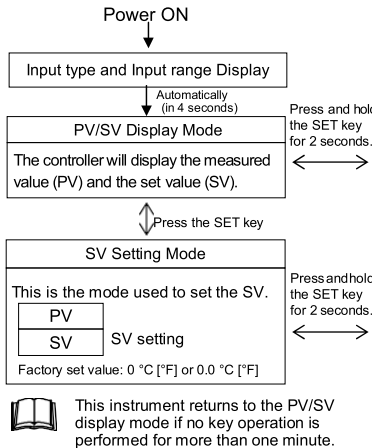
(6) (DOWN key)
Decrease numerals.

(7) (UP key)
Increase numerals.

To avoid damage to the instrument, never use a sharp object to press keys.

5. SETTING

5.1 Operation Menu



This instrument returns to the PV/SV display mode if no key operation is performed for more than one minute.

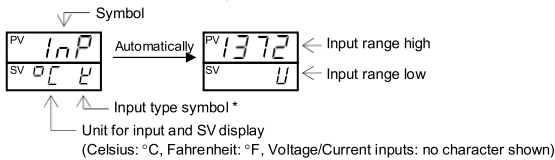
Parameters which are not related to existing functions on the controller are not displayed.

* These parameter are not displayed in C100 controller.

Input type and input range display

This instrument immediately confirms the input type symbol and input range following power ON.

Example: When sensor type of input is K thermocouple.



* Input Type Symbol Table

Symbol	K	J	R	S	B	E	T	N	PL II	W5Re/W26Re	U	L	JPt 100	Pt 100	Voltage input	Current input
Input type	Thermocouple (TC)										RTD					

5.2 Parameter List

The following parameter symbols are displayed as the SET key is pressed.

Parameter symbols which are not related to existing functions on the controller are not displayed.

Symbol	Name	Setting range	Description	Factory set value
CT	Current transformer (CT) input value monitor	0.0 to 100.0 A [Display only]	Display input value from the current transformer. [Displayed only when the instrument has the heater break alarm (HBA)]	
AL1	Alarm 1 set value (ALM1)	TC/RTD inputs: Deviation alarm, Process alarm: -1999 to +9999 °C [°F] or -199.9 to +999.9 °C [°F] Voltage/Current inputs: Deviation alarm: -199.9 to +200.0 % Process alarm: -199.9 to +300.0 %	Set the alarm 1 set value and alarm 2 set value. For the alarm action type, refer to page 7.	TC/RTD inputs: 50 (50.0) Voltage/Current inputs: 5.0
AL2	Alarm 2 set value (ALM2)			



Symbol	Name	Setting range	Description	Factory set value
HBA	Heater break alarm (HBA) set value ¹	0.0 to 100.0 A	Alarm value is set by referring to input value from the current transformer (CT). Used only for single-phase.	0.0
LBA	Control loop break alarm (LBA) time ²	0.1 to 200.0 minutes	Set control loop break alarm (LBA) set value.	8.0
Lbd	LBA deadband ³	TC/RTD inputs: 0 to 9999 °C [°F] Voltage/Current inputs: 0 to 100 % of input span	Set the area of not outputting LBA. No LBA deadband functions with 0 set. Differential gap : TC/RTD inputs: 0.8 °C [°F] Voltage/Current inputs: 0.8 % of input span	0
ATU	Autotuning (AT)	0: AT end or cancel 1: AT start or execution	Turns the autotuning ON/OFF.	0
P	Proportional band	TC/RTD inputs: 1 (0.1) to span 0.1 °C [°F] resolution: Within 999.9 °C [°F] Voltage/Current inputs: 0.1 to 100.0 % of input span 0 (0.0): ON/OFF action	Set when PI, PD or PID control is performed. Heat/Cool PID action: Proportional band setting on the heat-side. ON/OFF action differential gap: TC/RTD inputs: 2 (0.2) °C [°F] Voltage/Current inputs: 0.2 % of input span	TC/RTD inputs: 30 (30.0) Voltage/Current inputs: 3.0
I	Integral time	1 to 3600 seconds (0 second: PD action)	Set the time of integral action to eliminate the offset occurring in proportional control.	240
d	Derivative time	1 to 3600 seconds (0 second: PI action)	Set the time of derivative action to improve control stability by preparing for output changes.	60
Ar	Anti-reset windup (ARW)	1 to 100 % of heat-side proportional band (0 %: Integral action OFF)	Overshooting and undershooting are restricted by the integral effect.	100
T	Heat-side proportioning cycle	1 to 100 seconds (Not displayed if the control output is current output.)	Set control output cycle. Heat/Cool PID action: Heat-side proportioning cycle	Relay contact output: 20 Voltage pulse output/ Trigger output for triac driving: 2
Pc	Cool-side proportional band	1 to 1000 % of heat-side proportional band	Set cool-side proportional band when Heat/Cool PID action.	100
db	Deadband	TC/RTD inputs: -10 to +10 °C [°F] or -10.0 to +10.0 °C [°F] Voltage/Current inputs: -10.0 to +10.0 % of input span	Set control action deadband between heat-side and cool-side proportional bands. Minus (-) setting results in overlap.	0 or 0.0
t	Cool-side proportioning cycle	1 to 100 seconds (Not displayed if the control output is current output.)	Set control cool-side output cycle for Heat/Cool PID action.	Relay contact output: 20 Voltage pulse output: 2
LCK	Set data lock (LCK)	0100: No set data locked (All parameters changeable) 0101: Set data locked (All parameters locked) 0110: Only the set value (SV) is changeable with the set data locked	Performs set data change enable/disable.	0100

¹ Heater Break Alarm (HBA) function

The HBA function monitors the current flowing through the load by a dedicated current transformer (CT), compares the measured value with the HBA set value, and detects a fault in the heating circuit.

Low or No current flow (Heater break, malfunction of the control device, etc.):

When the control output is ON and the current transformer input value is equal to or less than the heater break determination point for the preset number of consecutive sampling cycle, an alarm is activated.

Over current or short-circuit:

When the control output is OFF and the current transformer input value is equal to or greater than the heater break determination point for the preset number of consecutive sampling cycle, an alarm is activated.

Precaution for HBA setting:

- Displayed only for when HBA is selected as Alarm 2.
- HBA is not available on a current output.
- Set the set value to approximately 85 % of the maximum reading of the CT input.
- Set the set value to a slightly smaller value to prevent a false alarm if the power supply may become unstable.
- When more than one heater is connected in parallel, it may be necessary to increase the HBA set value to detect a single heater failure.
- When the current transformer is not connected or the HBA set value is set to "0.0," the HBA is turned on.

² Control Loop Break Alarm (LBA) function

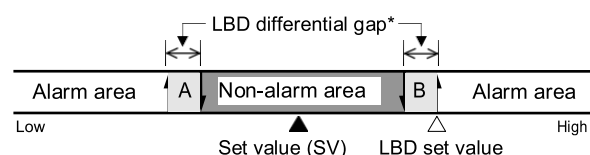
The LBA function is used to detect a load (heater) break or a failure in the external actuator (power controller, magnet relay, etc.), or a failure in the control loop caused by an input (sensor) break. The LBA function is activated when control output reaches 0 % or 100 %. LBA monitors variation of the measured value (PV) for the length of LBA time. When the LBA time has elapsed and the PV is still within the alarm determination range, the LBA will be ON.

Precaution for LBA setting:

- Displayed only for when LBA is selected as Alarm 1 or Alarm 2.
- No LBA function can be used at Heat/Cool PID control action.
- The LBA function can not be activated when AT function is turned on.
- The LBA function is activated when control output reaches 0 % or 100 %. The time required for the LBA output to turn on includes both the time from the initial occurrence of loop failure and the LBA setting time. Recommended setting for LBA is for the set value of the LBA to be twice the value of the integral time (I).
- If LBA setting time does not match the controlled object requirements, the LBA setting time should be lengthened.
If setting time is not correct, the LBA will malfunction by turning on or off at inappropriate times or not turning on at all.

³ LBA Deadband function

The LBA may malfunction due to external disturbances. To prevent malfunctioning due to external disturbance, LBA deadband (LBD) sets a neutral zone in which LBA is not activated. When the measured value (PV) is within the LBD area, LBA will not be activated. If the LBD setting is not correct, the LBA will not work correctly.



A: During temperature rise: Alarm area B: During temperature rise: Non-alarm area
During temperature fall: Non-alarm area During temperature fall: Alarm area

* TC and RTD inputs: 0.8 °C [°F] (fixed)
Voltage/Current inputs: 0.8 % of input span (fixed)



5.3 Changing Parameter Settings

Procedures to change parameter settings are shown below.

To store a new value for the parameter, always press the SET key.
The display changes to the next parameter and the new value will be stored.

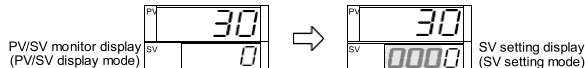
- A new value will not be stored without pressing SET key after the new value is displayed on the display.
- After a new value has been displayed by using the UP and DOWN keys, the SET key must be pressed within 1 minute, or the new value is not stored and the display will return to the PV/SV monitor screen.

● Change the set value (SV)

Change the set value (SV) from 0 °C to 200 °C

1. Select the SV setting mode

Press the SET key at PV/SV monitor screen until SV setting screen is displayed.



2. Shift the high-lighted digit

Press the shift key to high-light the hundreds digit.

The high-lighted digit indicates which digit can be set.



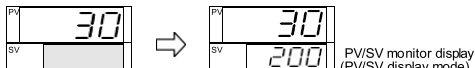
3. Change the set value

Press the UP key to change the number to 2.



4. Store the set value

Press the SET key to store the new set value. The display returns to the PV/SV monitor screen.



● Change parameters other than the set value (SV)

The changing procedures are the same as those of example 2 to 4 in the above "● Change the set value (SV)". Pressing the SET key after the setting end shifts to the next parameter. When no parameter setting is required, return the instrument to the PV/SV display mode.

6. OPERATION

CAUTIONS

- **All mounting and wiring must be completed before the power is turned on. If the input signal wiring is disconnected or short-circuited (RTD input only), the instrument determines that burnout has occurred.**
 - Displays:
 - Upscale: Thermocouple input, RTD input (when input break)
 - Downscale: Thermocouple input (specify when ordering), RTD input (when short-circuited), Voltage input (1 to 5 V DC), Current input (4 to 20 mA DC)
 - For the voltage (0 to 5 V DC) or current (0 to 20 mA DC) input, the display becomes indefinite (display of about zero value).
- Outputs:
 - Control output: OFF (Heat/Cool control: the control output on both heat-side and cool-side is turned off)
 - Alarm output: Both of the Alarm 1 and Alarm 2 outputs of this instrument are turned on when burnout occurs regardless of any of the following actions taken. (High alarm, low alarm, etc.) In addition, when used for any purposes other than these alarms (event, etc.), specify the Z-124 specification (not to be forcibly turned on).
- **A power failure of 20 ms or less will not affect the control action. When a power failure of more than 20 ms occurs, the instrument assumes that the power has been turned off. When power returns, the controller will retain the conditions that existed prior to shutdown.**
- **The alarm hold action is activated when not only the power is turned on, but also the SV is changed.**

6.1 Operating Precautions

- (1) All mounting and wiring must be completed before the power is turned on.
- (2) The settings for the SV and all parameters should be appropriate for the controlled object.
- (3) A power supply switch is not furnished with this instrument. It is ready to operate as soon as the power is turned on.

6.2 Set Data Lock (LCK) Function

The set data lock restricts parameter setting changes by key operation. This function prevents the operator from making errors during operation.

Set value	Parameters which can be changed
0100	All parameters [Factory set value]
0101	No parameters [All Locked]
0110	SV

Parameters protected by Set Data Lock function are still displayed for monitoring.

6.3 Autotuning (AT) Function

Autotuning (AT) automatically measures, calculates and sets the optimum PID and LBA constants. The following conditions are necessary to carry out autotuning and the conditions which will cause the autotuning to stop.



Caution for using the Autotuning (AT)

When a temperature change (UP and/or Down) is 1 °C or less per minute during Autotuning, Autotuning may be cancelled before calculating PID values. In that case, adjust the PID values manually. It is possible to happen when the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.

Requirements for AT start

Start the autotuning when all following conditions are satisfied:

- Prior to starting the AT function, end all the parameter settings other than PID and LBA.
- Confirm the LCK function has not been engaged.



When the autotuning is finished, the controller will automatically returns to PID control.

Requirements for AT cancellation

The autotuning is canceled if any of the following conditions exist.

- When the set value (SV) is changed.
- When the PV bias value is changed.
- When the PV becomes abnormal due to burnout.
- When the power is turned off.
- When power failure longer than 20 ms occurs.



If the AT is canceled, the controller immediately changes to PID control. The PID values will be the same as before AT was activated.



When AT is completed, the controller immediately changes to PID control. If the control system does not allow the AT cycling process, set each PID constant manually to meet the needs of the application.

7. INITIAL SETTING



WARNING

Parameters in the Initialization mode should be set according to the application before setting any parameter related to operation. Once the Parameters in the Initialization mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Initialization mode.

7.1 Go to Initialization Mode

1. Turn on the power to this controller. The instrument goes to the PV/SV display after confirming input type symbol and input range.
2. Press and hold the SET key for 5 seconds to go to the Parameter setting mode from the PV/SV display.
3. Press the SET key until "LCK" (Set Data Lock display) will be displayed.
4. The high-lighted digit indicates which digit can be set. Press shift key to high-light the hundreds digit. (The selection in each image of the controller shows the digits which are not high-lighted.)



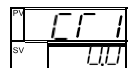
Set data lock function display

5. Press the DOWN key to change 1 to 0.



Set value
0: Initialization mode unlocked
1: Initialization mode locked

6. Press the SET key to store the new set value. The display goes to the next parameter, and the Initialization mode is unlocked.



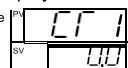
CT1 input value display

The parameter displayed varies on the instrument specification.

7. Press the shift key for 5 seconds while pressing the SET key to go to the Initialization mode. When the controller goes to the Initialization mode, "SL1" will be displayed.



CT1 input value display



Initialize code selection display of initialization mode



If the control is set to the initial set mode, all outputs are turned OFF.

7.2 Exit Initialization Mode



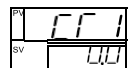
When any parameter setting is changed in the Initialization mode, check all parameter set values in SV setting mode and Parameter setting mode.

1. Press the shift key for 5 seconds while pressing the SET key from any display in the Initialization mode. The controller goes back to the operation mode and the PV/SV display will be displayed.
2. Press and hold the SET key for 5 seconds in the PV/SV display.
3. Press the SET key until "LCK" (Set Data Lock display) will be displayed.
4. The high-lighted digit indicates which digit can be set. Press shift key to high-light the hundreds digit.



Set data lock function display

5. Press the SET key to store the new set value. The display goes to the next parameter, and the Initialization mode is locked.



CT1 input value display

The parameter displayed varies on the instrument specification.



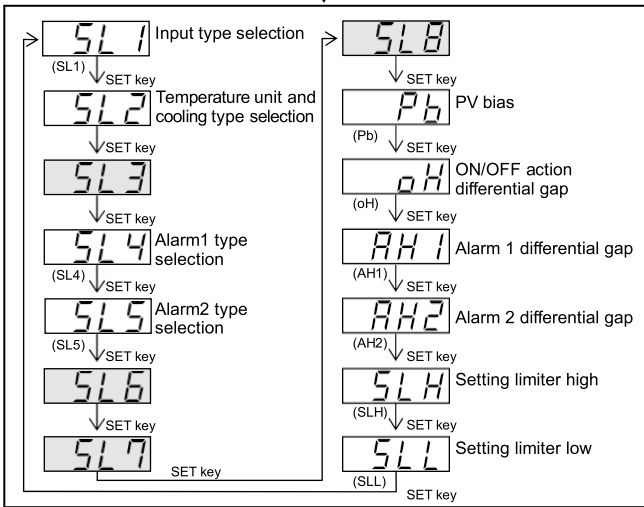
7.3 Initial Setting Menu

Display flowcharts in Initialization mode are shown in the following.

Do not change to the section parameters and any parameter in the Initialization mode which is not described in the initial setting menu below. It may result in malfunction or failure of the instrument.

PV/SV display mode or Parameter setting mode

Press the shift key while pressing the SET key for 5 seconds with the unlocked.



7.4 Input Type Selection (SL1)

When any parameter setting is changed in the Initialization mode, check all parameter set values in SV setting mode and Parameter setting mode.

Factory set value varies depending on the input type.

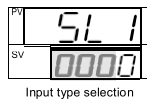
Set value	Input type	Hardware
0000	K	Thermocouple (TC)
0001	J	
0010	L	
0011	E	
0100	N	
0111	R	
1000	S	
1001	B	
1010	W5Re/W26Re	
1011	PL II	
0101	T	
0110	U	B
1100	Pt100 (JIS/IEC)	RTD
1101	JPt100 (JIS)	
1110	0 to 5 V DC	Voltage
1111	1 to 5 V DC	
1110	0 to 20 mA DC	Current
1111	4 to 20 mA DC	

Conduct setting so as to meet the instrument specification (input type). Setting change between different symbols may cause malfunction, but the setting can be changed when hardware types have the same symbol. However, when the setting is changed, always reset "SLH" and "SLL" (Refer to page 8).

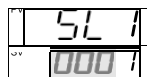
Change Settings

Example: Change the input type from "K" to "J"

1. Press the SET key. The display will go to SL1.



2. Press the UP key to change the number to 1.



3. Press the SET key to store the new set value. The display goes to the next parameter.

7.5 Temperature Unit and Cooling Type Selection (SL2)

Inappropriate settings may result in malfunction. Control type between Heat Only and Heat/Cool cannot be changed by this parameter.

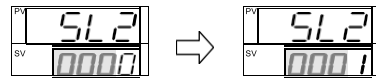
Factory set value varies depending on the instrument specification.

Set value	Description	
	Temperature unit	Cooling type selection
0000	°C	Air cooling (A type) or Heat only type (F, D type)
0001	°F	Air cooling (A type) or Heat only type (F, D type)
0010	°C	Water cooling (W type)
0011	°F	Water cooling (W type)

Change Settings

Example: Change the temperature unit of the Heat only type from "°C (0000)" to "°F (0001)"

- Press the SET key until SL2 is displayed.
- Press the UP key to change the number to 1.



- Press the SET key to store the new set value. The display goes to the next parameter.

7.6 Alarm 1 [ALM1] Type Selection (SL4) Alarm 2 [ALM2] Type Selection (SL5)

If the alarm function is not provided with the instrument when shipped from the factory, no alarm output is available by changing SL4 and/or SL5.

SL4 is set to 0000 in the following cases.

- When the instrument does not have ALM1 output
- When Control Loop Break Alarm (LBA) is provided and assigned to ALM1

SL5 is set to 0000 in the following cases.

- When the instrument does not have ALM2 output
- When Control Loop Break Alarm (LBA) is provided and assigned to ALM2
- When the SV alarm is provided and assigned to ALM2
- When the Heater Break Alarm (HBA) is provided

Factory set value varies depending on the instrument specification.

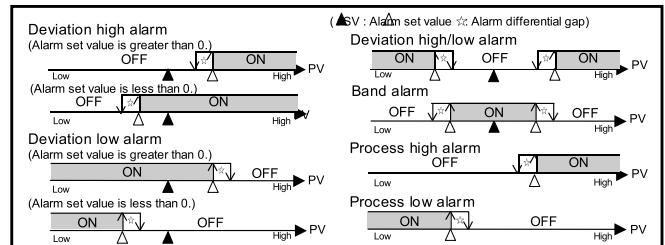
Set value	Details of setting
0000	No alarm
0001	Deviation high alarm
0101	Deviation low alarm
0010	Deviation high/low alarm
0110	Band alarm
0011	Process high alarm
0111	Process low alarm
1001	Deviation high alarm with hold action *
1101	Deviation low alarm with hold action *
1010	Deviation high/low alarm with hold action *
1011	Process high alarm with hold action *
1111	Process low alarm with hold action *

* Hold action:

When Hold action is ON, the alarm action is suppressed at start-up or the control set value change until the measured value enters the non-alarm range.

Alarm action type

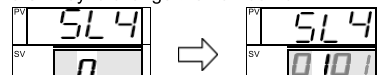
Both of the Alarm 1 and Alarm 2 outputs of this instrument are turned on when burnout occurs regardless of any of the following actions taken (High alarm, low alarm, etc.). In addition, when used for any purposes other than these alarms (event, etc.), specify the Z-124 specification (not to be forcibly turned on).



Change Settings

Example: Change the ALM1 type from "Deviation high alarm (0001)" to "Deviation low alarm (0101)"

- Press the SET key three times at SL1 until SL4 is displayed.
- Press the shift key to high-light the hundreds digit.
- Press the UP key to change the number to 1.



- Press the SET key to store the new set value. The display goes to the next parameter.

7.7 PV bias (Pb)

The value set in the PV bias is added to the input value (actual measured value) to correct the input value. The PV bias is used to correct the individual variations in the sensors or when there is difference between the measured values (PV) of other instruments.

Setting range: TC/RTD inputs: -1999 to +9999 °C [°F] or -199.9 to +999.9 °C [°F]

Voltage/Current inputs: -199.9 to +200.0 %

Factory set value: TC/RTD inputs: 0 °C [°F] or 0.0 °C [°F]

Voltage/Current inputs: 0.0 %

Continued on the next page.



Continued from the previous page.

Change Settings

Example: When the temperature is measured by two instruments

When the measured values (PV) are as shown in the following:

Main unit = 198 °C

Recorder = 200 °C

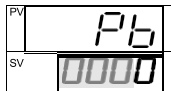
If a PV bias correction value of +2 °C is added to the measured value the main unit, the displayed value become:

Displayed value = Measured value (PV) + PV bias

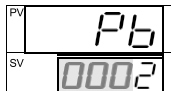
= 198 °C + 2 °C = 200 °C

The setting procedures is described in the following.

1. Press the SET key at "Pb" is displayed.



2. Press the UP key to change the number to 2.



3. Press the SET key to store the new set value. The display goes to the next parameter.

7.8 ON/OFF Action Differential Gap (oH)

Setting range: TC/RTD inputs: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]

Voltage/Current inputs: -199.9 to +200.0 %

Factory set value: TC/RTD inputs: 2 °C [°F] or 2.0 °C [°F]

Voltage/Current inputs: 0.2 % of input span

Change Settings

Example: Change the On/Off Action differential gap from "2 °C" to "4 °C"

1. Press the SET key at "oH" is displayed.
2. Press the UP key to change the number to 4.
3. Press the SET key to store the new set value. The display goes to the next parameter.

7.9 Alarm 1 Differential Gap (AH1) Alarm 2 Differential Gap (AH2)

Setting range: TC/RTD inputs: 0 to 100 °C [°F] or 0.0 to 100.0 °C [°F]

Voltage/Current inputs: 0.0 to 10.0 %

Factory set value: TC/RTD inputs: 2 °C [°F] or 2.0 °C [°F]

Voltage/Current inputs: 0.2 % of input span

Change Settings

Example: Change the Alarm 1 differential gap from "2 °C" to "4 °C"

1. Press the SET key at "AH1" is displayed.
2. Press the UP key to change the number to 4.
3. Press the SET key to store the new set value. The display goes to the next parameter.

7.10 Setting Limiter High (SLH) Setting Limiter Low (SLL)

For voltage or current input, set scaling within the input range.

Refer to 9. INPUT RANGE TABLE.

Factory set value varies depending on the instrument specification.

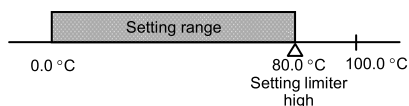
Input type	Setting range *	
TC	K	0 to 1372 °C / 0 to 2502 °F
	J	0 to 1200 °C / 0 to 2192 °F
	R	0 to 1769 °C / 0 to 3216 °F
	S	0 to 1769 °C / 0 to 3216 °F
	B	0 to 1820 °C / 0 to 3308 °F
	E	0 to 1000 °C / 0 to 1832 °F
	N	0 to 1300 °C / 0 to 2372 °F
	T	-199.9 to +400.0 °C / -199.9 to +752.0 °F
	W5Re/W26Re	0 to 2320 °C / 0 to 4208 °F
	PLII	0 to 1390 °C / 0 to 2534 °F
RTD	U	-199.9 to +600.0 °C / -199.9 to +999.9 °F
	L	0 to 800 °C / 0 to 1600 °F
RTD	Pt100	-199.9 to +649.0 °C / -199.9 to 999.9 °F
	JPt100	-199.9 to +649.0 °C

* Limit setting becomes SLH ≥ SLL.

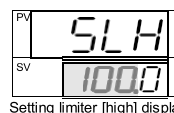
When changing the high-limit (SLH) and the low-limit (SLL) limiter settings, always set the set-value (SV) within the limiter range.

Change Settings

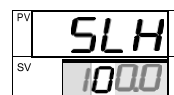
Example: The input range (input scale range) is from 0.0 to 100.0 °C, the setting limiter high is 80.0 °C.



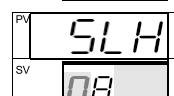
1. Press the SET key at "SLH" is displayed.



2. Press the shift key to high-light the tens digit.



3. Press the DOWN key to change the number to 8.



4. Press the SET key to store the new set value. The display goes to the next parameter.

8. ERROR DISPLAYS

Error display

Err	RAM failure (Incorrect set data write, etc.)	Turn off the power at once. If an error occurs after the power is turned on again, please contact RKC sales office or the agent.
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Over-scale and Underscale

Measured value (PV) [Flashing]	PV is outside of input range.	WARNING To prevent electric shock, always turn off the power before replacing the sensor. Check Input type, Input range and connecting state of sensor. Confirm that the sensor or wire is not broken.
0000 [Flashing]	Over-scale: PV is above the high input display range limit.	
UUUU [Flashing]	Underscale: PV is below the low input display range limit.	

9. INPUT RANGE TABLE

TC/RTD inputs		Input type	Range	Code	Range	Code	Range	Code	
TC	K		0 to 200 °C	K 01	0 to 400 °C	K 02	0 to 600 °C	K 03	
			0 to 800 °C	K 04	0 to 1000 °C	K 05	0 to 1200 °C	K 06	
			0 to 1372 °C	K 07	0 to 100 °C	K 13	0 to 300 °C	K 14	
			0 to 450 °C	K 17	0 to 500 °C	K 20	0 to 800 °F	K A1	
			0 to 1600 °F	K A2	0 to 2502 °F	K A3	20 to 70 °F	K A9	
		J		0 to 200 °C	J 01	0 to 400 °C	J 02	0 to 600 °C	J 03
				0 to 800 °C	J 04	0 to 1000 °C	J 05	0 to 1200 °C	J 06
				0 to 450 °C	J 10	0 to 800 °F	J A1	0 to 1600 °F	J A2
			0 to 2192 °F	J A3	0 to 400 °F	J A6	0 to 300 °F	J A7	
	R ¹		0 to 1600 °C	R 01	0 to 1769 °C	R 02	0 to 1350 °C	R 04	
			0 to 3200 °F	R A1	0 to 3216 °F	R A2	—	—	
	S ¹		0 to 1600 °C	S 01	0 to 1769 °C	S 02	0 to 3200 °F	S A1	
			0 to 3216 °F	S A2	—	—	—	—	
	B ²		400 to 1800 °C	B 01	0 to 1820 °C	B 02	800 to 3200 °F	B A1	
			0 to 3308 °F	B A2	—	—	—	—	
	E		0 to 800 °C	E 01	0 to 1000 °C	E 02	0 to 1600 °F	E A1	
			0 to 1832 °F	E A2	—	—	—	—	
	N		0 to 1200 °C	N 01	0 to 1300 °C	N 02	0 to 2300 °F	N A1	
		0 to 2372 °F	N A2	—	—	—	—		
T		-199.9 to +400.0 °C	T 01	-199.9 to +100.0 °C	T 02	-100.0 to +200.0 °C	T 03		
		0 to 350.0 °C	T 04	-199.9 to +752.0 °F	T A1	-100.0 to +200.0 °F	T A2		
		-100.0 to +400.0 °F	T A3	0.0 to 450.0 °F	T A4	0.0 to 752.0 °F	T A5		
W5Re/W26Re		0 to 2000 °C	W 01	0 to 2320 °C	W 02	0 to 4000 °F	W A1		
PLII		0 to 1300 °C	A 01	0 to 1390 °C	A 02	0 to 1200 °C	A 03		
		0 to 2400 °F	A A1	0 to 2534 °F	A A2	—	—		
U		-199.9 to +600.0 °C	U 01	-199.9 to +100.0 °C	U 02	0 to 400.0 °C	U 03		
		-199.9 to +999.9 °F	U A1	-100.0 to +200.0 °F	U A2	0.0 to 999.9 °F	U A3		
L		0 to 400 °C	L 01	0 to 800 °C	L 02	0 to 800 °F	L A1		
		0 to 1600 °F	L A2	—	—	—	—		
RTD	Pt100		-199.9 to +649.0 °C	01	-199.9 to +200.0 °C	D 02	-100.0 to +50.0 °C	D 03	
			-100.0 to +100.0 °C	04	-100.0 to +200.0 °C	D 05	0.0 to 50.0 °C	D 06	
			0.0 to 100.0 °C	D 07	0.0 to 200.0 °C	D 08	0.0 to 300.0 °C	D 09	
			0.0 to 500.0 °C	D 10	-199.9 to +999.9 °F	D A1	-199.9 to +400.0 °F	D A2	
			-199.9 to +200.0 °F	D A3	-100.0 to +100.0 °F	D A4	-100.0 to +300.0 °F	D A5	
			0.0 to 100.0 °F	D A6	0.0 to 200.0 °F	D A7	0.0 to 400.0 °F	D A8	
			0.0 to 500.0 °F	D A9	—	—	—	—	
			-199.9 to +649.0 °C	01	-199.9 to +200.0 °C	P 02	-100.0 to +50.0 °C	P 03	
			-100.0 to +100.0 °C	04	-100.0 to +200.0 °C	P 05	0.0 to 50.0 °C	P 06	
			0.0 to 100.0 °C	P 07	0.0 to 200.0 °C	P 08	0.0 to 300.0 °C	P 09	
	0.0 to 500.0 °C	P 10	—	—	—	—			

¹ 0 to 399 °C [0 to 799 °F]; ±6 °C [12 °F]

² 0 to 399 °C [0 to 799 °F]; Accuracy is not guaranteed.

Voltage/Current inputs

Type	Range	Code	Type	Range	Code
0 to 5 V DC	0.0 to 100.0 (Fixed)	4 01	0 to 20 mA DC	0.0 to 100.0 (Fixed)	7 01
1 to 5 V DC	0.0 to 100.0 (Fixed)	6 01	4 to 20 mA DC	0.0 to 100.0 (Fixed)	8 01



ADLEEPOWER®

INSTRUCTION MANUAL

GENERAL-PURPOSE INVERTER



THANK YOU VERY MUCH FOR YOUR PURCHASE
OF ADLEE INVERTER AS 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.

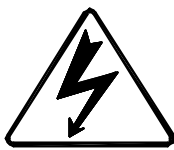
This manual will be helpful in the installation, parameter setting, troubleshooting, and daily maintenance of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the AC drives. Keep this operating manual handy and distribute 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 45gK
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 U, V and W.
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.

- V -



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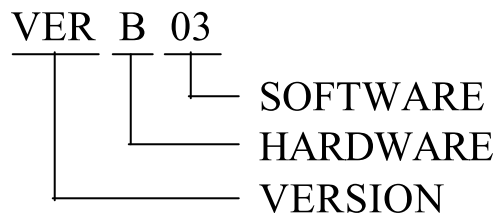
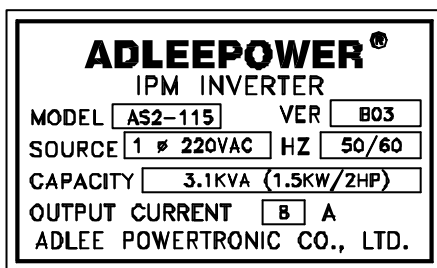
1. RECEIVING

This AS 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 : AS 2 - 115 R

AS series

Voltage class :

1 : 110V

2 : 220V

4 : 380/440V

R : REMOTE CONTROL SERIES

H : HIGH SPEED SERIES

T : TIMING AND SPEED CONTROL SERIES

RP : REMOTE CONTROL AND PID CONTROL SERIES

RT : REMOTE CONTROL AND SPEEDS WITH TIMING CONTROL SERIES

Max Applicable motor(4 pole)

Single Phase :

104 : 0.4KW 107 : 0.75KW 115 : 1.5KW

122 : 2.2KW 137 : 3.7KW

3 Phase :

304 : 0.4KW 307 : 0.75KW 315 : 1.5KW

322 : 2.2KW 337 : 3.7KW



2. SPECIFICATIONS

(1) Single phase input port

jçÇÉä	N		O					
sçäi~ÖÉ	éNs^øÛB		éOs^øÛB					
jçÇÉä=kç	Q	T	Q	T	R	O	T	
éii=ÉèiÉäÁó	w=øÛ							
liíliçäi~ÖÉ	é=s^							
liíliéÉèiÉäÁó	ú=w=ú=áÖÛ=ÑèÉèiÉäÁóF							
liíli o~iÉÇ=ÄiêêÉäi=F	^	^	^	^	^			
é~Ááióhs	hs^	hs^	hs^	hs^	hs^	hs^	hs^	
i~èÖÉèi=äçìçè htçäÉè	t	ht	t	ht	t	t	t	
áiêçä	pááÉ~iÉ=éiäèÉ=iáÇiÛ=äçÇiä~iáçä							
~áááÖ	oÉÖÉäÉè~iáiÉäéÄÛ~èÖÉè~áááÖ							
liÉèièéÉái é~Ááió	Ñ=é~iÉÇ=ÄiêêÉäi=áááiíÉF							
ÁÉäÉè~iáçääáÉ	ú=							
ÁÉäÉè~iáçääáÉ	ú=							
ÉèiÉäÁó	Öái~ä	rèÉ=áÉóÄç~(▲▼◀)Ö=~äÇ=AçäÑáéä=Äó					PROG	
èÉíiááÖ	~äçÖ	èÉèiÉäÁóäçÄ						
èéä~ó=ióéÉ	ibÖáiè							
çääáÖ=jÉiÛÇÇ	pÉäÑççäÉÇ	JÄççäÉÇ	pÉäÑççäÉÇ	pÉäÑççäÉÇ	JÄççäÉÇ	èJÄççäÉÇ	èJÄççäÉÇ	
ãÉäéäçä=Çè~iááÖ	Ö=N	Ö=O	Ö=N	Ö=N	Ö=O	Ö=O	Ö=P	
tÉäÖÛit=hd	d	d	d	d	d	d	d	

(2) 3 Phase input port

jçÇËä	O					Q				
sçäi~ÖÉ	é=s^øÛ					é=ÛN				
jçÇËä=kç	Q	T	R	O	T	T	R	O	T	
éií=ÉèìÉäÁó	w=øÛB									
líéíiçäi~ÖÉ	é=					é=				
líéíiÉèìÉäÁó	ú=w=ú=áÖÛ=ÑèÉèìÉäÁóF									
líéíi o~íÉÇ=ÁièèÉái=F	^	^	^			^	^	^	^	
é~Ááiós	hs^	hs^	hs^	hs^	hs^	hs^	hs^	hs^	hs^	
i~èÖÉéí=áçìçê htçäÈè	ht	t	ht	ht	ht	t	ht	ht	ht	
áièçä	pááÉ~íÉ=éìäèÉ=íáÇiÛ=äçÇiä~íáçä									
~áááÖ	oÉÖÉäÉè~íáíÉäèAÛ~èÖÉè~áááÖ									
líÉèìèÉái é~Ááió	Ñ=è~íÉÇ=ÁièèÉái=áááíiÉF									
ÁÉäÉè~íáçäááÉ	ú=									
ÁÉäÉè~íáçäááÉ	ú=									
ÉèìÉäÁó	Öái~ä	rèÉ=áÉóÄç~éÇ~é~E íáá~áÇ=ÄçäÑáèä=Äó							PROG	
èÉííááÖ	~äçÖ	éÉèìÉäÁóäçÄ								
ééä~ó=íóéÉ	ibÖáiè									
çäááÖ=jÉiÛçÇ	pÉäÑççäÉ	QÉäÑççäÉ	QJÄççäÉÇ	èJÄççäÉÇ	éJÄççäÉÇ	éJÄççäÉÇ	éJÄççäÉÇ	éJÄççäÉÇ	éJÄççäÉÇ	
ãÉäèäçä=Çè~íááÖ	Ö=N	Ö=N	Ö=O	Ö=O	Ö=P	Ö=O	Ö=O	Ö=P	Ö=P	
tÉäÖÛít=hd	hd	hd	hd	hd	hd	hd	hd	hd	hd	



3. DIMENSION DRAWINGS

Unit : mm

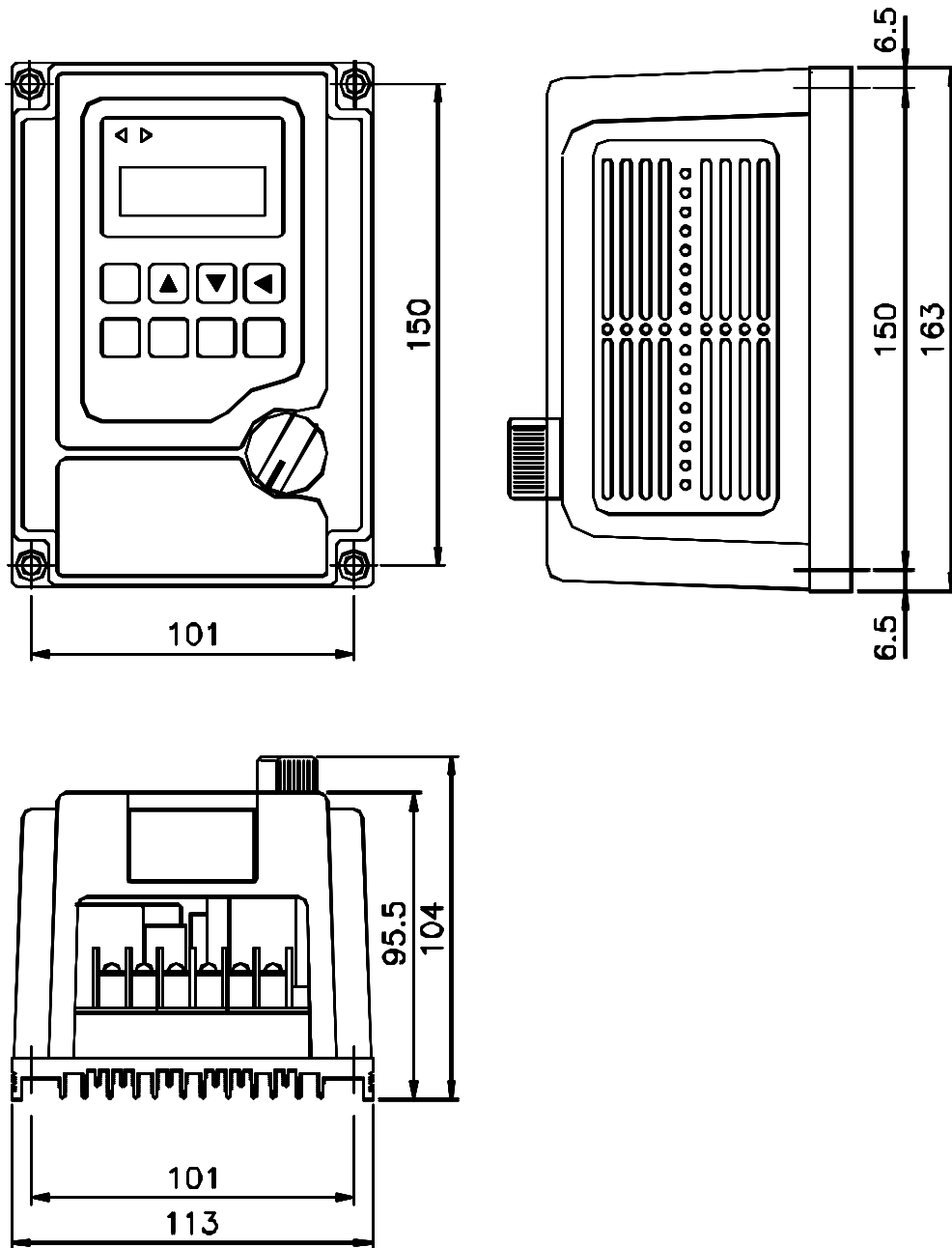


Fig 1

Unit : mm

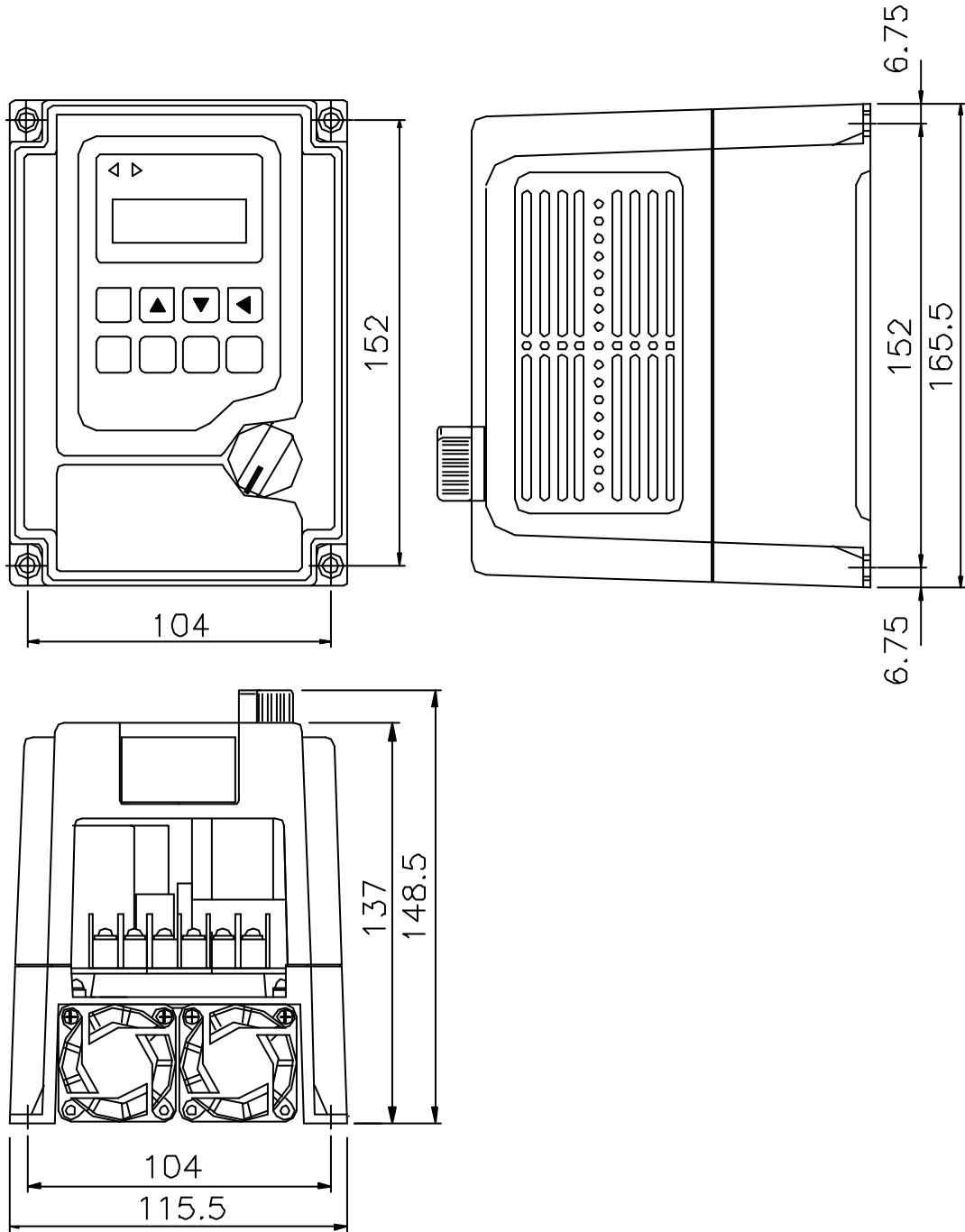


Fig 2

Unit : mm

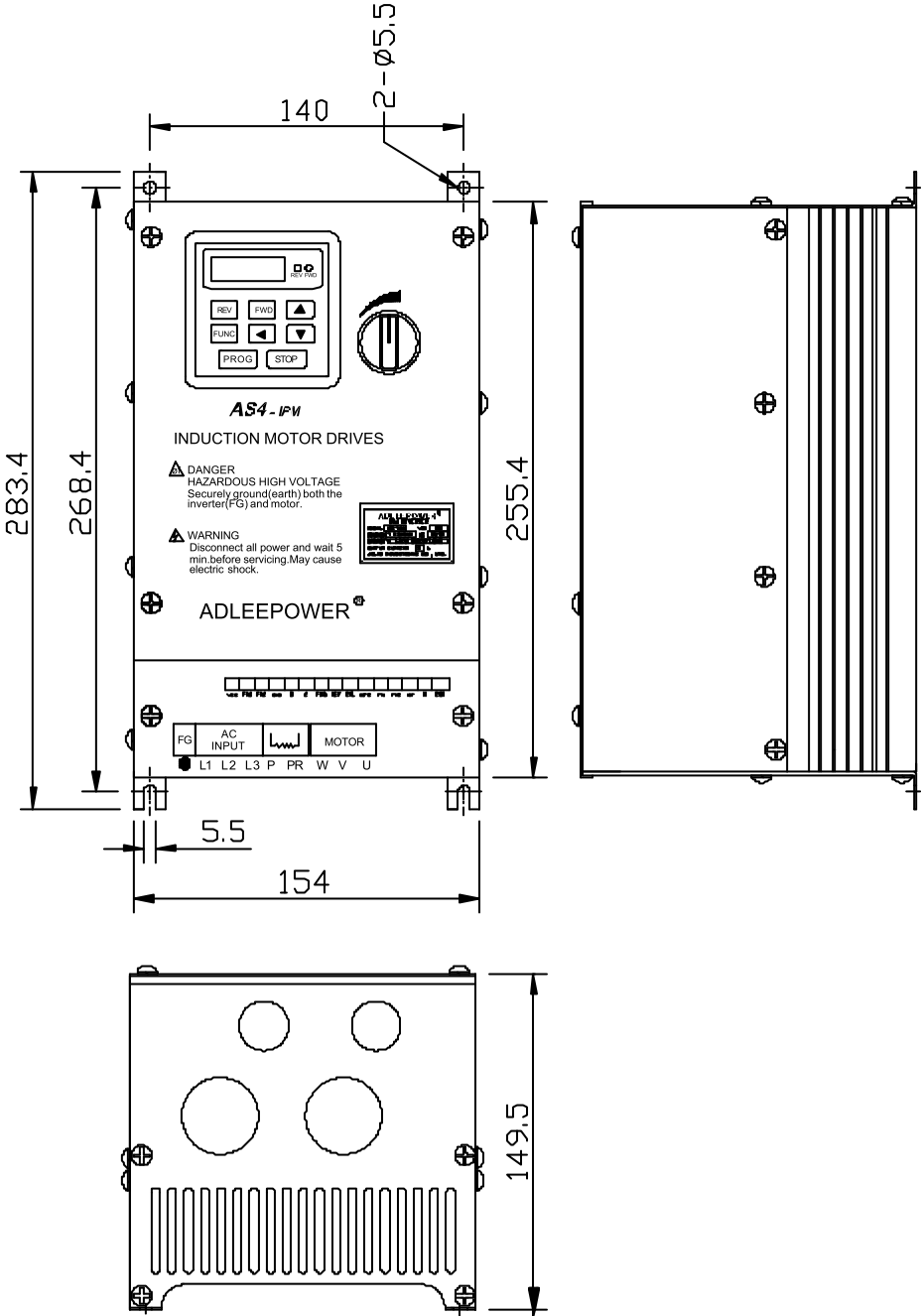


Fig 3

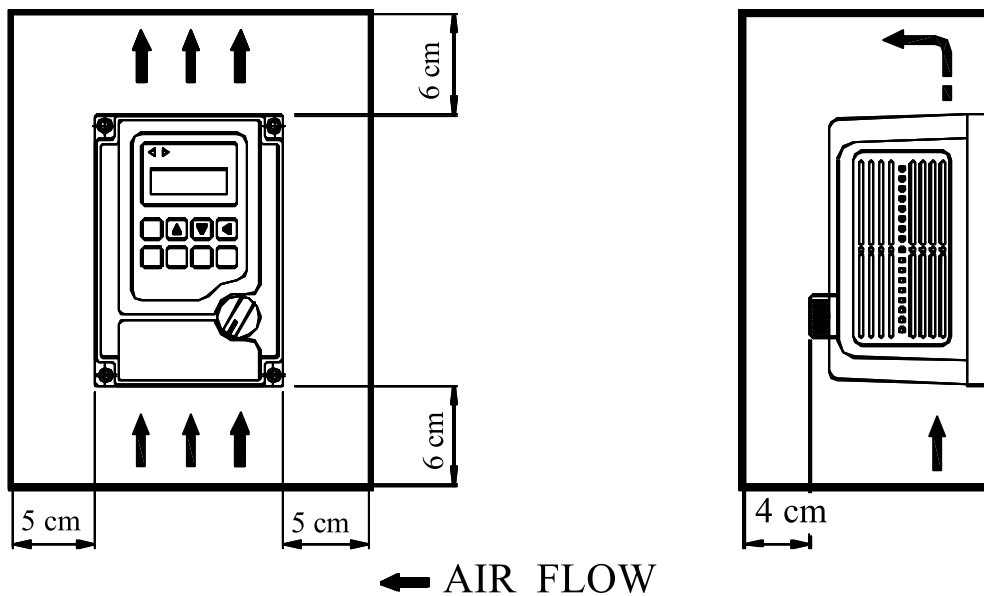


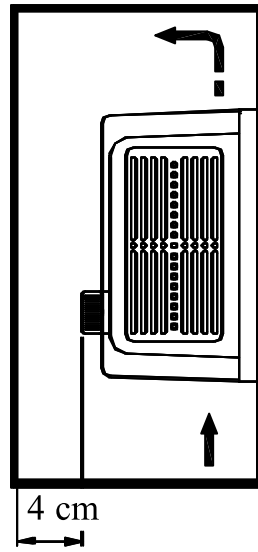
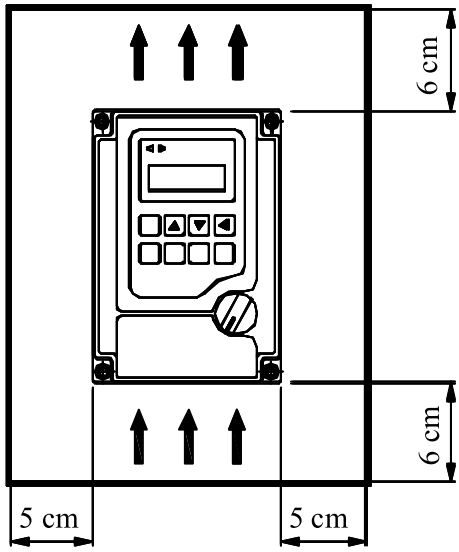
4. INSTALLATION

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

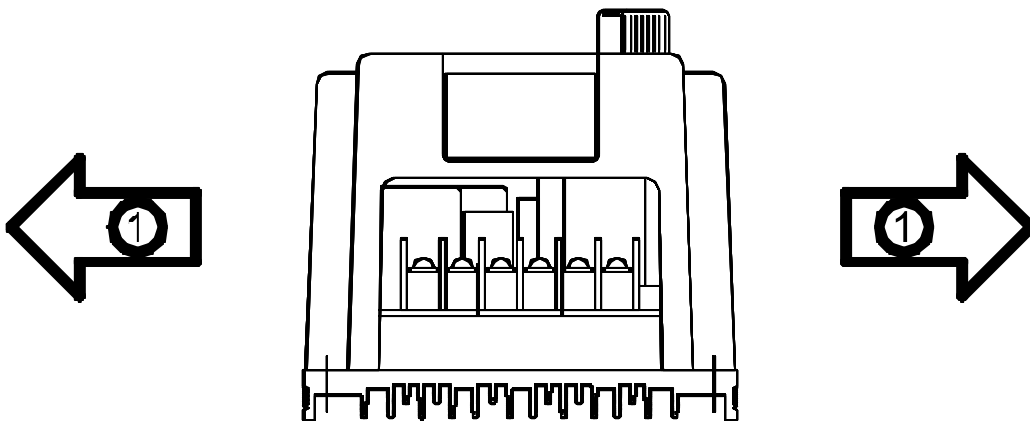
Before operating the AS series inverter, please check the following points :

- (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.



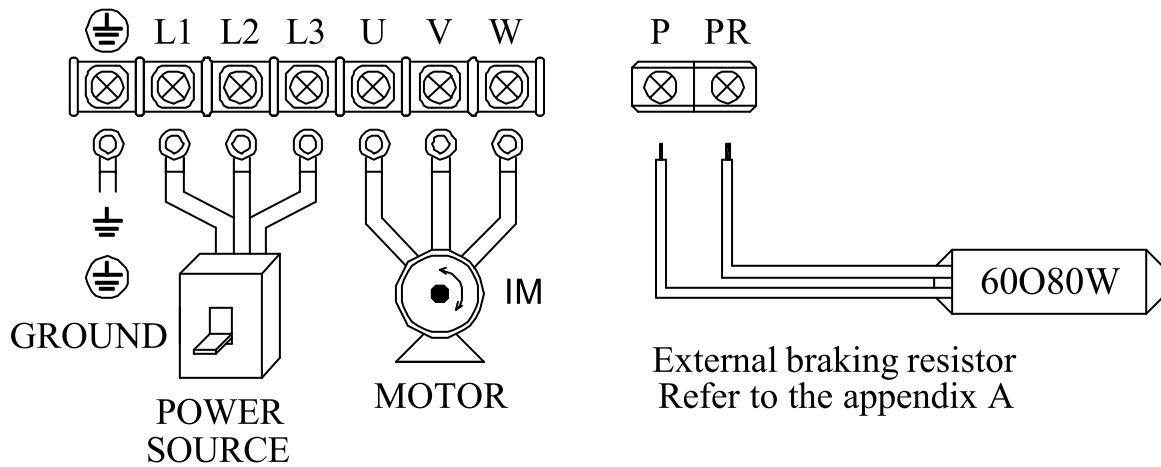


← AIR FLOW



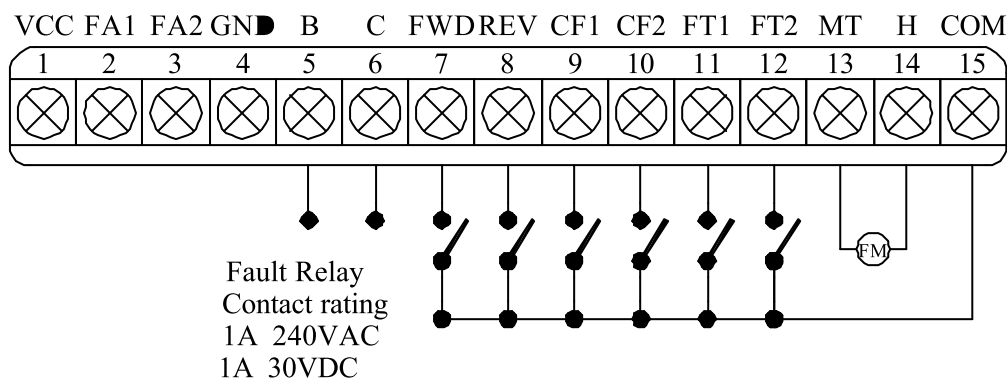
5. DESCRIPTION OF TERMINALS

(1) Main circuit connection diagram



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) 3 Phase
3	L2		
4	L3		
5	U	Inverter output	Terminals connected to motor
6	V		
7	W		
8	P	Dynamic brake	Terminals connected to braking Resistor
9	PR		

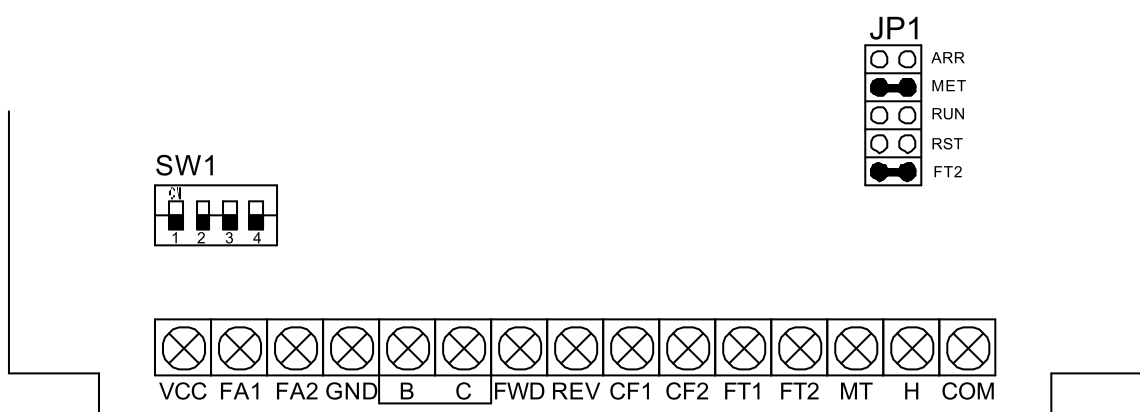
(2) Control circuit terminal



No	Symbol	Multi function analog terminal	
1	VCC	Analog source	Power source +5V of analog terminals
2	FA1	Free analog terminal 1	See CD44 & 3-1 SW1
3	FA2	Free analog terminal 2	See CD45 & 3-1 SW1
4	GND	Analog common terminal	Common terminal of free analog terminals

Control circuit terminal																		
No	Symbol	Terminal name	Description															
5	B	Alarm output B	Fault alarm contact (normal close)															
6	C	Alarm output C	Fault alarm contact (common)															
T	FWD	Forward operation	Forward operation / stop terminal															
U	REV	Reverse operation	Reverse operation / stop terminal															
9	CF1	Multistage speed terminal	<table border="1" style="margin-left: auto; margin-right: auto;"> <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																
10	CF2																	
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 (SEE 3-2 JP1)																
14	H	Ref source +10V	Basic source +10V 20mA															
15	COM	Common terminal	Common terminal of control terminals															

(3) Description of Hardware setting

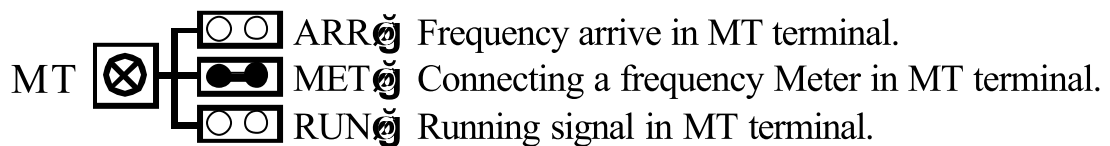


3-1 DIP Switch setting (SW1)

Setting FA1	Setting FA2
 FA1 : 0 - 10V	 FA2 : 0 - 10V
 FA1 : 0 - 5V	 FA2 : 0 - 5V
 FA1 : 4 - 20mA	 FA2 : 4 - 20mA
 Error setting	 Error setting

3-2 Jumper Setup (JP1)

MT : Multi function output terminal selector signal

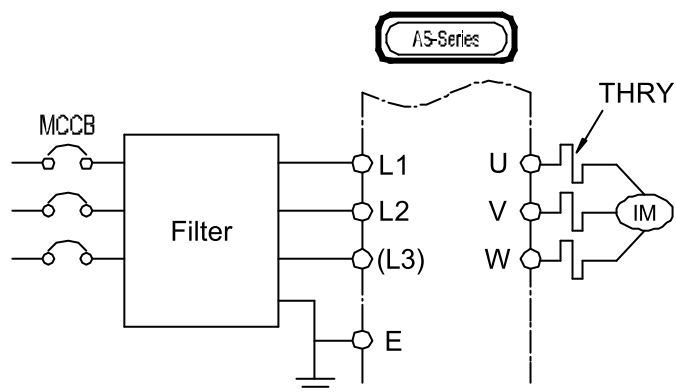


FT2 : Free Terminal 2 function selector



(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 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	AS1		AS2					AS4			
	04	07	04	07	15	22	37	07	15	22	37
Model No	04	07	04	07	15	22	37	07	15	22	37
Capacity (KVA)	1.1	1.9	1.1	1.9	3.1	4.2	6.5	1.9	3.1	4.2	6.5
Current (A)	3	5	3	5	8	11	17	2.5	4	6	9
Circuit Breaker (MCCB) (A)	15	15	10	10	15	20	20	10	10	10	15
Electro-Magnetic Contactor (A)	12	12	12	12	12	12	18	12	12	12	12
Thermal relay RC value (A)	4.8	7.6	2.4	3.8	6.8	9	15	1.9	3.4	3.8	6.8

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 RF1 noise and leakage current. (Refere to the table below)

Carrier frequency (kHz)	10	15	20	30
Recommended cable size (mm ²)	1.5	2.5	4.0	6.0

4-5 EMI filter specifications

AS SERIES	FREQUENCY (MHZ)					
	0.15	0.5	1	5	10	30
Typical insertion loss (dB)	11	50	62	65	65	60

4-6 Wiring and cautionary points

A. Main circuit

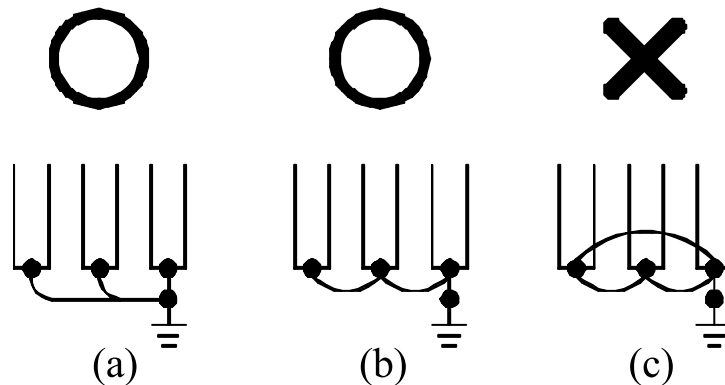
1. Connect the cables of the power supply side to the U, V and W output terminals for the motor.
2. Don't connect any electromagnetic contactor between the inverter and motor. If it is inevitable, turn on the contactor when both the inverter and motor are both at stand still.
3. Don't put the advance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

B. Control signal circuit

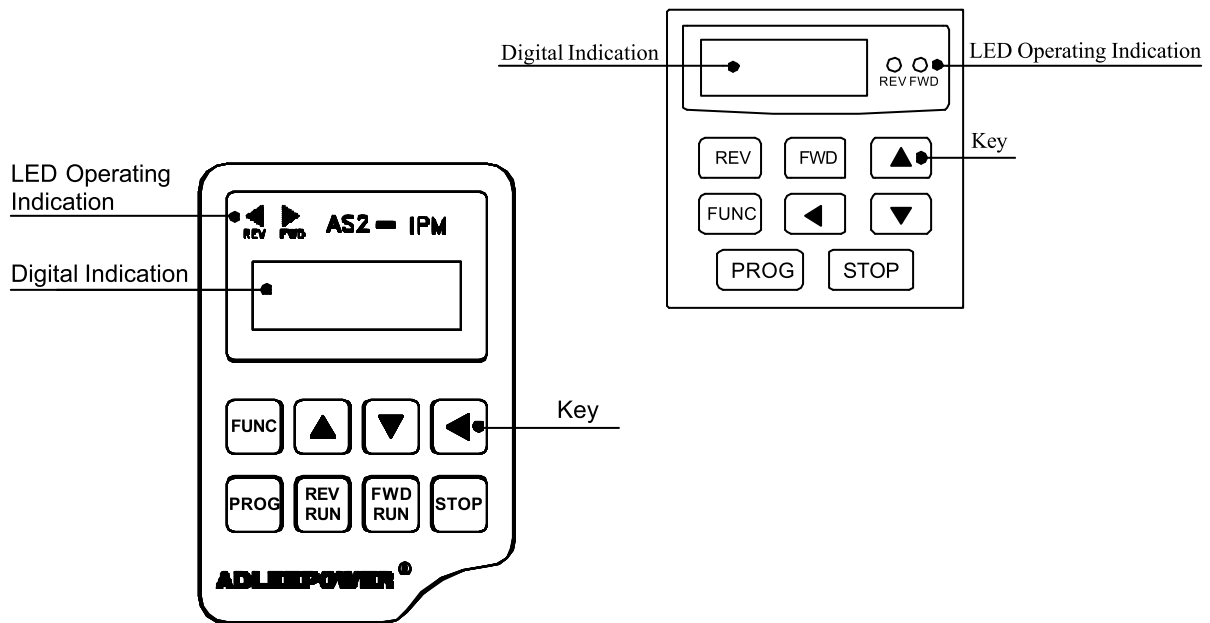
1. Separate the power cables of main circuit etc. from the control cables of the sequence and analog signals by passing the cables through the different ducts.
2. Use twisted pair shielded wire for control signal and connect the shield to earth terminal at on end, COMMON terminal of control board. Leave the other end of shielding 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 grounded at one end point.
4. Provide class 3 grounding (100μ 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 ORDER	FUNCTION NAME	STANDARD SETTING VALUE
∅◇	CD00	U : 60HZ
		E : 50(B03) / 0(B04)
CD01	Parameter lock	0
CD02	Acceleration time 1	10 Sec
CD03	Deceleration time 1	10 Sec
CD04	Jogging frequency	5HZ
CD05	Start frequency	0.5HZ
CD06	Jog mode	0
CD07	Frequency meter correspond	U : 120 HZ
		E : 100 HZ
CD08	CW or CCW or CW / CCW	0
CD09	Reserved	0
CD10	Keyboard / Analog signal from terminal	0
CD11	Dynamic brake / Free running	0
CD12	Terminal / Key board command	0
CD13	Reserved	
∅◇	CD14	U : 120 HZ
		E : 50 HZ
CD15	Minimum frequency limit	0
∅◇	CD16	U : 1
		E : 30
∅◇	CD17	U : 60 HZ
		E : 50 HZ

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

CHANGEABLE OF SETTING VALUE	UNIT	USER SETTING	REMARK
0 ~ 400 HZ	0.01 HZ		
0 or 1	----		0 = lock 1 = Unlock
0.1 ~ 6000 Sec	0.1 Sec		
0.1 ~ 6000 Sec	0.1 Sec		
0 ~ 400 HZ	0.01 HZ		
0.5 ~ 30 HZ	0.01 HZ		
0 or 1	----		0 = Normal 1 = Jog
30 ~ 400 HZ	0.01 HZ		
0 ~ 2	----		0 = CW/CCW 1 = CW 2 = CCW
0 or 1	----		0 = Keyboard input 1 = Frequency knob
0 or 1	----		0 = Dynamic brake 1 = Free running
0 or 1	----		0 = Keyboard 1 = Terminal
0.5 ~ 400 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0.01 ~ 500	0.01		Display = Frequency × Scale
25 ~ 400 HZ	0.01 HZ		



DISPLAY ORDER	FUNCTION NAME	STANDARD SETTING VALUE
CD18	V/F pattern setting	0
CD19	DC braking time	1 Sec
CD20	DC braking power	10
CD21	Torque boost	0 %
CD22	Second speed setting	20 (B03) / 0 (B04)
CD23	Third speed setting	30 (B03) / 0 (B04)
CD24	Fourth speed setting	40 (B03) / 0 (B04)
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 error record	NONE
CD37	Errors record 1	NONE



CHANGEABLE OF SETTING VALUE	UNIT	USER SETTING	REMARK
0 ~ 2	---		0 : Constant torque 1 : (Frequency) 2.0 2 : (Frequency) 3.0
0 ~ 25 Sec	0.1 Sec		
0 ~ 250	1.00		
0 ~ 25%	0.1 %		
0 ~ 400 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0.1 ~ 6000 Sec	0.1 Sec		
0.1 ~ 6000 Sec	0.1 Sec		
1KHZ ~ 16KHZ	0.1 KHZ		
50 ~ 100 %	0.1 %		
0 ~ 400 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0.5 ~ 3 HZ	0.01 HZ		
0 ~ 400 HZ	0.01 HZ		
0 or 1	---		0 = Positive 1 = Negative
40 ~ 200 %	0.1 %		

DISPLAY ORDER	FUNCTION NAME	STANDARD SETTING 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	FA2 Free Analog Terminal 2	0
CD46	Reserved	
CD47	5th speed setting	25 (B03) / 0 (B04)
CD48	6th speed setting	35 (B03) / 0 (B04)
CD49	7th speed setting	45 (B03) / 0 (B04)
CD50	8th speed setting	55 (B03) / 0 (B04)
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	60 HZ
CD57	No, of auto restart attempt	0




- ∅◇ This function provides different standard setting values for European and USA Version.

ib lcqfkd s^irb	rk	rp pbqqd	obj^oh
çê			É~ê
çê			áëéä~ó omj=ëéä~ó
çê			
ú=			obpbq=pb N
ú=			
ú=			
ú=	w		
ú=	w		
ú=	w		
ú=	w		
ú=M	N		íçìèääáÖ
ê=ççÉ~áÉèèáçá			
rp=çpÉèèáçá			
ú=			kçêä~ä ìèìÉ
ú=P			
ú=B	B		
w	w		
ú=			



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 U.V.W. (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. Also check that non-flammable material.
- (7) For operation start and stop, use    and FWD / REV terminals. Never use input power supply to switch ON/OFF.


Operating

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

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



speed : (a) Using frequency knob for motor speed setting.


(b) Using keyboard   and  for motor speed setting. set CD10 = 0 at first, see Function description


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 (B03) / 0 (B04)

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

Press  key to select the digit.


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.

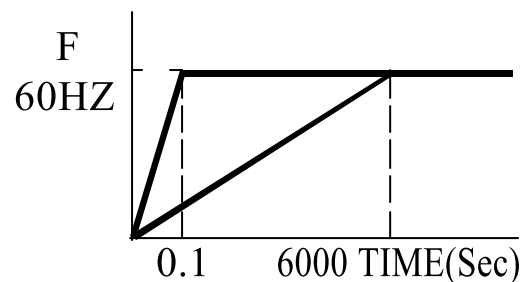
To change the contents CD02 ~ CD56 , set CD01=1 and press  first.

To lock the data set CD01=0 and press  .

Acceleration time 1
CD02

Setting Range	0.1 ~ 6000 Sec
Factory Setting	10 Sec

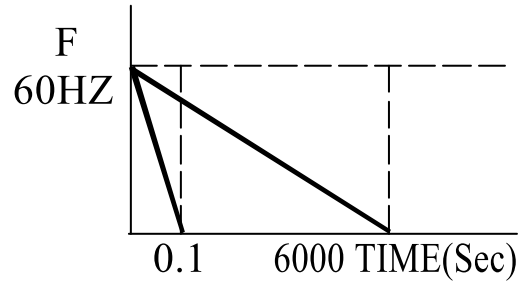
CD02 value corresponds to the time of acceleration from the minimum frequency to 60HZ.(For 120Hz. setting, the arrival time to 120Hz is double.)



Deceleration time 1
CD03

Setting Range	0.1 ~ 6000 Sec
Factory Setting	10 Sec

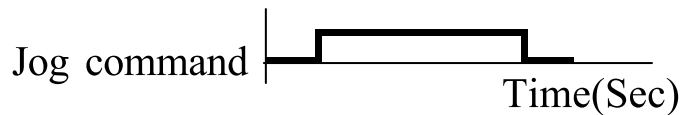
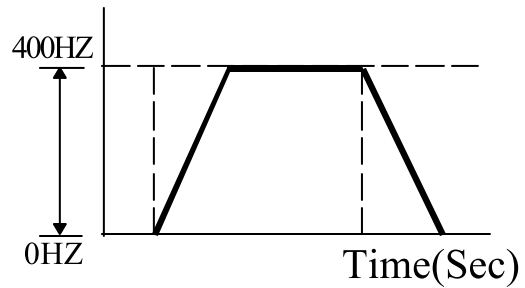
CD03 value corresponds to the time of deceleration from 60HZ to the minimum frequency.



Jogging frequency
CD04

Setting Range	0 ~ 400 HZ
Factory Setting	5 HZ

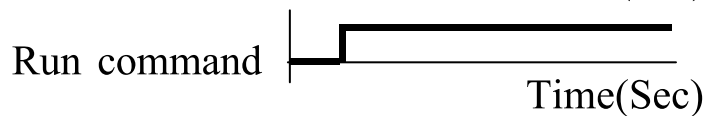
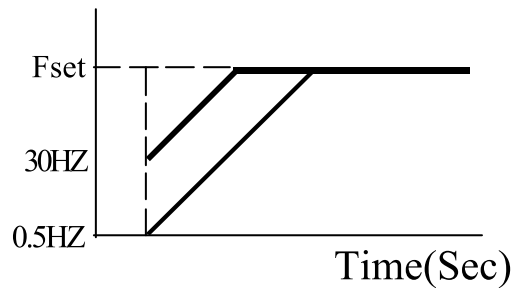
Use terminal control refer to CD12 and CD42 setting, keyboard control refer to CD06.



Start frequency
CD05

Setting Range	0.5 ~ 30 HZ
Factory Setting	0.5 HZ

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



Jog mode
CD06

Setting Range	0 or 1
Factory Setting	0

0 : Normal 1 : Jog Mode

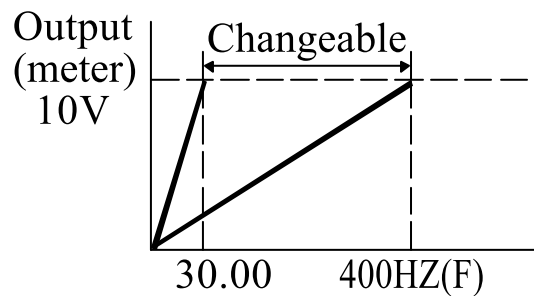
1. Set jogging operation from key panel **FWD RUN** & **REV RUN** .
2. **REV RUN** **FWD RUN** LED blinking in JOG mode.

Frequency meter correspond
CD07

Setting Range	30.00 ~ 400.00 HZ
USA Version	120.00 HZ
European Version	100.00 HZ

The specification of the output meter is 10V(i.e. 1mA) full scale rating and 30~400HZ frequency range.

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.





Analog / Digital frequency
CD10

Setting Range	0 or 1
Factory Setting	1

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

1 : Operation frequency change by adjusting the angle of the knob.

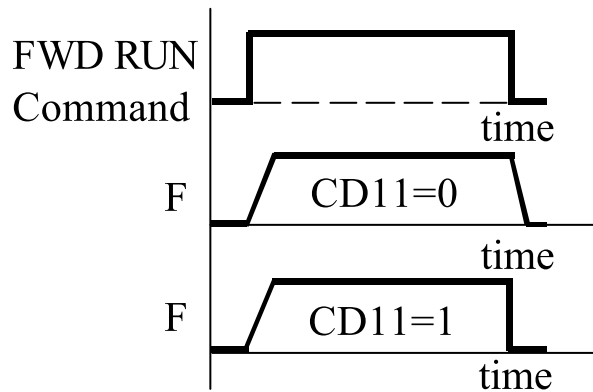
Note : Using   key to change motor speed when CD01=1, the “OPE3“ warning message would be indicated.

Dynamic brake / Free running
CD11

Setting Range	0 or 1
Factory Setting	0

0 : Activates dynamic brake function when deceleration. Decelerating time depends on CD3 setting.

1 : Output cut off when accept a stop command.



Terminal / Key board command
CD12

Setting Range	0 or 1
USA Version	0
European Version	1

0 : RUN/STOP Command from operation panel.

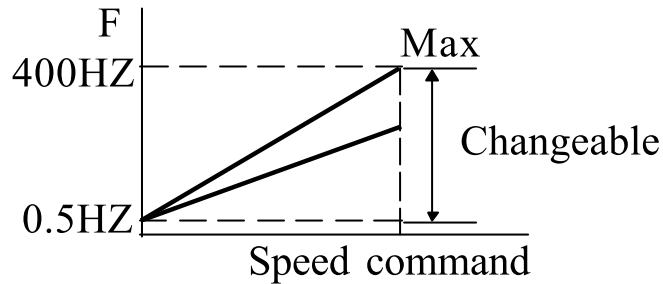
1 : RUN/STOP Command from control terminal.

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



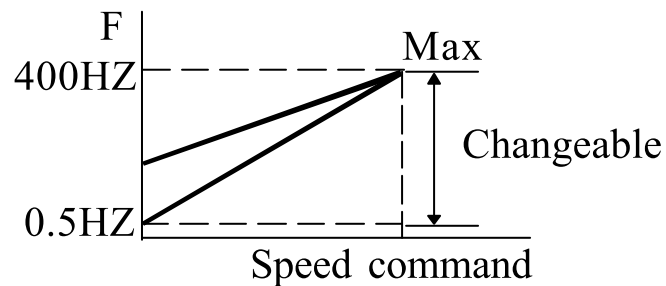
Maximum frequency limit
CD14

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	0.5 ~ 400 HZ
USA Version	1 HZ
European Version	30 HZ

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.

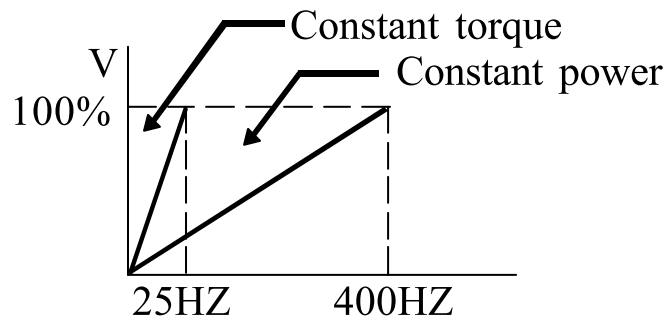
Setting CD41=1 for display shown RPM.

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

Maximum voltage frequency
CD17

Setting Range	25 ~ 400 HZ
USA Version	60 HZ
European Version	50 HZ

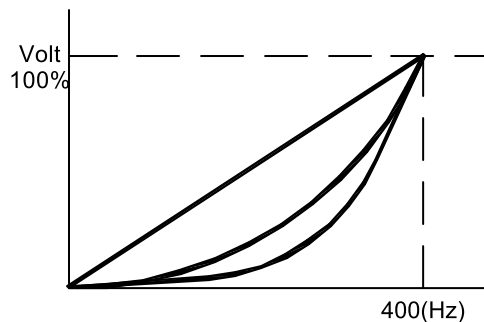
For constant torque and constant power setting.



V/F pattern
CD18

Setting Range	0 ~ 2
Factory Setting	0

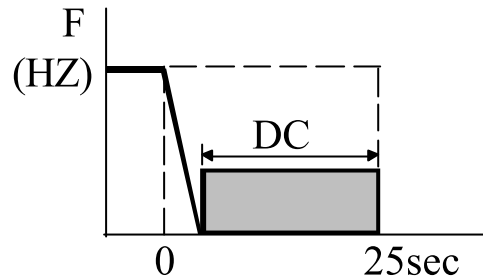
- 0 = Constant torque curve
- 1 = Reduce torque curve $F^{2.0}$
- 2 = Reduce torque curve $F^{3.0}$



DC braking time
CD19

Setting Range	0 ~ 25 Sec
Factory Setting	1 Sec

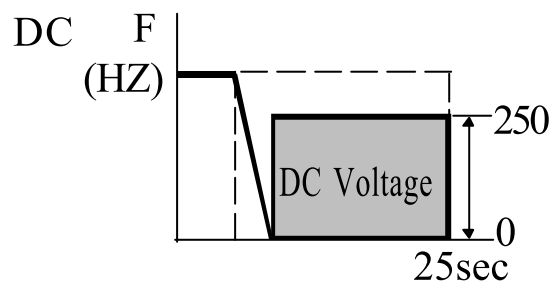
DC brake starting at frequency under 0.5HZ.



DC braking power
CD20

Setting Range	0 ~ 250
Factory Setting	10

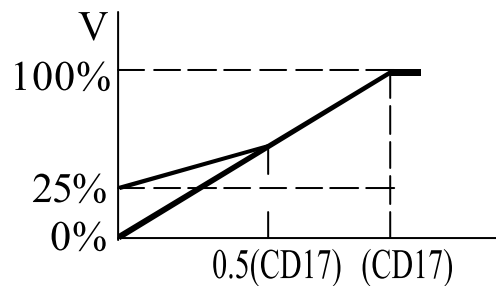
CD20 setting DC voltage gain various braking power.



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

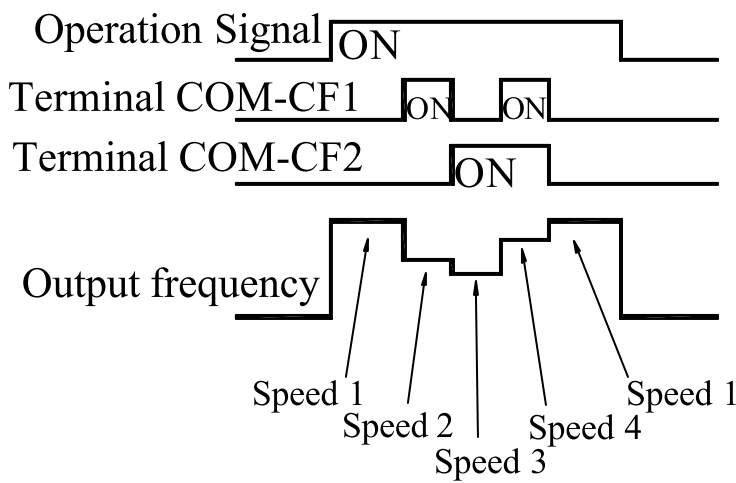
Setting Range	0 ~ 400 HZ
Factory Setting	20 (B03) / 0 (B04)

Third speed setting
CD23

Setting Range	0 ~ 400 HZ
Factory Setting	30 (B03) / 0 (B04)

Fourth speed setting
CD24

Setting Range	0 ~ 400 HZ
Factory Setting	40 (B03) / 0 (B04)



	Terminal order	7	6
SPEED			
SPEED - 1		OFF	OFF
SPEED - 2		ON	OFF
SPEED - 3		OFF	ON
SPEED - 4		ON	ON

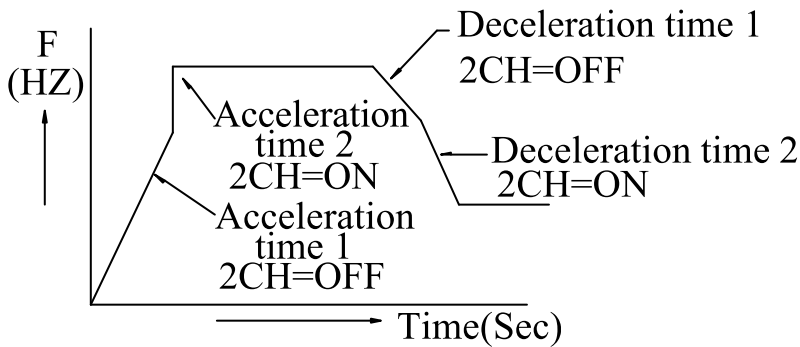
Acceleration time 2
CD25

Setting Range	0.1 ~ 6000 SEC
Factory Setting	10 SEC



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	

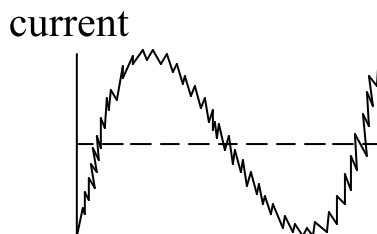
To operate inverter with 2CH function, check to see CD42 or CD43=3. 2CH command inputs from FT1 or FT2 terminal.

Carrier frequency
CD27

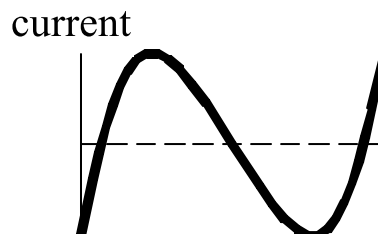
Setting Range	1 ~ 16 K
Factory Setting	16 K

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

Reduce the carrier frequency would reduce RF1 noise, reduce motor current, and then gain better efficiency.



Low carrier frequency

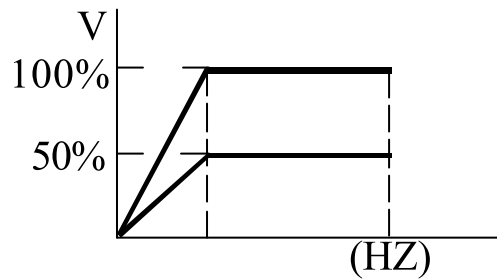


High carrier frequency

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

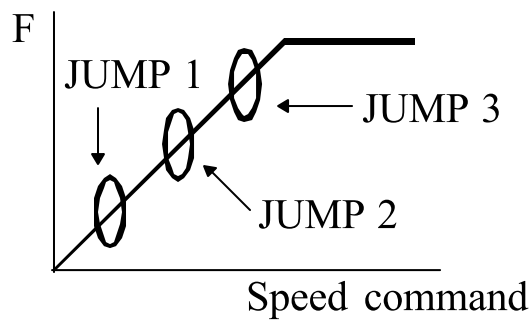
Setting Range	0 ~ 400 HZ
Factory Setting	0 HZ

Frequency jump 2
CD30

Setting Range	0 ~ 400 HZ
Factory Setting	0 HZ

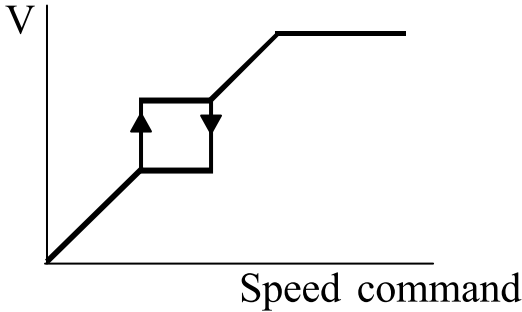
Frequency jump 3
CD31

Setting Range	0 ~ 400 HZ
Factory Setting	0 HZ



Jump range
CD32

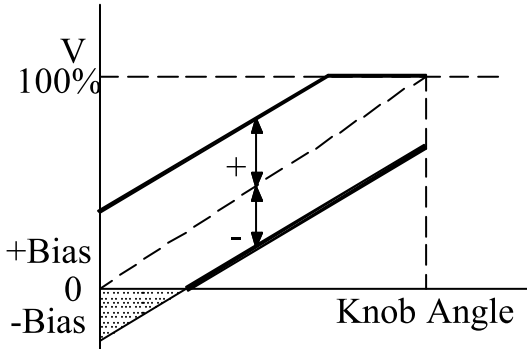
Setting Range	0.5 ~ 3 HZ
Factory Setting	0.5 HZ



Frequency reference bias
CD33

Setting Range	0 ~ 400 HZ
Factory Setting	0

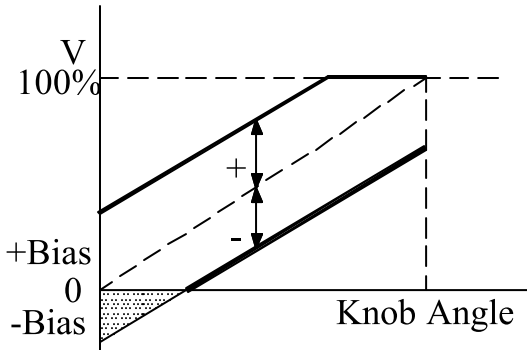
Move Frequency bias with same gradient.
 Frequency at negative bias range, The motor can not start.



Freq. ref. bias direction
CD34

Setting Range	0 or 1
Factory Setting	0

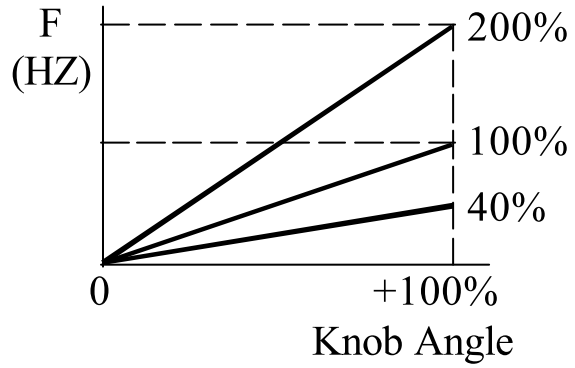
0 = Positive “+ “
 1 = Negative “-“
 Polarity setting for (CD33) frequency reference bias.



Frequency gain
CD35

Setting Range	40 ~ 200 %
Factory Setting	100 %

Application refer to example 04 at page 52.



The latest error record
CD36

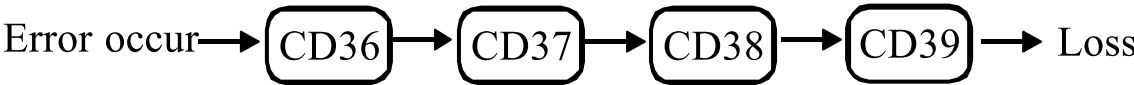
Error record 1
CD37

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  clear CD36 ~ CD39 Error Record the contents in CD36 ~ CD39 are “ NONE “

HZ/RPM Display
CD41

Setting Range	0 or 1
Factory Setting	0

0 = HZ Display 1 = RPM Display
 Setting current scale CD16 for rpm display shown.



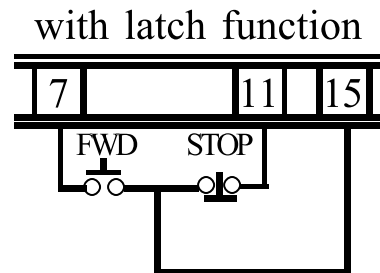
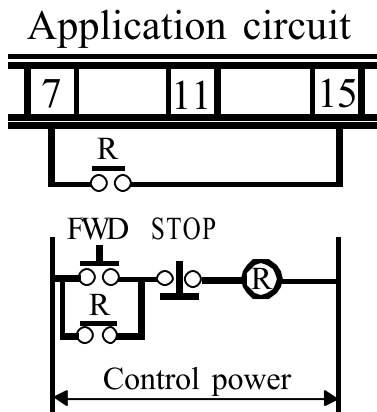
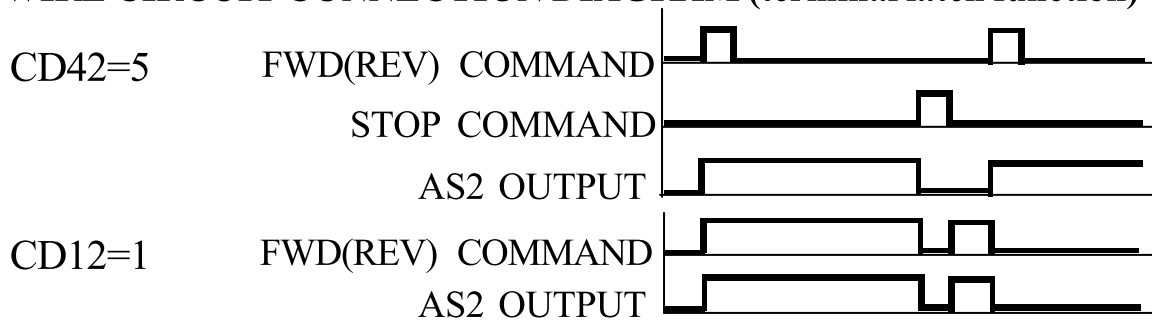
FT1 Multi-Function Terminal 1

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)



Ⓜ 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
Factory Setting	0

Refer to CD42 table.

Used for connection refer to 3-2 jumper setup (page 11).

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 04 (page 52).

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 ~ F-max
9	Speed 3	F-min ~ F-max
10	Speed 4	F-min ~ F-max
11	Fmax	F-min ~ CD14 content
12	Output voltage gain	50% ~ 100%
13	Speed 1	F-min ~ F-max
14	Reserved	
15	Reserved	



5th speed setting
CD47

6th speed setting
CD48

7th speed setting
CD49

8th speed setting
CD50

Dynamic braking energy limit
CD51

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)

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)



Version selector
CD52

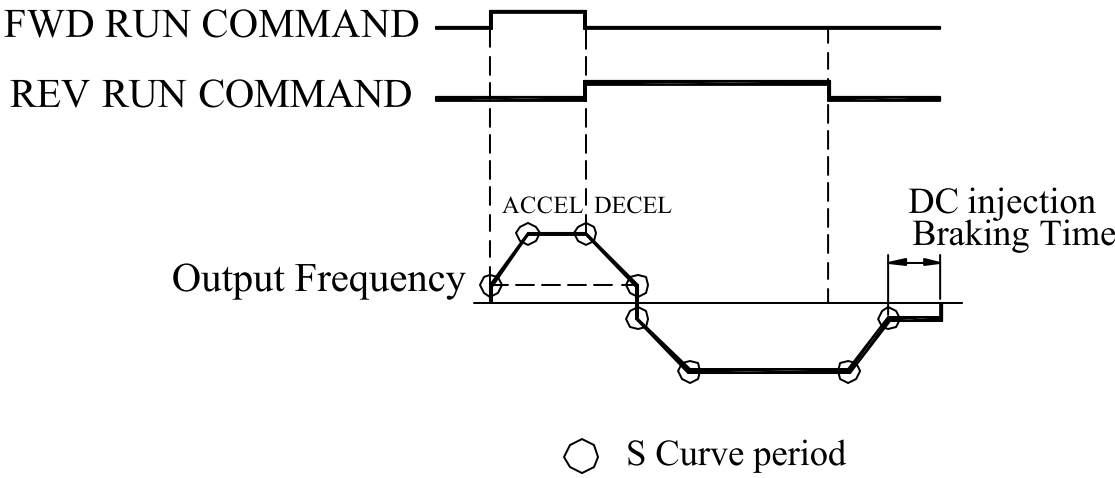
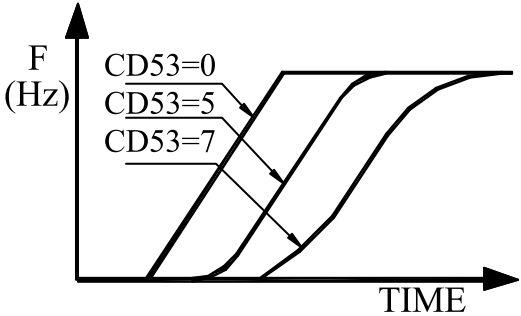
Eur → European Version
USA → US Version

Select function CD52, then use UP/Down key to select Eur/USA Version. Press **PROG** to save it. System return to the factory setting.

S curve
CD53

Setting Range	0 ~ 7
Factory Setting	0

Setting S curve non-Linear Accel/Decel Operation from 1 to 7. Setting 0 is normal operation without S curve.

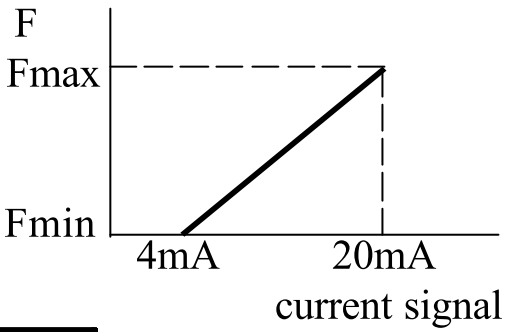


4 ~ 20 mA
CD54

Setting Range	0 ~ 3
Factory Setting	0

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

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

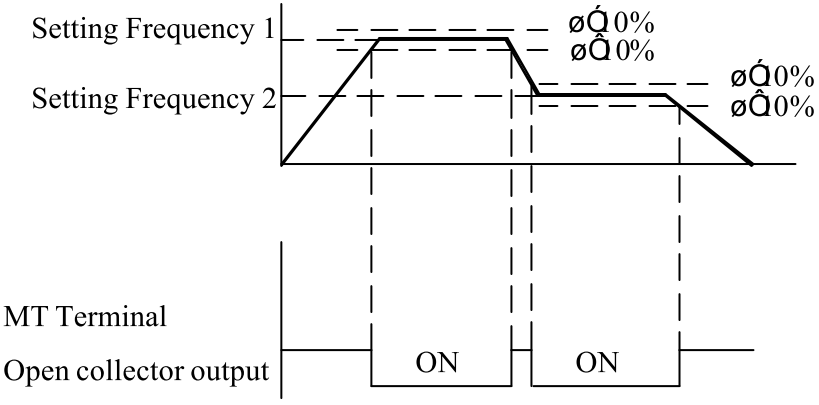


Frequency arrive signal range
CD55




Setting Range	0% ~ 100%
Factory Setting	10%

JP1 selector moves to ARR connection. If running Freq is suitable the attachment lists, the MT terminal will output ON signal.

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



Note : When setting CD55, please follow the sequence.

1. set CD15 = 0
2. set CD55 = xx use   or  key (xx cd value)
3. set CD15 = xx (if xx > 0)

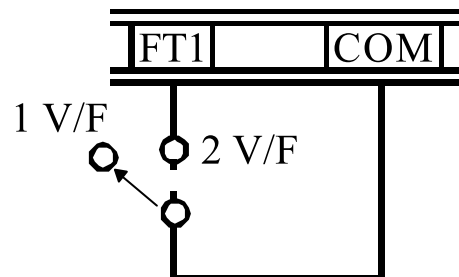
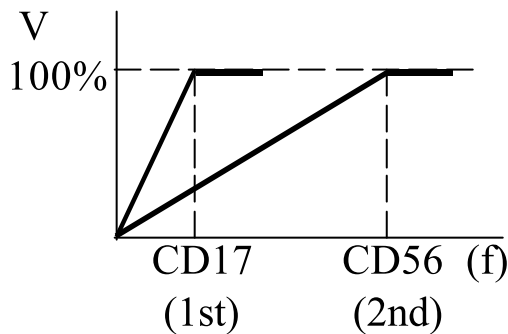
2nd Maximum Voltage frequency
CD56

Setting Range	25 ~ 400
Factory Setting	120

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.

























7-2. 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
		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
		Save CD02=12.3 and back to waiting mode

CHANGE maximum frequency limit

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 9
		Save CD14=90HZ and back to waiting 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 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.



9. HARDWARE PROTECTIVE FUNCTION

- (1) Over-current protection**
- (2) Short circuit protection**
- (3) Over-temperature protection**
 - A. U V W phase short protection**
 - B. Ground short protection**
- (4) Control supply under-voltage protection**
- (5) Power source under voltage**
- (6) Over voltage protection**



10. PRECAUTIONS

10-1 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.**

10-2 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.**

11. 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
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
		Power supply voltage is too high.	Reduce the voltage within specified range
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. Power supply voltage is too high.	Remove the cause Reduce the voltage
EEP1	EEPROM access error	Rework with previous process. Check for the same message.	Repair
EEP2	EEPROM check-sum error		

12. APPLICATION

EXAMPLE 01 : Using variable resistor for multistage speed setting

DESCRIPTION :

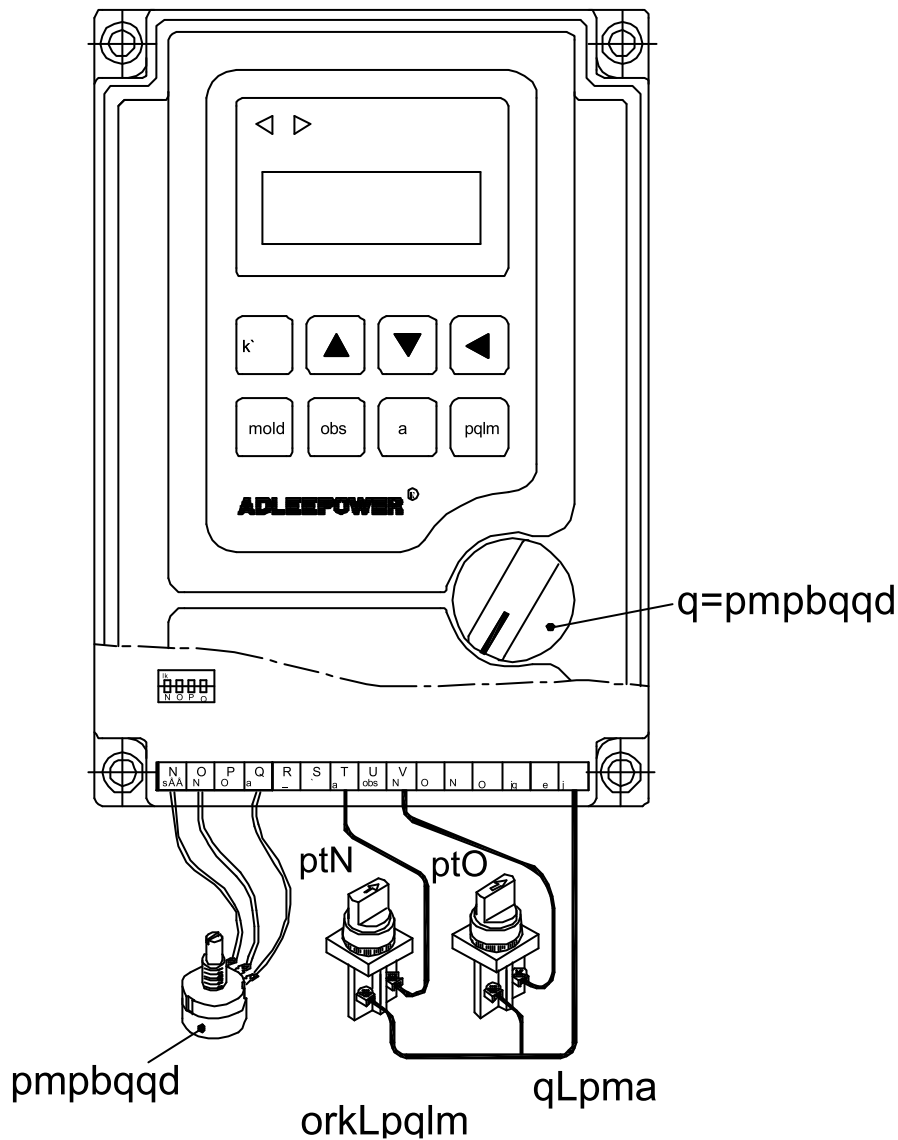
CD10 = 1 (Use frequency knob for 1st speed setting)

CD12 = 1 (External command)

CD44 = 8 (2nd speed signal enter from FA1)

SW1 = RUN / STOP

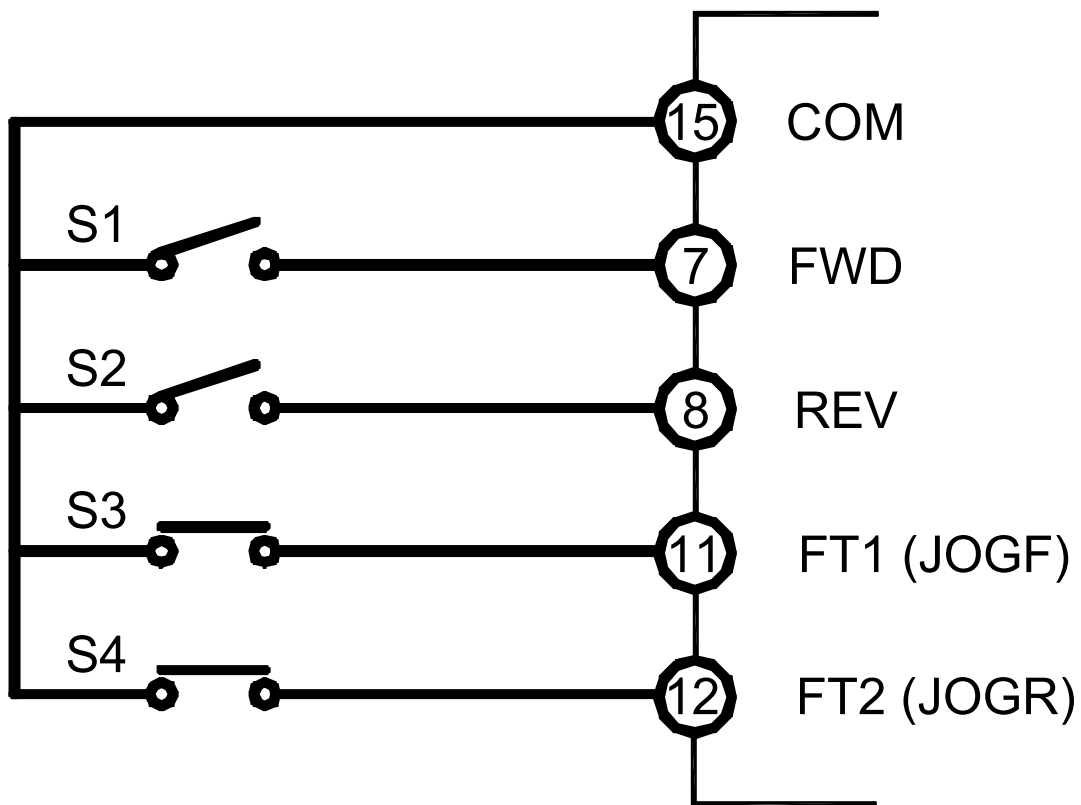
SW2 = 1st / 2nd SPEED



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

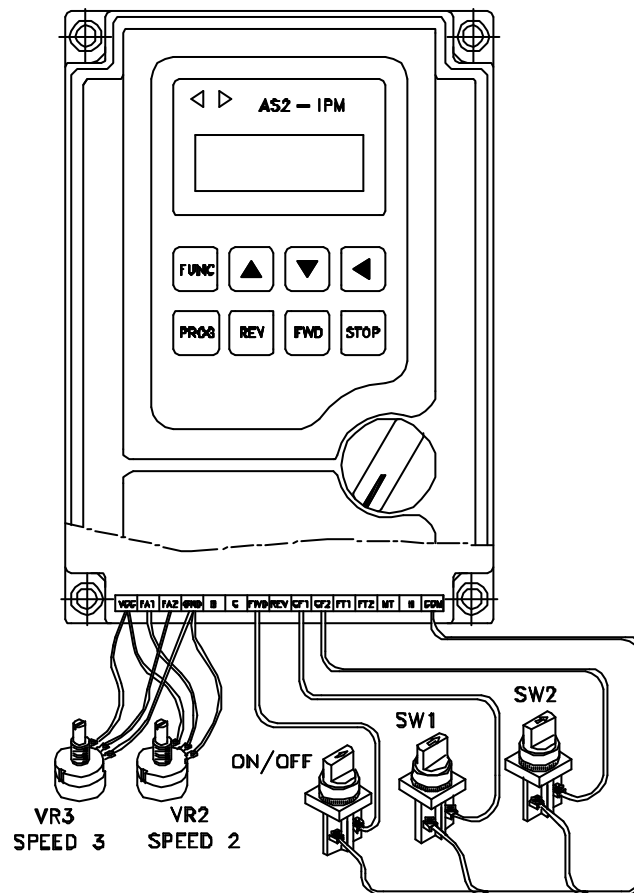
- S1 = FWD SW
- S2 = REV SW
- S3 = FWD JOG SW
- S4 = REV JOG SW

EXAMPLE 03 : Using rheostart for 3stage speed setting

DESCRIPTION :

- CD12 = 1 ; Terminal command (For External)
- CD44 = 8 ; 2nd speed signal enter from FA1
- CD04 = 1 ; 3rd speed signal enter from FA2

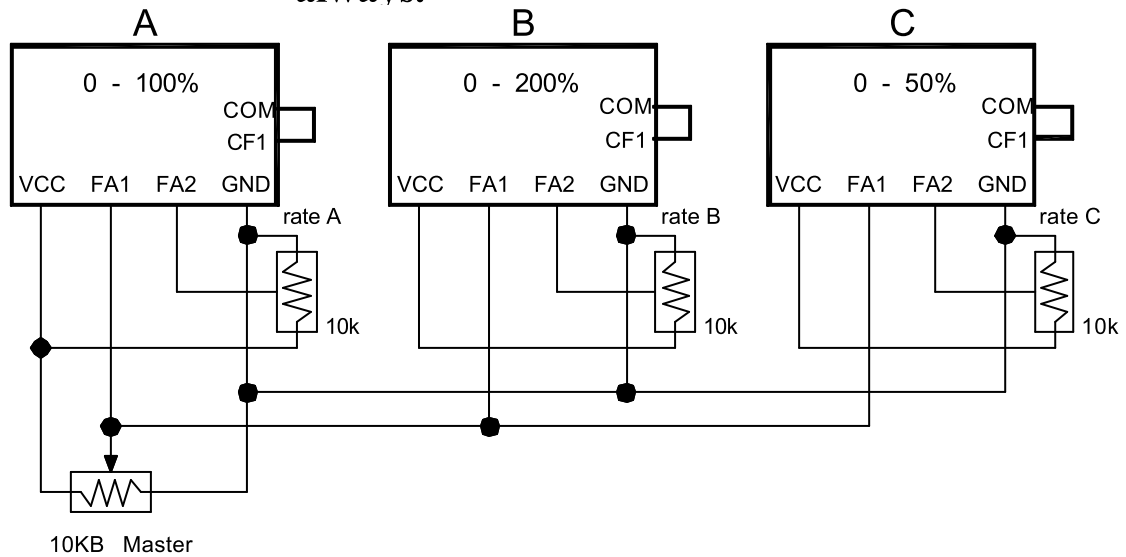
SPEED	TERMINAL		SPEED COMMAND ENTRY
	SW2	SW1	
1	OFF	OFF	FREQUENCY KNOB
2	OFF	ON	VR2
3	ON	OFF	VR3



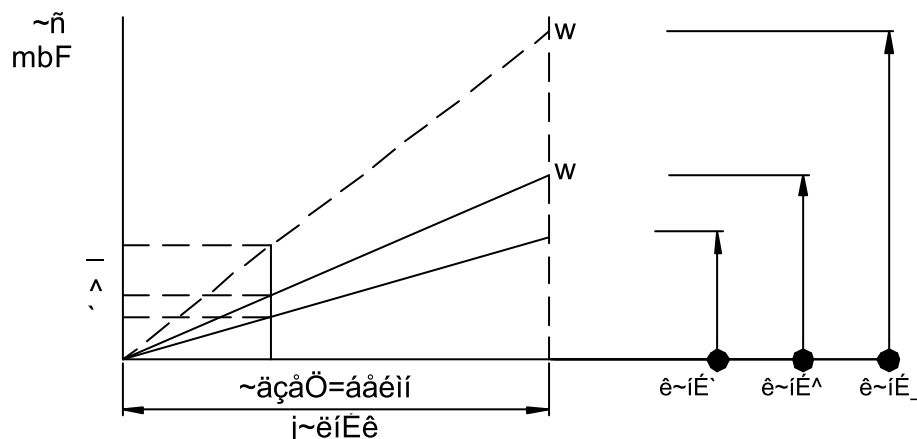
EXAMPLE 04 : Master / slave driver system

DESCRIPTION : Set FA1 as 2nd speed signal input terminal.

Connect COM and CF1 for 2nd speed command always.



Number	A	B	C
Speed rate	0 ~ 100%	0 ~ 200%	0 ~ 50%
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



13. Inverter Selection

Inverter Capacity Check Method

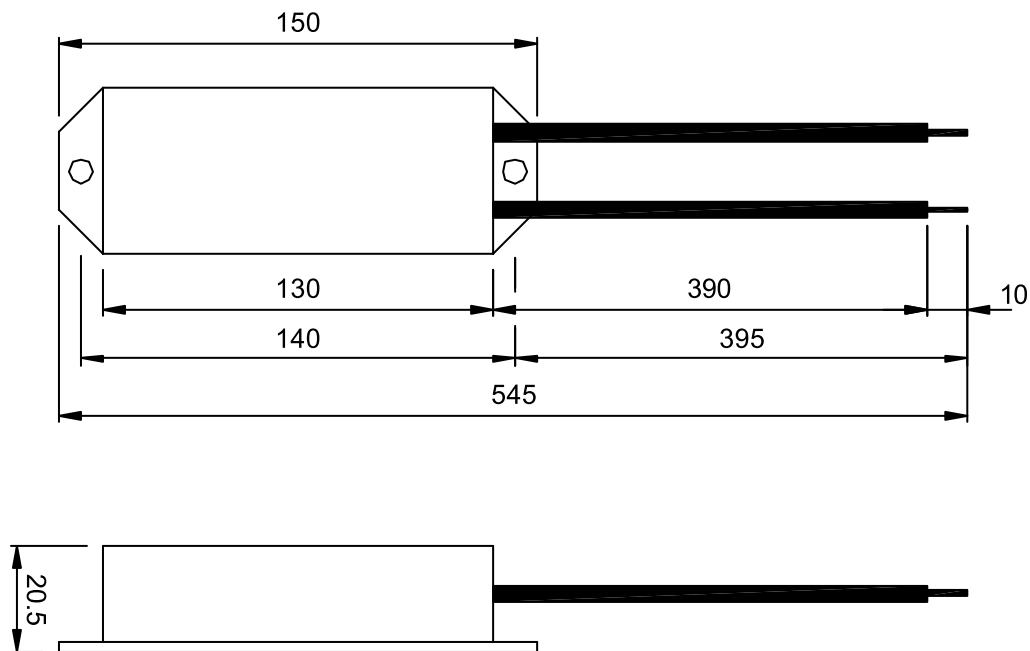
Description		Related factor
Load characteristics	Load type	Friction load and weight load Liquid(viscous) load inerita load Load with power transmission and accumulation
	Load speed and torque charcteristics	Constant torque Constant power Decreasing torque
	Load charcteristics	Motoring Braking or overhanging 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 and percentage impednace 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
∅			∅
∅		∅	
∅	∅	∅	∅
	∅	∅	
∅		∅	
∅			
		∅	∅
		∅	∅
	∅		



14. APPENDIX

A. Optional braking resistor



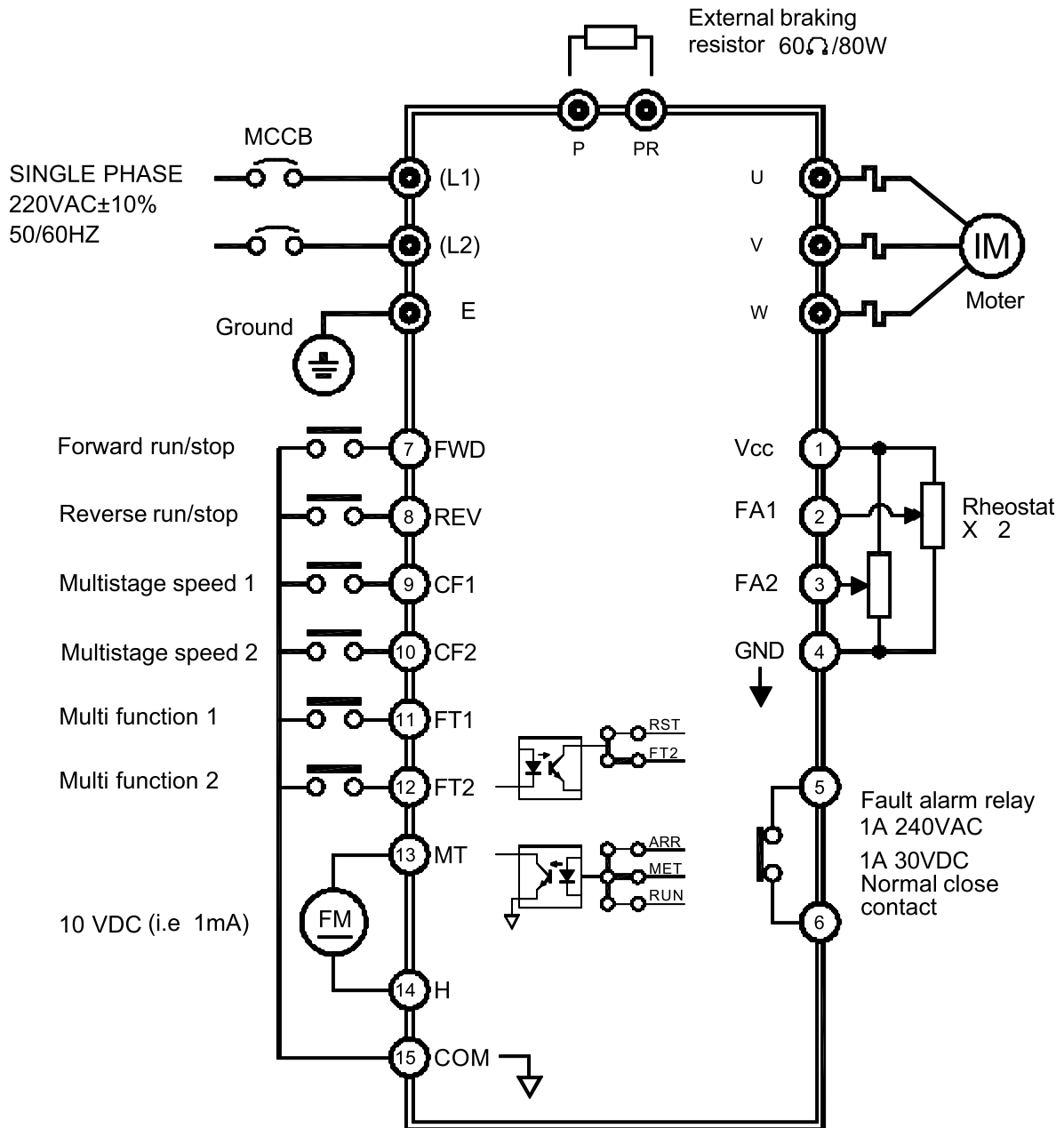
- A. The resistance of braking resistor is recommended in below list.
The resistance must be larger than that shown in list.
If not, may be damaged the inverter, when one want to add external braking resistor, it must remove the P,PR wiring first.
- B. Increase dynamic resistor capacity(W) when Deceleration time is setting short, or braking operation frequently.

Unit : Ohm

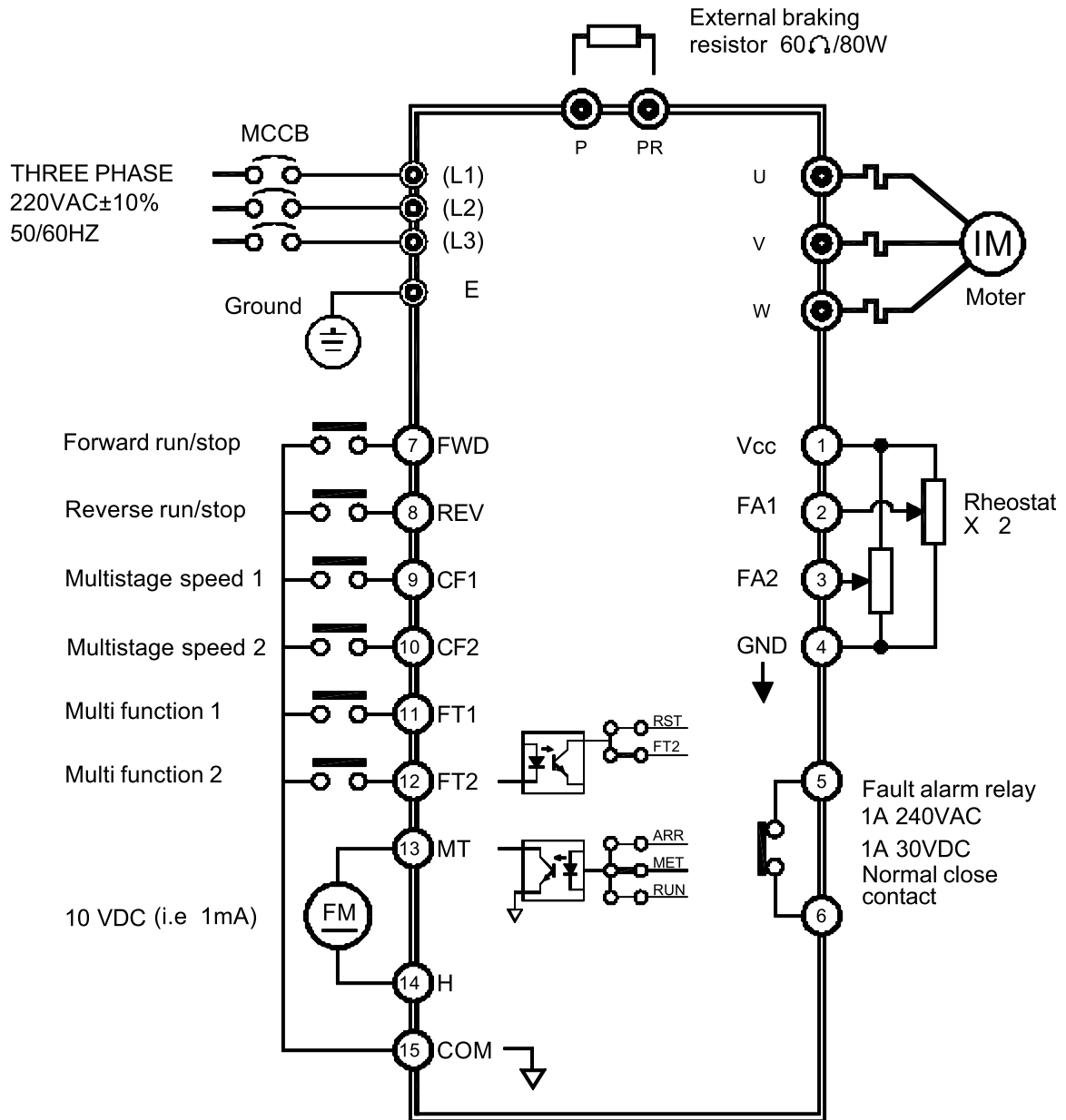
Model No	(3)04	(3)07	(3)15	(3)22	(3)37
AS1	60	60	--	--	--
AS2	60	60	60	60	40
AS4	200	180	180	180	160

B. Terminals wiring diagram

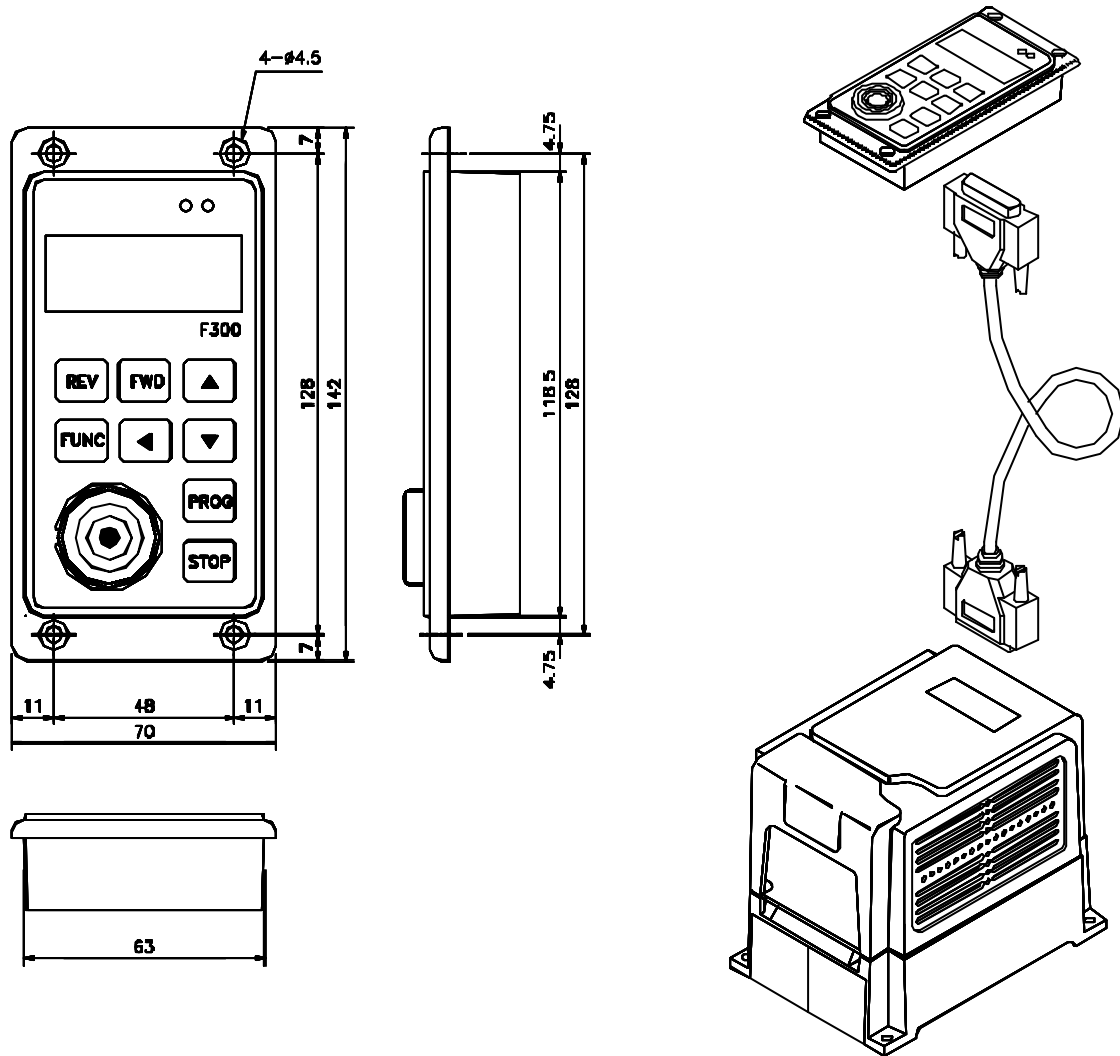
1. SINGLE PHASE



2. THREE PHASE



C. F300 Remote operator

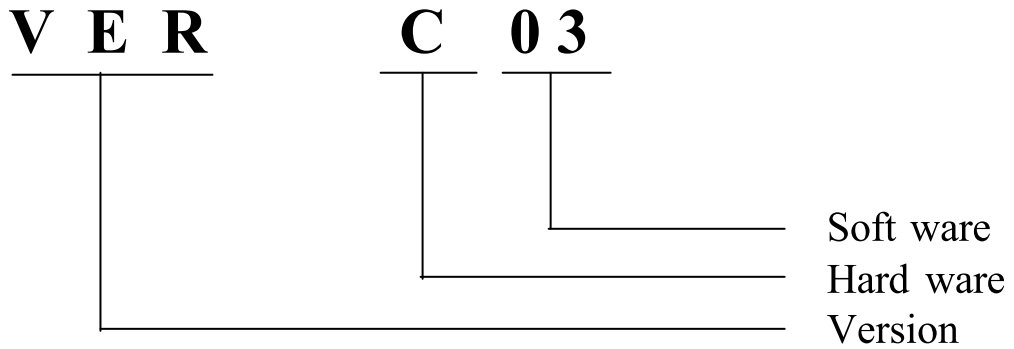


UNIT : M/M

F300 remote operator are for the remote inverters.
Please order “R“ model inverters for remote control
as AS2-(3)04R, AS2-(3)07R,AS2-(3)15R,
AS2-3(22)R and mark the extension cord length.
(1M/3M/5M)



D. Version



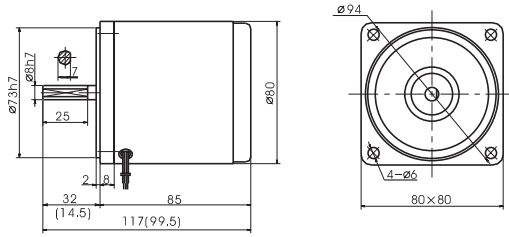
HARDWARE	DATE	NEW FUNCTIONS
Cxx	99.02	

SOFTWARE	DATE	NEW FUNCTIONS



电机外形尺寸 Motor Overall Dimension

感应电机 Induction Motor 25W



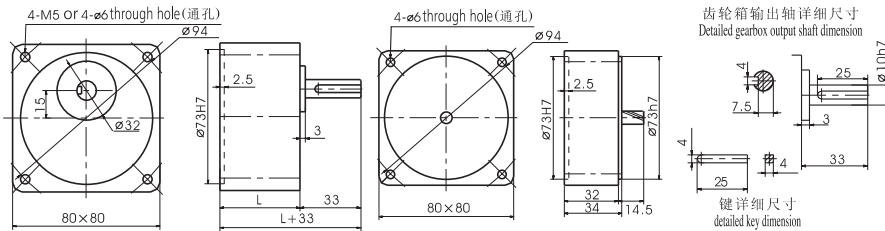
●其中()数字系小齿轮轴电机的数值。●The value in the () is the value of small gear shaft motor.

电机特性表 List of Motor Characteristics

电机型号 Model of Motor		出力 Output	电压 Voltage	频率 Frequency	极数 Poles	额定时间 Duty	额定 Rated			起动转矩 Starting Torque		电容量 / 耐压 Capacitor/Ve	
光电机 Motor	带齿轴电机 Motor with gear shaft	W	V	Hz	P		转速 Speed r/min	电流 Current A	力矩 Torque N.m kgf.cm		N.m kgf.cm	µF/VAC	
4IK25A-A	4IK25GN-A	25	1ph110	50	4		连续 CONT	1350	0.45	0.18	1.80	0.18	1.80
4IK25A-C	4IK25GN-C	25	1ph220	50	4	连续 CONT	1350	0.24	0.18	1.80	0.18	1.80	1.8/450
4IK25A-S	4IK25GN-S	25	3ph220	50	4	连续 CONT	1300	0.25	0.19	1.88	0.19	1.88	/
4IK25A-S ₃	4IK25GN-S ₃	25	3ph380	50	4	连续 CONT	1300	0.14	0.19	1.88	0.19	1.88	/
4IK25A-D		25	1ph220	50	2	连续 CONT	2700	0.28	0.09	0.90	0.09	0.90	2.5/450

●使用电压不同, 电容量也不相同。故应与使用电压相对应, 正确使用。●不能正确使用是造成故障的主要原因。订货时, 在确认使用电压后, 选择正确的型号进行订货。
●The capacitor capacitance will be different under different voltage. A correct capacitor capacitance is required to match the applied voltage. ●Wrong capacitor capacitance is the cause of trouble. You must confirm a correct voltage and select a correct model when your purchase order is placed.

齿轮箱外形尺寸 Overall Dimension of Gearbox



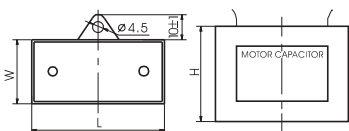
速比 Reduction Ratio	尺寸 L(mm)	质量(kg)	
4GN3K-GN18K	32	0.43	
4GN20K-GN50K	43.5	0.57	
4GN60K-GN200K		0.61	
中间齿轮箱 Intermediate Gearbox	4GN10X	32	0.43
电机 Motor			1.64

齿轮箱允许力矩 Allowable Torque on Gearbox

齿轮箱型式 Model of Gearbox: 4GN □ K

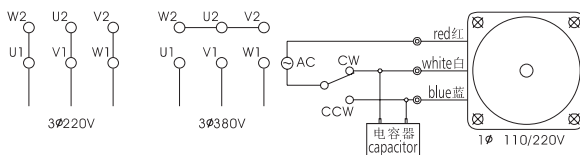
频率 Frequency	减速比 Reduction Ratio	输出轴转速 Output Shaft Speed	允许力矩 Allowable Torque																					
			3	3.6	5	6	7.5	9	10	12.5	15	18	20	25	30	36	40	50	60	75	90	100	120	150
50Hz	输出轴转速	r/min	500	417	300	250	200	166	150	120	100	83	75	60	50	41	37	30	25	20	16	15	12	10
	允许力矩	N.m	0.52	0.63	0.87	1.05	1.31	1.57	1.74	2.19	2.62	3.15	3.15	3.94	4.72	5.66	6.29	7.12	7.84	7.84	7.84	7.84	7.84	7.84
60Hz	输出轴转速	r/min	600	500	360	300	240	200	180	144	120	100	90	72	60	50	45	36	30	24	20	18	15	12
	允许力矩	N.m	0.43	0.51	0.72	0.85	1.07	1.28	1.43	1.78	2.15	2.57	2.58	3.22	3.86	4.64	5.16	5.82	6.99	7.84	7.84	7.84	7.84	7.84

电容器 Capacitor



电容量 µF capacity µF	耐压 Voltage	长 L ± 1	宽 W ± 1	高 H ± 1	类型 Type
1.8	450	38	18	28	引线式 Down-lead
2.5	450	38	18	28	
7.0	250	47	26	38	

接线图 Wiring Diagram

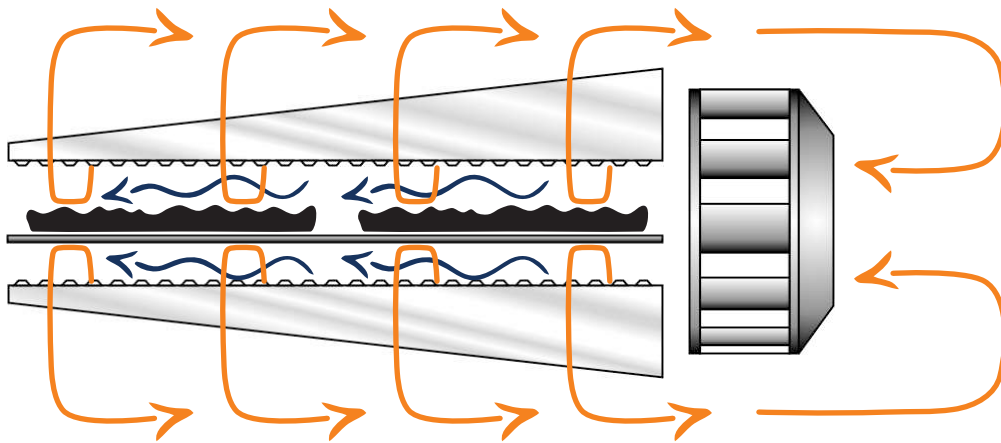


齿轮箱型式 Model of Gearbox: 4GN □ K

频率 Frequency	减速比 Reduction Ratio	输出轴转速 Output Shaft Speed	允许力矩 Allowable Torque	180	200
50Hz	输出轴转速	r/min		8	7.5
	允许力矩	N.m		7.84	7.84
60Hz	输出轴转速	r/min		10	9
	允许力矩	N.m		7.80	7.80



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