INVERTER

Series V3000

M A N U A L

NB612X

MANUAL

These two manuals provide you with a general information how to use V3000 frequency inverter and how to apply, if needed, special applications.

V3000 Installation manual provides you with the information necessary to install, start-up and operate the V3000 frequency converters. It is recommended that this manual is read thoroughly before powering up the frequency converter for the first time.

If any problem occurs, please contact your local distributors. WATT DRIVE Antriebstechnik GmbH is not responsible for the use of the frequency converters against the instructions.

WATT DRIVE WORLDWIDE

WATT DRIVE Antriebstechnik GmbH
Tel.: +43/2633/404-0 Fax: +43/2633/404-220
Internet: http:\\www.wattdrive.com
A-2753 Markt Piesting
Wöllersdorferstraße 68
e-mail: watt@wattdrive.com

WATT DRIVE Nord GmbH
Tel.: +49/2932/9681-0 Fax: +49/2932/9681-81
D-59759 Arnsberg
e-mail: watt-arnsberg@t-online.de

WATT DRIVE Süd GmbH
Tel.: +49/7471/9685-0 Fax: +49/7471/9865-29
D-72379 Hechingen
e-mail: watt-sued@t-online.de

WATT DRIVE Nord GmbH
Vertriebs- und Servicecenter Köln
Tel.: +49/2204/84-2800 Fax: +49/2204/84-2819
D-51429 Bergisch Gladbach
e-mail: watt-koeln@t-online.de

WATT DRIVE
Vertriebs- und Servicecenter Max LAMB KG
Tel.: +49/931/2794-0 Fax: +49/931/27455
D-97044 Würzburg
e-mail: ant@lamb.de

WATT EURO DRIVE (Far East) PTE LT
Tel.: +65/86 23 220 Fax: +65/86 23 33
SGP-629082 Singapore
e-mail: watteuro@pacific.net.sg

WATT EURO DRIVE (Malaysia) SDN BH
Tel: +603/736 89 81 Fax: +603/736 89 76
40400 Selangor, Malaysia
e-mail: cmfoo98@tm.net.my

Version: BA-FBE_UR.014.R003.10_00
File: N: Bedienungsanleitung / BA-FBE_UR.014.R003.10_00.doc
Date: 25h of October 2000 / CL

SAFETY

For the Best Results with **V3000** Series inverter, read this manual and all of the warning sign attached to the inverter carefully before installing and operating it, and follow the instructions exactly. Keep this manual handy for your quick reference.

Definitions and Symbols

A safety instruction (message) is given with a hazard alert symbol and a signal word;
WARNING or **CAUTION**. Each signal word has the following meaning throughout this manual.

This symbol means hazardous high voltage. It used to call your attention to items or operations that could be dangerous to your and other persons operating this equipment.
Read these message and follow these instructions carefully.

This is the "Safety Alert Symbol.." This symbol is used to call your attention to items or operations that could be dangerous to your or other persons operating this equipment. Read these messages and follow these instructions carefully.

WARNING
Indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, can result in minor to moderate injury, or serious damage of product.
The matters described under may, if not avoided, lead to serious results depending on the situation. Important matters are described in **CAUTION** (as well as **WARNING**), so be sure to observe them.

NOTE

NOTE
Notes indicate an area or subject of special merit, emphasizing either the product's capabilities or common errors in operation or maintenance.

HAZARDOUS HIGH VOLTAGE

Motor control equipment and electronic controllers are connected to hazardous line voltages. When servicing drives and electronic controllers, there might be exposed components with cases or protrusions at or above line potential. Extreme care should be taken to product against shock.
Stand on an insulating pad and make it a habit to use only one hand when checking components. Always work with another person in case an emergency occurs. Disconnect power before checking controllers or performing maintenance. Be sure equipment is properly grounded. Wear safety glasses whenever working on an electronic controllers or rotating electrical equipment.

PRECAUTION

⚠**WARNING** : This is equipment should be installed, adjusted and serviced by qualified electrical maintenance personal familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could results in bodily injury.
⚠**WARNING** : The user is responsible for ensuring that all driven machinery, drive train mechanism not supplied by WATT, Ltd., and process line material are capable of safe operation at an applied frequency of 150% of the maximum selected frequency range to the AC motor. Failure to do so can result in destruction of equipment and injury to personnel should a single point failure occur.
⚠**WARNING** : For protection, install a leak breaker type with a high frequency circuit capable of large currents to avoid an unnecessary operation. The ground faults protection circuit is not designed to protect personal injury.
⚠**WARNING** : HAZARD OF ELECTRICAL SHOCK. DISCONNECT INCOMING POWER BEFORE WORKING ON THIS CONTROL.
⚠**WARNING** : SEPARATE MOTOR OVERCURRENT, OVERLOAD AND OVERHEATING PROTECTION IS REQUIRED TO BE PROVIDED IN ACCORDANCE WITH THE SAFETY CODES REQUIRED BY JURISDICTIONAL AUTHORITIES.
⚠ **CAUTION** : These instructions should be read and clearly understood before working on V3000 series equipment.
⚠ **CAUTION** : Proper grounds,disconnecting devices and other safety devices and their location are the responsibility of the user and are not provided by WATT, Ltd.
⚠ **CAUTION** : Be sure to connect a motor thermal switch or overload devices to the V3000 series controller to assure that inverter will shut down in the event of an overload or an overheated motor.
⚠ **CAUTION** : DANGEROUS VOLTAGE EXISTS UNTIL CHARGE LIGHT IS OFF.
⚠ **CAUTION** : Rotating shafts and above ground electrical potentials can be hazardous. Therefore, it is strongly recommended that all electrical work conform to the National Electrical Codes and local regulations. Installation, alignment and maintenance should be performed only by qualified personnel. Factory recommended test procedures, included in the instruction manual, should be followed. Always disconnect electrical power before working on the unit.
NOTE : POLLUTION DEGREE 2 The inverter must be used environment of the degree 2. Typcal constructions that reduce the possibility of conductive pollution are; 1) The use of an un-ventilated enclosure 2) The use of a filtered ventilatied enclosure when the ventilation is fan forced that is, ventilation is accomplished by one or more blowers within the enclosure that provide a positive intake and exhaust.

Precautions for EMC (Electromagnetic Compatibility)

You are required to safety the EMC directive (89/336/EEC) when using an V3000 inverter in a European country. To safety the EMC directive and to comply with standard, follows the checklist below.

⚠**WARNING** : This equipment should be installed, adjusted, and serviced by qualifyed personal familiar with construction and operation of the equipment and the hazards involved. Failure to observe this precausion could result in bodily injury.

1.The power supply to V3000 inverter must meet these specifications:
   a. Voltage fluctuation +/-10% or less.
   b. Voltage imbalance +/-3% or less.
   c. Frequency variation +/-4% or less.
   d. Voltage distortion THD = 10% or less.

2.Installation measure:
   a. Use a filter designed for V3000 inverter.

3.Wiring
   a. Shielded wire (screened cable) is required for motor wiring, and the length must be less than 20 meters.
   b. The carrier frequency setting must be less than 5 kHz to satisfy EMC requirements.
   c. Separate the main circuit from the signal/process circuit wiring.

4.Environmental conditions – when using a filter, follow these guidelines:
   a. Ambient temperature: -10 - +50 degrees.
   b. Humidity: 20 to 90% RH (non-condensing)
   c. Vibration: 5.9 m/sec^2 (0.6 G) 10 – 55Hz.
   d. Location: 1000meters or less altitude, indoors (no corrosive gas or dust)

⚠WARNING

Do not remove the rubber bush. Due to the possibility that a wire may be damaged, shorted or may have a ground fault with the edge of the wiring cover. .....

Be sure to ground the unit. Otherwise, there is a danger of electric shock and/or fire. .....
Otherwise, there is a danger of electric shock and/or injury.

Only qualified personnel shall carry out wiring work. .....
Otherwise, there is a danger of electric shock and/or fire.

Implement wiring **after** checking that the power supply is off. .....
Otherwise, there is a danger of electric shock and/or injury.

Be sure to implement wiring **after** installing the body. .....
Otherwise, there is a danger of electric shock and/or injury.

"Use 60/75 deg. Cu wire only" or equivalent. .....

"A Class 2 circuit wired with Class 1wire" or equivalent. .....

"Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240V maximum". For models with suffix N or L. .....

"Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 480V maximum". For models with suffix H. .....

Use suitable circuit breaker listed in this manual for UL's listing purpose. .....
Otherwise, there is a danger of fire.

⚠ CAUTION

Install using non-combustible materials (metal etc.)
It is a fire risk. .....

Do not install combustible materials nearby.
It is a fire risk. .....

Do not carry unit by top cover, always carry by supporting base of unit.
There is a risk of falling and injury. .....

Do not allow substance of cutting waste, sputtering of welding, waste of iron, wire and dust etc. to come into contact with the unit.
It is a fire risk. .....

Make sure the surface the unit is installed onto can support the weight the unit comfortably.
There is a risk of falling and injury. .....

Do not install or operate the unit if the unit appears damaged.
There is a risk of injury. .....

Avoid locations of high temperatures, high humidity, dew condensation, dust, corrosive gases, explosive gases, combustible gases, coolant mist and sea damage etc. Install indoors, to avoid direct sunlight and the unit should be well ventilated. .....

Be sure that the rated voltage matches the AC power supply voltage of the unit.
Otherwise, there is the danger of injury and/or fire. .....

Be sure not to connect an AC power supply to the output terminals.
Otherwise, there is the danger of injury and/or fire. .....

Be sure not to connect an AC power supply to the output terminals.
Otherwise, there is the danger of injury and/or fire. .....

Be sure not to connect the resistor to the direct current terminals (PD, P, and N).
Otherwise, there is the danger of fire. .....

⚠ CAUTION	
Be sure to install the earth leakage circuit breaker on the inputting side. Otherwise, there is in the danger of fire.	.....
Be sure to use power cables, earth leakage breakers and electromagnetic contactors that are rated correctly. Otherwise, there is the danger of fire.	.....
Do not use the electromagnetic contactors to stop the Motor running always use the Inverters internal controls. Otherwise, there is the danger of injury and/or fire.	.....

1. Operation

⚠ CAUTION	
Make sure that the direction of the motor is correct. It is in danger of injury or machine damage.	.....
Make sure there is no abnormal noise and vibration. It is in danger of injury or machine damage	.....

C O N T E N T S

1.1 Standard specification list

(1) 200V class
(2) 400V class

Inverter Model		V3000-015HFE	V3000-022HFE	V3000-037HFE	V3000-055HFE	V3000-075HFE	V3000-110HFE	V3000-150HFE	V3000-185HFE	V3000-220HFE	V3000-300HFE	V3000-370HFE	V3000-450HFE	V3000-550HFE
Max. Applicadie Motor 4P (kW)		1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
Rated input Alternating (kVA)	400V	2.6	3.6	5.9	8.3	11.0	15.9	22.1	26.3	33.2	40.1	51.9	62.3	76.2
	480V	3.1	4.4	7.1	9.9	13.3	19.1	26.6	31.5	39.9	48.2	62.3	74.8	91.4
Rated input alternating voltage		Three-phase 380-480V (+-10%) 50Hz/60Hz												
Rated output voltage		Three-phase 380-480V (This corresponds to receving voltage.)												
Rated output current (A)		3.8	5.3	8.6	12	16	23	32	38	48	58	75	90	110
Start-ing	Regenerative Control	BRD circuit built-in						Regenerative unit is required						
	Option inclusion resistance %ED (%)	3	1.9	1.1	0.85	0.6	0.4	—	—	—	—	—	—	—

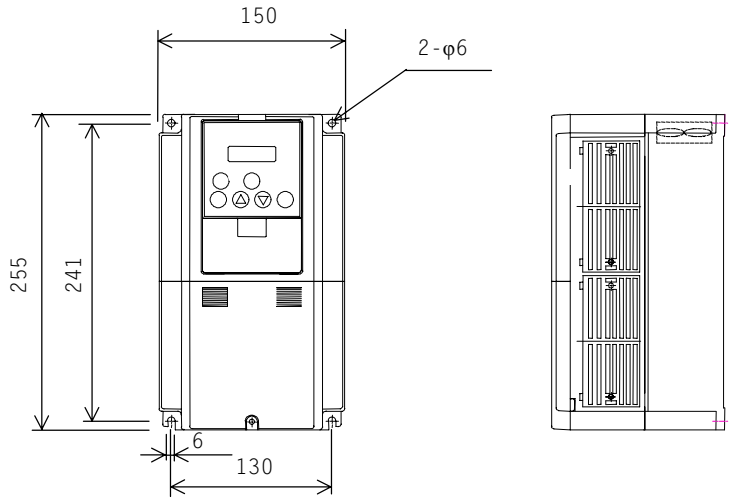
(3) Common specification for 200V/400V class

Inverter Model			V3000-015HFE	V3000-022HFE	V3000-037HFE	V3000-055HFE	V3000-075HFE	V3000-110HFE	V3000-150HFE	V3000-185HFE	V3000-220HFE	V3000-300HFE	V3000-370HFE	V3000-450HFE	V3000-550HFE
Control system			Sine-wave modulation PWM system												
Output frequency range			0.1-400Hz												
Frequency accuracy			Digital command +/-0.01% for Max. frequency, analog frequency +/-0.2%(25+-10C)												
Frequency resolving power			Digital setting : 0.01Hz Analog setting : Max. frequency/4000												
Voltage/ Frequency characteristic			V/f option variable, V/f control, (constant torque, reduced torque), sensor-less vector control (base frequency 30-400Hz)												
Speed fluctuation			+-0.5% (sensor-less vector control)												
Overload current rate			150% for 60 seconds 200% for 0.5 second												
Acceleration/ deceleration time			0.01-3600.0 seconds (straight or S-Curve on acceleration, deceleration is optional setting individually),												
Stating torque			200/0.5Hz (sensor-less vector control 150/Ohz area torque (0Hz sensor-less vector control□At the time of 1 frame under motor connection												
DC Braking			On starting and decelerating by stop command, inverter operates under operation setting frequency. Or inverter operates with external input (Breaking power, time, frequency can be set.)												
Input	Frequency	Operator	Setting by key.												
		Volume	DC 0 to 5V, -5 to +5V, 0 to 10V, -10 to +10V (input impedance 10k ohm), 4-20mA (input impedance 100 ohm)												
		Extend Signal	Setting with RS485 communication												
	Run/Stop	Operator	Run/Stop												
		Volume	Forward Run/Stop (1a connect), reverse command is impossible on assigning of terminal (selection of 1a, 1b is possible), input of 3 wires is possible.												
		Extend Signal	Setting with RS485 communication												
	Intelligent input terminal		Use by selecting terminals from; Reverse command (RV), multi-speed1-4 (CF1-CF4), jogging (JG), external dc braking (DB), 2nd control (SET),2nd acceleration (2CH), free-run stop (FRS), external trip (EXT), USP function (USP), commercial change (CS),software lock (SFT), analog input voltage / current / select (AT), 3rd control (SET3) ,reset inverter (RS), 3 wire run (STA),3 wire keep (STP),3 wire direction selection (F/R), PID selection valid/invalid (PID), PID integrating reset (PIDC),control gain change (CAS) ,remote control,up function (UP), remote control down function (DWN), remote control data clear (UDC), Compulsion operation(OPE) multi-speed bit 1-7(SF1-SF7),overload ristriction change (OLR),torque limit exist or no(TL),Torque limit change 1(TRQ1),Torque limit change 2(TRQ2),P/PI change(P/PI),Brake confirmation (BOK) orientation(ORT) LAD cancel(LAC) Position deviation clear (PCLR),90 degrees the phase difference permission (STAT) , permissive input signal for FW/RV(ROK), no assign (NO)												
	Thermistor input terminal		1 terminal												

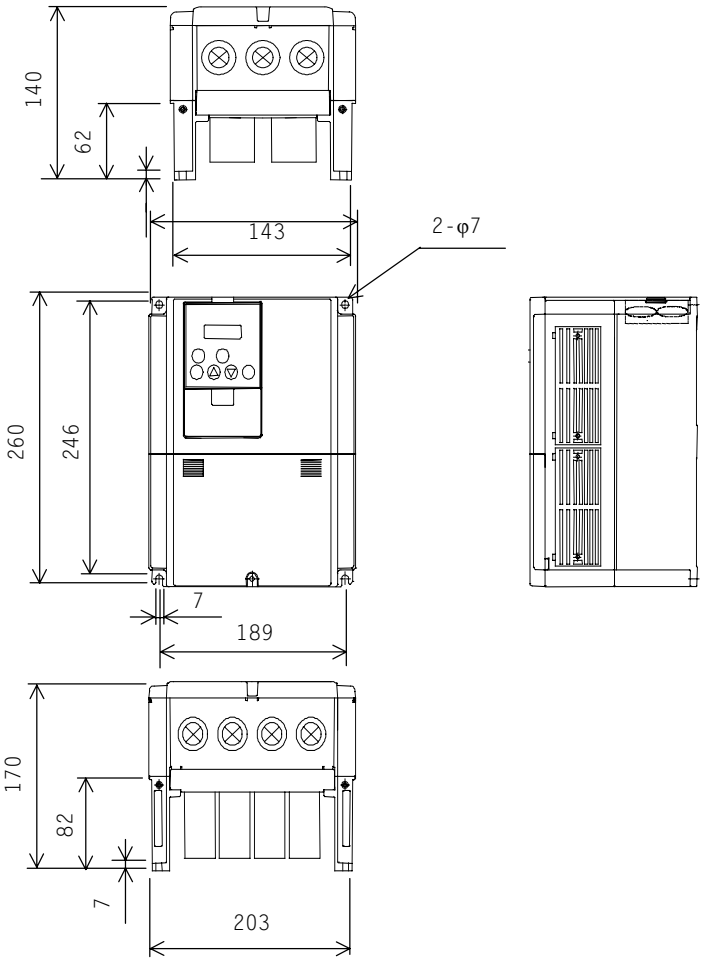
Output	Intelligent output terminal	Signal during run(RUN), Frequency arrival type 1 signal(FA1) Frequency arrival type 2 signal (FA2) Overload advance notice signal(OL) Output deviation for PID control(OD) Alarm signal(AL) Arrival signal for only setting frequency(FA3),Over torque(OTQ),Instantaneous stop signal(IP),Under voltage signal(UV),Torque limit(TRQ),RUN time over(RNT),ON time over(ONT),Thermal caution(THM),Brake opning(BRK),Brake error(BER),Zero speed detect signal(ZS),Speed deviation excessive(DSE) Positioning completion(POK),Arrival signal for over setting frequency2(FA4),Arrival signal for only setting frequency2(FA5),Overload advance notice signal2(OL2),Alarm cord0-3(AC0-AC3)												
	Intelligent monitor output terminal	Analog voltage output, analog current output, pulse line output											
Display monitor		Output frequency, output current, frequency conversion value, trip history, input output terminal state, input electric power, output voltage, motor torque											
Other function		V/f free setting (7points), Upper / lower frequency limitter, Frequency jump, Curve adjustable speed, Manual torque boost level / Braking point,Analog meter adjustment, Starting frequency, Carrier frequency adjustment, Electronic thermal free setting, External start/end (frequency/rate),Analog input selection, Trip retry, Reduced voltage start, Overload restriction,energy-saving operation, Restarting after an instantaneous power failure, Various kinds signal output, Initialization value setting, Automatic deceleration at the time of the power supply block,AVR function,Fuzzy,Autotuning(Online/Offline),High torque multi running(Sensor-less vector control with 1 inverters of 2 motors)												
Carrier frequency range		0.5 - 15kHz											
Protection function		Over-current, over-voltage, under-voltage, electronic thermal level, abnormal trouble, ground fault current on starting, instantaneous stop, USP error, open-phase error, control resistor overload, CT error, external trip, communication error											
Usage surroundin	Frequency temperature/Preservation temperature/humidty	-10 to 50 degrees / -20 to 65 degrees / 20 to 90 % RH (installed with no dew conensation)											
	Vibration	5.9 m/s^2 (0.6G) 10-55Hz								2.0 m/s^2 (0.2G) 10-55Hz			
	Using place	Under 1,000m above sea level, indoors (installed away from corrosive gasses dust))											
	Options	Vector control with sensor											
	Digital input option	4 column BCD 16bit binary											
Other options Schematic mass (kg)		Remote operator, copy unit, cable for each operator, braking resistor, regenerative control unit, alternating reactor, D.C. reactor, EMC Mains filter, higher harmonic control unit, LCR filter, applied control installation											
		3.5	3.5	3.5	3.5	5	5	12	12	12	20	30	30	50

2.1 Dimension

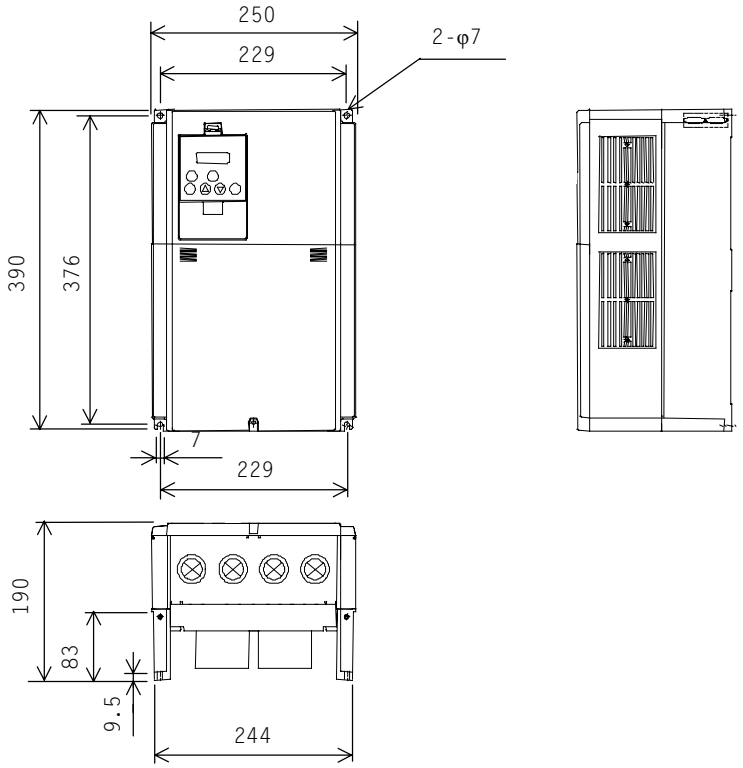
V3000-015 - 055HFE



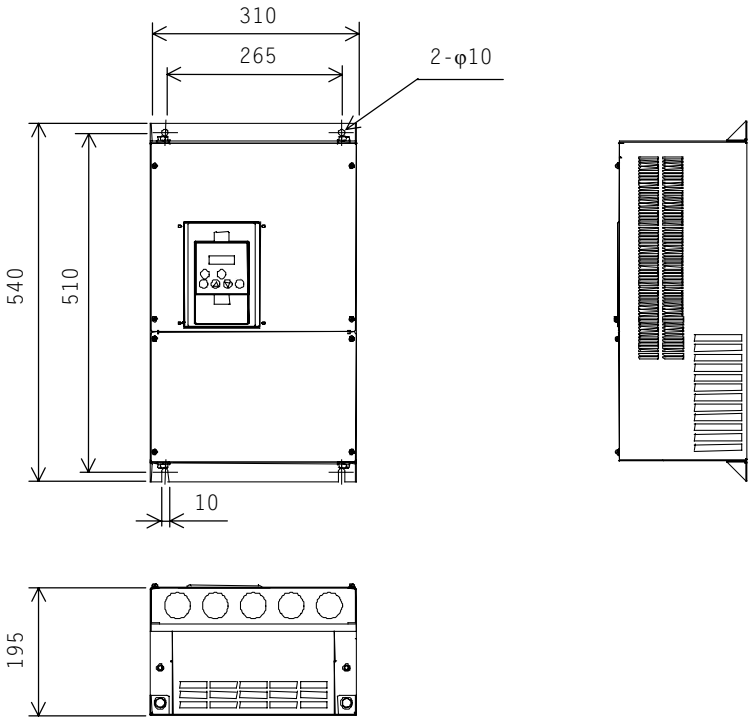
V3000-075 - 110HFE



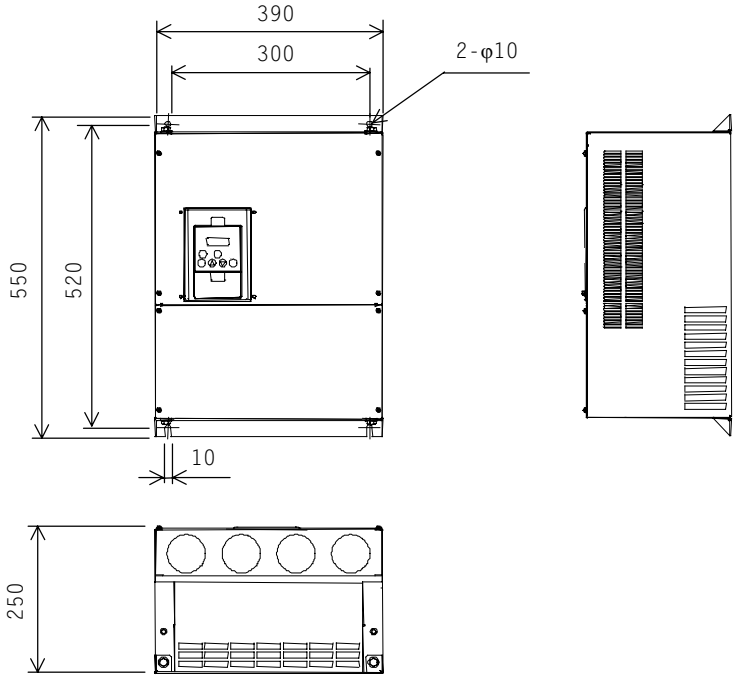
V3000-150 - 220HFE



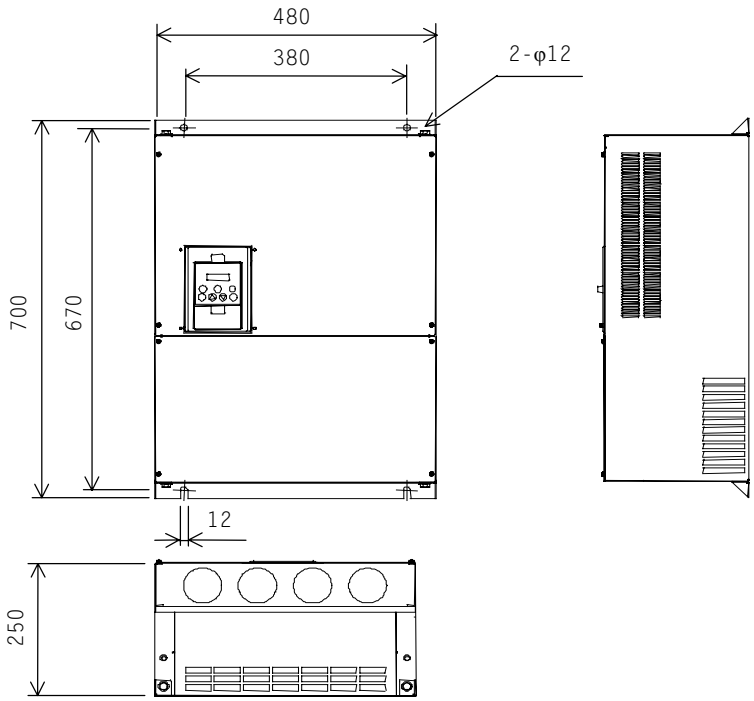
V3000-300HFE



V3000-370 - 450HFE



V3000-550HFE



3.1 Inspection upon Unpacking

3.1.1 Inspection of the unit

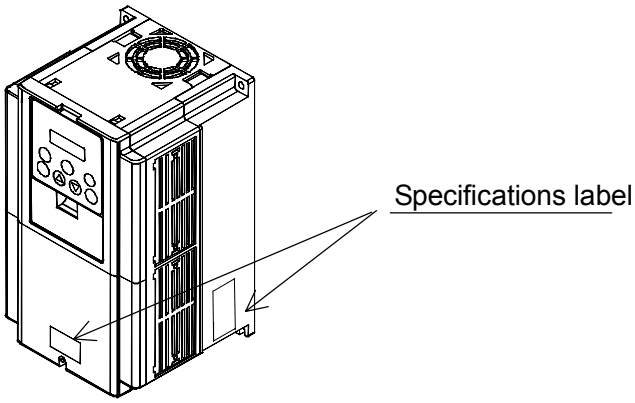
Open the package and pick out the inverter, please check the following item.

If you discover any unknown parts or the unit is in bad condition, please contact your supplier or the local WATT Distributor.

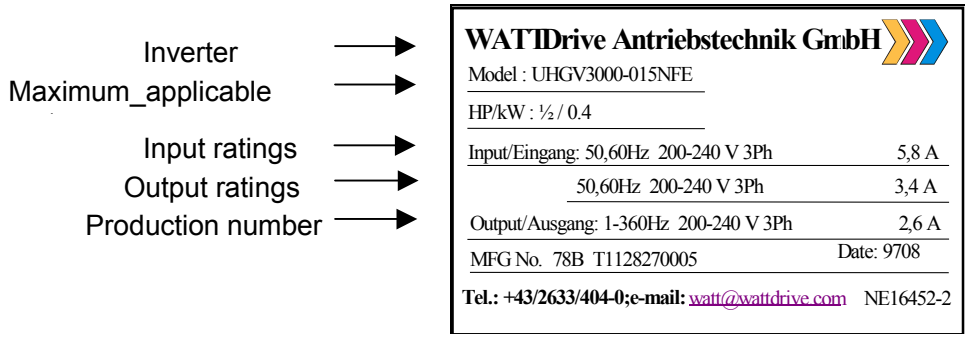
(1) Make sure that there was no damage (injury, falling or dents in the body) during transportation of the unit.

(2) After unpacking the unit, make sure that the package contains one operation manual for the Inverter.

(3) Make sure that the product is the one you ordered by checking the specification label.



Picture 1-1 Position of specification



3.1.2 Operation manual

This operation manual is the manual for the WATT Inverter V3000 Series.

Before operation of the Inverter, read the manual carefully. After Reading this manual, keep it to hand for future

reference.

When using optional units for this inverter; please refer to the operation manuals packed with the optional units.

This operation manual was correct at the time of going to press.

3.2 Question and Warranty of the Unit

3.2.1 Request upon asking

If you have any questions regarding damage to the unit, unknown parts or for general enquiries please contact your supplier or the local WATT Distributor with the following information.

(1) Inverter Model
(2) Production Number (MFG, NO)
(3) Date of Purchase
(4) Reason for Calling
Damaged part and its condition etc.
Unknown parts and their contents etc.

3.2.2 Warranty for the unit

The warranty period of the unit is one year after the purchase date.
However within the warranty period, the warranty will be void if the fault is due to;

(1) Incorrect use as directed in this manual, or attempted repair by unauthorised personnel
(2) Any damage sustained, other than from transportation (Which should be reported immediately)
(3) Using the unit beyond the limits of the specification.
(4) Act of God (Natural Disasters: Earthquakes, Lightning, etc)

The warranty is for the inverter only, any damage caused to third party equipment by malfunction of the inverter is not covered by the warranty.

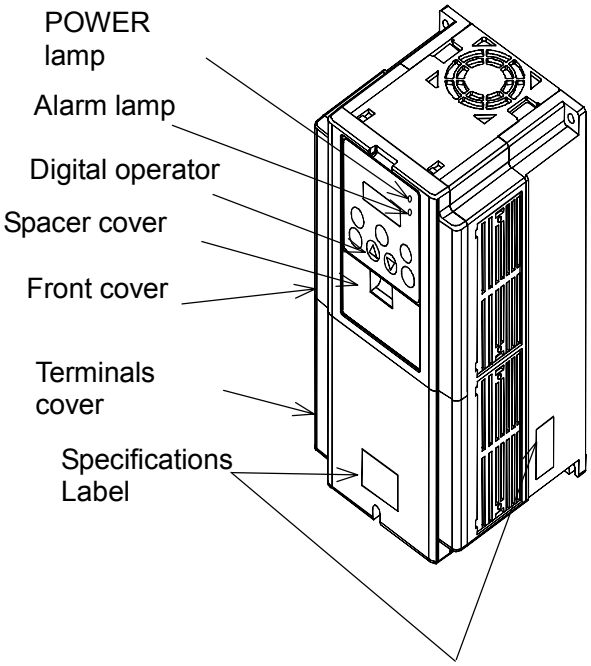
Any examination or repair after the warranty period (one year) is not covered. And within the warranty period any repair and examination which results in information showing the fault was caused by any of the items mentioned above,. the repair and examination cost are not covered.
If you have any questions regarding the warranty please contact either your supplier or the local WATT.

Distributor.
Please refer to the back cover for a list of the local WATT Distributors.

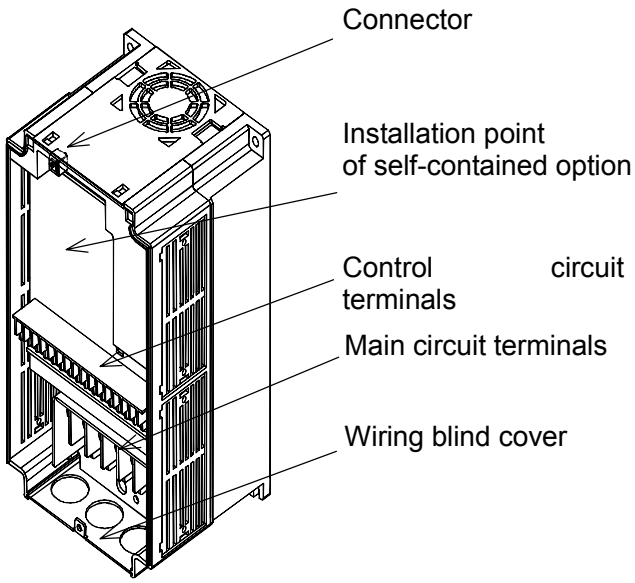
3.3 Appearance

3.3.1 Appearance and Names of Parts

Appearance from the front



Front cover removed



4.1 Installation

⚠WARNING

Do not remove the rubber bush. Due to the possibility that a wire may be damaged, shorted or may have a ground fault with the edge of the wiring cover.

! CAUTION

Install using non-combustible materials (metal etc.)
It is a fire risk.
Do not install combustible materials nearby.
It is a fire risk.
Do not carry unit by top cover, always carry by supporting base of unit.
There is a risk of falling and injury.
Do not allow substance of cutting waste, sputtering of welding, waste of iron, wire and dust etc. to come into
contact with the unit.
It is a fire risk.
Make sure the surface the unit is installed onto can support the weight of the unit comfortably.
There is a risk of falling and injury.
Do not install or operate the unit if the unit appears damaged.
There is a risk of injury.
Avoid locations of high temperatures, high humidity, dew condensation, dust, corrosive gases, explosive gases,
combustible gases, coolant mist and sea damage etc. Install indoors, to avoid direct sunlight and the unit should be well ventilated.

4.1.1 Installation

1. Transportation

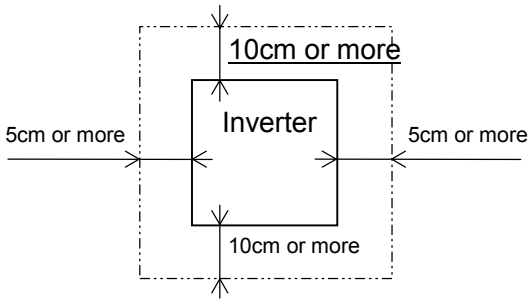
This inverter has plastic parts. So handle with care.

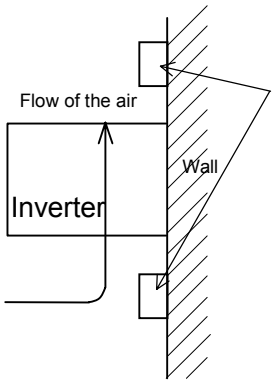
Do not over tighten the wall mounting fixings as the mountings may crack, causing is a risk of falling.

Do not install or operate the inverter if there appears to be damage or parts missing.

2. Surface for Mounting of Inverter

The temperature of the Inverter heatsink can become very high (the highest being about 150ºC). The surface, which you are mounting the Inverter onto, must be made of a non-flammable material (i.e steel) due to the possible risk of fire. Attention should also be made to the air gap surrounding the Inverter. Especially when there is a heat source such as a breaking resistor or a reactor.





Keep the space enough not to be prevented the ventilation of cooling by up and down of wiring duct.

3. Operating Environment - Ambient Temperature

The ambient temperature surrounding the Inverter should not exceed the allowable temperature range (usually -10 to 50ºC).

The temperature should be measured in the air gap surrounding the Inverter, shown in the diagram above. If the temperature exceeds the allowable temperature, the component life will become shortened especially in the case of the Capacitors.

4.Operating Environment - Humidity

The humidity surrounding the Inverter should be within the limit of the allowable percentage range (usually 5% to 90%). Under no circumstances should the Inverter be in an environment where there is the possibility of moisture entering the Inverter.

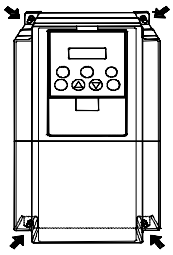
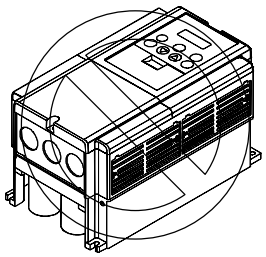
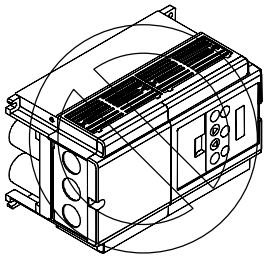
Also avoid having the Inverter mounted in a place that is exposed to the direct sunlight.

5. Operating Environment - Air

Install the Inverter avoiding any place that has dust, corrosive gas, explosive gas, combustible gas, mist of coolant and sea damage.

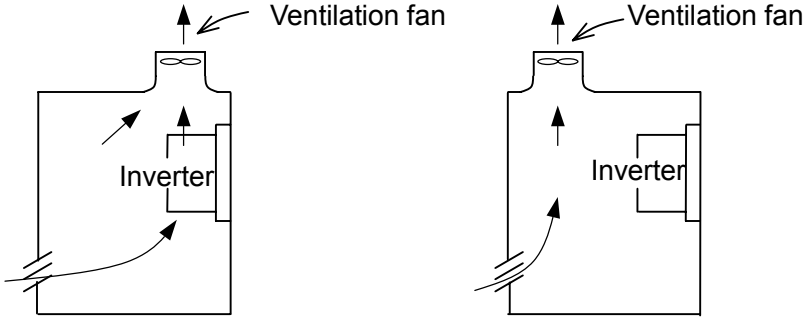
6. Mounting Position

Mount the Inverter in a vertical position using screws or bolts. The surface you mount onto should also be free from vibration and can easily hold the weight of the Inverter.

7. Ventilation within an Enclosure

If you are installing one or more Inverters in an enclosure a ventilation fan should be installed. Below is a guide to the positioning of the fan to take the airflow into consideration. The positioning of Inverter, cooling fans and air intake is very important. If these positions are wrong, airflow around the Inverter decreases and the temperature surrounding the Inverter will rise. So please make sure that the temperature around is within the limit of the allowable range.



(Good) (Bad example)

8.External cooling of Inverter

It is possible to install the inverter so that the heatsink is out of the back of the enclosure. This method has two advantages, cooling of the inverter is greatly increased and the size of the enclosure will be smaller.

To install it with the heatsink out of the enclosure, a metal fitting option is required to ensure heat transfer.

Do not install in a place where water, oil mist, flour and dust etc can come in contact with the inverter as there are cooling fans fitted to the heatsink.

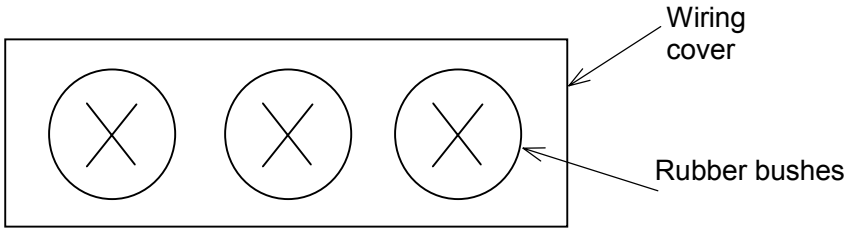
9. Approximate loss for each capacity

Inverter capacity (kW)	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
70% of rated output (W)	102	127	179	242	312	435	575	698	820	1100	1345	1625	1975
100% of rated output (W)	125	160	235	325	425	600	800	975	1150	1550	1900	2300	2800
100% of rated efficiency(%)	92.3	93.2	94.0	94.4	94.5	94.5	94.6	94.7	94.8	94.8	94.9	94.9	94.9

4.1.2 Blind cover of wiring parts

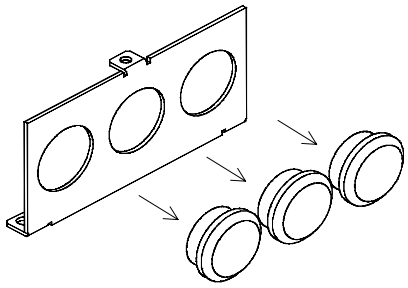
(1) Cable entry through Rubber Bushes

The wiring should be done after making a cut in the rubber bushes with nippers or cutters.



(2) Cable entry through Conduit

After taking out the rubber bushes, connect the conduit.



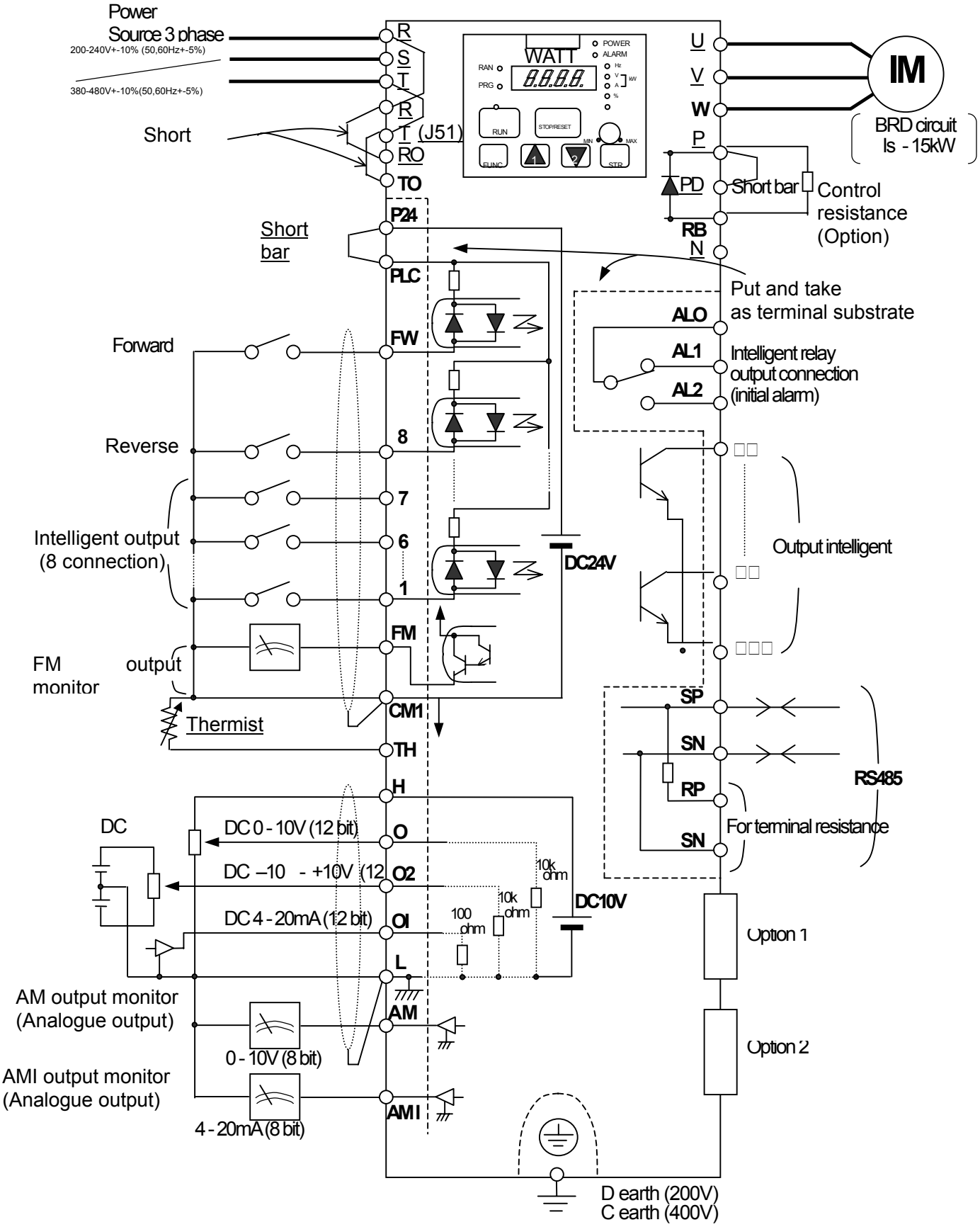
Note; Except for when connecting conduit, Do not take out the rubber bushes. It is possible that the wiring insulation is broken and a possible earth fault is caused.

4.2 Wiring

⚠WARNING

Be sure to ground the unit. Otherwise, there is a danger of electric shock and/or fire.
Otherwise, there is a danger of electric shock and/or injury.
Only qualified personnel shall carry out wiring work.
Otherwise, there is a danger of electric shock and/or fire.
Implement wiring **after** checking that the power supply is off.
Otherwise, there is a danger of electric shock and/or injury.
Be sure to implement wiring **after** installing the body.
Otherwise, there is a danger of electric shock and/or injury.
"Use 60/75 deg. Cu wire only" or equivalent.
"A Class 2 circuit wired with Class 1wire" or equivalent.
"Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 240V
maximum". For models with suffix N or L.
"Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 480V
maximum". For models with suffix H.

4.2.1 Terminal Connection Diagram



(1) Explanation of main circuit terminals

Symbol	Terminal Name	Explanation of contents
R, S, T (L1,L2,L3)	Main power	Connect alternating power supply. When using regenerative converter and RG series, don't connect.
U, V, W (T1,T2,T3)	Inverter output	Connect three-phase motor.
PD, P (+1,+)	D.C.reactor	Remove the short bar between PD and P, connect optional Power factor reactor (DCL-XX).
P, RB (+,RB)	External braking resistor	Connect optional External braking resistor.
P, N (+,-)	External braking unit	Connect optional Braking unit (BRD-XX). (Installed on 11kW and 15kW)
G ⏚	Inverter earth terminals	It is earth terminals of inverter case.

(2) Explanation of control circuit terminal

			Symbol	Terminal Name	Explanation of contents	
Analogue	Power Source		L	Analogue power common	It is common terminal of frequency command signal (0, 02, 01) and analogue output, AM, AMI. Don't earth.	
			H	Frequency power	It is the DC+10V power for terminals.	Allowable load current 20mA
	Frequency setting		O	Frequency command power terminal (voltage)	When inputting DC O - 10V, it is maximum frequency on 10V. When maximum frequency is expected to be on being less than 10V, set with A014.	Input Impedance 10k ohm Allowable maximum voltage 12V
			O2	Frequency command support (voltage)	When inputting DC O - +-10V, this signal is added to frequency command of 0 or 0I terminal.	Input Impedance 10k ohm Allowable maximum load current 20mA
			OI	Frequency command Terminal (current)	When inputting DC4 - 20mA, 20mA is maximum frequency. When only At terminal is ON, this input signal is effective.	Input Impedance 100 ohm Allowable maximum current 24mA
	Monitor		AM	Digital monitor (voltage)	Output one selected from monitor item, output frequency, output current, torque, output voltage, input electric power, electric thermal rate.	Allowable maximum current 2mA
			AMI	Analogue monitor (current)		Allowable output less than Impedance 250 ohm
			FM	Digital monitor (voltage)	Output the output frequency with digital besides above monitor.	Allowable maximum current 1.2mA Maximum frequency 3.6khz
Digital (connection)	Power Source		P24	Interface power	It is DC24V power for connection input signal. When selecting source logic, it's for connection input common.	Allowable maximum output current 100mA
			CM1	Interface power common	The common terminal is FW terminal, 1 - 8 terminal, TH terminal, FM terminal, Don't earth.	
			PLC	Intelligent input common	Change sink type and source type by short bar on control terminals. P24-PLC : Sink type CM1-PLC : Source type	
	Input signal	Setting	FW	Forward command	About FW signal, ON is Forward and OFF is stop command.	Allowable maximum voltage 27V Input impedance 4.7k ohm
		Operation/function Selection etc.	1 2 3 4 5 6 7 8	Input intelligent	Select 8 functions from 33 functions, and divide between 1 terminal and 8 terminals.	
	Output signal	Condition/Alarm	11 12 13 14 15	output intelligent	Select 8 functions from 13 functions, and divide between 1 terminal and 5 terminals	Allowable maximum voltage 27V current 5mA
			AL1 AL2	Alarm output terminal	Assign output function. Output is c contact.	Allowable maximum AC250V,0.2A Allowable minimum AC100V,10mA
			AL0	Common terminal	It is common terminal of alarm output terminal	
Analogue	Sensor		TH	Thermistor input terminal	When a Thermistor is connected to terminals TH and CM1,the Inverter checks for over-temperature and will cause trip event and turn off output to motor.	Allowable minimum Thermistor Power 100mW

4.2.2 Main circuit wiring

(1) Warning on wiring

When carrying out work on the Inverter wiring make sure to wait for at least ten minutes before you remove the cover. Making sure to check that the charge lamp is not illuminated.
A final check should always be made with a voltage meter.
After removing the power supply, there is a time delay before the capacitors will dissipate their charge.

1. Main power terminals(R, S, T)

Connect the main power terminals (R, S, and T) to the power supply through a electromagnetic contactor or an earth-leakage breaker.
We recommend connecting the electromagnetic contactor to the main power terminals. Because when the protective function of inverter operates, it isolates the power supply and prevent the spread of damages and accidents.
This unit is for the three-phase power supply. It isn't for the single-phase power supply. If you require a single phase power supply unit, please contact us.

2. Inverter output terminals (U, V, and W)

Wire with thicker wire than the applicable wire to control the voltage drop.
Particularly when outputting low frequencies, the torque of the motor will reduce by the voltage drop of the wire.
Do not install power factor correction capacitors or a surge absorber to the output.
The inverter will trip or sustain damage to the capacitors or the surge absorber.
In the case of the cable length being more than 20 metres, it is possible that a surge voltage will be generated and damage to the motor is caused by the floating capacity or the inductance in the wire (400V especially).
An EMC Mains Filter is available, please contact us.
In the case of two or more motors, install a thermal relay to each motor.

3. Direct current reactor (DCL) connection terminals (PD, P)

These are the terminals to connect the current reactor DCL (Option) to help improve the power factor.
The short bar is connected to the terminals when shipped from the factory, if you are to connect a DCL you will
need to disconnect the short bar first.
When you don't use a DCL, don't disconnect the short bar.

4. External braking resistor connection terminals (P, RB)

The regenerative braking circuit (BRD) is built-in as standard up to the 15kw Inverter.
When braking is required, install an external-braking resistor to these terminals.
The cable length should be less than 5 metres, and twist the two connecting wires to reduce inductance.
Don't connect any other device other than the external braking resistor to these terminals.
When installing an external braking resistor make sure that the resistance is correctly rated to limit the current drawn through the BRD

5. Regenerative breaking unit connection terminals

The Inverters rated more than 18.5kw don't contain a BRD circuit. If regenerative braking is required an external BRD circuit (Option) is required along with the resistor (Option).

Connect external regenerative braking unit terminals (P, N) to terminals (P,N) on the inverter. The braking resistor is then wired into the External Braking unit and not directly to the Inverter.

The cable length should be less than 5 metres, and twist the two connecting wires to reduce inductance.

6. Earth (G⏚)

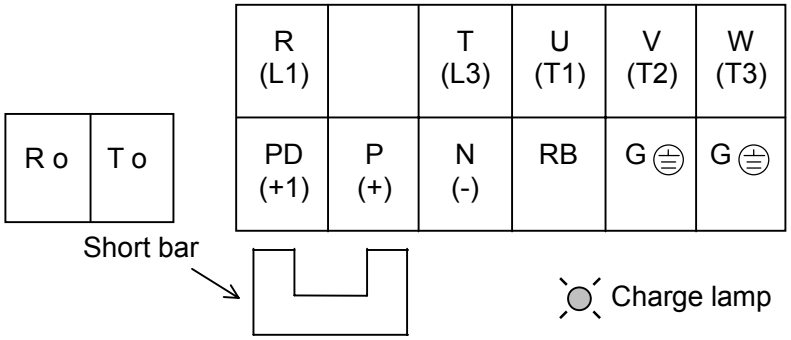
Make sure that you securely ground the Inverter and motor for prevention of electric shock.

The inverter and motor must be connected to an appropriate safety earth and follow the local standard. Failure

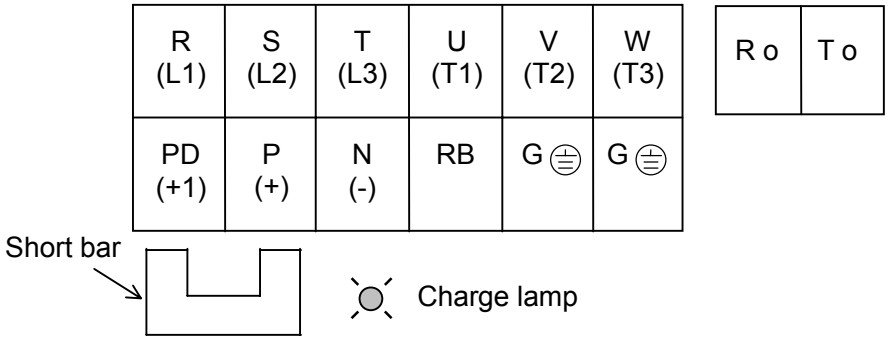
to do so constitutes an electrical shock hazard.

(2) Wiring of main circuit terminals

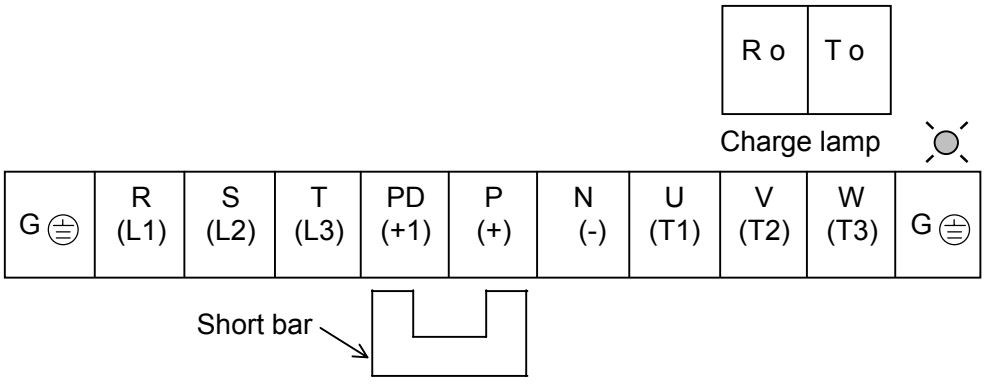
The wiring of main circuit terminals for inverter is the following picture.

<table>
<tr><th>Wiring of terminals</th><th>Corresponding type</th></tr>
<tr><td rowspan="2"> 
</td><td>V3000-015-037HFE

Ro-To : M4
Other : M4</td></tr>
<tr><td>V3000-055HFE

Ro-To : M4
Other : M5</td></tr>
<tr><td rowspan="2"> 
</td><td>V3000-075HFE

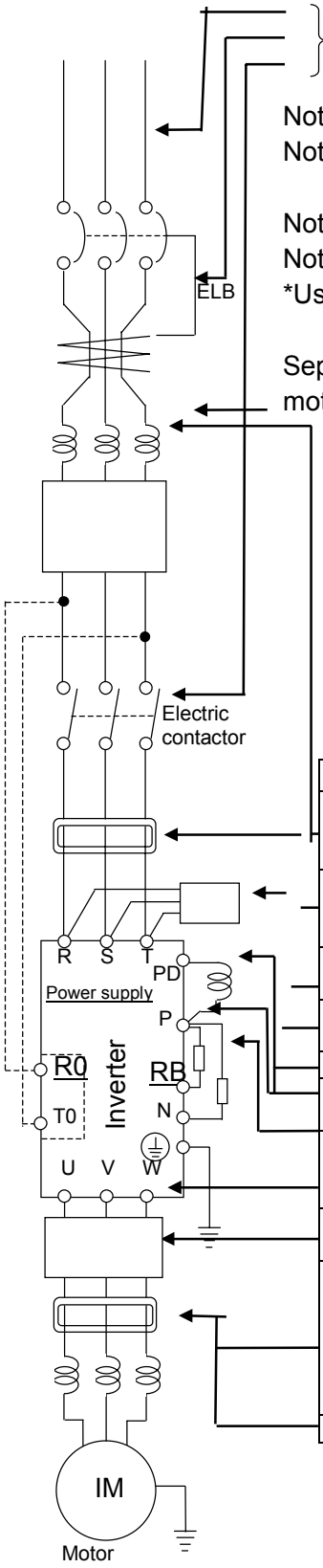
Ro-To : M4
Other : M5</td></tr>
<tr><td>V3000-110HFE

Ro-To : M4
Other : M6</td></tr>
<tr><td rowspan="2"> 
</td><td>V3000-150-370HFE

Ro-To : M4
Other : M6</td></tr>
<tr><td>V3000-450,550HFE

Ro-To : M4
Other : M8</td></tr>
</table>

(3)The Applicable Tools



See [(4) Common Applicable Tools] in this chapter

Note1: The applicable tools indicate for WATT standard four-pole squirrel-cage Motor.
Note2: Select applicable tools for breakers examining the capacity of breakers.
(Use Inverter type.)
Note3: It needs bigger wires for power lines, if the distance exceeds 20m.
Note4: Use earth-leakage breakers (ELB) for safety.
*Use 0.75mm^2 for Alarm output contact.

Separate by the sum(wiring distance from Inverter to power supply, from inverter to motor for the sensitive current of leak breaker (ELB).

Wiring distance	Sensitive Current(mA)
100m and less	50
300m and less	100

Note5: When using CV line and wiring by rigid metal conduit, leak flows.
Note6: IV line is high dielectric constant. So the current increase 8 times.
Therefore, use the sensitive current 8 times as large
as that of the left list. And if the distance of wire is over 100m,
use CV line.

Name	Function
Input reactor(harmonic control, electrical coordination, power-factor improvement)	This part is used when the unbalance voltage rate is 3% or more and power supply is 500 kVA or more, and there is a rapid change in the power supply/. It also improves the power factor.
Radio noise filter (zero-phase reactor)	Using the inverter may cause noise on the peripheral radio through the power lines. This part reduces noise.
Noise filter for Inverter	This part reduces common noise generated between the power supply and the ground, as well as normal noise. Put it in the primary side of inverter.
Input radio noise filter (capacitor filter)	This part reduces radiation noise emitted from wire at the input.
Direct reactor	This part control harmonic from inverter.
Breaking resistor Regenerative breaking unit	This part is used for applications that need to increase the brake torque of the inverter or to frequently turn on and off and to run high inertia load.
Output noise filter	This part reduces radiation noise emitted from wire by setting between inverter and motor. And it reduces wave fault to radio and TV , it is used for preventing malfunction of sensor and measuring instruments.
Radio noise filter(zero-phase reactor	This part reduces noise generated at the output of the inverter. (It is possible to use for both input and output.)
Output alternation reactor Reducing vibration, thermal Relay, preventing misapplication	Running motors with the inverter generates vibration greater than that with commercial power supply. This part installed between the inverter and motor reduces torque ripple. When the cable length between the inverter and motor is long (10m or more), a countermeasure for a malfunction of the thermal relay by harmonic due to switching on inverter is taken by inserting reactor. There is the way to use current sensor in stead of thermal relay.
LCR filter	Sine-wave filter at the output.

(4) Common applicable tools

	Motor Output (kW)	Applicable Inverter Model	Power lines R,S,T,U,V, W,P,PD,		External resister Between P and RB		Screw size of terminal	Terminal	Torque (Nm)	Applicable tools		
			mm^2 or more	AWG or more	mm^2	AWG				Leak breaker (ELB)	Circuit breaker	Electro -magnetic controller (Mg)
400V class	1.5	V3000-015HFE	2	18	2	18	M4	2-4	1.5	EX30(10A)	10A	H10C
	2.2	V3000-022HFE	2	16	2	16	M4	2-4	1.5	EX30(10A)	10A	H10C
	3.7	V3000-037HFE	2	14	2	14	M4	2-4	1.5	EX30(15A)	15A	H20
	5.5	V3000-055HFE	2	12	2	12	M5	2-5	1.5	EX50C(30A)	15A	H20
	7.5	V3000-075HFE	3.5	10	3.5	10	M5	3.5-5	1.5	EX50C(30A)	20A	H20
	11	V3000-110HFE	5.5	8	5.5	8	M6	5.5-6	1.5	EX50C(50A)	30A	H25
	15	V3000-150HFE	8	6	-	-	M6	8-6	4.9	EX60B(60A)	40A	H35
	18.5	V3000-185HFE	14	6	-	-	M6	14-6	4.9	EX60B(60A)	50A	H50
	22	V3000-220HFE	14	4	-	-	M6	14-6	4.9	RX100(75A)	60A	H50
	30	V3000-300HFE	22	3	-	-	M6	22-6	4.9	RX100(100A)	70A	H65
	37	V3000-370HFE	38	1	-	-	M6	38-6	4.9	RX100(100A)	90A	H80
	45	V3000-450HFE	38	1	-	-	M8	38-8	8.8	RX225B(150A)	125A	H100
	55	V3000-550HFE	60	1/0	-	-	M8	60-8	8.8	RX225B(175A)	125A	H125

#1 3/0 or 2 parallel of 1A

#2 250kcmil or 2 parallel of 1 AWG(75 deg.)

#3 350kcmil or 2 parallel of 1/0 AWG

Note : Field wiring must be made by a UL-listed and CSA-certified closed-loop terminal connector sized for the wire gauge involved. Connector must be fixed by using the crimping tool spcified by the connector manufacture

⚠WARNING

Use suitable circuit breaker listed in this manual for UL's listing purpose.
Otherwise, there is a danger of fire.

5) Connecting power to the control circuit, separating from main power

When the protection circuit of inverter is activated and the electromagnetic contactor on the input supply to the inverter isolates the power supply, the control circuit power supply from the inverter will also switch off and the alarm output signal will not be held.

The power terminals Ro and To are designed to allow a supply to go direct to the control circuit and therefore keep the alarm output signal on.

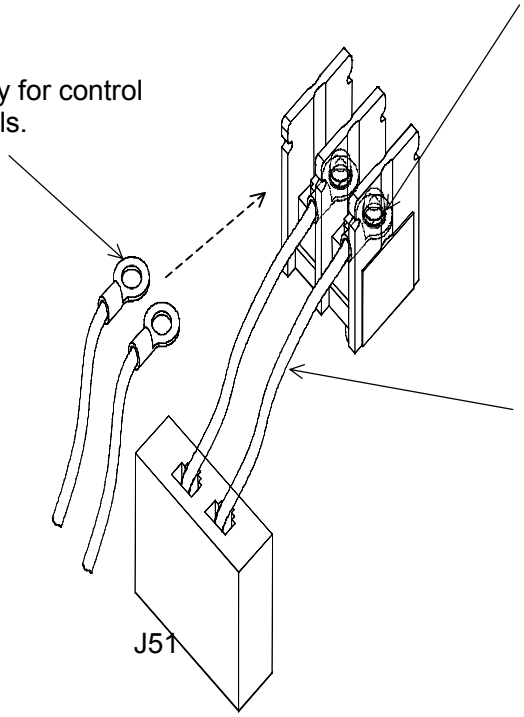
In this case, please connect power terminals Ro and To, to the primary side of the electromagnetic contactor.

(inverter unit side of ACL, EMI filter, on using input ACL, EMI filter).

[1] Remove the wires connected.

(Connection)

[3] Connect power supply for control circuit to power terminals.



4.2.3 Terminal Connection Diagram

(1) Wiring

1. Both the CM1 and L terminal is insulated to both the common terminal of the input and output signals.
   Do not short or earth these common terminals.

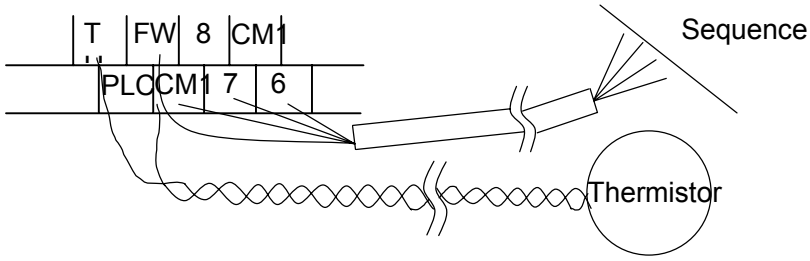
2. Use twisted screened cable, for the input and output wires of the control circuit terminals.
   Connect the screen to the common terminal.

3. Limit connection wires to 20m. When it is necessary to wire over 20m, use a VX applied controller RCD-A (Remoter operation bar) or a CVD-E (Insulated signal transducer).

4. Separate the control circuit wiring from the main power and relay control wiring.

5. If control and power wires must cross make sure they cross at 90 degrees to each other.

6. When connecting a thermistor to the TH and CM1 terminal, twist the thermistor cables separate from the rest.

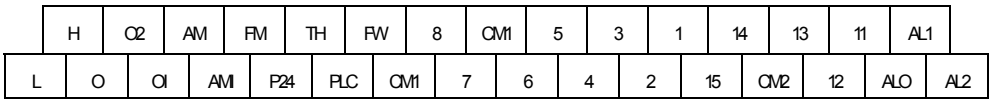


7. When using relays for the FW terminal or an intelligent input terminal use a control relay as they are designed to work with 24Vdc.

8. When the relay is used as an intelligent output, connect a diode for surge protection parallel to the coil.

9. Do not short the analogue voltage terminals H and L or the internal power terminals PV24 and CM1.
   There is risk of Inverter damage.

(2) Layout of control circuit terminals



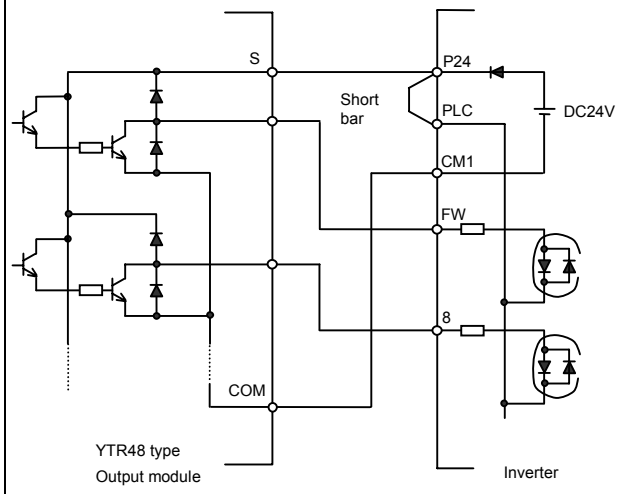
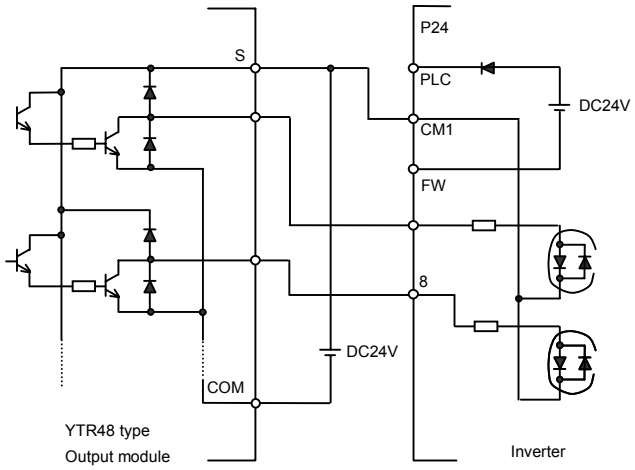
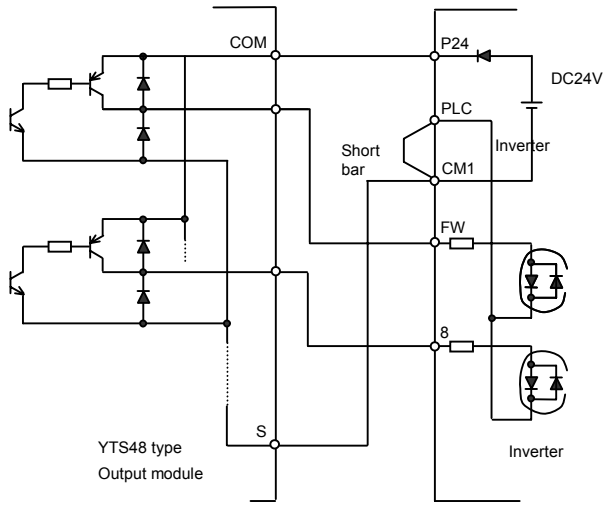
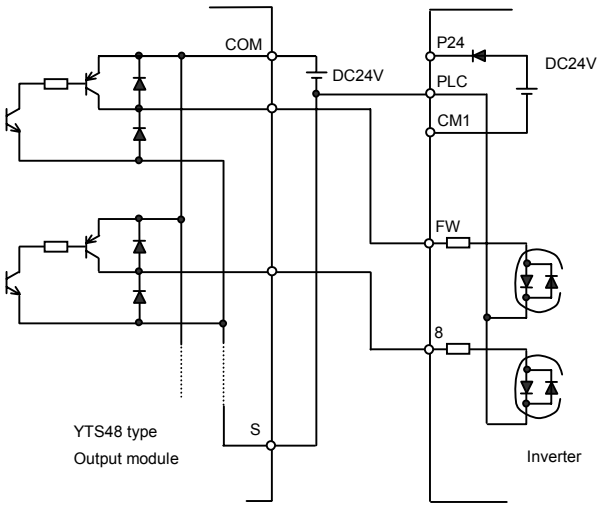
The terminal screw size; M3

(3)Change of input logic type

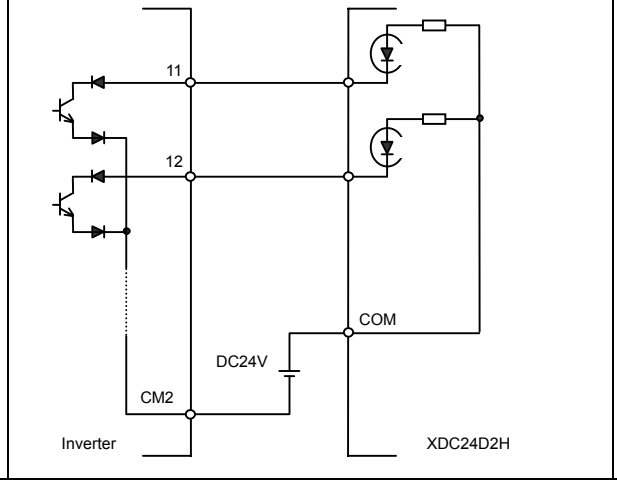
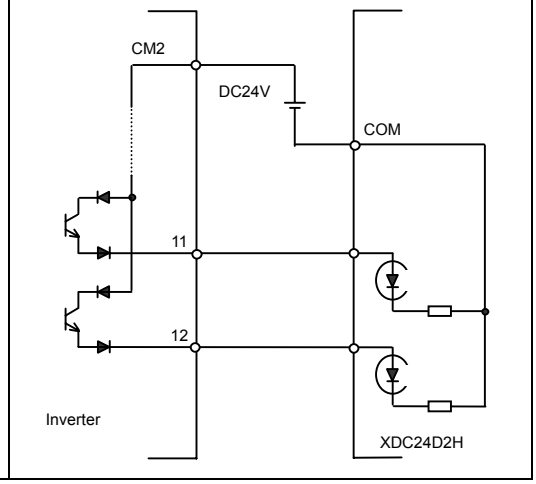
The logic type of intelligent input terminals is sink type (Factory Default).

To change the input logic type into source type, take off the short bar between P24 and PLC on the control terminal and connect it between PLC and CM1.

(4) The connection to the input programmable logic controller (sequencer)

	To use interface power within inverter	To use outside power (Take off the short bar of control terminal.)
Sink type		
Source type		

(5) The connection to the output programmable logic controller (sequencer)

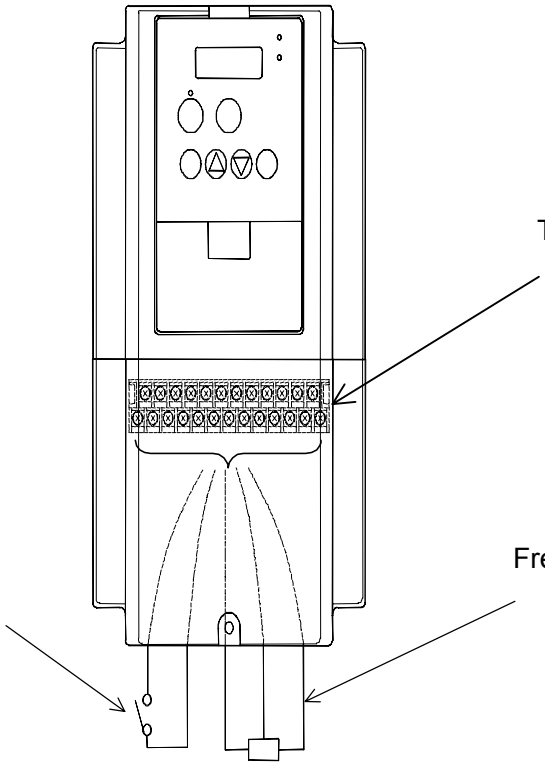
Sink type		Source type	

5.1 Operation

This inverter requires two different signals in order for the Inverter to operate correctly. The Inverter requires
both an operation setting and a frequency setting.
The following indicates the details of each method of operation and the necessary instructions for operation.

(1) Operation setting and a frequency setting by the terminal control.

This is the method by connecting signals from the outside (the frequency setting, the starting switch etc.)
with the control circuit terminals.
The operation is started when the operation setting (FW, RV) is turned ON while the input power is turned ON.
NOTE: The methods of the setting frequency with terminal are the voltage setting and the electric setting.
And they are selective by each system. The control circuit terminal list shows this in detail.
(Necessary things for operation)
[1] The operation setting: switch, relay etc.
[2] The frequency setting: signals from volume or outside (DCO-10V, DC-10-10V, 4-20mA etc.)



(2) Operation setting and frequency setting with the digital operator.

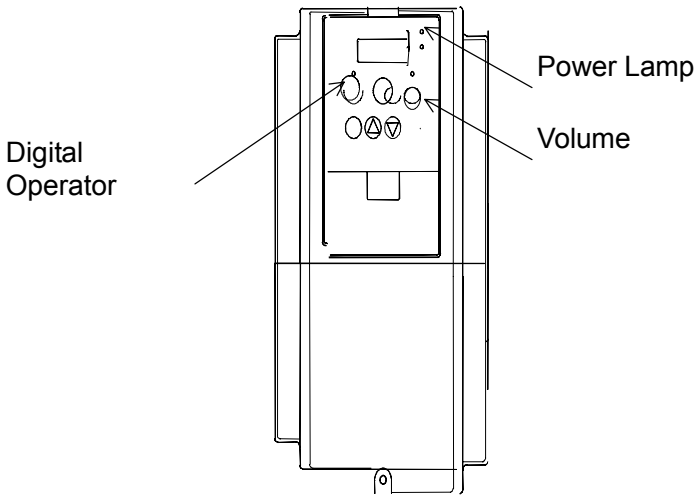
This is the method for operation from the digital operator, which comes equipped with the inverter as standard, or the remote operator keypad.

When the digital operator sets the operation, the terminals (FW, RV) don't need to be linked.

And it is possible to select frequency from the digital operator as a method of the frequency setting too.

(Necessary things for operation)

[1] Remote Operator (It's unnecessary in case of digital operator operation)



(3) Operation setting and frequency setting from both digital operator and terminal operator

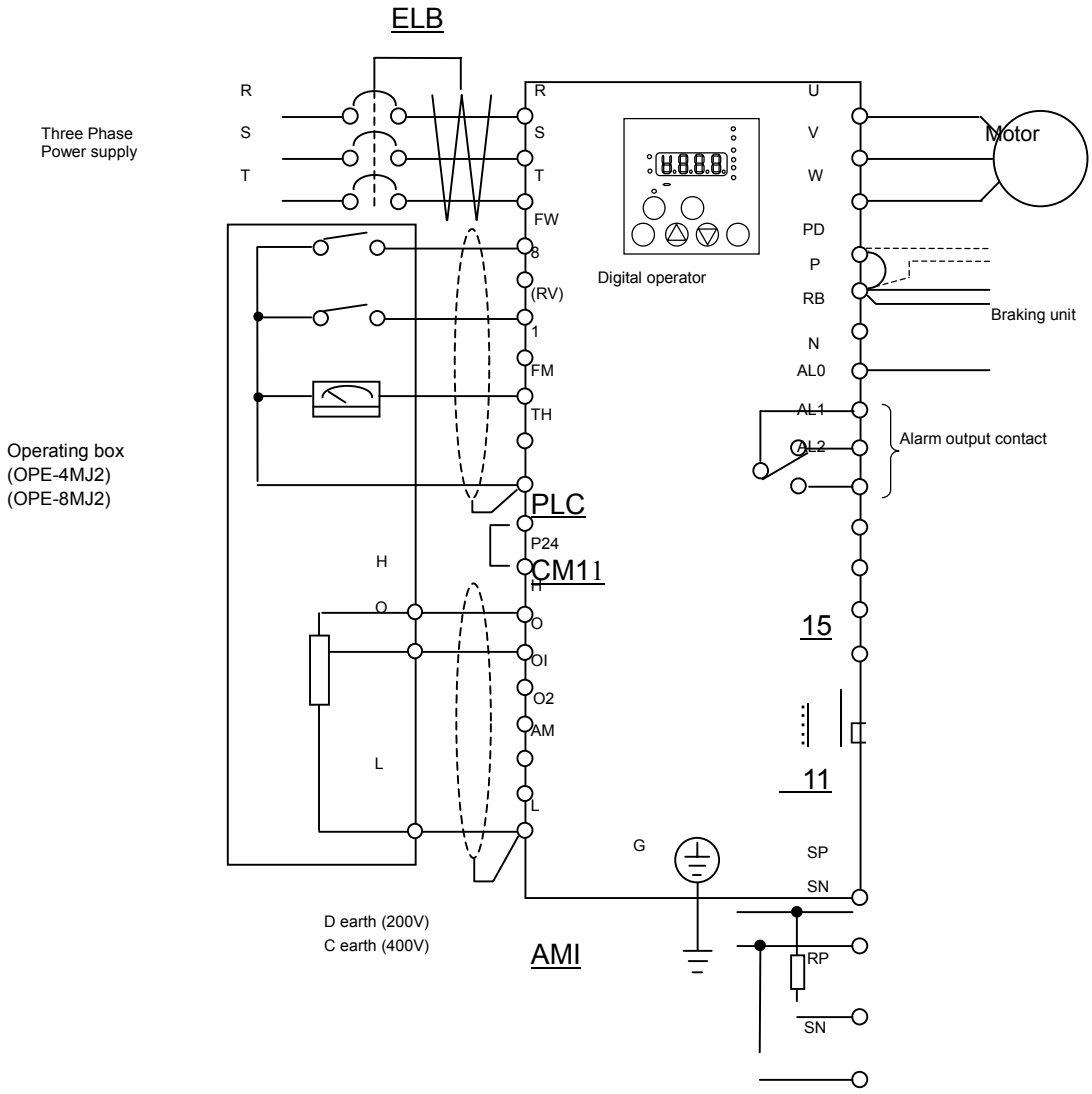
This is the method of inverter operating from both of the above two operating methods

It is possible that the operation setting and the frequency setting can be selected for both the digital operator and the terminal operator each separately.

5.2 Test Run

This is the common connection example. Please refer to 4.1 Digital Operator, for the detailed use of the digital operator (OPE-SR).

(1) To input the operation setting and the frequency setting from terminal control.



(Arrangements)

[1] Please make sure that the connections are correctly secure.

[2] Turn the ELB ON to supply power to the inverter.

(The red LED “POWER” on the digital operator should illuminate.)

[3] Set terminal with the frequency setting selection.

Set A001 as indication code, press the FUNC key once. (Two figures are shown.)

Set 01 with the ∧ key or the ∨ key, press the STR key once to set the frequency setting for terminal. (Indication code turns back to A001.)

[4] Set terminal with the operation setting selection.

Set A002 as indication code, press the FUNC key once. (Two figures are shown.)

Set 01 with the ∧ key or the ∨ key; press the STR key once to set the operation setting for terminal.

(Indication code turns back to A002.)

[5] Set monitor mode.

When monitoring the output frequency, set indication code to d001, and press the FUNC key once.

Or when monitoring the operating direction, set indication code to d003, press the FUNC key once.

[6] Input starting operation setting.

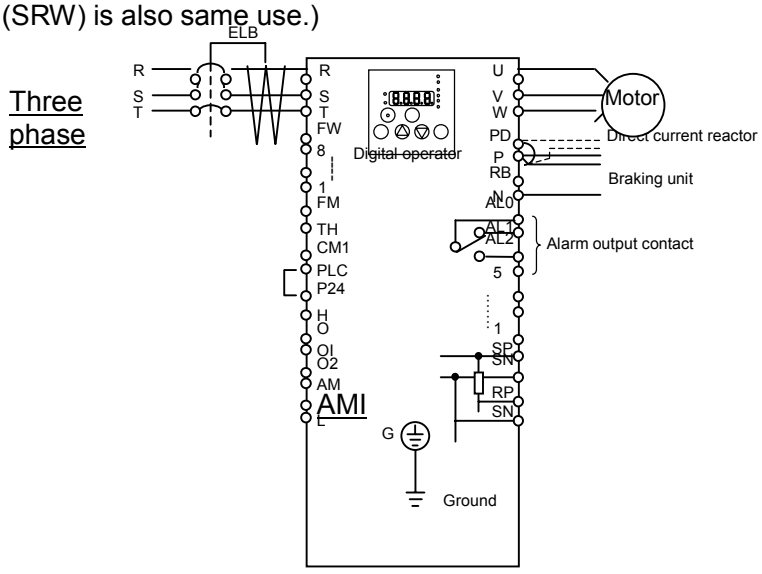
Turn ON between [FW] and [CM1] of terminal.

Impress voltage between [O] and [L] of terminal to start operation.

[7] Input ending operation setting.

Turn OFF between [FW] and [CM] to stop slowly down.

(2) Operation setting and the frequency setting from the digital operator
(Copy unit (SRW) is also same use.)



(Arrangements)

[1] Please make sure that there isn't matter about the connection.

[2] Turn the ELB on to supply power to the inverter.
(The red LED "POWER" on the digital operator should illuminate.)

[3] Set operator with the frequency setting selection.
Set A001 as indication code, press the FUNC key once.
(Two figures are shown.)
Set 02 with the ∧ key or the ∨ key, press the STR key once to set the frequency setting for the operator.
(Indication code turns back to A001.)

[4] Set operator with the operation setting selection.
Set A002 as indication code, press the FUNC key once.
(Two figures are shown.)

Set 02 with the ∧ key or the ∨ key, press the STR key once to set the operation setting for the
operator.
(Indication code turns back to A002.)

[5] Set the output frequency

Set F001 as indication code, as press the FUNC key once.
(Indication code of four figures is shown.)

Set to the desired output frequency with the ∧ key or the ∨ key, press the STR key once to
store it.
(Indication code turns back to F001.)

[6] Set the operation direction.

Set F004 as indication code, press the FUNC key once.
(00 or 01 is shown.)

Set operation direction to 00 in case of forward, or to 01 in case of reverse with the ∧ key or the ∨ key. Press the STR key once to establish it.
(Indication code turns back to F004.)

[7] Set monitor mode.

When monitoring the output frequency, set indication code to d001, and press the FUNC key once.
Or when monitoring the operation direction, set indication code to d003, press the FUNC key once.

(Indication code are  forward,  reverse or  stop.)

[8] Press the RUN key to start operating.
(The green LED “RUN” turns on a light, and the indication changes in response to the monitor mode set.

[9] Press the STOP/RESET key to decelerate to a stop.
(When the frequency turn back to 0, the green LED “RUN” light will switch off.)

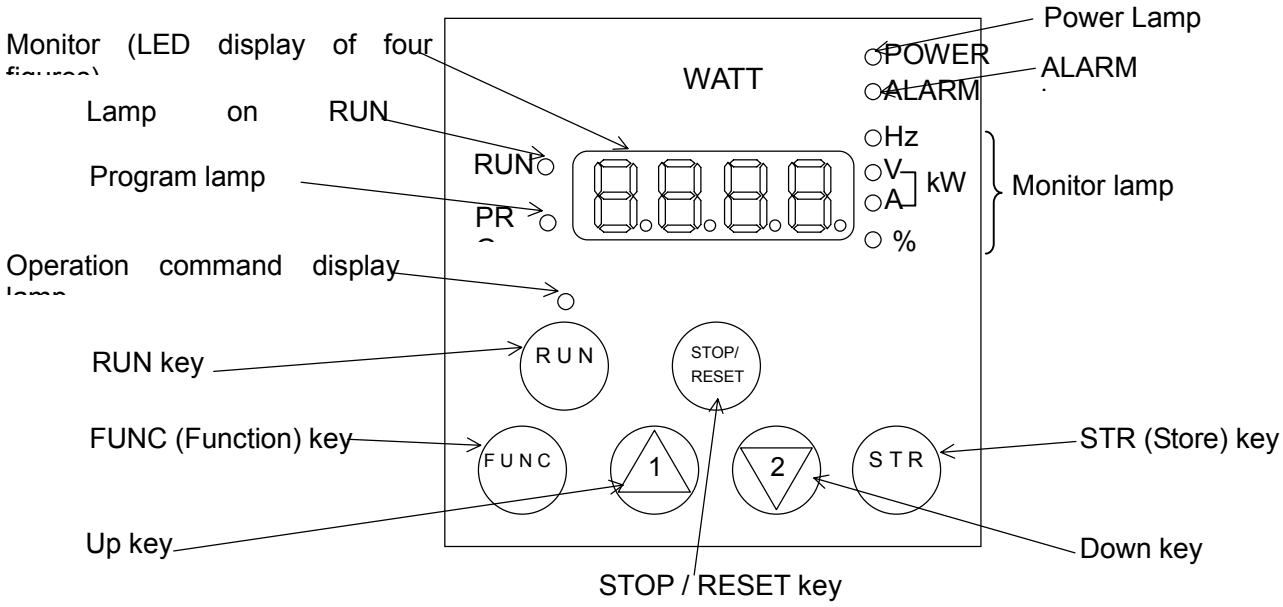
⚠ CAUTION
Make sure that the direction of the motor is correct. It is in danger of injury or machine damage. Make sure there is no abnormal noise and vibration. It is in danger of injury or machine damage.

Make sure that there is no tripping during the acceleration and deceleration and check that the revolution per minute and the frequency meter are correct.
When overcurrent tripping or overvoltage tripping occurs during the test run, increase the acceleration time
or the deceleration time.

6.1 About Digital Operator (OPE-S)

Explanation of operating the digital operator (OPE-S)
V3000 series operates by using the digital operator, which is fitted as standard.

1. Name and contents of each part of the digital operator



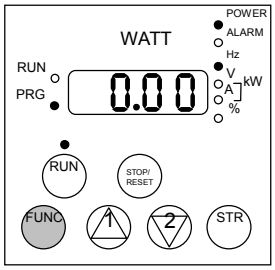
Name	Contents
Monitor	Display of frequency, output current and set value
Lamp on RUN (Operation)	Light on when the inverter is running
Program lamp	Light on when displaying set value of each function in monitor section Light will flash On and Off as a warning (when set value is incorrect)
POWER lamp	Power lamp of control circuit
ALARM lamp	Light on when the Inverter trips
Monitor lamp	Lamp display state of monitor section. Hz : Frequency V : Voltage A : Current kW : Electric power % : Rate
Operation command Display lamp	Light on only when operating command (RUN/STOP) is set in operator
Run key	Run command to start the motor. But this is only valid when operation command is from the operator. (Be sure that the operation command display lamp is illuminated.)
Stop (stop/reset) key	This key is used to stop motor, or reset an alarm.
FUNC (Function) key	The key containing monitor mode, basic setting mode, extension functions mode.
STR (Store) key	The key to store the data set. (On changing set value, must be pushed or value is lost.)
UP/DOWN key	The keys to change extension function mode, function mode and set value.

2. Operating method

(1) Method to display monitor mode, basic setting mode, extension function mode

Power on

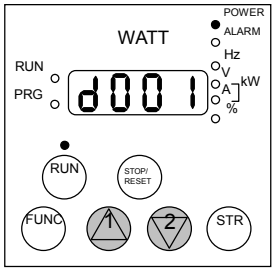
[1] Display of monitor contents set (Display 0.00 in initial state)



When power is turned off while the basic setting mode or the extension setting mode is displayed. The display will be different from the one above when the power is restored.

Push the FUNC key. (6

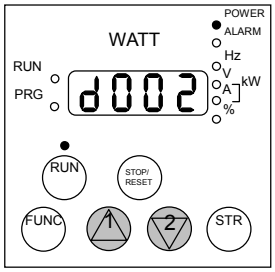
[2] Display monitor code No. (Display d001)



Monitor mode is displayed by pushing FUN (Function) key once when display of
Monitor mode No.

Push the 2 key. Push the 1 (8 times)

(Display d002)

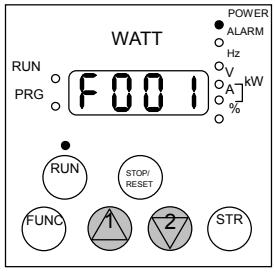


*1 Push the 1 (19 times)

Push the 2 (19 times)

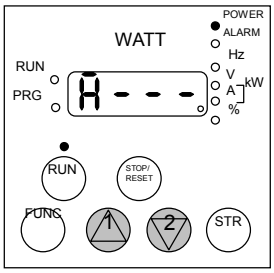
[3] Display code No. of basic setting mode.

(Display F001)



*1(3) Refer to setting method of function code.

[4] Display extension function mode (Display A - - -)

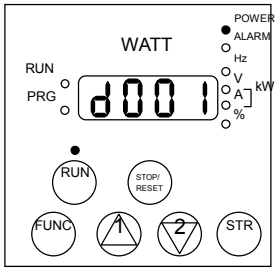


Extension function mode
Display in the order of
A ↔ b ↔ C ↔ H ↔ P ↔ U.

Push the 1 (8 times)

Push the 2 (8 times)

[5] Display monitor code No. (Display d001)



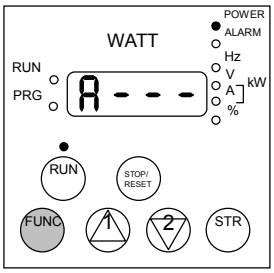
Return to the state of [2].

Push the 1 key. Push the 2 (6 times)

(2) Setting method of function

Change operation command part. (Operator → Control terminal)

[1] Display extension function mode

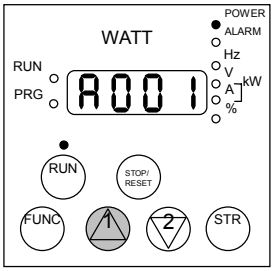


Make monitor display "A - - -" by referring to (1) displaying method.

Now operating command part is by the operator, so operating command display lamp should illuminate.

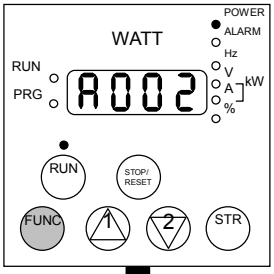
Push the FUNC key.

[2] Display code No. of function mode.



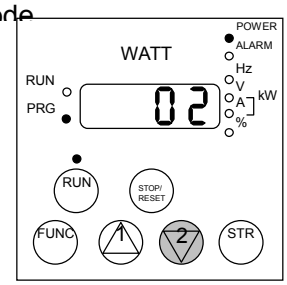
Push the 1 key.

(Display A002)



Push the FUNC key.

[3] Display contents of function mode

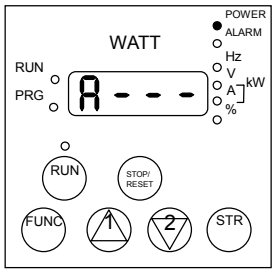


Push the 2 key.

Operation command part displays 02(operator).

Program (PRG) light on by displaying contents of function mode

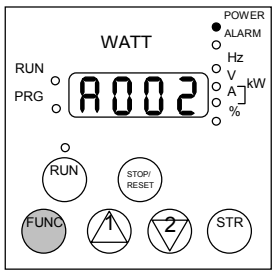
[5] Display extension function mode (Display A - - -)



It is possible to shift to other extension function modes, monitor modes and basic modes in this state.

Push the FUNC key.

[4] Display code No. of monitor mode. (Display A002)

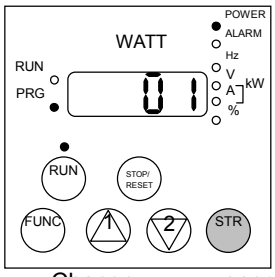


The changed set value is confirmed by pushing the STR key.

Operation command display lamp light will switch off so that operation command is now changed to the control terminal.

It is possible to change to other function

Push the STR key.



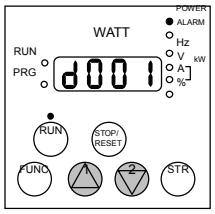
Change operation command part to control terminal 01.

(3) Setting method of function code

Code No. of monitor modes, basic setting modes and extension function codes can be set easily.

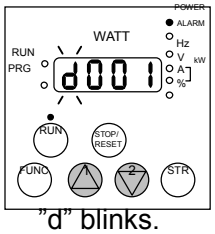
Indicate the method to change code No.d001 of monitor mode to function code No. A029 simply.

[1] Display code No. of monitor mode. (Displayd001)



Push the ▲ and ▽ key together.

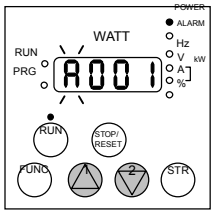
[2] Change extension function



"d" blinks.

Push the ▲ key. (2 times)

(Display A001)

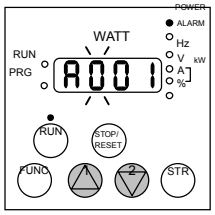


"A" blinks.

The figure lighting is decided by pushing STR key.

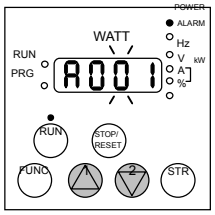
Push STR the (Confirm "A")

[3] Change third figure of function code No.



Push STR the

(Confirm "0")



First figure "0" blinks.

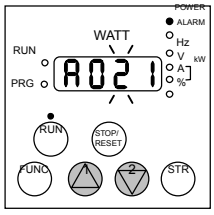
Don't change third figure and push the STR key and confirm 0.

[4] Change second figure of function code No.

Push the ▲ key. (2 times)

Second figures, "2"

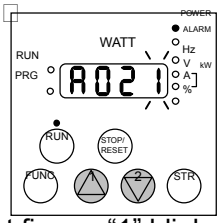
(Display 021)



Push STR the

First figure, "1" blinks.

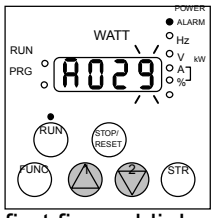
[5] Change first figure of function code No.



Push the ▽ or ▲ key.

"9" of first figure blinks.

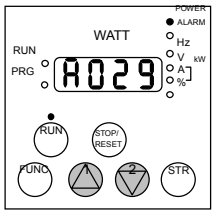
(Display 029)



Push the STR Key

(Decide "9")

[6] Finish setting function



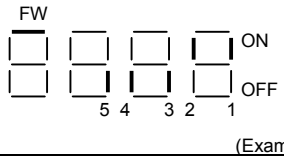
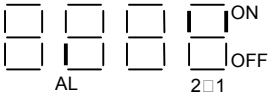
Finish setting A029

(Note) When you input code No. there isn't in the code list, "A" of left end blinks again. Confirm code No. and input it again.

6.2 Code list

Monitor code

(Note1)

Dis-play code	Function name	L3000 plus monitor or data range (new type digital operator)	Initial data	Setting On Running	Change mode during running	Page
d001	Output frequency Monitor	0.00-99.99/100.0-400.0(Hz)	-	-	-	4-10
d002	Output current Monitor	0.0-999.9(A)	-	-	-	4-10
d003	Operation direction Monitor	F(forward)/o(stop)/r(reverse)	-	-	-	4-10
d004	PID feedback Monitor	0.00-99.99/100.0-999.9/1000. -9999. / 1000-9999/{100-{999 (10000-99900)	-	-	-	4-10
d005	Intelligent input terminal monitor	 Terminal 5, 4, 3 :OFF (Example) Terminal2, 1:ON	-	-	-	4-11
d006	Intelligent output terminal monitor	 AL :OFF	-	-	-	4-11
d007	Frequency conversion monitor	0.00-99.99/100.0-999.9/1000. –9999. / 1000-3996	-	-	-	4-12
d013	Output voltage monitor	0.0-600.0 V	-	-	-	4-12
d014	Electric power monitor	0.0-999.9 kW	-	-	-	4-12
d016	Accumulated time monitor during RUN	0.-9999./1000-9999/{100-{999 hr	-	-	-	4-13
d017	Power ON time monitor	0.-9999./1000-9999/{100-{999 hr	-	-	-	4-13
d080	Number of trip time monitor	0.-9999./1000-6553(10000-65530) (time)	-	-	-	4-13
d081	Trip monitor 1	Trip Code, frequency(Hz), current(A), voltage(V) RUN time(hr) power ON time(hr)	-	-	-	4-13
d082	Trip monitor 2	Trip Code, frequency(Hz), current(A), voltage(V) RUN time(hr) power ON time(hr)	-	-	-	4-13
d083	Trip monitor 3	Trip Code, frequency(Hz), current(A), voltage(V) RUN time(hr) power ON time(hr)	-	-	-	4-13
d084	Trip monitor 4	Trip Code, frequency(Hz), current(A), voltage(V) RUN time(hr) power ON time(hr)	-	-	-	4-13
d085	Trip monitor 5	Trip Code, frequency(Hz), current(A), voltage(V)	-	-	-	4-13

		RUN time(hr) power ON time(hr)				
d086	Trip monitor 6	Trip Code, frequency(Hz), current(A), voltage(V) RUN time(hr) power ON time(hr)	-	-	-	4-13
d090	Warning monitor	Warning code	-	-	-	4-76
F001	Output frequency	0.0, starting frequency-Max. frequency (2^{nd} max. frequency)(Hz)	0.00			4-14
F002	1^{st} acceleration time	0.01-99.99/100.0-999.9/1000.-3600.(s)	30.00			4-16
F202	2^{nd} acceleration time	0.01-99.99/100.0-999.9/1000. -3600. (s)	30.00			4-16
F003	1^{st} deceleration time	0.01-99.99/100.0-999.9/1000. -3600. (s)	30.00			4-16
F203	2^{nd} deceleration time	0.01-99.99/100.0-999.9/1000. -3600. (s)	30.00			4-16
F004	Operation direction selection	00(forward)/01(reverse)	00	-	-	4-16

(Note1) Change mode during run by selection of b031 (software lock selection).
(Note2) Do not forget to press “STR” key when you change the display.

Function Code

Code		Function name	Setting range	Initial data	Setting on run	Change mode on run	Page
Base setting	A001	Frequency setting selection	00(VR)/01(terminal)/02(operator)/03(RS485)/04 (option1)/05(option2)	00	-	-	4-14
	A002	Operation setting selection	01(terminal)/02(operator)/03(RS485)/04(option1)/05(option2)	02	-	-	4-15
	A003	Base frequency	30. - Maximum. frequency(Hz)	60.	-	-	4-17
	A203	Base frequency, 2nd motor	30. - 2nd Maximum. frequency (Hz)	60.	-	-	4-17
	A004	Maximum frequency	30. - 400. (Hz)	60.	-	-	4-18
	A204	Maximum frequency, 2nd motor	30. - 400. (Hz)	60.	-	-	4-18
Analog input setting	A005	AT terminal selection	00(Changing of O and OI with AT terminal)/01(Changing of O and O2 with AT terminal)	00	-	-	4-19
	A006	02 selection	00(single)/01(auxiliary speed of O, OI) [no reversible] /02(auxiliary speed of O, OI [reversible]	00	-	-	4-19
	A011	0 start	0.00-99.99/100.0-400.0 (Hz)	0.00	-		4-20
	A012	0 end	0.00-99.99/100.0-400.0 (Hz)	0.00	-		4-20
	A013	0 start rate	0.-100.0 (%)	0.	-		4-20
	A014	0 end rate	0.-100.0(%)	100.	-		4-20
	A015	0 start selection	00 (external starting frequency)/01(OHz)	01	-		4-20
	A016	O, OI, O2 sampling	1.-30.(times)	8.	-		4-21
Multistage speed□jogging frequency setting	A019	Multi-speed selection	00(binary : range is to 16 stage speed with 4 terminals)/01(bit : range is to 6 stage speed with 5 terminals)	00	-	-	4-43
	A020	Multi-speed 0	0.00, starting frequency-maximum. frequency(Hz)	0.00			4-43
	A220	Multi-speed 0, 2nd motor	0.00, starting frequency-2nd maximum frequency(Hz)	0.00			4-43
	A021	Multi-speed1	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A022	Multi-speed2	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A023	Multi-speed3	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A024	Multi-speed4	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A025	Multi-speed5	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A026	Multi-speed6	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A027	Multi-speed7	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A028	Multi-speed8	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A029	Multi-speed9	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A030	Multi-speed10	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A031	Multi-speed11	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A032	Multi-speed12	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A033	Multi-speed13	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A034	Multi-speed14	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A035	Multi-speed15	0.00, starting frequency-maximum frequency(Hz)	0.00			4-43
	A038	Jogging frequency	0.00, starting frequency-9.99(Hz)	1.00			4-44
	A039	Jogging selection	00(free-run on JG stop / invalid on running) / 01(stop decelerating on JG stop / invalid on running) / 02(DC braking on JG stop/invalid on running) / 03(free-run on JG stop/valid on running[JG after stop decelerating]) / 04 (stop decelerating on JG stop/valid on running) / 05 (DC braking on JG stop/valid on operating)	00	-		4-44
V/f characteristic	A041	Torque boost selection	00 (manual torque boost) / 01 (automatic torque boost)	00	-	-	4-24
	A241	Torque boost selection, 2nd motor	00 (manual torque boost) / 01 (automatic torque boost)	00	-	-	4-24
	A042	Manual torque boost	0.0-20.0(%)	1.0			4-24
	A242	Manual torque boost, 2nd motor	0.0-20.0(%)	1.0			4-24
	A043	Manual torque boost point	0.0-50.0(%)	5.0			4-24
	A243	Manual torque boost point, 2nd motor	0.0-50.0(%)	5.0			4-24
	A044	1st control	00/(VC)/01(VP1.7power)/02(free V/f setting)	00	-	-	4-22
	A244	2nd control	00/(VC)/01(VP1.7power)/02(free V/f setting)	00	-	-	4-22
	A045	Output voltage gain	20. - 100.	100.			4-21
Direct current braking	A051	DC braking selection	00(invalid)/01(valid)	00	-		4-25
	A052	DC braking frequency	0.00-60.00(Hz)	0.50	-		4-25
	A053	DC braking wait time	0.0 - 5.0(s)	0.0	-		4-25
	A054	DC braking power	0. - 70. (%)	0.	-		4-25
	A055	DC braking time	0.0 - 60.0(s)	0.0	-		4-25
	A056	DC braking edge/level selection	00(edge action)/01(level action)	01	-		4-25
	A057	DC braking power (starting time)	0. - 70. (%)	0.	-		4-25
	A058	DC braking time (starting time)	0.00-60.0(s)	0.0	-		4-25
	A059	DC carrier frequency	0.5-12(kHz) Derating	3.0	-	-	4-25

Function Code

	Code	Function name	Setting range	Initial data	Setting on run	Change mode on run	Page
Upper and lower limiter / jump frequency	A061	1st frequency upper limiter	0.00, 1st frequency lower limiter-maximum frequency(Hz)	0.00	-		4-28
	A261	2nd frequency upper limiter	0.00, 2nd frequency lower limiter-2nd setting maximum frequency(Hz)	0.00	-		4-28
	A062	1st frequency lower limiter	0.00, start frequency-maximum frequency(Hz)	0.00	-		4-28
	A262	2nd frequency lower limiter	0.00, start frequency-2nd setting maximum frequency(Hz)	0.00	-		4-28
	A063	Jump frequency1	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-29
	A064	Jump frequency Width 1	0.00-10.00(Hz)	0.50	-		4-29
	A065	Jump frequency2	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-29
	A066	Jump frequency Width 2	0.00-10.00(Hz)	0.50	-		4-29
	A067	Jump frequency3	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-29
	A068	Jump frequency Width 3	0.00-10.00(Hz)	0.50	-		4-29
	A069	Acceleration stop frequency	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-29
	A070	Acceleration stop time	0.00-60.0(s)	0.0	-		4-29
PID control	A071	PID selection	00(invalid)/01(valid)	00	-		4-30
	A072	PID-P gain	0.2-5.0	1.0			4-30
	A073	PID-I gain	0.0-3600.(s)	1.0			4-30
	A074	PID-D gain	0.00-100.0(s)	0.00			4-30
	A075	PID scale	0.01-99.99(%)	1.00	-		4-30
	A076	PID feedback selection	00(feedback : OI)/01(feedback : O)	00	-		4-30
AVR	A081	AVR selection	00(ON always)/01(OFF always)/02(OFF on decelerating)	02	-	-	4-17
	A082	Motor voltage selection	200/215/220/230/240, 380/400/415/440/460/480, 575/600(V)	200/400	-	-	4-17
Operation mode/ adjustable function	A085	Operation mode selection	00(normal operation)/01(energy-saving operation)	00	-	-	4-31
	A086	Energy-saving response-accuracy adjustment	0.0-100.0(s)	50.0			4-31
	A092	Acceleration time2	0.01-99.99/100.0-999.9/1000.-3600.(s)	15.00			4-32
	A292	Acceleration time2(2nd motor)	0.01-99.99/100.0-999.9/1000.-3600.(s)	15.00			4-32
	A093	Deceleration time2	0.01-99.99/100.0-999.9/1000.-3600.(s)	15.00			4-32
	A293	Deceleration time2(2nd motor)	0.01-99.99/100.0-999.9/1000.-3600.(s)	15.00			4-32
	A094	2nd stage adjustable selection	00(change with 2CH terminal)/01(change with setting)	00	-	-	4-32
	A294	2nd stage adjustable selection(2nd motor)	00(change with 2CH terminal)/01(change with setting)	00	-	-	4-32
	A095	2nd acceleration frequency	0.00-99.99/100.0-400.0(Hz)	0.00	-	-	4-32
	A295	2nd acceleration frequency(2nd motor)	0.00-99.99/100.0-400.0(Hz)	0.00	-	-	4-32
	A096	2nd deceleration frequency	0.00-99.99/100.0-400.0(Hz)	0.00	-	-	4-32
	A296	2nd deceleration frequency (2nd motor)	0.00-99.99/100.0-400.0(Hz)	0.00	-	-	4-32
	A097	Acceleration pattern selection	00(straight line)/01(S-curve)/02(U-curve)/03(reverse U-curve)	00	-	-	4-33
	A098	Deceleration pattern selection	00(straight line)/01(S-curve)/02(U-curve)/03(reverse U-curve)	00	-	-	4-33
External frequency adjustment	A101	OI start	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-20
	A102	OI end	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-20
	A103	OI start rate	0.-100. (%)	20.	-		4-20
	A104	OI end rate	0.-100. (%)	100.	-		4-20
	A105	OI start selection	00(external start frequency)/01(0Hz)	01	-		4-20
	A111	O2 start	-400.--100./-99.9-0.00-99.9/100.-400.(Hz)	0.00	-		4-20
	A112	O2 end	-400.--100./-99.9-0.00-99.9/100.-400.(Hz)	0.00	-		4-20
	A113	O2 start rate	-100. - 100. (%)	-100.	-		4-20
	A114	O2 end rate	-100. - 100. (%)	100.	-		4-20
Adjustable speed	A131	Acceleration curve constant	01(small swelling)-10(large swelling)	02	-		4-33
	A132	Deceleration curve constant	01(small swelling-10(large swelling)	02	-		4-33
Instantaneous power failure restart	b001	Retry selection	00(trip)/01(Ohz start)/02(start after equal frequency)/ 03(trip after equaling frequency and deceleration stop)	00	-		4-34
	b002	Allowable under-voltage power failure time	0.3-1.0(s)	1.0	-		4-34
	b003	Retry wait time	0.3-100.(s)	1.0	-		4-34
	b004	Instantaneous power failure/ under-voltage trip during stop	00(invalid/01(valid)	00	-		4-34
	b005	Instantaneous power failure/ under-voltage retry time selection	00(16 times)/01(free)	00	-		4-34
	b006	Open-phase selection	00(invalid)/01(valid)	00	-		4-35
	b007	Frequency setting to match	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-34
Electronic thermal	b012	Electronic thermal level	0.2*constant current-1.20*constant current(A)	Rated Current of inverter	-		4-36
	b212	Electronic thermal level (2nd motor)	0.2*constant current-1.20*constant current(A)	Rated Current of inverter	-		4-36
	b013	Electronic thermal characteristic selection	00/(reduced characteristic)01(constant characteristic)/02(free setting)	00	-		4-36
	b213	Electronic thermal characteristic selection (2nd motor)	00/(reduced characteristic)01(constant torque characteristic)/ 02(free setting)	00	-		4-36
	b015	Free electronic thermal frequency 1	0.-400.(Hz)	0.	-		4-37
	b016	Free electronic thermal current 1	0.0-1000.(A)	0.0	-		4-37
	b017	Free electronic thermal frequency 2	0.-400.(Hz)	0.	-		4-37
	b018	Free electronic thermal current 2	0.0-1000. (A)	0.0	-		4-37
	b019	Free electronic thermal frequency 3	0.-400.(Hz)	0.	-		4-37
	b020	Free electronic thermal current 3	0.0-1000.(A)	0.0	-		4-37

Function code

	Code	Function name	Setting range	Initial data	Setting on run	Change on run mode	Page
Overload limit	b021	Overload restriction selection	00(invalid)/01(enabled on acceleration / constant speed)/02(enabled on constant speed)	01	-		4-38
	b022	Overload restriction level	0.50* rated current-1.50* rated current(A)	Rated current of inverter x 1.20	-		4-38
	b023	Overload restriction limit constant	0.10-30.00(s)	1.00	-		4-38
	b024	Overload restriction 2 selection	00(invalid)/01(valid on acceleration / constant speed)/02(valid on constant speed)	01	-		4-38
	b025	Overload restriction level 2	0.50*rated current-1.50*rated current(A)	Rated current of inverter x1.20	-		4-38
	b026	Overload restriction constant 2	0.10-30.00(s)	1.00	-		4-38
Lock	b031	Software lock mode selection	00(impossible to change the data except this item when SFT terminal is ON)/ 01(impossible to change the data except setting frequency item when SFT terminal is ON)/02(impossible to change the data except this item)/ 03(impossible to change the data except setting frequency item)/ 10(possible to change data on operating)	01	-		4-45
Free V/f setting	b100	Free V/f frequency 1	0.- Free V/f frequency2(Hz)	0.	-	-	4-23
	b101	Free V/f voltage 1	0.-800.0(V)	0.0	-	-	4-23
	b102	Free V/f frequency 2	0.- Free V/f frequency3(Hz)	0.	-	-	4-23
	b103	Free V/f voltage 2	0.-800.0(V)	0.0	-	-	4-23
	b104	Free V/f frequency 3	0.- Free V/f frequency4(Hz)	0.	-	-	4-23
	b105	Free V/f voltage 3	0.-800.0(V)	0.0	-	-	4-23
	b106	Free V/f frequency 4	0.- Free V/f frequency5(Hz)	0.	-	-	4-23
	b107	Free V/f voltage 4	0.-800.0(V)	0.0	-	-	4-23
	b108	Free V/f frequency 5	0.- Free V/f frequency6(Hz)	0.	-	-	4-23
	b109	Free V/f voltage 5	0.-800.0(V)	0.0	-	-	4-23
	b110	Free V/f frequency 6	0.- Free V/f frequency7(Hz)	0.	-	-	4-23
	b111	Free V/f voltage 6	0.-800.0(V)	0.0	-	-	4-23
	b112	Free V/f frequency 7	0.-400.(Hz)	0.	-	-	4-23
	b113	Free V/f voltage 7	0.-800.0(V)	0.0	-	-	4-23
Intelligent input terminal setting	C001	Intelligent input 1 setting	01/(RV:Reverse is valid)/02(CF1:Multi-speed1)/ 03(CF2:Multi-speed2)/ 04(CF3:Multi-speed3)/ 05(CF4:Multi-speed4)/ 06(JG:Jogging)/ 07(DB:External DC braking)/ 08(SET:2nd control)/ 09(2CH:two-stage adjustable speed)/ 11(FRS:Free-run)/ 12(EXT:External trip)/ 13(USP:Unattended start protection)/ 14(CS:commercial change)/ 15(SFT:software lock)/ 16(AT:Analog input voltage/current select)/ 18(RS:Reset inverter)/ 20(STA:3wire run)/ 21(STP:3wire keep)/ 22(F/R:3wire forward/reverse)/ 23(PID:PID selection valid/invalid)/ 24(PIDC:PID integrating reset)/ 27(UP:Remote control UP function)/ 28(DWN:Remote control DOWN function)/ 29(UDC:Remote control data clear)/ 32(SF1:Multi-speed bit1)/ 33(SF2:Multi-speed bit2)/ 34(SF3:Multi-speed bit3)/ 35(SF4:Multi-speed bit4)/ 36(SF5:Multi speed bit5)/ 37(SF6:Multi-speed bit6)/ 38(SF7:Multi-speed bit7)/ 39(OLR:Overload restriction change)/no(NO:No assign)	18	-		4-42
	C002	Intelligent input 2 setting		16	-		4-42
	C003	Intelligent input 3 setting		03	-		4-42
	C004	Intelligent input 4 setting		02	-		4-42
	C005	Intelligent input 5 setting		01	-		4-42
Input terminal setting intelligent	C011	Intelligent input1 a/b (NO/NC) selection	00(NO)/01(NC)	00	-		4-42
	C012	Intelligent input2 a/b (NO/NC) selection	00(NO)/01(NC)	00	-		4-42
	C013	Intelligent input3 a/b (NO/NC) selection	00(NO)/01(NC)	00	-		4-42
	C014	Intelligent input4 a/b (NO/NC) selection	00(NO)/01(NC)	00	-		4-42
	C015	Intelligent input5 a/b (NO/NC) selection	00(NO)/01(NC)	00	-		4-42
	C019	Input FW a/b (NO/NC) Selection	00(NO)/01(NC)	00	-		4-42
Intelligent output terminal setting	C021	Intelligent output 11 setting	00(RUN:running)/01(FA1:Frequency arrivaltype1 signal)/02(FA2:frequency arrival type2 signal)/03(OL:Overload advance notice signal)/04(OD:Output deviation for PID control)/05(AL:Alarm signal)/ 06(FA3:Only setting frequency)/08(IP:On instantaneous stop/09(UV:Under voltage/11(RNT:RUN time over/12(ONT:ON time over)/13(THM:thermal caution)	01	-		4-51
	C022	Intelligent output 12 setting		00	-		4-51
	C026	Alarm relay output		05	-		4-51
	C027	FM selection	00(Output frequency)/01(Output current) / 03(Digital output frequency)/04(Output voltage)/ 05(Output electric power)/06(thermal load rate)/07(LAD frequency)	00	-		4-56
	C028	AM selection	00(Output frequency)/01(Output current)/04(Output voltage)/ 05(Output electric power)/06(thermal load rate)/07(LAD frequency)	00	-		4-57
	C029	AMI selection	00(Output frequency)/01(Output current)/04(Output voltage)/ 05(Output electric power)/06(Thermal load rate)/07(LAD frequency)	00	-		4-57
Output terminal state	C031	Intelligent output 11 a/b	00(NO)/01(NC)	00	-		4-52
	C032	Intelligent output 12 a/b	00(NO)/01(NC)	00	-		4-52
	C036	Alarm relay output a/b	00(NO)/01(NC)	01	-		4-52
	C040	Overload advance notice signal output mode	00(On accel. And decel, constant speed)/01(Only constant speed)	01	-		4-39
	C041	Overload advance notice level	0.0-2.0*rated current(A)	Inverter rated current	-		4-38
	C042	Frequency arrival setting for acceleration.	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-53
	C043	Arrival frequency setting for deceleration.	0.00-99.99/100.0-400.0(Hz)	0.00	-		4-53
	C044	PID deviation setting level	0.0-100.0(%)	3.0	-		4-31

	Code	Function name	Setting range	Initial data	Setting on run	Change mode on run	Page
Communication function adjustment	C070	Data command	02(operator)/03(RS485)/04(option1)/05(option2)	02	-	-	4-61
	C071	Communicating transmission speed	03(2400bps)/04(4800bps)/05(9600bps)/06(19200bps)	04	-		4-61
	C072	Communication code	1. -32.	1.	-		4-61
	C073	Communication bit	7(7bit)/8(8bit)	7	-		4-61
	C074	Communication parity	00(no parity name)/01(even parity)/02(odd parity)	00	-		4-61
	C075	Communication stop bit	1(bit)/2(bit)	1	-		4-61
	C078	Communication waiting time	0.-1000.(ms)	0.	-		4-61
Analog meter setting	C081	O adjustment	0.-9999./1000-6553(10000-65530)	Setting on forwarding			-
	C082	OI adjustment	0.-9999./1000-6553(10000-65530)	Setting on forwarding			-
	C083	O2 adjustment	0.-9999./1000-6553(10000-65530)	Setting on forwarding			-
	C085	Thermistor adjustment	0.0 - 1000.	105.0			4-57
	C086	AM offset adjustment	0.0 - 10.0(V)	0.0			4-57
	C087	AMI adjustment	0. - 255.	50			4-57
	C088	AMI offset adjustment	0. - 20.0(mA)	Setting on forwarding			4-57
The others	b034	RUN time/Power ON time level	0.-9999./1000-6553(10000-65530)hr	0.	-		4-55
	b035	Operation direction restrict	00(Reverse is valid)/01(Only forward)/02(Only reverse)	00	-	×	4-14
	b036	Start reduced voltage	00(Start reduced voltage time small)-06(Start reduced voltage time large)	06	-		4-40
	b037	Display selection	00(all display)/01(each function display)/02(User setting / main setting)	00	-		4-59
	b080	AM adjustment	0. - 255.	150			4-57
	b081	FM adjustment	0. - 255.	60			4-56
	b082	Start frequency adjustment	0.10-9.99(Hz)	0.50	-		4-40
	b083	Carrier frequency setting	0.5-15.0(kHz) Derating enable,	3.0	-		4-18
	b084	Initialize mode	00(Trip history clear)/01(Data initialization)/02(Trip history clear + data initialization)	00	-	-	4-58
	b085	Country code for initialization	00(Interior)/01(EC)/02(USA)	00	-	-	4-58
	b086	Frequency scalar conversion factor	0.1-99.9	1.0			4-12
	b087	STOP key enable	00(valid)/01(invalid)	00	-		4-15
	b088	Resume on FRS cancellation mode	00(Ohz start)/01(Start f-equaling)	00	-		4-46
	b090	BRD usage ratio	0.0-100.0(%)	0.0	-		4-41
	b091	Stop mode selection	00(deceleration stop)/01(Free-run stop)	00	-	-	4-15
	b092	Cooling fan control	00(Always ON)/01(ON during run, After power ON, then for 5 minutes on stop is implied.)	00	-	-	4-41
	b095	BRD selection	00(invalid)/01(valid<invalid during stop>)/02(valid<valid during stop>)	00	-		4-41
	b096	BRD ON level	330-380/660-760(V)	360/720	-		4-41
	b098	Thermistor selection	00(invalid)/01(Positive temperature coefficient enable)/02 (NTC enable)	00	-		4-57
	b099	Thermistor error level	0. – 9999. (ohm)	3000.	-		4-57
	C061	Thermal warning level	0. – 100. (%)	80	-		4-36
	C091	Debug mode selection	00(No display)/01(Display)	00	-		-
	C101	UP/DWN selection	00(No frequency data)/01(Keep frequency data)	00	-		4-49
	C102	Reset selection	00(Trip cancel during ON)/01(Trip cancel during OFF)/ 02(Valid only during trip<Cancel during ON>)	00			4-48
	C103	Reset f frequency matching selection	00(0Hz start)/01(Start f-equaling)	00	-		4-48
	C121	O zero adjustment	0.-9999./1000-6553(10000-65530)	Set on forwarding			—
	C122	OI zero adjustment	0.-9999./1000-6553(10000-65530)	Set on forwarding			—
	C123	O2 zero adjustment	0.-9999./1000-6553(10000-65530)	Set on forwarding			—
	H003	1st allowable motor selection	0.20-75.0(kW)	Set on forwarding	-	-	4-60
	H203	2nd allowable motor selection	0.20-75.0(kW)	Set on forwarding	-	-	4-60
	H004	1st motor pole selection	2/4/6/8(pole)	4	-	-	4-60
	H204	2nd motor pole selection	2/4/6/8(pole)	4	-	-	4-60
	H006	1st stabilized factor	0. - 255.	100.			4-60
	H206	2nd stabilized factor	0. - 255.	100.			4-60
	P001	Option1 operation selection on error	00(TRP)/01(RUN)	00	-		4-60
	P002	Option2 operation selection on error	00(TRP)/01(RUN)	00	-		4-60
	P011	Encoder pulse setting	128.-9999.1 1000-8500 (10000-65000) Pulse	1024.			
	P012	Control mode selection	OOIASR Model / 01 (APR Mode)	00			
	P013	Pulse line Input mode selection	00 (Mode 0) / OIIMode 1) / 02 (Mode 2)	00			
	P014	Stop position setting for Orientation	0. - 4095	0			
	P015	Frequency setting fot orientation	0.00-99.99 / 100.0-120.0 (1*)	5.00		□	
	P016	Direction setting for Orientation	00 #8Forward) / 0t (Reverse) ~.-9999./~	00			
	P017	Completion range setting for orientation		5		1	
	P018	Completion delay time setting for orientation	0.00-9.99 (s)	0.00			
	P019	Position selection for electronic gear	00 (Position teed back side) I_Ot (Position_command_side) 0. – 9999.	00			
	P020	Numerator of ratio setting for etec. Tronic_gear					
	P021	Denominator of ratio setting for elec-tronic gear		1			
	P022	Feed forward gain setting for position con rot	0.00-99.99 It 00.0~655.3	0,00			
	P023	Loop gain selling for position control	0,00-99.99 / 100.0	0,50			

	P025	Tt,e 2 nest resistance revision presence selection	00 (Diaabie) / 01 (Enabis)	00		1	
	P026	Over speed abnormal detection level	0.00-99.99 / 100,0-f 50.0) %)	135.0			
	P027	Speed error over detection evel	0.00-99.99 / 100.0-120.0 (1*)	7.50			

PID feedback monitor

When you select PID function (01) in A071, the inverter displays the feedback value changed by A075 (PID scale).

" Display of monitor part " = " Feedback quantity " x " PID scale "

(Frequency command value) (A075)

(Setting)

A071 : 0.1(PID is effective)

A075 : 0.01-99.99(Display is 0.01-99.99(Set with the 0.01 unit)

(Display)

0.00 - 99.99 : Display is in 0.01 unit.

100.0 - 999.9: Display is in 0.1 unit.

1000 - 9999 : Display is in 1 unit.

{100 - {999 : Display is in 10 unit.

Relation

d004: PID feedback monitor
A071:PID selection
A075: PID scale

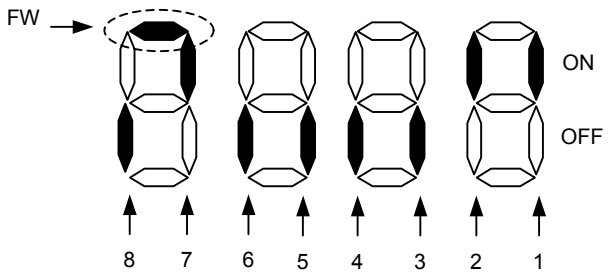
Intelligent input monitor

The LED display will monitor the state of the intelligent inputs.

Relation
d005: Intelligent input monitor

(Example)

FW; input intelligent terminal 7,2,1:ON
Input intelligent terminal 8,6,5, 4, 3:OFF



Input intelligent terminal

Display
(Black): Lights up
(White): Lights out
In case of FW
Lights up: ON
Lights out: OFF

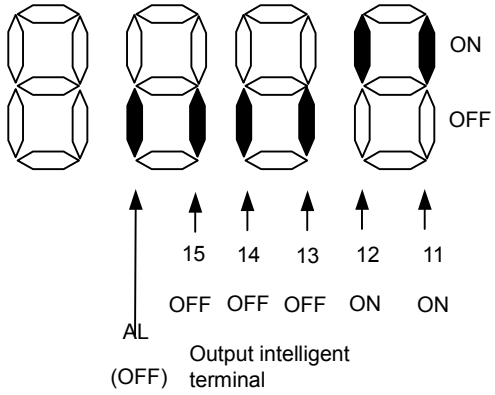
Intelligent output monitor

The LED display will monitor the state of the intelligent outputs.

Relation
d006: Intelligent output monitor

(Example)

Output intelligent terminal 12, 11: ON
Output alarm AL, Output intelligent terminal 15, 14, 13: OFF



Display
(Black): Lights up
(White): Lights out

8.1 Protection function list

8.1.1 Protection function

Name	Description		Display of digital panel□ digital operator	Display of remote operator/ Copy unit ERR1***
Over-current protection	Motor is restricted and decelerates rapidly, excessive current is drawn through the inverter and there is a risk of damage. Current protection circuit operates and the inverter output is switched off.	At constant Speed	E01	OC. Drive
		On decelertion speed	E02	OC. Decel
		On acceleration speed	E03	OC. Accel
		Other	E04	Over. C
Overload protection (note1)	When the Inverter detects an overload in the motor, the internal electronic thermal overload operates and the inverter output is switched off.		E05	Over. L
Braking resistor overload protection	When BRD exceeds the usage ratio of the regenerative braking resistor, the over-voltage circuit operates and the inverter output is switched off.		E06	OL. BRD
Over-voltage protection	When regenerative energy from the motor exceeds the maximum level, the over-voltage circuit operates and the inverter output is switched off.		E07	Over. V
EEPROM error (note2)	When EEPROM in the inverter is subject to radiated noise or unusual temperature rises, the inverter output is switched off.		E08	EEPROM
Under-voltage	When the incoming voltage of inverter is low, the control circuit can't operate correctly. The under-voltage circuit operates and the inverter output is switched off.		E09	Under. V
CT error	When an abnormality occurs to a CT (current detector) in the inverter, the inverter output is switched off.		E10	CT
CPU error	When a mistaken action causes an error to the inbuilt CPU, the inverter output is switched off.		E11	CPU1
External trip	When a signal is given to the EXT intelligent input terminal, the inverter output is switched off. (on external trip function select)		E12	EXTERNAL
USP error	This is the error displayed when the inverter power is restored while still in the RUN mode. (Valid when the USP function is selected)		E13	USP
Ground fault protection	When power is turned ON, this detects ground faults between the inverter output and the motor.		E14	GND. Flt
Incoming over-voltage protection	When the incoming voltage is higher than the specification value, this detects it for 60 seconds then the over-voltage circuit operates and the inverter output is switched off.		E15	OV. SRC
Temporary power loss protection	When an instantaneous power failure occurs for more than 15ms, the inverter output is switched off. Once the instantaneous power failure wait time has elapsed and the power has not been restored it is regarded as a normal power failure. However, when the operation command is still ON with restart selection the inverter will restart. So please be careful of this.		E16	Inst. P-F
Abnormal temperature	When main circuit temperature raises by stopping of cooling fan, the inverter output is switched off.		E21	OH. FIN
Gate Allay error	Communication error between CPU and gate allay indicate		E23	GA
Open-phase protection	When an open-phase on the input supply occurs the inverter output is switched off.		E24	PH. Fail
IGBT error	When an instantaneous over-current is detected on the output the inverter output is switched off to protect the main devices.		E30	IGBT
Thermistor error	When the Inverter detects a high resistance on the thermistor input from the motor the inverter output is switched off.		E35	TH

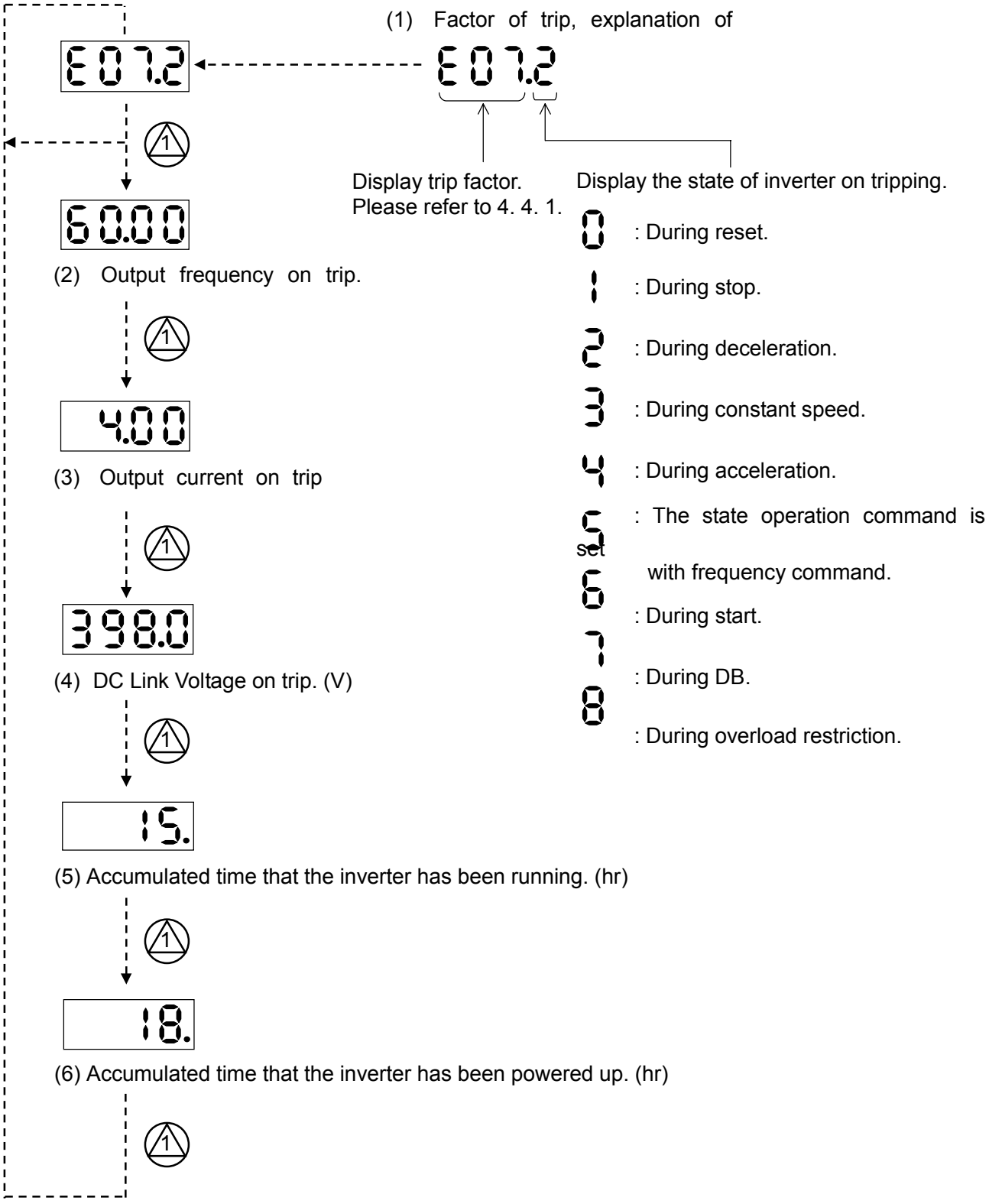
Code List

Name	Description	Display of digital panel digital operator	Display of remote operator/ Copy unit ERR1***
Abnormal brake	When inverter cannot detect switching of the brake(ON/FF) after releasing the brake ,and for waiting for signal condition(b124) (When the braking control selection(b120) is enable.)	E36	BRAKE
Option 1 error 0-9	These indicate the error of option 1. You can realize the details each instruction manual.	E60 - E69	OP1 0-9
Option 2 error 0-9	These indicate the error of option 2. You can realize the details by each instruction manual.	E70 - E79	OP2 0-9
During under-voltage waiting	When the incoming voltage of the inverter has dropped, the inverter output is switched off and the inverter waits.	_ _ U	UV. WAIT

Note1: After a trip occurs and 10 minutes pass, restart with reset operation.

Note2: When EEPROM error E08 occurs, confirm the setting data

8.1.2 Trip monitor display



8.1.4 Warning Monitor display

Relation
d090 : Warning Monitor

Warning messages will appear when the data set is contradicting to others.
Program lamp (PRG) turns ON during the warning (until the data is changed).
Below is the description of the warnings.

Warning	Codes	<, >	Basic code
001/ 201	frequency upper limiter A061/A261	>	Maximum frequency A004/A204
002/ 202	frequency lower limiter A062/A262	>	
004/ 204	Base frequency A003/A203	>	
005/ 205	Output frequency F001, Multi stage speed 0 A020/A220	>	
006/ 206	Multi stage speed 1~15 A021~A035	>	
012/ 212	frequency upper limiter A062/A262	>	frequency upper limiter A061/A261
015/ 215	Output frequency F001, Multi stage speed 0 A020/A220	>	
016/ 216	Multi stage speed 1~15 A021~A035	>	
021/ 221	frequency upper limiter A061/A261	<	frequency lower limiter A062/A262
025/ 225	Output frequency F001, Multi stage speed 0 A020/A220	<	
031/ 231	frequency upper limiter A061/A261	<	Starting frequency b082
032/ 232	frequency lower limiter A062/A262	<	
035/ 235	Output frequency F001, Multi stage speed 0 A020/A220	<	
036	Multi stage speed 1~15 A021~A035	<	
037	Jogging frequency A038	<	
085/ 285	Output frequency F001, Multi stage speed 0 A020/A220	<>	Jump frequency 1/2/3 +- Jump width A063+-A064 A065+-A066 A067+-A068 (note 1)
086	Multi stage speed 1~15 A021~A035	<>	
091/ 291	frequency upper limiter A061/A261	>	Free v/f frequency 7 b112
092/ 292	frequency lower limiter A062/A262	>	
095/ 295	Output frequency F001, Multi stage speed 0 A020/A220	>	
096	Multi stage speed 1~15 A021~A035	>	
110	Free v/f frequency 1~6 b100, b102, b104, b106, b108, b110	>	
	Free v/f frequency 2~6 b102, b104, b106, b108, b110	<	Free v/f frequency 1 b100
	Free v/f frequency 1 b100	>	Free v/f frequency 2 b102
	Free v/f frequency 3~6 b104, b106, b108, b110	<	
	Free v/f frequency 1, 2 b100, b102	>	Free v/f frequency 3 b104
	Free v/f frequency 4~6 b106, b108, b110	<	
	Free v/f frequency 1~3 b100, b102, b104	>	Free v/f frequency 4 b106
	Free v/f frequency 5, 6 b108~b110	<	
	Free v/f frequency 1~4 b100, b102, b104, b106	>	Free v/f frequency 5 b108
	Free v/f frequency 6 b110	<	
	Free v/f frequency 1~5 b100, b102, b104, b106, b108	>	Free v/f frequency 6 b110
120	Free electronic thermal frequency 2, 3 b017, b019	<	Free electronic thermal frequency 1 b015
	Free electronic thermal frequency 1 b015	>	Free electronic thermal frequency 2 b017
	Free electronic thermal frequency 3 b019	<	
	Free electronic thermal frequency 1, 2 b015, b017	>	Free electronic thermal frequency 3 b019

Warning is cleared when the setting fulfils the above condition.

Data will be changed automatically to the basic code.

(Note 1) The jump frequency will be automatically re-written to the lowest jump frequency (= Jump frequency – jump width)

8.2 Precautions for Maintenance/Inspection

8.2.1 Daily inspection

Every day before operation check the following;

[1] Does the motor operate according to the settings?
[2] Is there any trouble with the surroundings of the installation?
[3] Is there any trouble with the cooling or ventilation system?
[4] Is there any abnormal vibration or sound?
[5] Are their any signs of over-current or discoloration?
[6] Is their any unusual odour present?

Check the input voltage to the inverter by using a meter during running

[1] Is the supply voltage constant?
[2] Are all the phases of the supply balanced?

8.2.2 Cleaning

Make sure that the inverter is not dirty when operating.
Wipe clean with a soft cloth and synthetic detergent or ethanol.

(Notes) Don't use solvents containing any of the following, acetone, benzene, toluene, alcohol etc. as they can cause melting of the inverter surface, peeling of paint.
Never clean the display part of the digital operator with detergent or alcohol.

8.2.3 Regular inspection

Inspections should be regularly carried out on the parts that can't be inspected while the inverter is running.

[1]Is there any trouble with the cooling system? - - - Cleaning of air filter etc.
[2]Check that all screw terminals and fixings are tight as they may loosen due to vibration or temperature change etc.
[3]Is there any corrosion, damage to insulators?
[4]Measurement of insulation resistance.
[5]Check of cooling fan, smoothing capacitor, relay and exchange if necessary.

8.3 Daily inspection and regular inspection

Inspec-tion Parts	Inspection item	Inspection item	Inspection cycle			Inspection methods	Decision standard	Meter
			Daily	Regular 1	Regular 2 year			
Whole	Surroundings	Check temperature of surrounding, humidity, dust.	○			Refer to 2.1 Installing.	Temperature range is between –10 and 40 degrees. No dew present and humidity is below 90%.	Thermometer, hygrometer, recorder
	Whole equipment	Is there abnormal vibration, abnormal sound?	○			By watching, hearing.	No trouble.	
	Power voltage	Is main circuit voltage normal?	○			Measurement of inverter terminal R, S, T phase voltage	Within alternating voltage allowable change.	Tester, digital multi-meter
Main circuit	Whole	(1)Megger check (Between circuit terminal and earth terminal) (2)Are all screws terminals tight? (3)Is there any sign of over-voltage? (4)cleaning		○ ○ ○	○	(1)After you remove connector J61 from inside the inverter Take out the wiring of input/output of inverter main circuit terminal and control terminal, measure beween parts shortened terminal R,S,T,U, V,W,P,PD,N,RB and earth terminal with megger. (2)Incremental clamping. (3)Watch.	(1)To be over 5M ohm. (2)(3) No abnormality .	DC500V class megger
	Connection conductor/ electric line	(1)Is there warp in conductor? (2)Is there any damage of coating of wires?		○		(1)(2) By watching	(1)(2) No abnormality	
	Terminals	Is there any damage?		○		By watching.	No abnormality.	
	Inverter parts Converter parts	Resistance check Between each Terminal.		○		Take out connect of inverter, measure terminal between R,S,T and P,N, between U,V,W and P,N with tester x 1 ohm range.	Refer to check method of 5.5 inverter, converter parts.	Analog form tester
	Smoothing capacitor	(1)Is there any liquid? (2)Does relief valve come out? Is there any swell? (3)Measure of allow-able static-electricity.	○ ○		○	(1),(2) By watching. (3)Measure with capacity measure.	(1),(2) No abnormality (3) Over 80% of rated capacity.	Capacity meter
	Relay	(1)Is there abnormal sound in operation? (2)Is there damage to the contacts?			○	(1)By hearing (2)By watching	(1) No abnormality (2) No abnormality	
	Resistor	(1)Is there any crack, discoloration of resistance insulator. (2)Confirm existance of breaking of wire.		○ ○		(1)By watching.cementing resistance. Curl type resistance. Take out connection to other side, measure it with tester.	(1)No abnormality Error to be within 10% of Display resistance.	Tester , Digital multi-meter
Control circuit Protec-tion circuit	Operation check	(1)Confirm balance of each output phase voltage with inverter single operation. (2)Operate sequence protection moving test. And no abnormality.		○ ○ ○		(1)Measure inverter output terminal U,V,W phase voltage. (2)Short or open protection circuit output of inverter.	(1)Phase voltage balance 200v/400v class is within 4V/8V. (2)On sequence, to operate abnormality.	Digital multi-meter, rectification type voltmeter
Cooling system	Cooling fan	(1)Is there abnormal vibration, abnormal sound? (2)Is there loosening of connecting parts?	○	○		(1)Revolve by hands in the state of tone-on idle. (2) By watching.	(1)Revolving smooth. (2)No abnormality.	
Display	Display	(1)Is the LED lamp illuninated? (2) Cleaning.	○	○		(1)Lamp indicates lamp on operator. (2) Cleaning with cloth.	(1)Confirm light.	
	Meter	Is direction value Normal?	○	○		Confirm indication value of board meter.	Satisfy normal value, control value.	Voltage meter, current meter
Motor	Whole	(1)Is there abnormal signal,abnormal sound? (2)Is there any abnormal odour?	○ ○			(1)By hearing, feeling, watching. (2)Abnormal odour from overheat, damage etc. Confirmation.	(1)(2) No abnormality.	
	Inslated resistance	(1)Megger check (terminal collection - earth terminal)			○	Remove connection to U,V and W and disconnect motor wiring.	(1) To be over 5M ohm.	DC 500V Megger

(Notes) Life time of the capacitors depends on the ambient temperature.