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You can read the recommendations in the user guide, the technical guide or the installation guide for HITACHI J300. You'll find the answers to all your questions on the HITACHI J300 in the user manual (information, specifications, safety advice, size, accessories, etc.). Detailed instructions for use are in the User's Guide.

User manual HITACHI J300
User guide HITACHI J300
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Instructions for use HITACHI J300
Instruction manual HITACHI J300

HITACHI INVERTER

J300 SERIES

INSTRUCTION MANUAL

Three phase input 200/400V class

J300 U : USA version

After reading this manual, keep it at hand for future reference.

NBS06XC

Hitachi, Ltd.
Tokyo Japan



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APPEARANCE AND NAMES OF PARTS

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..... OPERATION OF THE DIGITAL OPERATOR

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PROTECTION FUNCTIONS

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... A-32 -v- 1. SAFETY PRECAUTIONS 1.

Installation CAUTION * * * * * Be sure to install the unit on flame resistant material such as metal.

... Otherwise, there is a danger of fire.



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Be sure not to place anything inflammable in the vicinity.

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. Otherwise, there is a danger of fire. Be sure not to let the foreign matter enter such as cut wire refuse, spatter ...
..... from welding, iron refuse, wire, dust, etc. Otherwise, there is a danger of fire.

Be sure to install it in a place which can bear the weight according to

. the specifications in the text (4. Installation). Otherwise, it may fall and there is a danger of injury. Be sure to install the unit on a perpendicular wall which is not subject .

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..... to vibration. Otherwise, it may fall and there is a danger of injury. Be sure not to install and operate an inverter which is damaged or parts ...

..... of which are missing. Otherwise, there is a danger of injury.

Be sure to install it in a room which is not exposed to direct sunlight

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. and is well ventilated. Avoid environments which tend to be high in temperature, high in humidity or to have dew condensation, as well as places with dust, corrosive gas, explosive gas, inflammable gas, grinding-fluid mist, salt damage, etc. Otherwise, there is a danger of fire. Be sure that the wall surface is a nonflammable material, such as steel

..... plate. p. 4-1 p. 4-1 p. 4-1 p.

4-1 p. 4-1 p. 4-1 p. 4-1 p. 4-2 2.

Wiring WARNING * * * * Be sure to ground the unit. Otherwise, there is a danger of electric shock and/or fire. Wiring work shall be carried out by electrical experts. Otherwise, there is a danger of electric shock and/or fire. Implement wiring after checking that the power supply is off. It might incur electric shock and/or fire. After installing the main body, carry out wiring. Otherwise, there is a danger of electric shock and/or injury. Wait until DC bus voltage is discharged after power supply is turned off. Otherwise, there is a danger of electric shock. 1-1

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p. 5-1

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5-10 CAUTION * * * Make sure that the input voltage is: Three phase 200 to 220 V/50 Hz, 200 to 230 V/60 Hz, Three phase 380 to 415 V/50 Hz, 400 to 460 V/60 Hz. Be sure not to input a single phase to a 3 phase type. Otherwise, there is a danger of fire. Be sure not to connect AC power supply to the output terminals [U (T1), V (T2), W (T3)]. Otherwise, there is a danger of injury and/or fire. SET key as an emergency switch may cause an injury.

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p. 7-1 1-4 CAUTION * * * Radiating fin and discharging resistor will have high temperature. Be sure not to touch them. Otherwise, there is a danger of getting burned. Low to high speed operation of the inverter can be easily set. Be sure to operate it after checking the tolerance of the motor and machine. Otherwise, there is a danger of injury. If a motor is operated at a frequency higher than 60Hz, be sure to check the speeds of the motor and the machine with each manufacturer, and after getting their consent, operate them. Otherwise, there is a danger of machine breakage. Check the follower supply side, so that the circuit does not allow automatic restarting after the power supply recovers.

If the optional remote operator is used and the retry function has been selected, this will also cause automatic restarting when an operation instruction has been input, so please be careful. Motor PV24 Turn ON and OFF (Good example) 1-7 CAUTION * Do not insert leading power factor capacitors or surge absorbers between the output terminals of the inverter and the motor. Earh leakage breaker Surge absorber (L1) (L2) (L3) R, S, T, (T1) (T2) (T3) U, V, W, Power supply INV Motor Leading power factor capacitor * * Be sure to ground the grounding terminal, . When inspecting the unit, after turning the power supply off be sure to wait until the CHARGE lamp beside the control terminal is off before opening the cover. (If the lamp is lit or still flickering, then the

internal capacitor's residual voltage is still dangerous.

) * **MOTOR TERMINAL SURGE VOLTAGE SUPPRESSION FILTER (FOR THE 400 V CLASS)** In a system using an inverter of the voltage control PWM system, a surge voltage caused by the cable constants such as the cable length (especially when the distance between the motor and inverter is 10 m or more) and cabling method may occur at the motor terminal. A dedicated filter of the 400 V class for suppressing this surge voltage is available. Please order one. *

PROTECTION AGAINST NOISE INTERFERENCE FROM INVERTER The inverter uses many semiconductor switching elements such as transistors and IGBTs. Thus, a radio set or measuring instrument located near the inverter is susceptible to noise interference. To protect the instruments from erroneous operation due to noise interference, they should be installed well apart from the inverter.

It is also effective to shield the whole inverter structure. Addition of an EMI filter on the input side of the inverter also reduces the effect of noise from commercial power line on external devices. Note that external dispersion of noise from the power line can be minimized by connecting an EMI filter on the primary side of inverter. 1-8 CAUTION EMI filter Power source R1 S1 T1 R2 S2 T2 Inverter L1(L1) U (T1) U L2(L2) V (T2) V L3(L3) W (T3) W Motor Power source EMI filter Noise Inverter Remote operator Motor Terminal for grounding Noise Piping (to be grounded) or shielded wire Ground the frame.

Completely ground the shield made of metal screen, enclosed panel, etc. with as short a wire as possible. * **EFFECTS OF DISTRIBUTOR LINES ON INVERTERS** In the cases below involving a general-purpose inverter, a large peak current flows on the power supply side, sometimes destroying the converter module. Where such situations are foreseen, or the paired equipment must be highly reliable, install an AC reactor between the power supply and the inverter. (A) The unbalance factor of the power supply is 3% or higher. (B) The power supply capacity is at least 10 times greater than the inverter capacity (and the power supply capacity, 500 kVA or more).

(C) Abrupt power supply changes are expected. Examples: (1) Several inverters are interconnected with a short bus. (2) A thyristor converter and an inverter are interconnected with a short bus. (3) An installed phase advance capacitor opens and closes. In cases (A), (B) or (C), we recommend installing an AC reactor of 3% (in a voltage drop at rated current) with respect to the supply voltage on the power supply side. * * When occurring an EEPROM error (), be sure to confirm the setting value again. When setting b contact to the reverse command ([REV] terminal), the inverter state automatically. Do not set to b contact. **GENERAL CAUTION** In all the illustrations in this manual, covers and safety devices are occasionally removed to describe the details. When the product is operated, make sure that the covers and safety devices are placed as they were specified originally and operate it according to the instruction manual.

1-9 2. **INSPECTION UPON UNPACKING** Before installation and wiring, be sure to check the following: Make sure that there was no damage during transportation the unit.



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After unpacking the unit, make sure that the package contains one inverter and one operation manual. Make sure that the product is the one you ordered by checking the specifications label on the front of the cover. Model abbreviation (The example is for the J300-055HFE2) INVERTER HITACHI Input power supply, phase, and frequency Production year J300 055HFU OUTPUT INPUT 380-415V 3 Ph 50 Hz 400-460V 3 Ph 60 Hz DATE 1995 max:380-460V 3 Ph Amps (CT) 13 A/(VT) 16 A (CT) 5.5kW(VT) 7.

5kW NE15390 MFG. NO. J300U-055H251L Made in Japan Hitachi, Ltd. Output voltage Rated output current Maximum applicable motor (4P kW)

Production number and factory control symbol Contents of Specifications Label If you discover any problems, contact your sales agent immediately.

Description of Inverter Model J300 055 H F U Version number U : USA version Structure type F: with digital operator (Semi-closed, open type) Input voltage L : Three phase 200V class H : Three phase 400V class Applicable motor capacity (4P.

kW) 055: 5.5 kW 550: 55 kW 075: 7.5 kW 750: 75 kW 110: 11 kW 900: 90kW 150: 15 kW 1100: 110 kW 220: 22 kW 1320: 132 kW 300: 30 kW 1600: 160kW

370: 37 kW 2200: 220 kW 450: 45 kW Series name 2-1 3. APPEARANCE AND NAMES OF PARTS 3.1 Names of Parts Blind cover Front cover A set screw

Charge lamp (LED) Control circuit terminals Digital operator Main circuit terminals Wiring holes Cover Case 3-1 4. INSTALLATION CAUTION * * * * *

* Be sure to install the unit on flame resistant material such as metal. Otherwise, there is a danger of fire. Be sure not to place anything inflammable in the vicinity. Otherwise, there is a danger of fire. Be sure not to let the foreign matter enter such as cut wire refuse, spatter from welding, iron refuse, wire, dust, etc.

Otherwise, there is a danger of fire. Be sure to install it in a place which can bear the weight according to the specifications in the text (4. Installation). Otherwise, it may fall and there is a danger of injury. Be sure to install the unit on a perpendicular wall which is not subject to vibration. Otherwise, it may fall and there is a danger of injury. Be sure not to install and operate an inverter which is damaged or parts of which are missing. Otherwise, there is a danger of injury. Be sure to install it in a room which is not exposed to direct sunlight and is well ventilated. Avoid environments which tend to be high in temperature, high in humidity or to have dew condensation, as well as places with dust, corrosive gas, explosive gas, inflammable gas, grinding-fluid mist, salt damage, etc.

Otherwise, there is a danger of fire. NOTE : ENCLOSURE SIZE FOR 75 kW to 110kW The inverters, 75kW to 110kW must be installed into an enclosure with dimensions no less than 183cm (72 in) by 183cm (72 in) by 60cm (24 in). NOTE : ENCLOSURE SIZE FOR 132 kW AND BIGGER The inverters, 132kW and bigger, are complied as recognized components. These devices are intended for use in an overall enclosure with an internal ambient of 40 degree C for variable torque rating or 50 degree C for constant torque rating maximum. End product temperature testing should be conducted to verify sufficient forced air ventilation is provided to maintain this ambient in room ambient of 10-40 degree C.

Based upon component level testing, end product temperature testing may be conducted at any convenient room ambient in the range of 20-40 degree C, unless the room ambient in the intended application exceeds 40 degree C, in which case testing should be conducted at the elevated ambient. Enclosure internal ambient temperature should be measured above the drive on to the upper left or right side. Temperature measurements on the drive itself should not be necessary. 4-1 For cooling purposes, be sure that the inverter is installed vertically. In addition, be sure that it is separated from other components and walls.

If foreign matter is introduced into the interior of the inverter, this may cause malfunctions, so make sure that no foreign matter can enter it. 10 cm or more (30cm or more) Flow of air 5 cm or 5 cm or Wall more more 10 cm or more (30cm or more) (a) NOTE: Install the inverter vertically. Do not install it on the floor or horizontally. () is for 75 to 260kW (b) CAUTION Be sure that the wall surface is a nonflammable material, such as steel plate. Be sure to check the ambient temperature. Place of installation Within the enclosure (NOTE 1) Load characteristics Constant torque Variable torque Ambient temperature -10 to 50C -10 to 40C Applicable model All models (NOTE 2) NOTE 1: The inverter should be installed in a locked enclosure that meets the requirements in IP4X. The higher the ambient temperature inside the inverter, the shorter its life will be. If a heat generating unit is used near the inverter, try to keep it as far away as possible. Also, when installing the inverter in a box, be sure to carefully consider ventilation and the dimensions. NOTE 2: Each of inverters 22 kW to 260 kW must be installed in a locked enclosure.

4-2 Precaution for installation and wiring When executing the wiring work or another work, attach a cover on the vent hole (slit) on the top of the inverter to prevent wire chips, weld spatters, iron scraps, or dust from falling into the inverter. 15 cm or more Cover (a nonflammable plate such as an iron plate) Vent hole 4-3 5. WIRING WARNING * Be sure to ground the unit. Otherwise, there is a danger of electric shock and/or fire. * Wiring work shall be carried out by electrical experts. Otherwise, there is a danger of electric shock and/or fire. * Implement wiring after checking that the power supply is off. It might incur electric shock and/or fire. * After installing the main body, carry out wiring. Otherwise, there is a danger of electric shock and/or injury.

5-1 CAUTION * Make sure that the input voltage is: Three phase 200 to 220 V/50 Hz, 200 to 230 V/60 Hz Three phase 380 to 415 V/50 Hz, 400 to 460 V/60 Hz * Be sure not to input a single phase to a 3 phase type. Otherwise, there is a danger of fire. * Be sure not to connect AC power supply to the output terminals [U (T1), V (T2), W (T3)]. Otherwise, there is a danger of injury and/or fire. INPUT Note) OUTPUT (T1) (T2) (T3) UVW (L1) (L2) (L3) R S T Power supply * Fasten the screws with the specified fastening torque.

Check so that there is no loosening of screws. Otherwise, there is a danger of fire. Be sure to install an earth leakage breaker. * The ground fault protection is designed to detect current flowing to the ground upon power on. This function is to protect the inverter, not people.

Install the earth leakage breaker to protect against the ground fault on wires between the inverter and the motor. (Use a breaker that is very sensitive to high frequency current so as not to cause malfunction.) * Be sure to set the fuse(s) (the same phase as the main power supply) in the operation circuit.



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Otherwise, there is a danger of fire. As for motor leads, earth leakage breakers and electromagnetic contactors, be sure to use the equivalent ones with the specified capacity (rated). Otherwise, there is a danger of fire. 5-2 The terminal board will be exposed when the front cover or terminal cover (450L/HF, 550L/HF) is removed. Wire the inverter in this state. 5.1 Wiring the Power Supply and Motor G (PE) R (L1) S (L2) T (L3) RB (RB) P (+) N (-) U (T1) V (T2) W G (T3) (PE) MOTOR Dynamic braking resistor Braking Units ELB Power supply The inverter will be damaged if the power supply is connected to the motor terminals U(T1), V(T2) and W(T3), so be sure not to make any mistakes.

If multiple motors are to be connected, be sure to attach a thermal relay to each motor. NOTE 1: When changing the power supply of the motor between the inverter and commercial power, be sure to install mechanically interlocked switches Mg1 and Mg2. Mg1 ELB Power supply Mg0 R (L1) S (L2) T (L3) (T1) U Inverter (T2) V (T3) W Mg2 Motor NOTE 2: Install an earth leakage breaker at the input of the inverter. (Select an earth leakage breaker whose sensitive current level is raised in high frequency range.) When the cable length between the inverter and motor is long (more than 10 m), the thermal relay may malfunction due to higher harmonics. Therefore, install an AC reactor on the output side of the inverter or use a current sensor in place of the thermal relay. 5-3 NOTE 3: Be sure that the specified grounding is carried out. Be sure to separate the unit's grounding pole from those of other heavy electric machinery, and avoid using common grounding poles. If multiple inverters are used, make sure that the grounding connections do not create a loop. Improper grounding Inverter Inverter Inverter Proper grounding Inverter Inverter Inverter Grounding bolt (at the site) CAUTION External or remote over load protection required, if multiple motors to be connected.

For models J300-450LFU and -550LFU only, connect to branch circuit protected at maximum 300% of output current rating. Suitable for use on a circuit capable of delivering not more than 10,000 rms symmetrical amperes, *** volts maximum, (where *** = input voltage) 5-4 5.2 Wiring of Control Circuit Terminals SINK TYPE wiring (Factory settings) FM CM1 PLC P24 FW 8 7 6 5 4 3 2 1 H O OI L CM2 12 11 RY AL2 AL1 AL0 RY Input intelligent terminal Frequency setting (500 to 2 k) Current input DC 4 to 20 mA Fault alarm For output Intelligent terminal 27 VDC 50 mA 50 mA max Frequency meter SOURCE TYPE wiring FM CM1 PLC P24 FW 8 7 6 5 4 3 2 1 H O OI L CM2 12 11 RY AL2 AL1 AL0 RY Input intelligent terminal Frequency setting (500 to 2 k) Current input DC 4 to 20 mA Fault alarm For output Intelligent terminal 27 VDC 50 mA 50 mA max Frequency meter NOTE 1: When an output intelligent terminal is used, be sure to install a surge absorbing diode in parallel with the relay (RY). Otherwise, the surge voltage created when the relay (RY) goes ON or OFF may damage the output intelligent terminal circuit. NOTE 2: Use a twisted and shielded wire for the signal line, and cut the shielded covering as shown in the diagram below.

Make sure that the length of the signal line is 20 meters or less. 5-5 Insulate No grounding necessary Connect FG (frame ground) of the inverter. NOTE 3: When the frequency setting signal is turned on and off with a contact, use a relay which will not cause contact malfunctions, even with the extremely weak currents and voltages, such as crossbar twin contacts, etc. NOTE 4: Use relays which do not have contact defects at 24 V DC, 3 mA for the other terminals. NOTE 5: Separate the main circuit wiring from the relay control circuit wiring.

If they must cross, be sure that they cross at a right angle. Main circuit power line (R, S, T, U, V, W, PP, P, RB, N, L1, L2, L3, T1, T2, T3, +, -, etc.) Right angle Signal input line (FM, CM1, PLC, P24, FW, 8, 7, 6, 5, 4, 3, 2, 1, H, O, OI, L, CM2, 12, 11, AL0, AL1, AL2) Separate by 10 cm or more. NOTE 6: Do not short between the terminals H and L and between the terminals P24 and CM1 of the control circuit. NOTE 7: Insulate the common terminal L for frequency analog command input and the common terminal (COMMON) of the peripheral equipment such as the sequencer before starting use. 5-6 5.3 Connection to the Programmable Controller (1) When the internal interface power source is used x This is an example when the sink type transistor output (open collector output) module of the sequencer is connected Note: Make sure of the short-circuit bar or wire between the terminals PLC and P24. J300 series S P24 CM1 PLC FW 2 8 + 24V DC y This is an example when the source type transistor output (open collector output) module of the sequencer is connected Note: Make sure of the short-circuit bar or wire between the terminals CM1 and PLC. J300 series COM P24 CM1 PLC FW 2 8 + 24V DC 1 - 1 8 2 8 2 9 COM 1 9 S 1 YTR48 type output module (by Hitachi) Inverter YTS48 type output module (by Hitachi) Inverter (2) When the external interface power source is used x This is an example when the sink type transistor output (open collector output) module of the sequencer is connected Note: Remove the short-circuit bar or wire between the terminals CM1 and PLC or P24 and PLC. + 24V DC y This is an example when the source type transistor output (open collector output) module of the sequencer is connected Note: Remove the short-circuit bar or wire between the terminals CM1 and PLC or P24 and PLC.

J300 series COM + 1 24V DC J300 series P24 CM1 PLC FW + 24V DC S - 1 P24 CM1 PLC FW + 24V DC - 2 8 2 8 8 2 8 2 9 COM 1 9 S 1 Inverter Inverter YTR48 type output module YTS48 type output module (by Hitachi) (by Hitachi) Note: Be sure to turn the inverter on after the controller and external power source are turned on. (Otherwise, the data in the inverter may be changed.) 5-7 5.4 Wiring Equipment, Options (EMI filter, etc.) Standard equipment (200V class) Wiring (AWG or Kcmil) Applicable equipment Constant torque Variable torque Power Signal Signal Earth leakage Electrolines lines breaker (ELB) magnetic External FM, CM1, PCL P24, AL0, AL1 contactor resistor FW, 8, 7, 6, 5, 4, 3 AL2 P, RB 2, 1, H, O, OL, L, CM2, 12, 11 Power supply Inverter model Motor Power Motor Power output lines output lines (kW) R, S, T, U, V (kW) R, S, T, U, V RB1, 2, 3, W, P, N W, P, N J300-055LF 5.5 7.5 11 15 22 30 37 45 55 ELB J300-075LF J300-110LF J300-150LF Magnetic contactor J300-220LF J300-300LF J300-370LF J300-450LF J300-550LF AWG 8 or more AWG 6 or more AWG 4 or more AWG 3 or more AWG 1/0 or more AWG 3/0 or more AWG 4/0 or more 300 or more 350 or more 7.



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5 11 15 22 30 37 45 55 75 AWG 18 AWG 16 AWG 8 10 or more or more Shielded or more AWG 6 wire 10 or more or more AWG 4 or more When the number of AWG 3 shielded or more wires to be used is 11 AWG 1/0 or more, or more the section AWG 3/0 of each shielded or more wire AWG 4/0 should be AWG 20 or more 300 or more 350 or more EX50C(30A) EX50C(30A) EX50C(50A) EX60B(60A) RX100(75A) H20 H20 H25 H35 H50 RX100(100A) H65 RX100(100A) H80 RX225(150A) H100 RX225(175A) H125 (400V class) Wiring Inverter model Constant torque Variable torque Applicable equipment Power Signal Signal Earth leakage Electrolines lines lines breaker (ELB) magnetic External FM, CM1, PCL P24, AL0, AL1 contactor resistor FW, 8, 7, 6, 5, 4, 3 AL2 P, RB 2, 1, H, O, OL, L, CM2, 12, 11 Motor Power Motor Power output lines output lines (kW) R, S, T, U, V (kW) R, S, T, U, V RB1, 2, 3, W, P, N W, P, N J300-055HF J300-075HF J300-110HF J300-150HF J300-220HF J300-300HF J300-370HF J300-450HF J300-550HF J300-750HF J300-900HF J300-1100HF J300-1320HF J300-1600HF J300-2200HF 5.5 7.5 11 15 22 30 37 45 55 75 90 110 132 160 220 AWG 8 or more AWG 8 or more AWG 8 or more AWG 6 or more AWG 4 or more AWG 4 or more AWG 2 or more AWG 1 or more AWG 3/0 or more 300 or more 300 or more 350 or more AWG 4 / 0 parallel 300 parallel 350 parallel 7.

5 11 15 22 30 37 45 55 75 90 110 132 160 220 260 AWG 8 10 AWG 18 AWG 16 or more or more Shielded or more AWG 8 wire 10 or more or more AWG 8 8 When the or more number of AWG 6 shielded or more wires to be used is 11 AWG 4 or more, or more the section AWG 4 of each shielded or more wire AWG 2 should be AWG 20. or more AWG 1 or more AWG 3/0 or more 300 or more 300 or more 350 or more AWG 4 / 0 parallel 300 parallel 350 parallel EX50C(30A) EX50C(30A) EX50C(50A) EX60B(60A) RX100(75A) H20 H20 H25 H35 H50 RX100(100A) H65 RX100(100A) H80 RX225(150A) H100 RX225(175A) H125 RX225(225A) H150 RX225(250A) H220 RX400(350A) H250 RX400(400A) RX600(600A) RX600(600A) H400 H600 H600 5-8 Part description AC reactor for improving the power factor (ALIL) (ALIH) Radio noise filter (Zero phase reactor) (ZCL-A) EMI filter for inverter (FFJ300 Function This part is used when the unbalance voltage ratio 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. Using the inverter may cause noise on the peripheral equipment through the power lines. This part reduces noise. 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. This part is used for applications that needs to increase the brake torque of the inverter or to frequently turn on and off and to run high inertia load. This part reduces noise generated at the output of the inverter. (It is possible to use for both input and output.

) 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, a countermeasure for a malfunction of the thermal relay is taken. R S T (L1) (L2) (L3) (+) P Inverter RB (T1) (T2) (T3) U VW Regenerative resistor (RB -) Radio noise filter (Zero phase reactor) (ZCL-A) AC reactor for reducing vibration (ACL-L) (ACL-H) Thermal relay IM Motor NOTE NOTE NOTE NOTE 1: 2: 3: 4: The applicable equipment is for Hitachi standard four pole squirrel-cage motor Be sure to consider the capacity of the circuit breaker to be used. Be sure to use bigger wires for power lines if the distance exceeds 20m. Be sure to use an grounding wire same size of power line or similar. (*) Use AWG 16 wire for the alarm signal wire. Classify the detective current of the earth leakage breaker depending on the total distance between the inverter and the motor. Detective current (mA) length 100 m and less 30 300 m and less 100 600 m and less 200 NOTE 5: When using CV wire and metal tube, the leakage current is around 30 mA/km. NOTE 6: The leakage current becomes eight times because IV wires have a high dielectric constant.

Therefore, use an one class larger earth leakage breaker according to the left table. 5-9 5.5 Terminal (1) Main circuit terminal Terminal layout Width Type R G (PE) (L1) R G (PE) (L1) S (L2) S (L2) RB T (L3) (RB) T (L3) P (+) P (+) N (-) N (-) U (T1) U (T1) V (T1) V (T1) W (T1) W (T1) G (PE) G (PE) G (PE) R (L1) S (L2) T (L3) PD (+1) ,,,, ,,,, ,,,, ,,,, P (+) P (+) 055, 075LF 055, 075HF 011, 150LF 011, 150HF 220 to 370LF 450, 550LF 220 to 370HF Internal short circuit bar N (-) U (T1) V (T1) W (T1) G (PE) 450, 550HF 750, 900HF Internal short circuit bar N (-) U (T1) V (T1) W (T1) G (PE) G (PE) R (L1) S (L2) T (L3) PD (+1) 1100HF 1320 to 2200HF Main circuit Terminal symbol R, S, T (L1), (L2), (L3) Terminal description Function RB R (RB) (L1) S (L2) T (L3) PD (+1) P (+) Main power Connect the power supply Braking resistor DCL Braking Units U, V, W (T1), (T2), (T3) Inverter output External braking resistor Connect the motor Power supply ELB P, RB (+), (RB) Connect a braking resistor (option) * Only the 055LF/HF and 075LF/HF are equipped RB terminals . Internal short circuit bar PD (+1) P (+) ,, DCL P, N (+), (-) Dynamic braking unit Connect a dynamic braking unit (option) Ground Ground (connect grounding to avoid electric shock) Connect a choke coil (DCL) for harmonics current reduction Ground (connect grounding to avoid electric shock) Remove the internal short circuit bar when DCL is connected. WARNING Wait until DC bus voltage is discharged after power supply is turned off. Otherwise, there is a danger of electric shock. G (PE) PD (+1) External choke coil Ground at case (2) Control circuit terminal The intelligent I/O terminals 1 to 8 and 11 and 12 are initialized as shown below at factory before shipment. FM CM1 PLC P24 FW REV CF1 USP CH1 FRS FM CM1 PLC P24 FW 8 7 6 5 4 JG 3 AT 2 RS 1 H O O I L H O O I L CM2 RUN FA1 CM2 12 11 AL2 AL1 AL0 AL2 AL1 AL0 5-10 Screw Width diameter (mm) M5 M6 M8 M10 M6 M8 M10 M10 M16 13 17.5 23 35 17.5 23 35 40 51 N (-) U V (T1) (T2) W G (T3) (PE) MOTOR Control circuit Terminal symbol FM CM1 PLC P24 Input monitor signal FW 8 7 6 5 4 3 2 1 Frequency command input H O O I L Output signal CM2 12 11 Fault alarm AL0 output AL1 AL2 AL2 AL1 AL0 Terminal description and function Frequency monitor Common for monitor Common terminal for the external power source of the sequencer (PLC) Internal power source for the frequency monitor and intelligent input terminal Forward operation Intelligent input terminal 8 Intelligent input terminal 7 Intelligent input terminal 6 Intelligent input terminal 5 Intelligent input terminal 4 Intelligent input terminal 3 Intelligent input terminal 2 Intelligent input terminal 1 Power supply for frequency command Voltage frequency command Current frequency command Common for frequency command Common for intelligent output terminal Intelligent output signal 12 Intelligent output signal 11 Normal: AL0-AL1 close Abnormal, Power off: AL0-AL1 open Standard setting of intelligent terminal Remarks Dry contact Close: ON (run) Open: OFF (stop) Min.



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ON time: 20 ms or more REV Reverse operation CF1 Multistage speed (First stage) USP Prevention function of restart upon power on. CH1 2 stage acc./dec. FRS Free run input signal JG AT RS Jogging Current input selection Reset (NOTE 1) Note: If the power is turned on when the input terminals 1 to 5 are kept on, all the data stored in the inverter is initialized. Therefore, never turn the power on in such a state.

10 VDC 0-5 VDC (nominal), 0-10 VDC (nominal)(Input impedance 30 k) DC 4-20 mA (nominal) Input impedance 250 RUN Run signal FA1 Frequency arrival signal 27 VDC 50 mA max Contact rating 250 VAC 2.5 A (Resistor load) 0.2 A (cos=0.4) 30 VDC 3.0 A (Resistor load) 0.7 A (cos=0.4) Min 100 VAC 10 mA 5 VDC 100 mA CAUTION Alarm connection may contain hazardous live voltage even when inverter is disconnected. In case of removing front cover for maintenance or inspection, confirm that incoming power for alarm connection is surely disconnected. NOTE1: Terminal RS can use only contact a (normally open). It cannot use contact b (normally closed). 5-11 5.6 Control Circuit Terminals Terminal name Monitor terminal Common terminal 1 Internal interface common Input signal power source Description Analog: Output frequency, current, torque Digital: Output frequency x frequency converted value (Set in the remote operator monitor mode), max. pulse: 3.6 kHz Common terminal for the monitor terminal Common terminal for the external power source of the sequencer Internal power source for the contact input terminal and frequency monitor terminal, 24 VDC. Common for the FW terminal and intelligent input terminals OUTPUT frequency Forward Reverse SWF SWR ON ON SWF CM1 PLC P24 FW 8 SWR 1 Terminal symbol FM CM1 PLC P24 FW REV Forward run/stop terminal Reverse run/stop CF1 SW1 Frequency (Hz) CF2 Multistage speed SW2 Switch SW1 SW2 SWF Fourth (FS) speed Third speed Second speed First speed (Source type) CM1 PLC P24 FW 8 7 6 Time ON ON ON ON ON ON ON SWF SW1 SW2 CF3 (NOTE 1) JG DB STN SET SW3 Jogging External DC braking Initialization 2nd function When setting frequency, connect P24 and 6 or 7 and set with digital operator 1 or 2.

CH1 FRS EXT USP CS SFT AT RS UP DWN Two-stage acceleration or deceleration Free run stop External trip Power-ON restart prevention Commercial power source switching Terminal software lock Analog input command Reset Remote control function, acceleration Remote control function, deceleration Jogging run DC braking input signal Initialization (shipment status at factory) input The output frequency setting, base and maximum frequencies, control method, motor constant, acceleration or deceleration time, manual torque boost setting, and electronic thermal setting are changed in batch. The acceleration or deceleration time or selection of two-stage acceleration or deceleration is changed by turning the contact ON. The inverter stops and the motor stops free run FRS functions when the contact is opened. (European version) External trip input signal (The contact is open.) Restart prevention when the power is turned on in the RUN state (The contact is open.) Switch signal from the commercial power source to inverter drive (Note: When the terminal is used, a trip is also canceled.) The data of all functions except for output frequency setting is locked. See I2-9 [F-25]. Analog input voltage-current switching (When the contact is ON, current input signal to OI-L is active.) Trip or alarm signal is reset.

When the contact is turned ON, the operation is accelerated. (Available only when the frequency command is sent to the operator.) When the contact is turned ON, the operation is decelerated. (Available the frequency command is sent to the operator.) 1 to 8 5-12 Terminal symbol Terminal name H Frequency command power terminal O OI L Frequency command terminal (voltage command) Frequency command terminal (current command) Frequency command common terminal Description Initialization of a voltage signal by an external command is between 0 and 10 VDC.

(Switching from 0 to 5V is executed by A48.) When inputting 4 - 20 mA, turn the input terminal at ON. H O OI L H O OI L + - H O OI L + - VRO (500 to 2 k) DC0 to 10 V DC4 to 20 mV DC0 to 5V Input impedance 250 k Input impedance 30 k When a current is inputted from between OI and L and the value is 4 mA, the output frequency may 0.6 Hz. If this occurs, set a value more than the frequency which is outputted by [A 4] start frequency setting.

(NOTE 2) CM2 FA1 Common terminal 2 Frequency arrival signal Signal during run Over-torque signal 11 12 RUN OTQ Common terminal for intelligent output terminal When each operator is used, and arrival signal can be outputted at an optional frequency. The transistor output is turned ON during running. (Outputted even during DC injection braking) The transistor output is turned ON when the torque is more than the set value. The set value can be changed by the remote operator. Use this function only under the sensorless vector control. AL0 AL2 AL1 AL0 Normal: AL0-AL1 close Abnormal, Power off: AL0-AL1 open Min 100Vac 10 mA 5 VDC 100 mA AL1 Fault alarm terminal AL2 Contact rating 250 VAC 2.5 A (Resistor load) 0.2 A (Cos=0.4) 30 VDC 3.0 A (Resistor load) 0.

7 A (cos=0.4) NOTE 1: To set four or more multispeeds, use the CF3 terminal. NOTE 2: When an inconvenience occurs in the above characteristics, adjust it using and . The sum of both analog input signals is outputted When selecting one of analog input current and voltage, make sure that the other is not inputted. 5-13 5.7 Terminal Connection Diagram Mg AX BSS AX Mg Power supply Inverter ELB Three phase power supply Mg R (L1) S (L2) T (L3) P24 PLC FW 8 7 EF BSS (T1) U (T2) V (T3) W Motor 24 VDC (+) P RB P RB AL1 AL1

P24 AL0 AL1 AL2 11 1 FM CM1 Dynamic braking resistor 055, 075LF: RB1, RB2 or RB3 055, 075HF: RB2, two each in series. Fault alarm signal (Normal: AL0-AL1 ON) RY 10 VDC 3 Frequency setter 500 to 2 k Current input 4 to 20 mA H 2 O OI 1 L CM2 G (PE) Grounding (NOTE 4) Main circuit power supply Operation command NOTE 1: Common terminal for each terminal is different. Output frequency Terminal FM FW, 8 to 1 H, O, OI 11, 12 Number of name revolutions Command CM1 CM1 (P24)* L CM2 of motor *: P24 is for source type wiring. NOTE 3: When the operation command is input first and the main circuit power is turned ON, and direct start results and a trip occurs. NOTE 2: The regenerative resistor has a temperature sensor.

NOTE 4: Do not input the operation command When it works, turn off power supply to the inverter simultaneously when the main circuit o set the deceleration time longer. is turned on. 5-14 12 RY 24 VDC Follow the timing shown as below upon power on. 0.6 or more seconds 6. OPERATION 6.1 Before Starting Operation Prior to the test run, check the following.



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WARNING ***** Be sure to turn on the input power supply after mounting the surface cover. While being energized, be sure not to remove the cover. Otherwise, there is a danger of electric shock. Be sure not to operate the switches with wet hands. Otherwise, there is a danger of electric shock. While the inverter is energized, be sure not to touch the inverter terminals even during stoppage. Otherwise, there is a danger of electric shock. If the re-try mode is selected, it may suddenly restart during the trip stop.

Be sure not to approach the machine. (Be sure to design the machine so that personnel safety will be secured even if it restarts.) Otherwise, there is a danger of injury. Even if the power supply is cut for a short period of time, it may restart operation after the power supply is recovered if the operation command is given. If it may incur danger to personnel, be sure to make a circuit so that it will not restart after power recovery. Otherwise, there is a danger of injury. The Stop Key is effective only when the function is set. Be sure to prepare the Key separately from the emergency stop. Otherwise, there is a danger of injury. After the operation command is given, if the alarm reset is conducted, it will restart suddenly.

Be sure to set the alarm reset after checking the operation command is off. Otherwise, there is a danger of injury. Be sure not to touch the inside of the energized inverter or to put a bar into it. Otherwise, there is a danger of electric shock and/or fire. 6-1 CAUTION *** Radiating fin and discharging resistor will have high temperature.

Be sure not to touch them. Otherwise, there is a danger of getting burned. Low to high speed operation of the inverter can be easily set. Be sure to operate it after checking the tolerance of the motor and machine. Otherwise, there is a danger of injury.

If a motor is operated at a frequency higher than 60Hz, be sure to check the speeds of the motor and the machine with each manufacturer, and after getting their consent, operate them. Otherwise, there is a danger of machine breakage. Note: (1) Make sure that the power lines (input power supply R(L1), S(L2) and T(L3), and output terminals, U(T1), V(T2) and W(T3) are connected correctly. (2) Make sure that there are no mistakes in the signal line connections. (3) Make sure that the inverter case () is grounded. (4) Make sure that terminals other than those specified are not grounded. (5) Make sure that the inverter is installed vertically on a wall, and a nonflammable material such as a steel plate is used as a mounting surface. (6) Make sure that there are no short-circuits caused by stray pieces of wire, solderless terminals or other objects left from wiring work. Also, make sure that no tools have been left behind. (7) Make sure that the output wires are not short-circuited or grounded.

(8) Make sure that there are no loose screws or terminals. (9) Make sure that the maximum frequency setting matches the machine specifications. Be sure to refer to page 10-2 when conducting insulation resistance and withstand voltage tests. Never test terminals other than those which are indicated. 6-2 6.2 Test Run CAUTION Check the following before and during the test run. Otherwise, there is a danger of machine breakage. Was the direction of the motor correct? Was the inverter tripped during acceleration or deceleration? Were the SPEED (rpm) and frequency meter correct? Were there any abnormal motor vibrations or noise? When overcurrent tripping or overvoltage tripping occurs during the test run, increase the acceleration time or deceleration time.

Factory settings Maximum frequency: 60 Hz Forward operation An example of a general connection diagram is shown below. Operating with digital operator: When setting frequency, run and stop with digital operator.

(The same way as remote operator (DOP) or copy with (DRW).) ELB Three L1 phase L2 power L3 supply Inverter R(L1) S(L2) T(L3) (T1)U (T2)V (T3)W RB (+)P (-)N Running from external command: When setting frequency, run and stop from external command (FW, RV Terminal.) The following shows run from the operation box (OPE-4MJ2, OPE-8MJ2) Inverter R(L1) S(L2) T(L3) (T1)U (T2)V (T3)W RB (+)P (-)N ELB Three L1 phase L2 power L3 supply Motor Dynamic braking resistor Daynamic braking unit * FW CM1 Digital PLC operator AL0 P24 AL1 8 AL2 1 H 11 O OI 12 L G (PE) CM2 Ground Dynamic braking resistor Daynamic braking unit Frequency meter Fault alarm signal (Normal: AL0-AL1: ON Abnormal: Power off: AL0-AL1: OFF) Forward run/stop Reverse run/stop Frequency setter * H O L Operator OPE-4MJ2 OPE-8MJ2 PLC P24 FW Digital 8 operator FM AL0 CM1 AL1 AL2 H O 11 OI L 12 G (PE) Fault alarm signal CM2 Ground *: For sink type wiring. 6-3 Operating with digital operator: Runnign from external command: Procedure (1) Turn on ELB to supply power to the inverter. Make sure that the POWER LED on the digital operator turns ON.

(2) Press the (3) Press 2 FUNC key once to display . . FUNC of the digital operator four times to display FUNC (4) Press the key and then press the 2 key to set . Press the FUNC key to establish the data. (5) Press the 1 key four times to display .

(6) Press 1 of the digital operator five times to dispaly . (7) Press the FUNC (4) Press the key and then press the 2 key to set . Press the FUNC key to establish the data. (5) Press the 1 key four times to display . (6) Short the terminals FW and P24 (CM1*) of the control terminal block. (7) Apply a voltage between the terminals O and L to start running. (8) Open the terminals FW and P24 (CM1*) of the control terminal block to stop deceleration. key and then the 1 key so as to increase to frequency or the 2 key so as to decrease the frequency. (When the 1 or 2 key is pressed continuously, the frequency is changed continuously.) When the displayed.

FUNC key is pressed, is *: Symbols are indicated for Sink type wiring. Refer to page 5-5. (8) Check the output frequerncy and rotation direction. When the 1 or 2 key is pressed to display and then the key is pressed, the rotation direction can be checked. indicates forward FUNC rotation and r indicates reverse rotation. When the rotation direction is checked, press the FUNC key. When the rotation direction cannot be found, operate the equipment at a low frequency to check the rotation direction. (9) Presst the RUN key. The equipment starts running. (10) Press the STOP/RESET key.

The equipment decelerates and stops. 6-4 The failure alarm signal is generated from the terminal AL0 and AL1 when a failure happens. At this time the contents of the failure are displayed on the digital operator. Whether the alarm terminal output is to be turned on or off during normal run can be selected by the extension function . The alarm output terminals at initial setting are as follows (1).

The alarm output terminals are valuable as follows (2) by setting (1) Contact b During normal operation At occurrence of an alarm or power off .



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At occurrence of an alarm (2) Contact a During normal operation or at power off AL2 AL1 AL0 AL2 AL0-AL1 Closed Open Open AL1 AL0 AL2 AL1 AL0 AL2 AL0-AL1 Open Closed Open AL1 AL0 Contact Power Operation Status ON Normal b (initial ON Abnormal setting) OFF AL0-AL2 Open Closed Closed Contact Power Operation Status ON Normal a ON Abnormal OFF AL0-AL2 Closed Open Closed Contact specification Maximum 250 VAC 2.5 A (Resistor load) 0.2 A (cos=0.4) 30 VDC 3.

0 A (Resistor load) 0.7 A (cos=0.4) Minimum 100 VAC 10 mA 5 VDC 100 mA Working voltage: Max. 50 V Saving the alarm signal When an alarm signal is outputted, the alarm signal data is stored even if the input power is turned off and the contents can be checked by turning the power on once again. However, when the input power is turned off, the inverter control power is also turned off. As a result, when the power is turned on next, the alarm contact output is reset (deleted). Therefore, when saving the alarm contact output, let the external sequence receive and save it and then turn off the inverter input power. When the alarm contact output is set ON during normal run, a time delay occurs until the contact is closed when the power is turned on. Therefore, when using the alarm contact output, set a time delay of about 2 seconds when the power is turned on. 6-5 Resetting (Any one of A, B and C is possible) A) Turn control terminal 1 on.

(In the initialization at factory before shipment, intelligent input terminal 1 is allocated to the reset RS terminal.) B) Press STOP/RESET CM1 PLC P24 1 When the internal interface power source P24-CM1 is used (Source type wiring) on the digital operator. (This is effective only when an alarm occurs.) C) Open the power receiving breaker of the inverter, and make sure that the Charge lamp on the control board goes out. (See page 3-1.) Then, close the power receiving breaker. CM1 PLC P24 1 When the internal interface power source P24-CM1 is used (Sink type wiring) NOTE: When the control circuit terminal RS is used, never short-circuit RS-P24 (CM1*) for four seconds or more. Otherwise, a communication error R-ERROR COMM<2> may occur (Although the digital operator display is , the inverter is normal). When the above error occurs, open the RS terminal and press the operator key. *: For sink type wiring How to return to the initialization (state before shipment) When returning the equipment to the initial state set at factory before shipment for some reason, see page 7-14.

6-6 7. OPERATION OF THE DIGITAL OPERATOR The standard type digital operator is modified so as to be used easily by minimizing key operations. Data can be set simply. 7.1 Names of Parts Monitor (LED display) This display shows frequency, motor current, motor revolution speed, and Trip history POWER Lamp Power lamp of control circuit FUNC.

FUNC (Function) key This key is used for changing commands. When pressing key after setting data and parameter, they are automatically memorized. Up key, Down key RUN STOP/RESET STOP/RESET These keys are used to change data and increase or decrease the frequency. STOP/RESET key This key is used for stopping the motor or resetting errors. (When either operator or terminal is selected, this key works.

If the extension function is used, this function is void.) RUN key This key is used for starting. (When terminal run is selected, this key does not work.)

WARNING 1 The STOP/RESET key works only when a function is set. Prepare an emergency switch separately. The use of the STOP/RESET key as an emergency switch may cause an injury. 7.2 Operation Procedure (Example that the frequency is set and the equipment starts running) . Display after power is turned on Press the FUNC key once. Press the 1 key five times.

Press the FUNC key once and set the frequency by using the 1 and 2 keys. . (Frequency monitor) Press the FUNC key once. When selecting the monitor Press RUN mode, press 1 and 2 to display . 7-1 Start run The frequency which is set by the FUNC key is stored. 7.3 1 Key Description 2 Data display Code display UP/DOWN key The key are used to select the code and change the data. When the 1 key is pressed once, the monitor mode , , is displayed 1 first and then , are one by one. If the is displayed, the display is is displayed and the key is pressed once again when returned to . If an optional code is selected when FUNC key is pressed, the extension function mode can be selected.

FUNC [Function key] . . . This key allows the selection of commands and memorizes parameters. When this key is pressed once in the state of , , the data state is set.

When the key is pressed once in the state of , the extension function code selection state is set. . 2 1 FUNC FUNC FUNC 2 FUNC 1 2 . 1 Select the extension function code. .

A setting method which is the same as that for to is used for the subsequent screen transition. . screen transition screen transition RUN [RUN key] . . . This key starts the run. The set value of F4 determines a forward run or a reverse run. [STOP/RESET key] . . .

This key stops the run. When a trip occurs, this key becomes the reset key. STOP/RESET 7-2 7.4 Explanation of Screen Display When the inverter is turned on, the latest display appears. However, when the display unit for data of the commands F2 to F14 is turned off, the commands (F2 to F14) are displayed.

(d10 and d11 excluded) Data during running in any function mode or extension function mode can be displayed. Even if data cannot be changed during running, data can be monitored. In each of the function modes , , , and , data can be changed even during running. In other function modes and extension function modes, data cannot be set during running. to RUN to Or data display Running start The display is left unchanged.

, Code which can change data during running 7-3 . FUNC Data can be changed even during running 7.5 Transition of Each Code <Monitor mode> Output frequency monitor Motor revolution speed monitor Output current monitor Frequency converted value monitor Trip monitor To extension function code setting <Extension function mode> Control method setting Motor capacity setting Motor poles setting Speed control response constant setting Start frequency adjustment Maximum frequency limiter setting Minimum frequency limiter setting Jump frequency setting 1 Jump frequency setting 2 Jump frequency setting 3 Carrier frequency setting Frequency command sampling frequency setting Multispeed first speed setting Multispeed second speed setting Multispeed third speed setting Electronic thermal level adjustment Electronic thermal characteristic selection Motor pole number setting for motor speed monitor External frequency setting start External frequency setting end Instantaneous restart selection Dynamic braking usage ratio Optional arrival frequency for acceleration Optional arrival frequency for deceleration Monitor signal selection Frequency converted value setting Analog input selection Frequency arrival signal output method Restarting after FRS signal selection Reduced voltage soft start setting Running mode selection Jogging frequency setting Base frequency setting Maximum frequency setting Maximum frequency selection Frequency command/ output frequency adjust (O-L terminal) Frequency command/ output frequency adjust (OI-L terminal) Trip history monitor <Function mode> Output frequency setting Running direction setting Acceleration time setting Deceleration time setting Manual torque boost setting Run command, frequency command Analog meter adjustment Motor receiving voltage Extension function setting Selection of reset terminal performance P gain setting of PID function I gain setting of PID function D gain setting of PID function Selection of PID function Setting method of PID reference value Setting of PID reference value Auto tuning setting Motor data selection Ro-To option selection Input terminal setting 1 Input terminal setting 2 Input terminal setting 3 Input terminal setting 4 Input terminal setting 5 Input terminal setting 6 Input terminal setting 7 Input terminal setting 8 Output terminal setting 11 Output terminal setting 12 Input terminal a and b contact setting Output terminal a and b contact setting When the FUNC key is pressed once to set the extension function, the screen is changed to the extension function code selection screen.

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