

E3000 SELECTOR

取扱説明書 / OPERATON MANUAL

日本語 : P1 - P24 / English : P27 - P53 OM-K0442 001



Thank you for purchasing the E3000 Ultra-Precision, High-Speed spindle system. The E3000 SELECTOR was designed for controlling multiple sequentially controlled spindles on CNC lathes, robots, NC lathes and special purpose machines. The motor, spindle and E3000 CONTROLLER are designed to work as an integrated system capable of 80,000 min⁻¹. This system utilizes air to cool the motor and protect the spindle. Always use an NSK Air Line Kit to ensure clean, dry, properly regulated air is supplied to the motor and spindle. The E3000 system is capable of being used with coolants and cutting lubricants. Please read this Operation Manual and E3000 CONTROLLER Operation Manual carefully before use.

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IMPORTANT INSTRUCTIONS AND WARNING - Electric Devices

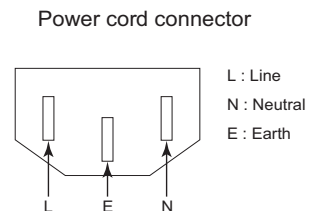
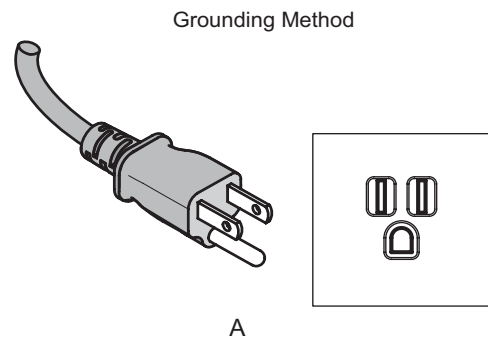
WARNING

When using electric tools, basic safety precautions should always be followed to reduce the risk of fire, electrical shock and personal injury.

Read all these instructions before operating this product and save these instructions.

A. GROUNDING INSTRUCTIONS

1. In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This tool is equipped with an electric cord with a grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.
2. Do not modify the plug provided if it does not fit the outlet. A qualified electrician must install the proper outlet.
3. Improper connection of the grounding conductor can result in electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the grounding conductor to a live terminal.
4. Check with a qualified electrician or service person if the grounding instructions are not completely understood, or if in doubt as to whether the tool is properly grounded.
5. Use only 3-wire extension cords that have 3-prong grounding plugs and 3-pole receptacles that accept the power cords plug.
6. Repair or replace damaged or worn cord immediately.
7. This tool must be used on a circuit that has an outlet that looks like the one illustrated in Sketch A in figure (See below) (115V). The tool has a grounding plug that looks like the plug illustrated in Sketch A in Figure (below).
8. **FOR Installation in Machine Electrical Cabinet or when wiring directly to machine internal power terminal strip:**
 - 1) Please refer to the pin diagram below for the proper wiring configuration. The plug shown is the female plug that attaches to the E3000 SELECTOR main power inlet.
 - 2) Make sure you test each individual wire to verify proper circuit prior to attaching any wire to the terminal block. Do not assume wire colors are the same for all power cords.
9. Install an over current protective device of maximum 10 Amps on the E3000 SELECTOR main power circuit.
10. **USE PROPER EXTENSION CORD.** Make sure your extension cord is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current your product will draw. An undersized cord will cause a drop the line voltage resulting in loss of power and overheating. Table (below) shows the correct size to use depending on cord length and nameplate ampere rating. If in doubt, use the next heavier gage. The smaller the gage number, the heavier the cord.



Minimum gage for cord

Ampere Rating		Volts	Total length of cord			
		120V 240V	7.5m (25ft.) 15m (50ft.)	15m (50ft.) 30m (100ft.)	30m (100ft.) 60m (200ft.)	45m (150ft.) 90m (300ft.)
More Than	Not More Than					
0	6	18	16	16	14	
6	10	18	16	14	12	
10	12	16	16	14	12	
12	16	14	12	Not Recommended		

Only the applicable parts of the Table need to be included. For instance, a 120-volt product need include the 240-volt heading.

B. OTHER WARNING INSTRUCTIONS

1. For your own safety read instruction manual before operating this tool.
2. Replace cracked collet chuck or chuck nut immediately.
3. Do not over tighten the chuck nut.
4. Use only NAKANISHI manufactured collet chucks and arbors for grinding and sawing applications.
5. REMOVE ADJUSTING KEYS AND WRENCHES. Always check to see that keys and adjusting wrenches are removed from tool before turning the units main power switch on.
6. KEEP WORK AREA CLEAN. Cluttered areas and benches invite accidents.
7. DO NOT USE IN DANGEROUS ENVIRONMENTS. Don't use power tools in damp or wet locations, or expose them to rain.
8. Keep work area well illuminated.
9. There is a risk of injury due to accidental starting. Do not use in an area where children may be present.
10. DO NOT FORCE THE TOOL. Never use a tool for an application it was not designed for.
11. USE THE CORRECT TOOL. Do not force tools or attachments to do a job for which it was not designed.
12. WEAR PROPER APPAREL. Do not wear loose clothing, gloves, neck ties, rings, bracelets, or other jewelry that might get caught in moving parts. Nonslip footwear is recommended. Wear protective hair covering to contain long hair.
13. ALWAYS USE SAFETY GLASSES. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses. Also use face or dust mask if cutting operation is dusty.
14. SECURE YOUR WORK. Use clamps or a vise to hold work at all times.
15. MAINTAIN TOOLS WITH CARE. Keep tools sharp and clean for best performance and to reduce the risk of injury. Follow instructions for changing accessories.
16. DISCONNECT TOOLS before servicing or when changing accessories, such as blades, cutters etc.
17. REDUCE THE RISK OR UNINTENTIONAL STARTING. Make sure Main Power Switch is in off position before plugging in.
18. NEVER LEAVE TOOL RUNNING UNATTENDED. TURN POWER OFF. Don't leave tool until it comes to a complete stop.
19. For recommended operating speed for various applications, please follow recommendations of the cutting tool manufacturer.

1. CAUTIONS FOR HANDLING AND OPERATION

- Read these warnings and cautions carefully and only use in the manner intended.
- These warnings and cautions are intended to avoid potential hazards that could result in personal injury or damage to the device. These instructions are classified as follows in accordance with the seriousness of the risk.

Class	Degree of Risk
⚠ WARNING	A hazard that could result in bodily injury or damage to the device if the safety instructions are not properly followed.
⚠ CAUTION	A hazard that could result in light or moderate bodily injury or damage to the device if the safety instructions are not followed.

⚠ **WARNING**

- ① The SELECTOR is not a hand tool. It is designed to be used on a NC lathe or special purpose machines.
- ② Do not touch the cutting tool while the spindle and tool are rotating. It is very dangerous.
- ③ Wear safety glasses, dust mask, and use a protective cover around the motor spindle whenever the motor spindle is rotating.
- ④ Never connect, disconnect or touch the Power Cord Plug and Motor Cord Plug with wet hands. This may cause an electric shock.
- ⑤ Never operate or handle the SELECTOR, CONTROLLER, motor or spindle until you have thoroughly read the owner's manual for each component, and safe operation has been confirmed.
 - 1) To prevent injuries/damages, check the SELECTOR, CONTROLLER, motor spindle and cutting tool for proper installation, then operate the motor spindle.
 - 2) Before disconnecting the SELECTOR, CONTROLLER or motor spindle, always turn the control power OFF and turn the compressed air supply to the control unit OFF. Then it is safe to remove the SELECTOR, CONTROLLER, and motor spindle.
- ⑥ Do not use in dangerous environments. Protect the SELECTOR from moisture and other contaminants. Failure to protect SELECTOR can result in damage to internal components and injury to the operator.
- ⑦ Reduce the risk of unintentional starting. Make sure the Main Power Switch is in the OFF position before connecting the SELECTOR or plugging the system in.
- ⑧ In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current, reducing the risk of electric shock. This system is equipped with an electric cord with a grounding conductor and grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.
- ⑨ Check to ensure that the supply voltage is the same as the SELECTOR rated voltage.

⚠ **CAUTION**

- ① A motor cooling and spindle purge air is required to operate the system correctly. The input air line must be connected to the air inlet joint on the front of the SELECTOR. 0.35MPa air must be supplied.
- ② The electric motor spindle requires air for cooling and purging. Ensure that this air supply is clean and dry. Introduction of dust, moisture and other contaminants into the SELECTOR and motor spindle will cause damage to the internal components.
- ③ Do not hit, drop or subject the motor spindle or SELECTOR to any type of shock. This will cause damage to internal components and result in a malfunction.
- ④ Do not disassemble, modify or attempt to repair the SELECTOR or motor spindle as it will damage internal components. There are no user serviceable parts available.

CAUTION

- ⑤ When an error occurs, and error LED will illuminate on the SELECTOR, an Error Code will be displayed on the CONTROLLER and cause an Error Code output to be sent, stopping the Motor. Check and correct the cause of the malfunction before continuing use. Failure to correct the problem will result in damage to the CONTROLLER and motor spindle.
- ⑥ When the warning LED on the SELECTOR blinks, conditions exist that could result in dangerous operation. Check operating conditions and continue to use only after correcting the problem.
- ⑦ When using CONTROLLER continuously, refer to continuous area on torque Characteristics Graph and check LOAD Monitor LED of the CONTROLLER for a maximum output of (3 Green LED's).
- ⑧ Do not install the system next to RF noise sources, as malfunctions can occur.
- ⑨ If smoke, noise or strange odors emanate from the SELECTOR, CONTROLLER or motor, immediately turn OFF the Main Power Switch.
- ⑩ Do not place anything on top of the SELECTOR.
- ⑪ Attach the provided connector cap (for motor output) and air plug (for air stoppage) for safety and dust proofing when not using SELECTOR.
- ⑫ Connect to the E3000 CONTROLLER when using E3000 SELECTOR.
- ⑬ When disposal of CONTROLLER or SELECTOR is necessary, follow the instructions from each local government and dispose as an industrial waste.
- ⑭ Stop working immediately when abnormal rotation or unusual vibration are observed. Please check the content of P52 " 12. TROUBLESHOOTING " section.

2. FEATURES

- ① Up to 4 motors can be connected to selector providing individual control of each motor.
(4 motors cannot be run simultaneously)
- ② External control signals and external monitoring can be done with the E3000 CONTROLLER and E3000 SELECTOR Combination. Control and monitoring input and output signals will all be connected to Input / Output connector A / B on the E3000 CONTROLLER.
- ③ Wide speed range, 1,000 - 80,000 min⁻¹ makes high precision machining possible.
- ④ Compact SELECTOR design allows easy installation in space restricted machines.
- ⑤ The SELECTOR is capable of being connected to AC 100V or AC 240V power sources. The Auto Sensing feature reduces installation time and eliminates the possibility of connecting the wrong voltage.

3. SPECIFICATIONS AND DIMENSIONS

3 - 1 Specifications

Product name	E3000 SELECTOR
Model	NE212
Input Voltage	AC100 - 240V, 50 / 60Hz, 0.15A
Speed Range	1,000 - 80,000min ⁻¹ *Note1
Operating Temperature	0 - 40° C
Over Voltage Category	II
Pollution Degree	Class 2
Weight	1.9kg
Dimensions	W88 × D138 × H238 mm


*Note1 : Motor Speed Limited Area


Motor speed limits depend on the Motor Model. Before using, refer to the P50 " 3 - 1 Specifications Note : 1 " section of the E3000 CONTROLLER Operation Manual.

3 - 2 Compatibility

(1) The E3000 SELECTOR is compatible with the following overseas safety standards.

• Safety standard in North America (UL,CSA)

UL508C CSA C22.2 No. 14-05 

• EC Directive 

Low Voltage Directive IEC/EN61800-5-1

EMC Directive EMS : EN61000-6-2

EMI : EN61000-6-4

(2) The E3000 SELECTOR is *RoHS compliant.

*RoHS : Restriction of Hazardous Substances by the European Union (EU).

3 - 3 Standard Accessories

Standard Accessories	
<ul style="list-style-type: none"> • Power Cord...1pc. • Conversion Adapter...1pc. • Communication Cable (length : 60cm)...1pc. • Bracket...1set. • Air Plugs (for air stoppage) (φ4)...3pcs. • Nylon Tension Relief ...1pc. • Fuse...2pcs. 	<ul style="list-style-type: none"> • Motor Communication Cord (length : 60cm)...1pc. • Mounting Screw...5pcs. • Connector cap (for Motor output)...5pcs. • Air Plugs (for air stoppage) (φ6)...2pcs. • Rubber Pad (4pcs.)...1set. • Serial I/F Connector Cover...1pc. • Operation Manual...1set.

3 - 4 Outside View

*Below is an outside view with Brackets (Standard Accessory) attached.

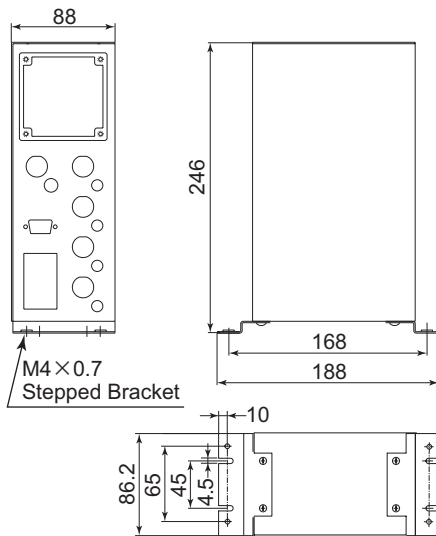


Fig. 1 Bottom Mounting

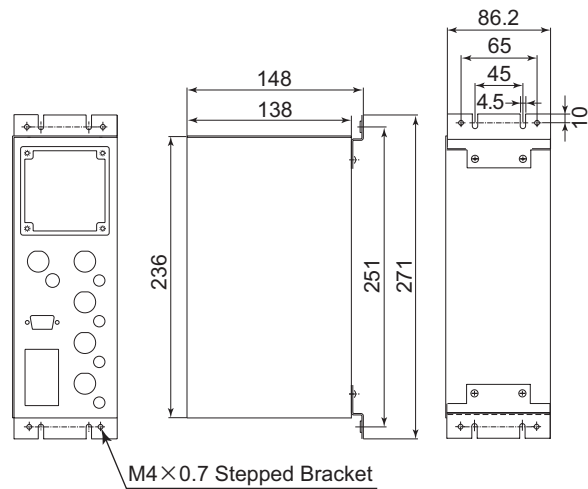


Fig. 2 Rear Mounting

4. CONTROL PANEL FEATURES

4 - 1 System

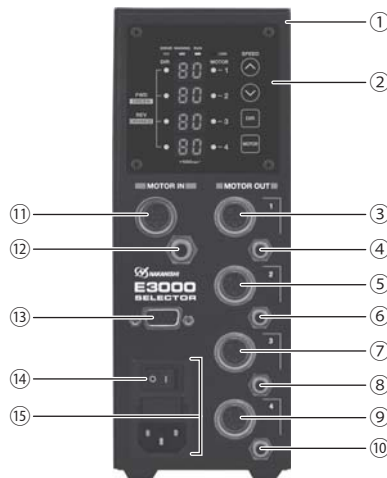


Fig. 3

① E3000 SELECTOR

② Control Panel

Refer to P34 " 4 - 2 Control Panel Details " section.

③⑤⑦⑨ Motor Output Connector

Connects the Motor Cord Plug to the SELECTOR. Attach the provided Connector Caps (for Motor output) for safety and dust proofing when not using other Motor Output Connector.

④⑥⑧⑩ Air Output Joint

Supply clean, dry, regulated air for motor and spindle cooling and purging. Attach the provided Air Plugs ($\phi 4$ for air stoppage) for safety and dust proofing, when not using other air output joints.

⑪ Motor Input Connector

Connects the Motor Communication Cord (length : 60cm) from the E3000 CONTROLLER Motor Connector to the SELECTOR Motor Input Connector.

⑫ Air Input Joint

Supply clean, dry, regulated air for motor cooling. Regulate air pressure to 0.35MPa. Max. Air Consumption 120Nℓ / min. Air must be supplied to operate the system correctly.

⚠ CAUTION

If the air pressure is too low the E3000 CONTROLLER and SELECTOR will not operate.

⑬ Serial I/F Connector

Connect the provided Communication Cable to the E3000 CONTROLLER Serial I/F Connector to the E3000 SELECTOR Serial I/F Connector. Attach the provided Serial I/F Connector Cover for safety and dust proofing, when not using E3000 SELECTOR.

⑭ Main Power Switch

ON / OFF main power source. The designation " I " Indicates ON. The designation " O " Indicates OFF.

⑮ Main Power Inlet with Power Supply Fuses

Insert the Power Cord Plug. Refer to P37 " 7. POWER CORD CONNECTION " section.

Two fuses (T1.6AL (250V)) have been installed. Make sure the proper rated and type of fuses when replacements are necessary.

When replacing fuses, refer to P35 " 5. REPLACING FUSES " section.

4 - 2 Control Panel Details

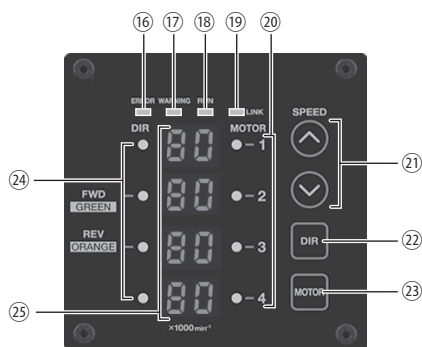






Fig. 4

- ⑩ Error LED (ERROR)
When a problem with the E3000 SELECTOR, or motor alarms are detected, this LED illuminates. The motor may shut down and the Digital Speed Indicator in E3000 CONTROLLER Control Panel will display an error code.
- ⑪ Warning LED (WARNING)
The operating and working conditions of the E3000 SELECTOR and motor are constantly monitored and the Warning LED flashes when a hazardous condition has been detected. When a hazardous condition is detected the Warning LED flashes and the Digital Speed Indicator on E3000 CONTROLLER Control Panel alternates between the warning code and the actual or preset speed, depending on whether or not the motor spindle is rotating or not.
- ⑫ Rotating LED (RUN)
When the motor is rotating this LED will illuminate.
- ⑬ LINK LED (LINK)
LINK LED illuminates when E3000 SELECTOR is correctly connected to E3000 CONTROLLER.
Confirm that the LINK LED lights after connecting the provided Communication Cable.
- ⑭ Selection motor LED
The LED corresponds to the selected motor port.
- ⑮ Motor Speed Adjustment Button (SPEED , )
Manual adjustable speed control is possible. ( (UP) or  (DOWN)) (1 digit is 1,000min⁻¹.)
- ⑯ Rotation Direction Button (DIR)
Right hand rotation (FWD.) and left hand rotation (REV.) are as viewed with the cutting tool facing the operator.
With the cutting tool facing the operator right hand rotation (FWD.) will be clockwise rotation.
- ⑰ Motor Selection Button (MOTOR)
Select the motor to be controlled, either motor (No.1 / No.2 / No.3 / No.4 motor.)
If motor No.1 selected, LED ⑳ (Motor -1) illuminates.
- ⑱ Motor Rotation Direction LED
LED illuminates Green indicates Right hand rotation (FWD.).
LED illuminates Orange indicates Left hand rotation (REV.).
- ⑲ Digital Speed Indicator
Preset speed, actual speed are displayed in 2 digit format.

5. CHANGING THE FUSES

⚠ WARNING

- Before removing the fuse holder and fuses, be sure that the Main Power Switch ⑭ is turned OFF and remove the Power Cord has been removed from the SELECTOR.
- Verify type and use only following the properly rated and type of fuse.
Specified fuses : T1.6AL (250V)
- *Failure to use the proper type and rated fuse will result in fire, injury, electric shock and /or product damage.

- (1) Push on the clips on the right and left of the fuse holder and remove the fuse holder block.
- (2) Remove the bad fuse or fuses and replace with the proper type and rating of fuse by the input voltage being used.
- (3) Replace the fuse holder containing the fuses into the Main Power Inlet with Power Supply Fuses ⑮ and verify it snapped in place.



Fig. 5

6. BRACKET AND RUBBER PAD INSTALLATION

6 - 1 Installation of the Bracke

⚠ CAUTION

- If there is a possibility for the SELECTOR from its mounting location, be sure to secure it with the provided Brackets for safety.
- When installing the SELECTOR, be sure to protect the SELECTOR (air joints and other connectors) from cutting oil, mist oil, powder dust, other contaminants that can buildup heat and damage to the internal components of the SELECTOR.

- The Bracket can be installed on the " Bottom mounting (Fig. 6) " and on the " Rear mounting (Fig. 7) " of the SELECTOR.

- (1) Attach the Installation Brackets (2pcs.) using the provided mounting screws (4pcs.).
- (2) Attach the SELECTOR (Bracket' s Slotted Area) to the machine using the provided mounting screws.

Bottom mounting

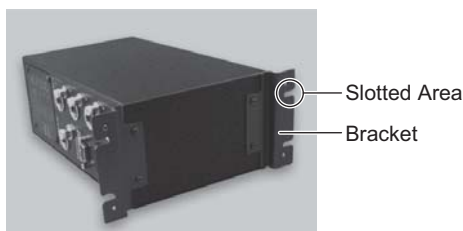


Fig. 6

Rear mounting

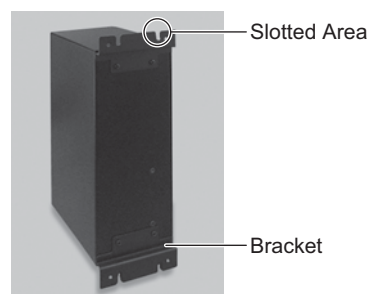


Fig. 7

6 - 2 Installation of the Rubber Pad

⚠ Caution when installing the SELECTOR horizontally

- When rotating the direction of Control Panel ②, ensure that the Main Power Switch ⑭ is turned OFF and the Power Cord has been removed from the SELECTOR.
- Never install the SELECTOR with the Control Panel ② upward. This may allow debris to enter the SELECTOR causing electric shock or fire.

When placing the SELECTOR horizontally, the Rubber Pads (Provided) must be installed on the side of the SELECTOR.

The Control Panel ② can be rotated 90° from the original position. To rotate, remove the 4 Control Panel Mounting Screws attached to Control Panel ②. Change position of the Control panel ② and re-install the 4 Control Panel Mounting Screws.

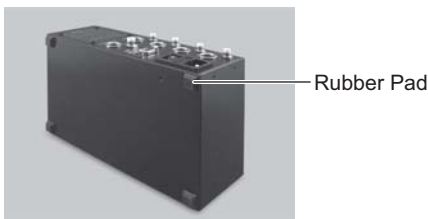


Fig. 8



Fig. 9

6 - 3 Proper Clearance

⚠ CAUTION

When installing 2 or more CONTROLLER's in the machine cabinet, make sure to check that each unit has the proper clearance on all sides for sufficient air flow. Insufficient clearance will cause heat damage to the CONTROLLER and SELECTOR.

When installing the CONTROLLER and SELECTOR, refer to Fig. 10 and Fig. 11.

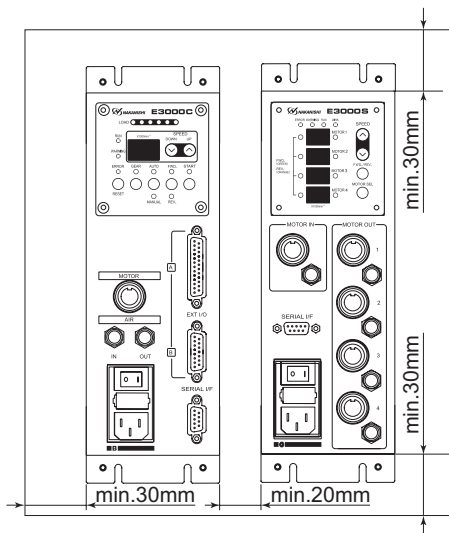


Fig. 10 Rear mounting

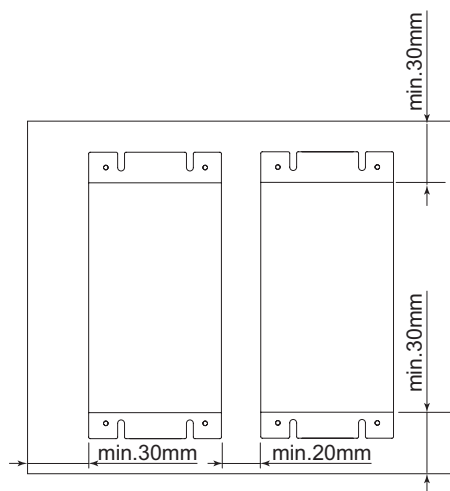


Fig. 11 Horizontal Bottom mounting

7. POWER CORD CONNECTION

⚠ WARNING

Only use grounded power sources. Failure to properly ground the SELECTOR may result in electric shock, injury, fire and/or damage to the system components.

⚠ CAUTION

- When connecting the Power Cord Plug, make sure the Main Power Switch ⑭ is turned OFF.
- When installing the SELECTOR, provide space of approximately 10cm around the SELECTOR for easy access to the air inlet and the Power Cord Plug.

- (1) Insert the female Power Cord Plug into the Main Power Inlet with Power Supply Fuses ⑮ on the front of the SELECTOR.
- (2) A tapped hole is provided on the lower, right side of the SELECTOR for attaching the tension relief. Use the provided nylon tension relief to attach the Power Cord to the side of the SELECTOR when mounting vertically.
*When placing the SELECTOR horizontally (Fig. 12), do not use the provided nylon tension relief to attach the Power Cord to the side of the SELECTOR.

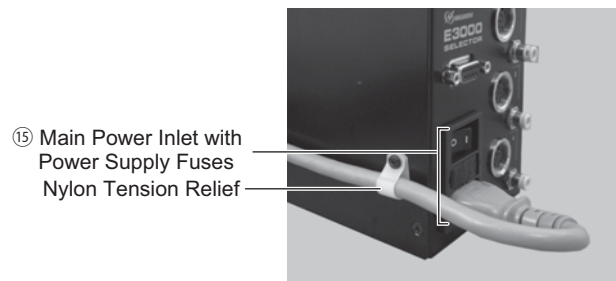


Fig. 12

8. MOTOR CORD CONNECTION

⚠ CAUTION

- Before connecting to the Motor Cord Plug, make sure the Main Power Switch ⑭ is turned OFF. If the Main Power Switch ⑭ is turned ON while connecting the Motor Cord Plug, damage may occur to the SELECTOR.

- (1) Ensure the alignment pin is located upward (12 o'clock).
- (2) Carefully insert the Alignment Pin into the Alignment Hole and push straight into the Motor Output Connector on the front of the SELECTOR.
- (3) Tighten the Coupling Nut.

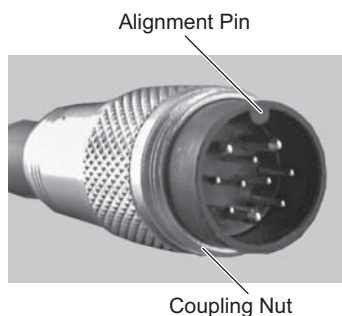


Fig. 13

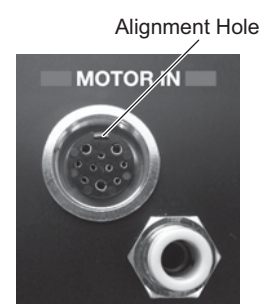


Fig. 14

9. CONNECTION OF THE E3000 CONTROLLER TO THE SELECTOR

9 - 1 Connection of the Motor Communication Cord to the SELECTOR

Connect the provided Motor Communication Cord (length: 60 cm) from the SELECTOR to Motor Connector on the E3000 CONTROLLER.

Motor Input Connector ⑪ refer to P37 " 8. MOTOR CORD CONNECTION " section.

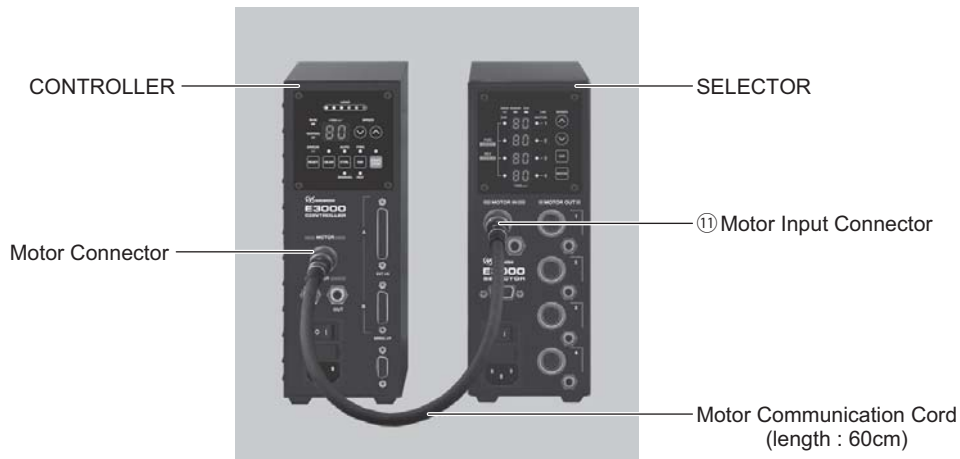


Fig. 15

9 - 2 Connection of Communication Cable

⚠ CAUTION

Never use the provided Communication Cable for any purpose other than connection between the CONTROLLER and SELECTOR. Do not use any cable other than the provided Communication Cable for data transfer between the CONTROLLER and SELECTOR. Failure to adhere to this caution could cause damage to the CONTROLLER and SELECTOR.

Connect provided Communication Cable (length: 60 cm) to Serial I/F Connector on the E3000 CONTROLLER and Serial I/F Connector ⑬ on the E3000 SELECTOR. After connecting, be sure to tighten the mounting screws of the Communication Cable (length : 60cm).

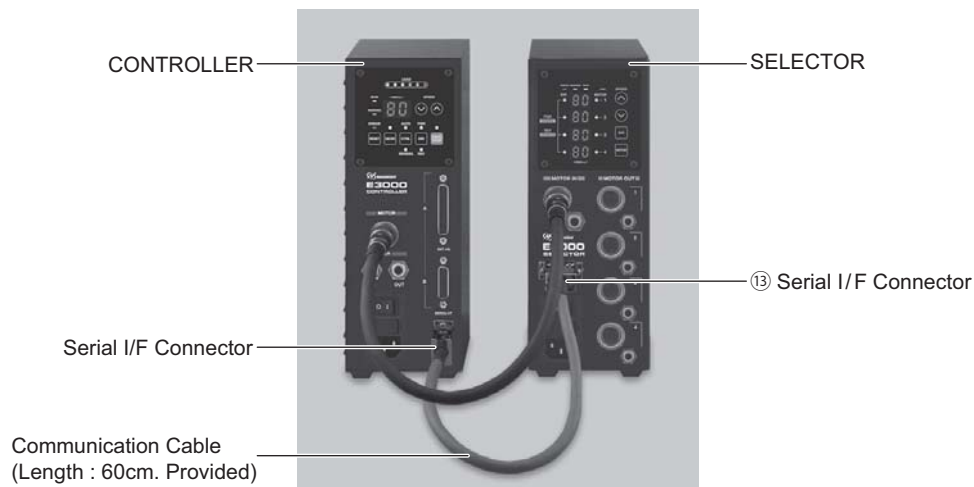


Fig. 16

9 - 3 Connection of Motor Cord

⚠ CAUTION

Attach the provided Connector Cap (for Motor Output) for safety and dust proofing when not using additional Motor Output Connector.

Connect to the Motor Cord Plug of the motor spindle to the Motor Output Connector 3 - 4 (③ , ⑤ , ⑦ , ⑨) on the SELECTOR. (Refer to P37 " 8. MOTOR CORD CONNECTION " section.)

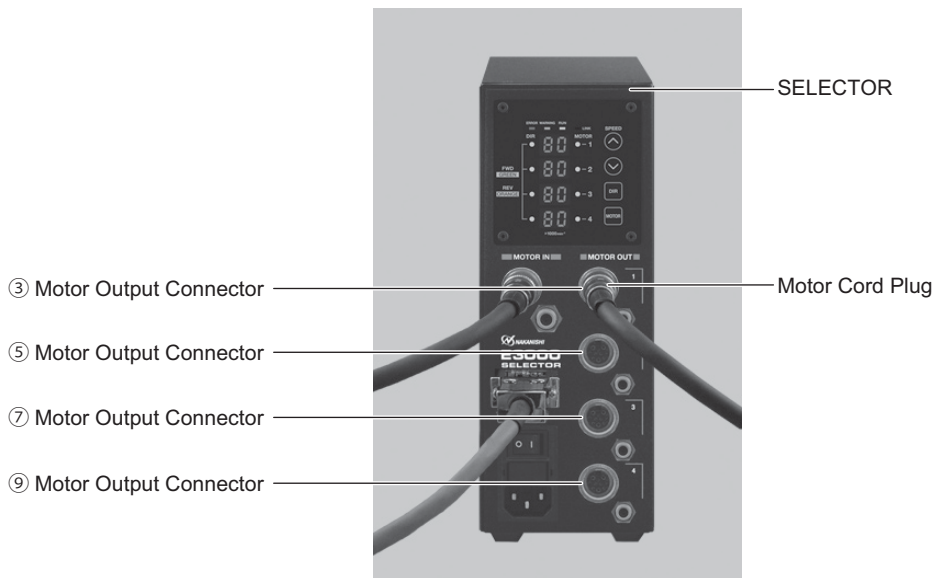


Fig. 17

9 - 4 Connection of the Air Hose

(1) Connection to the Air Input Joint

⚠ CAUTION

When not using NAKANISHI Air Line Kit, make sure that the incoming air supply is dry, clean and properly regulated.

Insert the provided ϕ 6mm air hose with filter from the AL-201 Air Line Kit into the Air Input Joint ⑫ on the front of the SELECTOR.

(2) Connection of Air Output Joint

⚠ CAUTION

Attach the provided air plug (for air stoppage) for safety and dust proofing when not using the air output joint on the CONTROLLER.

Insert one end of the provided ϕ 4mm cooling air hose into the air Output Joint (④ , ⑥ , ⑧ , ⑩) on the front of the SELECTOR. Insert another end of air hose to air joint at the rear of the motor spindle.

(3) Air Pressure Adjustment

Regulate air pressure 0.35MPa.

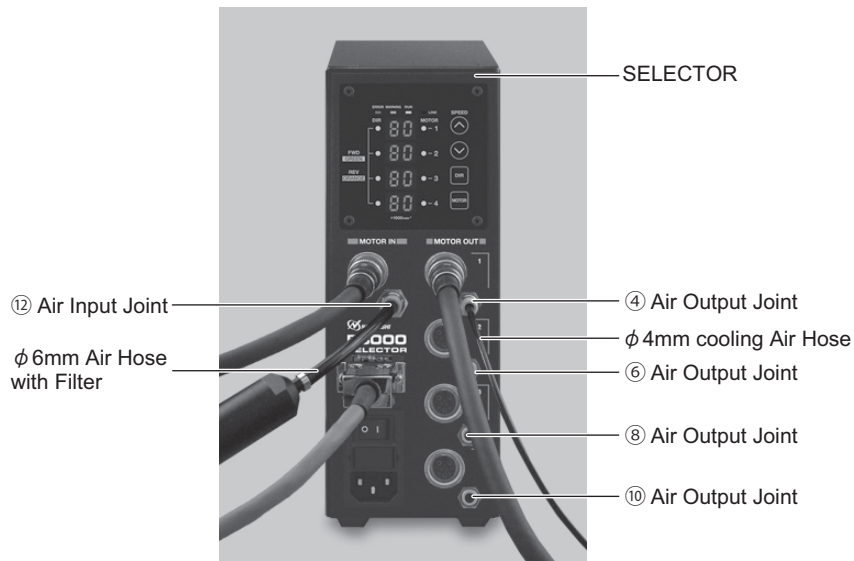


Fig. 18

(4) CONTROLLER to SELECTOR Connections

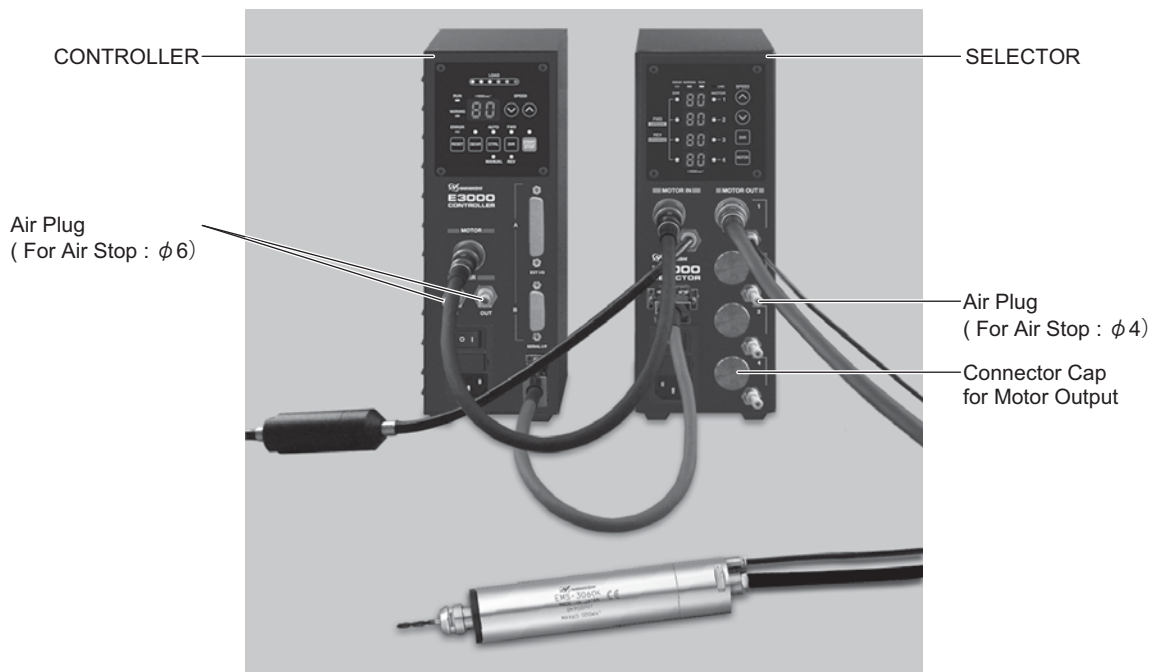


Fig. 19

CAUTION

- Regulate the air supply 0.35MPa. If the air pressure is too low, the CONTROLLER will not operate and an Error code will be generated.
- When using SELECTOR, it is not necessary to supply the cooling air to CONTROLLER. Insert the provided air plug (for air stoppage: ϕ 6) into the CONTROLLER'S Air Input Joint and Air Output Joint.

⚠ CAUTION

- The cooling air also provides air purge protection to the motor spindle. If the Main Power Switch ⑭ is turned OFF, the cooling air will continue to flow. When using the CONTROLLER and SELECTOR without supplying cooling air change setting parameter " P Selection of Air Input Monitoring Override " of the CONTROLLER to on. Never spray coolant directly on the spindle body without an air purge.
- Check that cooling air is being supplied to the motor spindle. Ensure that the cooling air hose is properly connected to the motor spindle and the SELECTOR. Failure to connect the air hose properly or supply the proper amount of cooling air to the motor will cause damage to the motor spindle
- When plumbing the hose, never apply excessive force to the hose as it can easily become bent or broken. Failure to supply proper air may cause damage to the motor spindle.
- Never supply over the regulated air pressure. There is a possibility to damage to the air detection sensor inside the SELECTOR.
- The air detect function with the SELECTOR detects air input supply only. If the Air Out hose is damaged from the SELECTOR, it will not be able to detect the lack of cooling and purging air to the motor spindle.

10. OPERATION PROCEDURES

10 - 1 Select Control Mode (MANUAL / AUTO)

(Select the control button (CTRL) ① of the Fig. 20 CONTROLLER Control Panel.)

- (1) When manually operating with the CONTROLLER Control Panel, push the Control Button (CTRL) ① of Fig .20 and select MANUAL. The Manual LED will illuminate
- (2) When operating from an External Signal Source, push the Control Button (CTRL) ① of Fig .20 and select AUTO.
 - MANUAL Mode : Controlled by Control Panel ②.
 - AUTO Mode : Controlled by Input / Output Connector A ③ and from an External Signal Source.



Fig. 20 CONTROLLER Control Panel

10 - 2 Setting Motor Rotating Direction, Gear Ratio (GEAR), Motor Start / Stop, Motor Speed

10 - 2 - 1 Manual Mode Operation

When using Manual Mode with the CONTROLLER and SELECTOR combination, the following functions will be controlled from the front panel of the respective units.

E3000 CONTROLLER	E3000 SELECTOR
Gear mode operation and selection Motor Start / Stop	Motor Speed
	Motor Selection
	Rotating Direction
	500min ⁻¹ Rotation

- (1) Set Motor Selection (Set the Motor Selection Button (MOTOR) ②③ of the Fig. 22 SELECTOR Control Panel.)
Motor No.1 – No.4 (③ , ⑤ , ⑦ , ⑨) is selected by pushing the Motor Selection Button (MOTOR) ②③ . LED ②④
The corresponding motor selected LED will be illuminated.
- (2) Set Motor Rotating Direction (Set the Rotation Direction Button (DIR) ②② of the Fig. 22 SELECTOR Control Panel.)
Check the color of LED ②④ to verify Motor Direction.
Green: Right hand rotation (FWD.)
Orange: Left hand rotation (REV.)
When changing direction, push the Rotation Direction Button (DIR) ②② .
With the cutting tool facing the operator, right hand rotation (FWD.) will be clockwise rotation.
- (3) Set 500 min⁻¹ Centering Rotation
(Set the Motor Speed Adjustment Button (SPEED ⬆️ , ⬇️) ②① of the Fig. 22 SELECTOR Control Panel.)

⚠ CAUTION
Never attempt to cut while rotating in Centering Mode.

To select 0.5 (500 min⁻¹), push the Speed Adjustment Button (SPEED ⬆️ , ⬇️) ②① .
When controlling motor speed from 1,000 min⁻¹ to 500 min⁻¹ or from 500 min⁻¹ to 1,000 min⁻¹, stop the motor spindle prior to changing speed.

- (4) Setting Gear Ratio (Set the Gear Mode Select Button (GEAR) ① of the Fig. 23 CONTROLLER Control Panel.)
Push the Gear Mode Select Button (GEAR) ① . (GEAR LED will light.) Check the gear ratio of the spindle or reducer combination being used. Select the appropriate gear ratio, by pushing the Speed Adjustment Button (SPEED ⬆️ , ⬇️) ② . Display Speed Indicator ⑤ , will show the 6 possible gear ratios : 1.0, 1.5, 2.7, 4.0, 6.0, 16.
If a GEAR ratio is set other than " 1.0 ", the dot displayed on Digital Speed Indicator ⑤ will blink.
(Refer to Fig.21.)
If you are not using a speed reducer or an angle type spindle, you do not need to set Gear Ratio Mode.
(Set Gear Ratio to 1.0)

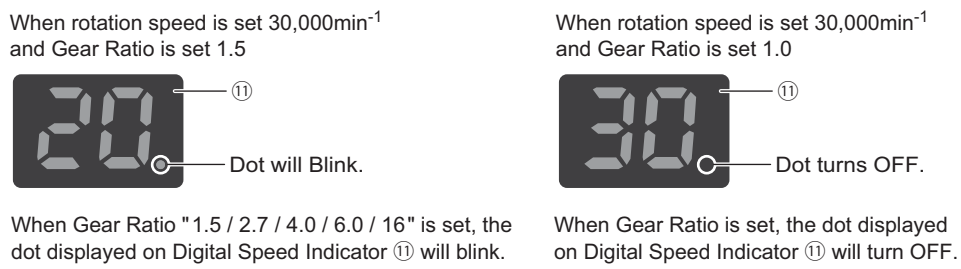


Fig. 21

- (5) Setting Motor Speed (Set the Speed Adjustment Button (SPEED ⬆️ , ⬇️) ②① of the Fig. 22 SELECTOR Control Panel)
Set the speed by pushing the Speed Adjustment Button (SPEED ⬆️ , ⬇️) ②①
 - Motor Speed Range is 1,000 - 80,000 min⁻¹
 - The motor speed is displayed in 1,000 min⁻¹ increments. 80 equals 80,000 min⁻¹
 - When using Gear Mode the digital speed Indicator ⑤ will show Motor Speed changes at a slower rate than during operation at ratio 1.0.
 *Motor Speed limits depend on the Motor Model. Before using it, refer to the P50 " 3 - 1 Specifications Note : 1 " section of the E3000 CONTROLLER Operation Manual.

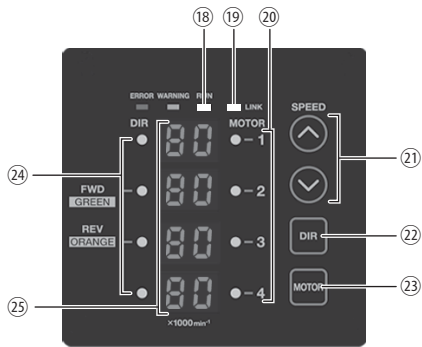


Fig. 22 SELECTOR Control Panel

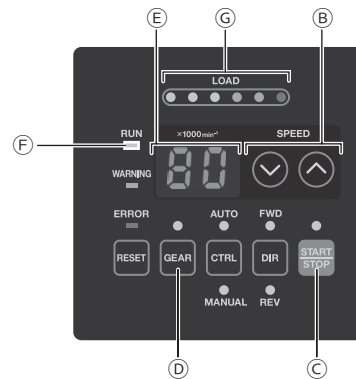


Fig. 23 CONTROLLER Control Panel

- (6) Motor Start / Stop (Motor Start / Stop by pushing the Start / Stop Button (START / STOP) ③ of the Fig. 23 CONTROLLER Control Panel)

The motor spindle will start and the LED will illuminate.

Push Start / Stop Button (START / STOP) ③ and START / STOP again and the motor will stop and the LED will go out.

10 - 2 - 2 Setting Auto Mode

Use the Input / Output Connector A to input control signals to the CONTROLLER. (Except setting the gear ratio) Refer to P45 " 11. EXTERNAL INPUT / OUTPUT CONNECTOR OF THE CONTROLLER " section.

- (1) Set Motor Selection

Motor Selection Signal (Pin No. 5 : SEL1 and Pin No. 17 : SEL0) Select Motor by inputting signals in the following order. (Refer to Table. 1.)

Table. 1

Select Motor	SEL1 (Pin No.5)	SEL0 (Pin No.17)
Motor 1	OFF (Open)	OFF (Open)
Motor 2	OFF (Open)	ON (Close)
Motor 3	ON (Close)	OFF (Open)
Motor 4	ON (Close)	ON (Close)

- (2) Set motor Rotating Direction

Input the Motor Rotating Direction Signal to Pin No. 2 : DIR_IN

Right hand rotation is "OFF" (Open) ("FWD", LED will illuminate)

Left hand rotation is "ON" ('Closed') ("REV", LED will illuminate)

With the cutting tool facing the operator right hand rotation (FWD.) will be clockwise rotation.

- (3) Set 500 min-1 Centering Rotation

⚠ CAUTION

Never attempt to cut while rotating in centering mode.

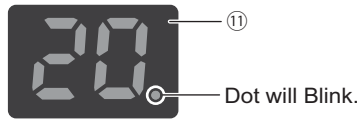
Input the Centering Rotation Signal to Pin No.16 : 500 min⁻¹. 500 min⁻¹LED will illuminate.

- (4) Setting Gear Ratio (Set the Gear Mode Select Button (GEAR) ④ of the Fig. 23 CONTROLLER Control Panel) Push the Gear Mode Select Button ④. (GEAR LED will be illuminated.) Check the gear ratio of the spindle or reducer combination being used, select the appropriate gear ratio, by pushing the Speed Adjustment Button (SPEED ⬆, ⬇) ⑤. Display Speed Indicator ⑥, will show the 6 possible gear ratios : 1.0, 1.5, 2.7, 4.0, 6.0, 16.

If GEAR ratio is set other than "1.0", the dot displayed on Display Speed Indicator ⑥ will blink. (Refer to Fig.24.)

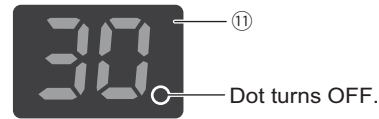
If you are not using a speed reducer, or an angle type spindle, you do not need to set Gear Ratio Mode. (Set Gear Ratio to 1.0)

When rotation speed is set 30,000min⁻¹ and Gear Ratio is set 1.5



When Gear Ratio "1.5 / 2.7 / 4.0 / 6.0 / 16" is set, the dot displayed on Digital Speed Indicator ⑪ will blink.

When rotation speed is set 30,000min⁻¹ and Gear Ratio is set 1.0



When Gear Ratio is set, the dot displayed on Digital Speed Indicator ⑪ will turn OFF.

Fig. 24

(5) Setting the Motor Speed

- Motor Speed Range is 1,000 - 80,000 min⁻¹. Limit the motor speed depends on motor and spindle model.

Setting parameter (P2), allows the Motor Speed to be adjusted in Auto Mode using the Motor Speed Adjustment Button ⑪ of the Fig .22.

(Refer to P84 "15 - 4 ② (P2) Setting AUTO Mode for Motor Speed Control" section of the E3000 CONTROLLER Operation Manual.

Rotation speed can be set by the following 3 methods.

① Setting by the Analog signal

Input the "Motor Speed Control Voltage" to Pin No. 23 : VR

Refer to P50 "11 EXTERNAL INPUT / OUTPUT CONNECTOR OF THE CONTROLLER (3) Input / Output Signal ④ Motor Speed Control Signal" section.

When using the motor with specification of 80,000min⁻¹, set parameter (PB) of the CONTROLLER.

This will change the Motor Speed Characteristics of the motor speed and Speed Control Voltage Signal characteristics. (Refer to P87 "15 - 4 ⑧ (PB) Selection of Motor Speed Control Voltage / DC+10V Signal Method " section of the E3000 CONTROLLER Operation Manual.)

② Setting by the Pulse Signal

Set parameter (P5) of the CONTROLLER. (Refer to P85 "15 - 4 ⑤ (P5) Selection of External Speed Control Mode" section of the E3000 CONTROLLER Operation Manual.)

Input the "Count Pulse Signal" for Setting Motor Speed (Pin No.3 : CNT_IN) and "UP / DOWN Signal" for Setting Motor Speed" (Pin No.15 : UD_IN).

One pulse will increase or decrease 1,000min⁻¹ in Spindle Speed. Counted on the leading edge of the signal. UP / DOWN Signal for Setting Motor Speed is "ON" (Close) : Increase speed, "OFF" (Open) : Decrease speed.

③ Set by the Speed Point Signal



CAUTION

When connecting the CONTROLLER to the SELECTOR, setting the Speed Point Signal is not possible.

(6) Motor Start / Stop

Input the Motor Start Signal (Pin No.14 : START).

Motor rotating is "ON" (Close).

When startup, RUN LED (RUN) ⑱ of the CONTROLLER and RUN LED (RUN) ⑶ of the SELECTOR will light and motor will rotate.



CAUTION

- When using the SELECTOR and CONTROLLER combination, if the LINK LED ⑲ on the CONTROLLER is not lit, data is not being passed to the CONTROLLER. In this case Motor Rotation Direction, Motor Speed, and Motor Selection Functions will not be able to be controlled from the SELECTOR. Please check the Communication Cable (length : 60cm, provided) connections and Communication Cable (length : 60cm, provided).
- If SELECTOR does not link properly to CONTROLLER, LINK LED ⑲ will not light, and motor speed will not be displayed. Check the link Communication Cable (length : 60cm, provided) between SELECTOR and CONTROLLER

11. EXTERNAL INPUT / OUTPUT CONNECTOR OF THE CONTROLLER

Table 2 details in External Input / Output Connector A Signals. Make sure to refer to the Operation Manual of the E3000 CONTROLLER.

⚠ WARNING

- **DO NOT** connect any circuit other than SELV (DC+24V) (Safety Extra Low Voltage) to the External Input / Output Connector A of the CONTROLLER. This will cause I / O board damage in the CONTROLLER.
- **Do not** supply over voltage or over current into the input / output circuit. Always install a LOAD (resistor) to the output circuit to eliminate the chance of damage to the CONTROLLER.

⚠ CAUTION

Input / Output Connector A DOES NOT use Pins No. 9 and No. 22. If pin No. 9 and No. 22 are connected, the CONTROLLER will be damage.

(1) Detail in External Input / Output Connector A Signal

Table. 2

Pin No.	Code	Function	Input / Output	Description	
1	COM_1	External Power source for External input	Input	DC0V or DC+24V	Power source to be used for External Inputs Signals.
2	DIR_IN	Rotating Direction	Input	OFF (Open) : FWD. ON (Closed) : REV.	Controls the rotational direction of the motor spindle. Setting parameter (P6), can start with reverse rotation. (Refer to P86 "15 - 4 ⑥ (P6) Selection of External Motor Start Signal Control Mode" section of the E3000 CONTROLLER Operation Manual.)
3	CNT_IN	Count Pulse Signal for Setting Motor Speed	Input	OFF (Open) → ON (Closed)	One pulse will increase or decrease 1,000min ⁻¹ in Spindle Speed depending on parameter (P5) setting. (Refer to P85 "15 - 4 ⑤ (P5) Selection of External Speed Control Mode" section of the E3000 CONTROLLER Operation Manual.)
4	RESET	Error Release	Input	ON (Closed) → OFF (Open)	Error Code can be released and the system restarted by toggling this signal OFF and ON. Error will not be released until cause of the error has been removed.
5	SEL1	Motor Select 1	Input	—	Use when selecting motor, after connecting CONTROLLER to the SELECTOR. 4 motors can be selected by SEL0 and SEL1 combination. Refer to P65 "12 - 2 - 2 (7) Motor Selection Table. 2 of the E3000 CONTROLLER Operation Manual.)
		Speed Point Select 1			Note : When Connecting the CONTROLLER to the SELECTOR, "Speed Point Select 1" can not be used.

Pin No.	Code	Function	Input / Output	Description	
6	RUN	Rotating	Output	OFF (Open) : Stop ON (Closed) : Rotating	Output shows that the motor is rotating.
7	DIR_OUT	Rotating Direction	Output	OFF (Open) : FWD. ON (Closed) : REV.	Output shows the direction of the Motor is rotating.
8	ERR	Error	Output	OFF (Open) : Error ON (Closed): Normal	Output shows that error has occurred. Error code will be displayed on Digital Speed Indicator of the E3000 CONTROLLER. When setting parameter P11 , Error Output Mode can be changed. (Refer to P84 "15 - 4 ① P11 Setting of Error Output Mode" section of the E3000 Operation Manual.)
9	—	Not used	—	—	*Note : Never use pin labeled not used.
10	GND	Internal GND for Motor Speed Control Voltage	Output	Internal CONTROLLER GND	This GND will be used for "Motor Speed Control Voltage Signal (VR)".
11	Vcc	Internal Power Source for Motor Speed Control Voltage	Output	Internal Power Source : DC+10V	Internal Power Source for "Motor Speed Control Voltage Signal (VR)".
12	MOTOR_I	Motor Current Monitor	Output	2Amp / V, DC0V – DC+10V	Output Motor Current Monitor with Analog Monitor Voltage. 2Amp / 1V. Max. 20Amp.
13	GND	Internal GND for Analog Monitor	Output	Internal CONTROLLER GND	This GND will be used for analog monitor (MOTOR_I, SPEED_V, and LOAD).
14	START	Rotate Command	Input	OFF (Open) : Stop ON (Closed) : Start	Motor Start and Motor Stop Signal Setting parameter P6 , can start with forward rotation. (Refer to P86 "15 - 4 ⑥ P6 Selection of External Motor Start Signal Control Mode" section of the E3000 CONTROLLER Operation Manual.)
15	UD_IN	UP / DOWN Signal for Setting Motor Speed	Input	OFF (Open) : Speed Down ON (Closed) : Speed Up	Determines speed up or speed down. Need to set parameter P5 . (Refer to P85 "15 - 4 ⑤ P5 Selection of External Speed Control Mode" section of the E3000 CONTROLLER Operation Manual.)
16	500min ⁻¹	Rotates Motor at "Centering" speed	Input	ON (Closed) : 500min ⁻¹ OFF (Open) : Normal Operation	Set motor rotation speed is 500 min ⁻¹ . Use the Centering Mode.

Pin No.	Code	Function	Input / Output	Description	
17	SEL0	Motor Select 0	Input	—	Use when selecting motor, after connecting CONTROLLER to the SELECTOR. 4 motors can be selected by SEL0 and SEL1 combination. (Refer to P65 "12 - 2 - 2 (7) Motor Selection Table. 2 of the E3000 CONTROLLER Operation Manual.)
		Speed Point Select 0			Note : When Connecting the CONTROLLER to the SELECTOR, "Speed Point Select 0" can not be used.
18	COM_2	External Power Source for External Output	Input	DC0V or DC+24V	Power source to be used for External outputs Signals.
19	PULSE	Rotating Pulse	Output	1 pulse / rotation	1 revolution of the motor generates one pulse. Duty 50%.
20	WARNING	WARNING	Output	OFF (Open) : Normal Operation ON (Closed) : Warning	Output shows that warning has occurred. Warning code will be displayed on Digital Speed Indicator of the E3000 CONTROLLER.
21	COIN	Speed Achievement	Output	OFF (Open) : Set speed not achieved ON (Closed) : Set speed achieved	Shows that the Motor has achieved more than 90% of the set speed.
22	—	Not used	—	—	*Note : Never use a pin labeled not used.
23	VR	Motor Speed Control Voltage	Input	Speed (min ⁻¹) = Speed Control Voltage Signal × 10000 / 1.5 DC0V - DC+10V	Sets rotating speed of motor. (For 60,000min ⁻¹ of motor) When using 80,000min ⁻¹ of motor speed. Setting parameter $\text{P} \text{B}$. (Refer to P87 "15 - 4 ⑧ $\text{P} \text{B}$ Selection of Motor Speed Control Voltage / DC+10V Signal Method" section of the E3000 CONTROLLER Operation Manual.) Refer to P51 "Fig. 31, 32" about relationship between motor speed and control signal.
24	LOAD	Torque Load Monitor	Output	Torque Load Monitor (%) = Torque Load Monitor Voltage × 20	Shows that the torque being applied to the analog motor. 20% / V 100% (rating) / DC+5V Torque Load Monitor : 0 – 200% (DC0V – DC+10V)
25	SPEED_V	Rotating Speed Analog Monitor Voltage	Output	10,000min ⁻¹ / V	Output the rotation speed of rotating motor with Analog Monitor Voltage. 10,000min ⁻¹ / V DC0V – DC+10V

(2) Input / Output Diagram

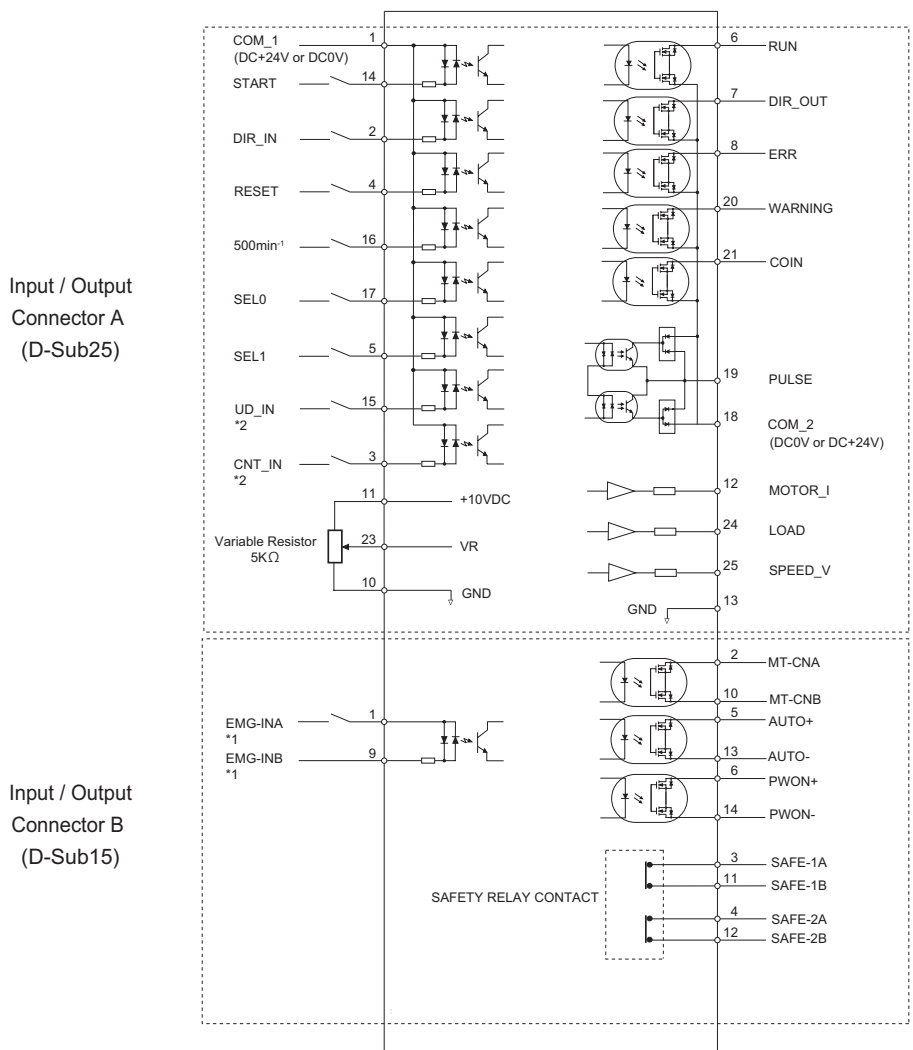


Fig. 25

*1 When using the "EMG - IN" Signal, set parameter $P9$ (Refer to P87 "15 - 4 $P9$ Selection of Emergency Stop Function" section of the E3000 CONTROLLER Operation Manual.)

*2 When using the "UD_IN and CNT_IN" Signal, set parameter $P5$. (Refer to P85 "15 - 4 $P5$ Selection of External Speed Control Mode" section of the E3000 CONTROLLER Operation Manual.)

(3) Input / Output Signal

① Input Signal

There are 8 different input signals : "Rotation Command (START)", "Rotating Direction Setting (DIR_IN)", "Rotates Motor at "Centering" speed (500min⁻¹)", "Error Release (RESET)", "UP / DOWN Signal for Setting Motor Speed (UD_IN)", "Count Pulse Signal for Setting Motor Speed (CNT_IN)", "Motor Select 0 (SEL0)", and "Motor Select 1 (SEL1)". These signals are DC+24V signals from an external signal source.

Please use a separate power source that is capable of supplying DC+24V ± 10%, 100mA. Refer to Fig. 26 for connections.

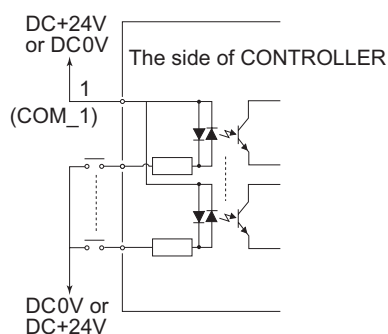


Fig. 26

② Output Signal I

There are 5 kinds of output signals : "Rotating (RUN)", "Rotating Direction (DIR_OUT)", "Error (ERR)", "Warning (WARNING)" and "Rotating Speed Achieved (COIN)". These signals are MOSS Relay Contact Connections. The output current can be connected to either sinking and the sourcing.

Voltage and Current Specifications

- Applied Voltage (V) ≤ DC+30V
- Working Current (Ip) ≤ 100mA

Use an external power source for output circuits. It is recommended to use the same DC+24V power source used for input signals. Please refer to Fig. 27 for connections.

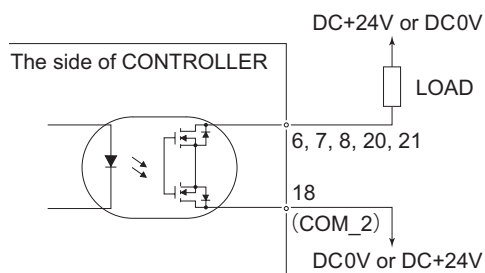


Fig. 27

③ Output Signal II

Refer to Fig. 28 regarding the Output Signal of the Rotating Pulse (Pulse). The output signal can be connected for either sinking or sourcing.

Voltage and Current Specifications

- Applied Voltage (V) \leq DC+30V
- Working Current (Ip) \leq 50mA

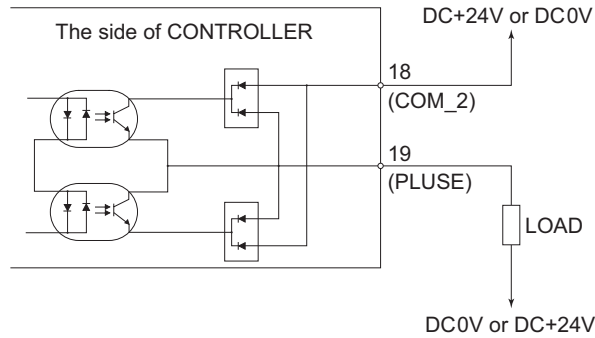


Fig. 28

④ Motor Speed Control Signal

Rotation Speed can be selected by, applying analog voltage to the " Motor Speed Control Voltage (VR) "

Refer to Fig. 29, 30 for connections. Refer to Fig. 31 about relationship between Motor Speed and Control Signal.



CAUTION

When applying the DC 0V to DC+10V, never input more than DC+10V (Fig. 30). This will cause serious damage to the I / O Board in the CONTROLLER.

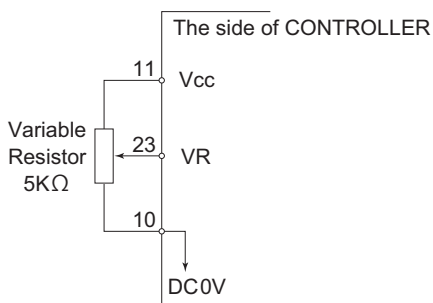


Fig. 29

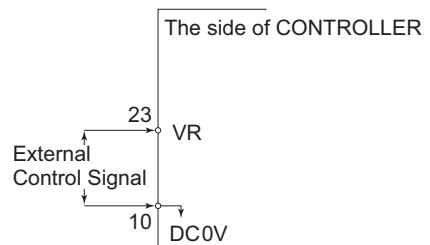


Fig. 30

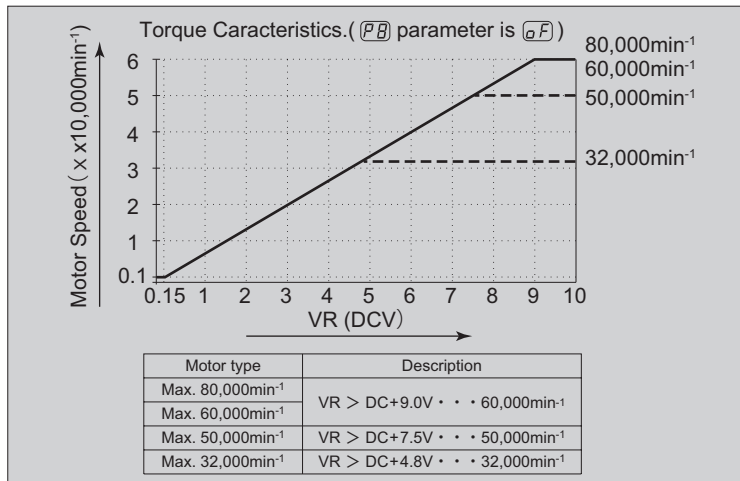


Fig. 31

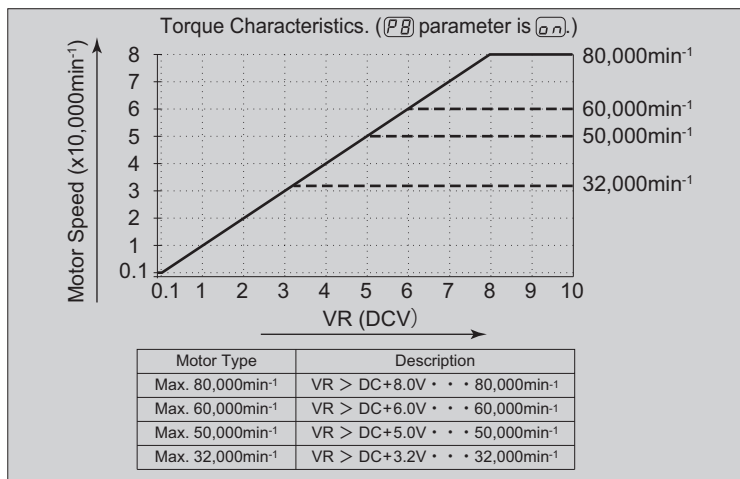


Fig. 32

⑤ Analog Monitor Signals

There are 3 types of monitoring signals : "Motor Current Monitor (MOTOR_I)", "Torque Load Monitor (LOAD)", and "Rotating Speed Analog Monitor Voltage (SPEED_V)". Please refer to Fig. 33 for connections.

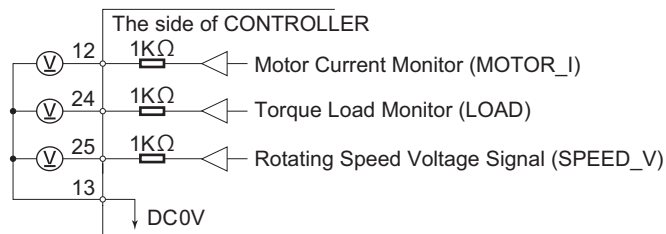


Fig. 33

12. TROUBLESHOOTING

If a problem or concern occurs, please check the following prior to consulting your dealer.
(Make sure read Operation Manual of the E3000 CONTROLLER.)

Trouble	Cause	Inspection/Corrective Action
Motor does not run.	Power is not supplied.	<ul style="list-style-type: none"> • Make sure to turn ON the Main Power Switch on the front of the SELECTOR. • Insert the Power Cord Plug correctly into the Main Power Inlet with Power Supply Fuses ⑮ of the SELECTOR. • Check if the fuse is blown.
	Motor Cord (provided with SELECTOR) is not connected to the SELECTOR and CONTROLLER.	Connect the Motor Cord (for SELECTOR) correctly to the SELECTOR and CONTROLLER.
	Communication Cable is not connected to the SELECTOR and CONTROLLER.	Connect the Communication Cable correctly to the SELECTOR and CONTROLLER.
	Not using the Communication Cable (LINK LED ⑲ does not illuminate)	Use the Communication Cable.
	Control Button (CTRL) is set to Manual mode but trying to start with an External Command Signal through Input/Output Connector A.	Start with the Start / Stop Button (START / STOP) ㉞, or set the Control button (CTRL) ㉟ on the Control Panel to Auto mode. (Fig. 23)
	Control Button (CTRL) is set to Auto mode but trying to start with the Start Button (START / STOP) ㉞ on the Control Panel. (Fig. 23)	Start with an External Command Signal or set the Control Button ㉟ on the control panel to Manual mode. (Fig. 23)
	Error has occurred. (Error LED ⑯ is lit.)	Check P77 " 14 - 3 Resetting System after Error Codes Table. 6 " of the E3000 CONTROLLER Operation Manual. Error will not be released until cause of the error has been removed.
Low air pressure.	Adjust air pressure to 0.35MPa.	
Motor speed is not displayed correctly.	Not using the Communication Cable. (LINK LED ⑲ does not illuminate.)	Install the Communication Cable.
	Not connect the air plug ($\phi 4$) to avoid Air Flow to Air Output Joint of Air Output Joint.	Insert the air plug ($\phi 4$) to avoid Air Flow to Air Output Joint when you don't use Air Output Joint.
	Parameter of CONTROLLER ㉑ "Setting AUTO Mode for Motor Speed Control" is changed.	Set Parameter mode ㉑ by External Input / Output Connector A Signal or control by the Button on Control Panel of the SELECTOR. (Refer to P84 " 15 - 4 ㉒ ㉑ Setting AUTO Mode for Motor Speed Control " section of the E3000 CONTROLLER Operation Manual.)
	Motor Fixed Speed is set in the ㉓ parameter.	Release parameter ㉓. (Refer to P85 " 15 - 4 ㉓ ㉓ Setting Fixed Motor Speed " section of the E3000 CONTROLLER Operation Manual.)

Trouble	Cause	Inspection/Corrective Action
Motor speed is not displayed correctly.	Motor Maximum Speed is set in the (P4) parameter.	Release parameter (P4) . (Refer to P85 " 15 - 4 ④ (P4) Setting Maximum Motor Speed " section of the E3000 CONTROLLER Operation Manual.)
	Air Input Monitoring Override is set in the (P7) parameter and the motor's maximum speed is limited to 30,000 min ⁻¹ .	Release parameter (P7) . Set the desired motor speed, by supplying the cooling air into the motor spindle. (Refer to P86 " 15 - 4 ⑦ (P7) Selection of Air Input Monitoring Override " section of the E3000 CONTROLLER Operation Manual.)
	Motor spindle (motor speed of the 80,000min ⁻¹) is connected to the SELECTOR and (PB) parameter is set (PF) .	Set (PF) Parameter (PB) . (Refer to P87 " 15 - 4 ⑧ (PB) Selection of Motor Speed Control Voltage / DC+10V Signal Method " section of the E3000 CONTROLLER Operation Manual.)
Not change motor rotation direction.	Not using the Communication Cable. (LINK LED ⑲ does not illuminate.)	Use the Communication Cable.
	Control Mode is set to AUTO. (The Control Button (CTRL) is set to AUTO)	Set the control mode to MANUAL. (The Control Button (CTRL) is set to MANUAL on the control panel of the E3000 CONTROLLER.)
Motor stops during rotation.	Not using the Communication Cable (LINK LED ⑲ does not illuminate.)	Use the Communication Cable.
	Load level too high.	Check the Load monitor LED ⑤ and control motor speed. (Refer to Fig. 23)
	Air pressure is too low.	Check the air pressure.

*Refer to P78 " 15 SETTING OF OPERATING PARAMETERS " section of the E3000 CONTROLLER.

※仕様及び形状等は予告なく変更する場合がありますので、ご了承ください。

※Specifications may be changed without notice.

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