

# ELECTROMAGNETIC CONTROLLER Type-FSC

## OPERATION MANUAL



Thank you very much for your purchase of our Electromagnetic Controller. For safe and proper use of this product, please carefully read this operation manual before using it. After reading it through, keep it in a safe place that allows for easy access during daily operation. Also, please provide this manual to the end user who will actually use this product.



**FUJITA Co., LTD.**

Before installation, operation, maintenance and checking of the Electromagnetic Controller, please be sure to read the following safety precautions, as well as other instruction manuals related to it for safe and proper use.

In this manual, the safety precautions are classified into “Warning” and “Caution,” which are defined as follows:

 <b>WARNING</b>	This indicates an imminently hazardous situation which, if this product is not handled properly, may result in death or serious injury.
 <b>CAUTION</b>	This indicates a potentially hazardous situation which, if this product is not handled properly, may result in injury or property damage.

Even in the case of “CAUTION,” a serious accident may occur depending on situation.

Therefore, be sure to follow every instruction specified below.

Keep all of the related instruction manuals in a safe place that allows for easy access during daily operation. Also, please provide them to the end users who will actually use this product.

## **WARNING**

### General Warning

■ Do not use it with the following equipment or parts.

1. Medical equipment designed to maintain or control human life
2. Mechanical transfer equipment designed to transport people
3. Important parts of mechanical equipment for storage

This product is not designed to be used with equipment that requires high levels of safety.

■ Do not use it beyond the specification limit; otherwise, it may be broken or damaged.

### Installation

- Do not use it in a place where there is an ignition source, or an exploding or flammable material; otherwise, a fire, explosion or flash off may occur.
- At the time of installation securely fix it; otherwise, dropping or unexpected motion may occur, resulting in injury.
- Do not use it in a place which is exposed to water or oil drop.
- The grounding work must be Class D or higher in rating; otherwise, electric shock or malfunction may occur in case of ground leakage.
- When wiring, be sure to follow the instructions specified in the wiring instruction manual to prevent wrong wiring; otherwise, failure or malfunction may occur.

### Operation

- This product is not equipped with any power protection device. If the primary power supply is shut off due to blackout or instantaneous power failure, the output voltage to the electromagnet will be also shut off. Therefore, if there is a possibility of blackout or instantaneous power failure, be sure to also use a power protection device (uninterruptible power supply system, etc); otherwise, a workpiece dropping from the magnet could hurt you.  
The output to the electromagnet is also shut off at the time of detecting a failure. Therefore, if there is a possibility of personal injury or machine damage due to the material drop, be sure to install a safety catcher.
- Do not wash it. Also, prevent it from being exposed to water. Exposure to water or washing may cause mechanical damage or personal injury due to unexpected motion, electric shock, fire, etc.
- When the power is supplied, do not touch the terminal block. Also, do not connect or disconnect any I/O connector; otherwise, electric shock or unexpected motion may occur.
- Before turning on power, check to make sure that any magnetizing signal is not input; otherwise, the magnetizing motion could start at the time of power-on, causing injury.

- In case of generation of abnormal smoke, odor or heat in this product, immediately turn off power. If it is continuously used in that state, it may be broken or cause fire.
- If its protection function (alarm) is activated, remove the cause before use; otherwise, unexpected motion may occur, causing personal injury, product damage or failure.
- If its display units do not light up after power-on, immediately turn off power.

## Maintenance & Checking

- Never disassemble or modify it; otherwise, unexpected motion may occur, causing injury, electric shock, or fire.
- Before maintenance or checking, be sure to turn off power; otherwise, injury, electric shock or fire could occur.

## Disposal

- Do not throw it into the fire; otherwise, it could break or toxic gas could be generated.

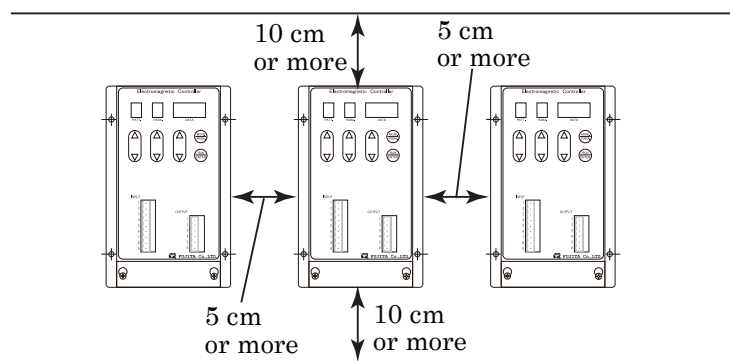
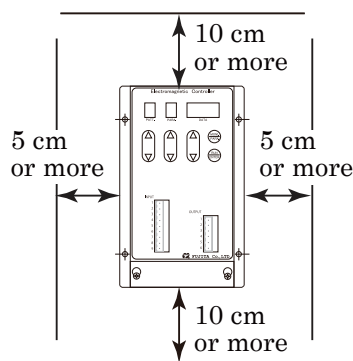
## CAUTION

### General Caution

- Do not touch the radiation fin; otherwise, you may get burned because it becomes very hot.

## Installation

- Use this product under the following ambient conditions; otherwise, failure or abnormal motion may occur.
  1. Ambient temperature ranging from -10°C to 40°C
  2. Humidity ranging from 10% to 90%RH without dew condensation
  3. The environment must be free from corrosive gas, combustible gas, oil mist, dust, and moisture
  4. Vibration: lower than 4.9 m/s<sup>2</sup> (vibrational frequency: less than 20 Hz) or 9.8 m/s<sup>2</sup> (less than 50 Hz)
  5. The altitude must be lower than 1,000 m.
- Install it in a well-ventilated indoor place with sufficient distances kept from other devices. In the case where two or more units are used, also keep enough space between them as shown below. The following dimensions indicate the minimum distances. A cooling fan is incorporated in the upper portion of this controller (※1), so the vertical distance from the upper surface shall be large enough (at least 10 cm) to prevent interruption of ventilation.



※1. The cooling fan monitors the temperature in the controller, and automatically rotates only when the temperature exceeds a certain level. It does not always rotate.

## For Selection of Electromagnet

- Total current of electromagnet(s) that can be connected with the electromagnetic controller must be within 80% of the controller's maximum output current. If two or more electromagnets are connected, refer to the following formula.

$$\text{Number of controllable electromagnets} = \frac{\text{Controller's maximum output current}}{\text{Electromagnets' current value}} \times 0.8 \text{ (ratio delay)}$$

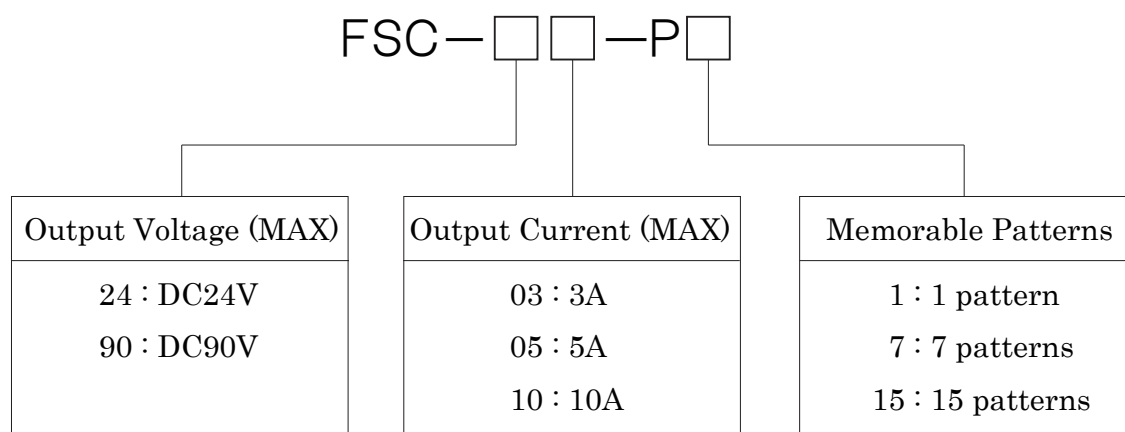
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## 1-1. Specifications of Electromagnetic Controller

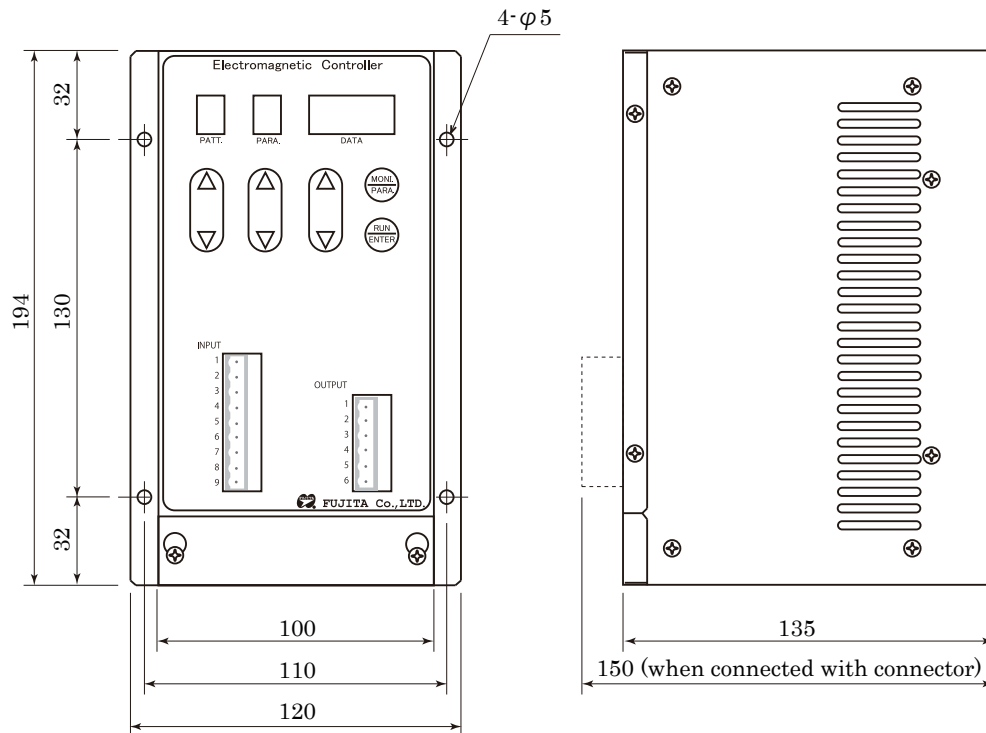
Power source	Rated input power	Single-phase AC 100V, 50/60 Hz $\pm 10\%$
	Input power efficiency	More than 90%
Output	Output voltage	MAX DC24V / 90V ※ depending on model
	Output current	MAX 3A / 5A / 10A ※ depending on model
Operation specification	Number of memorable patterns	1 pattern / 7 patterns / 15 patterns ※ depending on model
	Control method	PWM control method
	External input circuit	Photo Coupler insulation type, DC24V, 10mA (max), L-shaped plug 9P, Applicable wire size : AWG 28 to 12
	External output circuit	Photo Coupler insulation type, Open-collector type, DC24V, 40mA (max) for magnetizing, L-shaped plug 6P, Applicable wire size : AWG 28 to 12, Max. output : 250mA (For internal 24V power) DC22V to 27V (For external 24V power)
Use conditions	Ambient temperature range	-10°C to 40°C
	Humidity range	10% to 90%RH without dew condensation
	Environment	Free from corrosive gas, combustible gas, oil mist, dust, and moisture
	Vibration	Lower than 4.9m/s <sup>2</sup> (vibrational frequency : less than 20 Hz) or 9.8m/s <sup>2</sup> (less than 50 Hz)
	Altitude	Lower than 1,000 m
Protective functions		Protection against instantaneous overcurrent, overload, grounding fault, radiation fin overheat, and undervoltage
Weight		2.2 kg

## 1-2. Model indication

As shown below, the model number of this electromagnetic controller is indicated on the face plate, which is located on the right side surface.



## 1-3. Outside dimensions



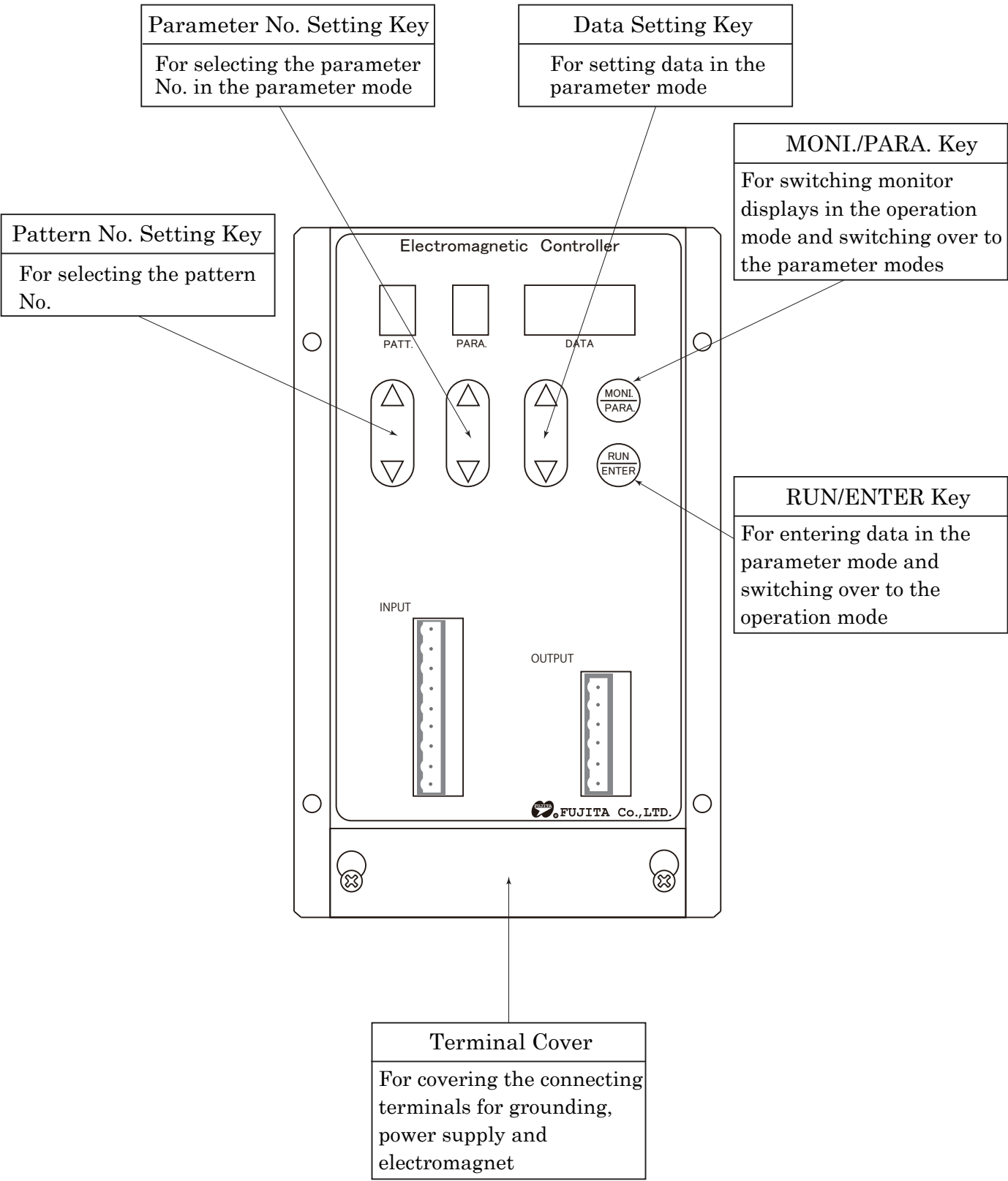
## 1-4. Accessories

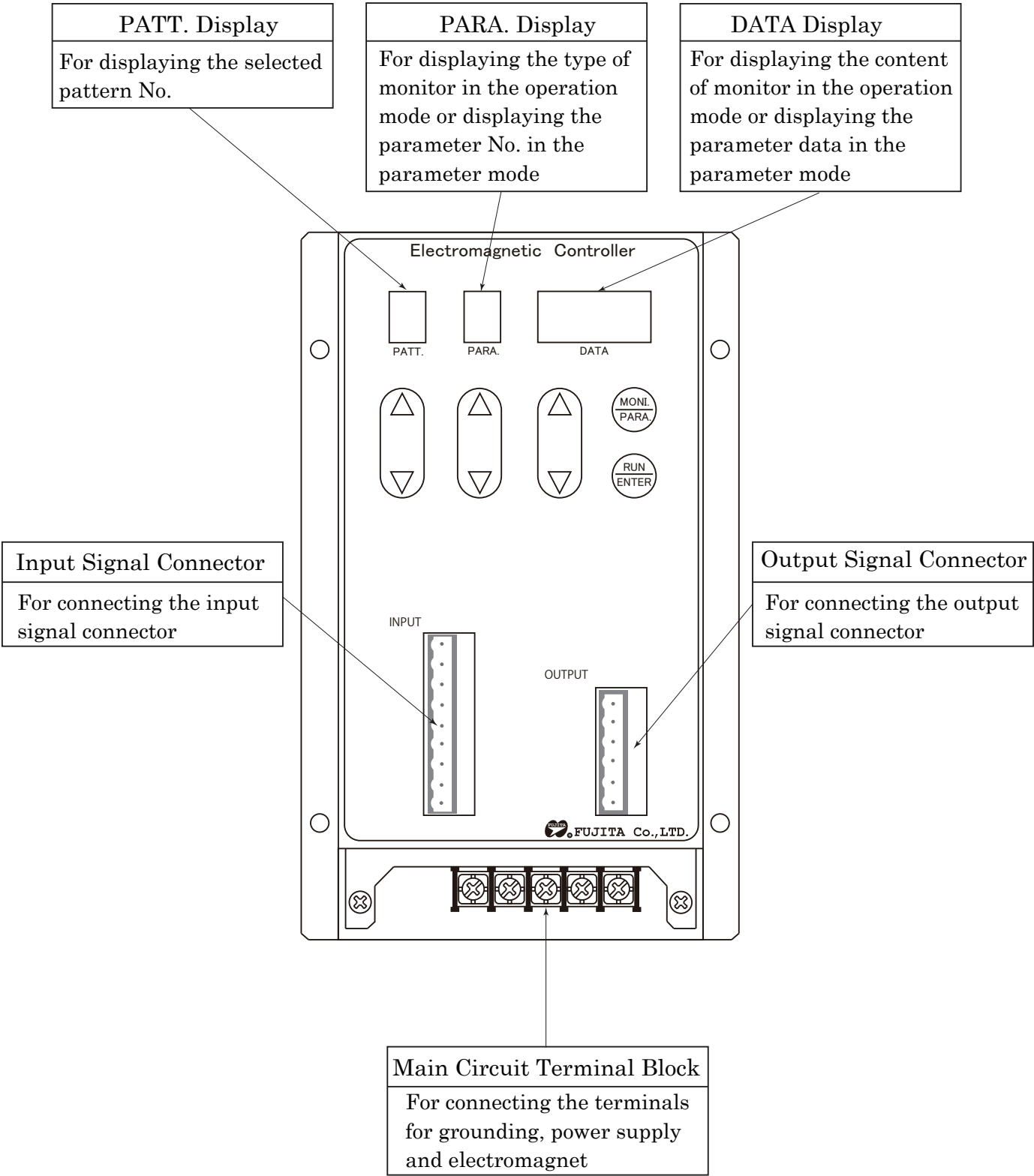
The following accessories are contained in the package.

Check to make sure that all of them are actually contained.

- ☐ Electromagnetic controller ————— 1 unit
- ☐ Input signal connector 9P ————— 1 piece  
[ Cage Clamp Connector made by WAGO: 232-109/026-000 ]
- ☐ Output signal connector 6P ————— 1 piece  
[ Cage Clamp Connector made by WAGO: 232-106/026-000 ]
- ☐ Connector wiring lever ————— 1 piece  
[ Operation lever made by WAGO: 231-131 ]
- ☐ Operation manual (this manual) ————— 1 copy

## 1-5. Names and functions of keys







### 2-1. Installation

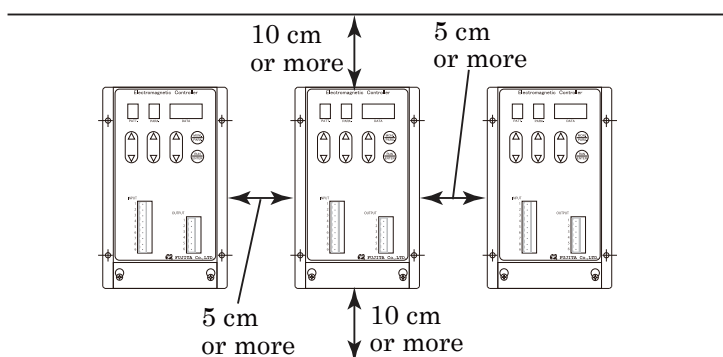
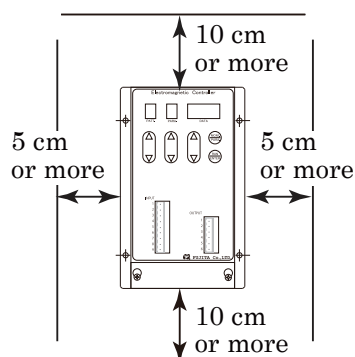
When installing this product, be sure to follow the instructions specified below.

#### WARNING

- Do not use it in a place where there is an ignition source, or an exploding or flammable material; otherwise, fire, explosion or flash off may occur.
- At the time of installation securely fix it; otherwise, dropping or unexpected motion may result in injury.
- Do not use it in a place which is exposed to water or oil drop.
- The grounding work must be Class D or higher in rating; otherwise, electric shock or malfunction may occur in case of ground leakage.
- When wiring, be sure to follow the instructions specified in the wiring instruction sheet to prevent wrong wiring; otherwise, failure or malfunction may occur.

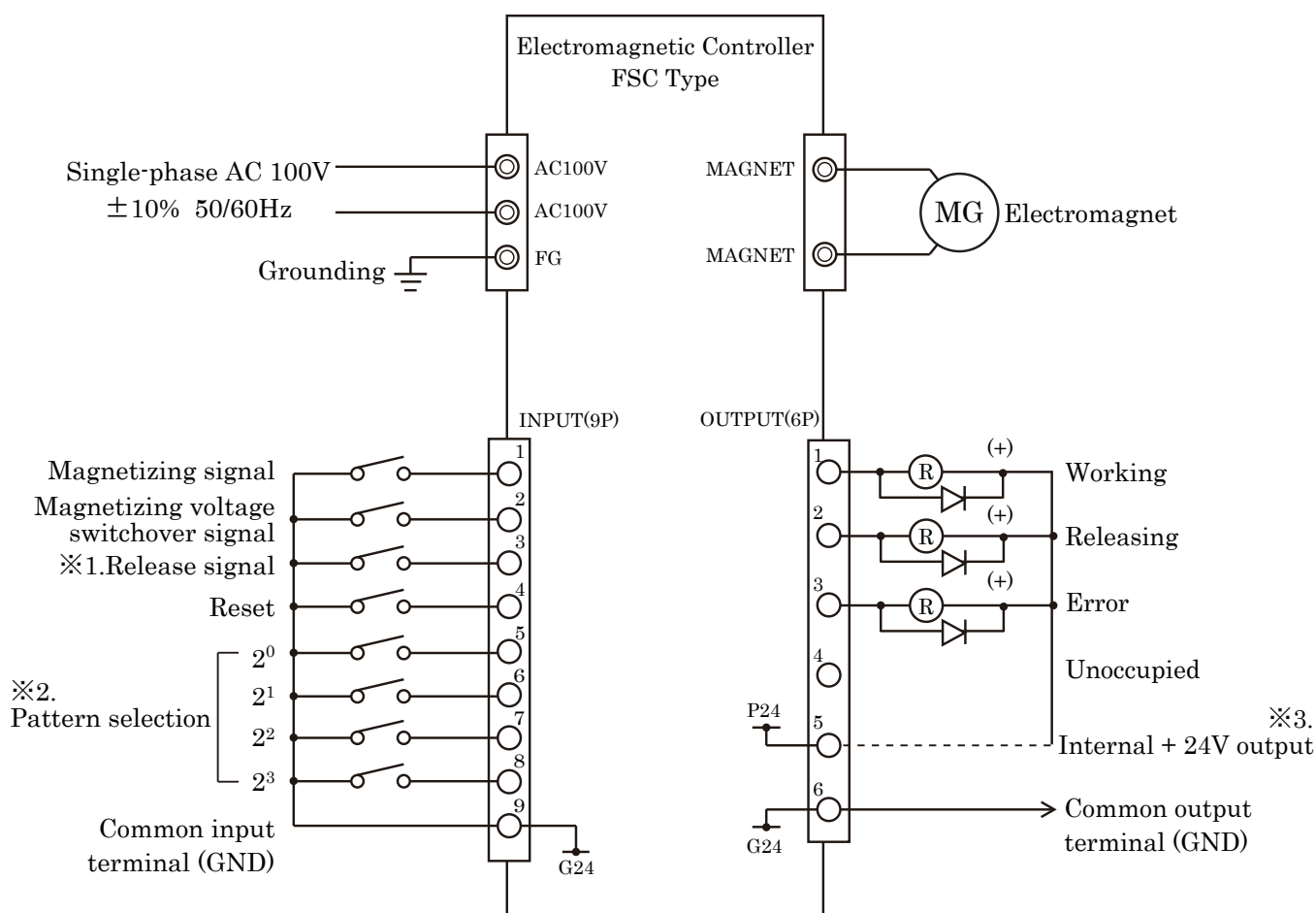
#### CAUTION

- Use this product under the following environmental conditions; otherwise, failure or abnormal motion may occur.
  1. Ambient temperature ranging from -10°C to 40°C
  2. Humidity ranging from 10% to 90%RH without dew condensation
  3. The environment must be free from corrosive gas, combustible gas, oil mist, dust, and moisture.
  4. Vibration: lower than 4.9 m/s<sup>2</sup> (vibrational frequency: less than 20 Hz) or 9.8 m/s<sup>2</sup> (less than 50 Hz)
  5. The altitude must be lower than 1,000 m.
- Install it in a well-ventilated indoor place with sufficient distances kept from other devices. In the case where two or more units are used, also keep enough space between them as shown below. The following dimensions indicate the minimum distances. A cooling fan is incorporated in the upper portion of this controller (※1), so the vertical distance from the upper surface shall be large enough (at least 10 cm) to prevent interruption of ventilation.



※1. The cooling fan monitors the temperature in this product, and automatically rotates only when the temperature exceeds a certain level. It does not always rotate.

### 2-2. Terminal Connection Diagram



#### [ ※1. Release Signal ]

For release signal receiving, you can choose between “Valid (1)” and “Invalid (0)” by setting the corresponding parameter.

For more details, refer to “4. Parameter Setting” on P. 18.

#### [ ※2. Pattern Selection ]

Ports used for pattern selection vary according to model.

For more details, refer to “2. Connection” on P. 11.

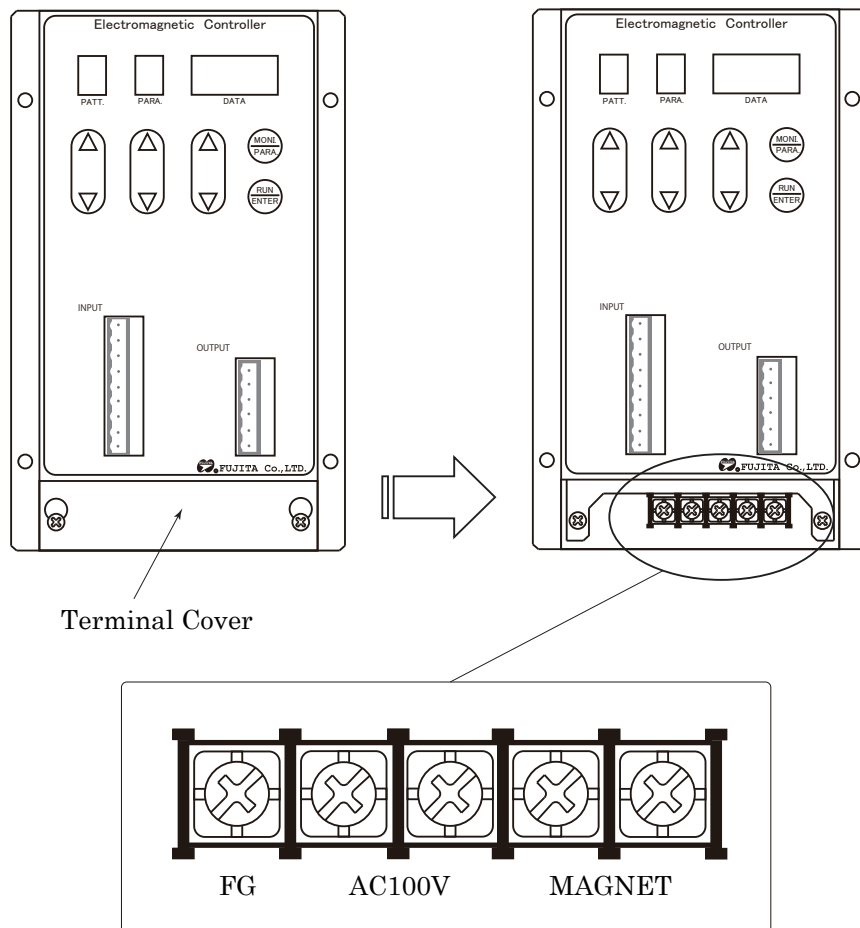
#### [ ※3. Internal + 24V output ]

When an external power source is used, do not connect the terminal No.5 (indicated by the dotted line).

### 2-3. Main circuit terminal connection

The main circuit (for power supply, electromagnet, and grounding) shall be connected as follows: The table shows the function of each terminal.

- ① Detach the terminal cover.
- ② Connect each terminal with wires.
- ③ After wiring, be sure to attach the terminal cover.

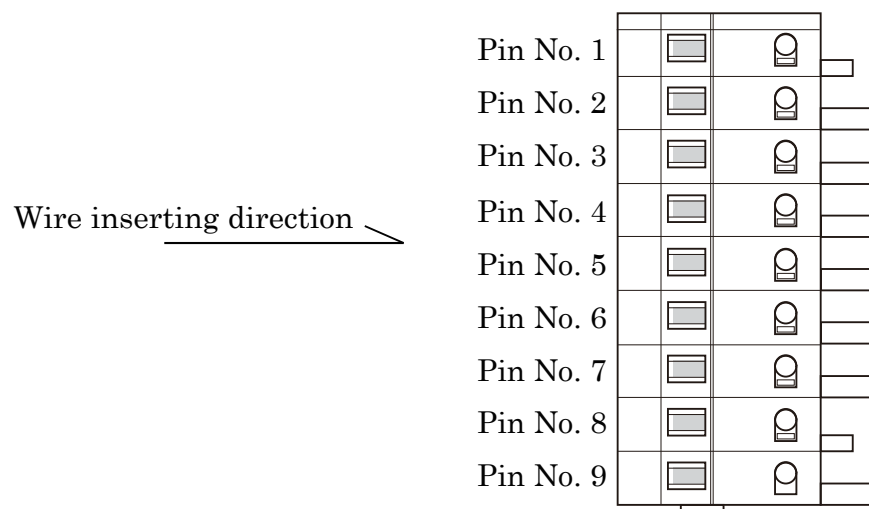


Terminal code	Terminal function
FG	Ground terminal. The Class D grounding work is required.
AC100V	Power terminal. Connect it with the single-phase AC 100 V $\pm 10\%$ (50/60 Hz).
MAGNET	Electromagnet terminal. Polarity does not matter.

### 2-4. Control signal connection

#### 2-4-1. Input signal connection

Locations and functions of individual input signal connector pins are as follows:



PIN No.	Name of terminal	Function of terminal												
1	Magnetizing signal	If this signal is input, magnetizing (attracting) motion will start. If it is shut off, the release motion can start. ※ To enable the release motion, set the parameter No.9 for selection of release signal receiving to “Valid.” The release motion will start when the release signal is input to Pin No.3. For more details, refer to “4. Parameter Setting” on P. 18.												
2	Magnetizing voltage switchover signal	If this signal is input, the current magnetizing voltage will be changed to the next magnetizing voltage. The input must be done with the pulse signal of more than 50 msec. Even if the parameter No.2 (first magnetizing time) or the parameter No.4 (second magnetizing time) has been set, priority is given to this signal. If this signal is input, the current magnetizing voltage will be forced to change to the next magnetizing voltage. For more details, refer to “4. Parameter Setting” on P. 18.												
3	Release signal	If this signal is input, the workpiece release motion will start. ※ To make this signal valid, set the parameter No.9 for selection of release signal receiving to “1” (valid). For more details, refer to “4. Parameter Setting” on P. 18.												
4	Reset	This is the error resetting signal. The input must be done with the pulse signal of more than 50 msec.												
5	Pattern selection 2 <sup>0</sup>	These are pattern selection signals. The selectable ports for individual models are as follows:												
6	Pattern selection 2 <sup>1</sup>													
7	Pattern selection 2 <sup>2</sup>													
8	Pattern selection 2 <sup>3</sup>													
		<table> <tr> <th>Model</th><th>Memorable patterns</th><th>Pattern selection ports</th></tr> <tr> <td>FSC-****-P1</td><td>1 pattern</td><td>Pin No.5 [ 2<sup>0</sup> ]</td></tr> <tr> <td>FSC-****-P7</td><td>7 patterns</td><td>Pin No.5/6/7 [ 2<sup>0</sup>/2<sup>1</sup>/2<sup>2</sup> ]</td></tr> <tr> <td>FSC-****-P15</td><td>15 patterns</td><td>Pin No.5/6/7/8 [ 2<sup>0</sup>/2<sup>1</sup>/2<sup>2</sup>/2<sup>3</sup> ]</td></tr> </table>	Model	Memorable patterns	Pattern selection ports	FSC-****-P1	1 pattern	Pin No.5 [ 2 <sup>0</sup> ]	FSC-****-P7	7 patterns	Pin No.5/6/7 [ 2 <sup>0</sup> /2 <sup>1</sup> /2 <sup>2</sup> ]	FSC-****-P15	15 patterns	Pin No.5/6/7/8 [ 2 <sup>0</sup> /2 <sup>1</sup> /2 <sup>2</sup> /2 <sup>3</sup> ]
Model	Memorable patterns	Pattern selection ports												
FSC-****-P1	1 pattern	Pin No.5 [ 2 <sup>0</sup> ]												
FSC-****-P7	7 patterns	Pin No.5/6/7 [ 2 <sup>0</sup> /2 <sup>1</sup> /2 <sup>2</sup> ]												
FSC-****-P15	15 patterns	Pin No.5/6/7/8 [ 2 <sup>0</sup> /2 <sup>1</sup> /2 <sup>2</sup> /2 <sup>3</sup> ]												
9	Common input	Common input signal (GND)												

### 2-4-2. Input signal specifications

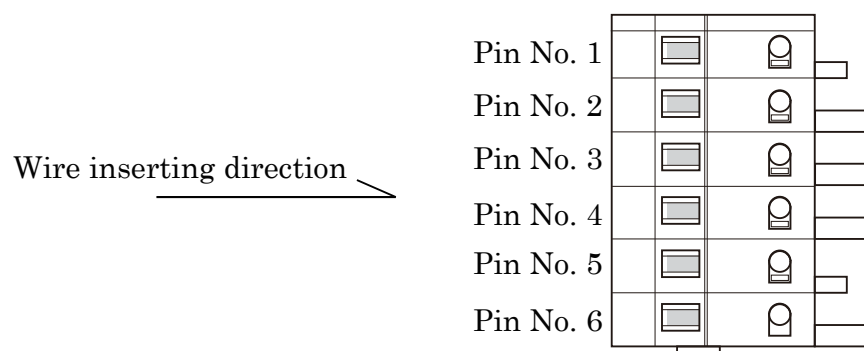
Specifications for input signals are as follows:

Type of input signal	Photo Coupler insulation type, Minus common
Input points	8 points (DC 24V, 10 mA max.)
Connector	9P connector [ Cage Clamp Connector made by WAGO: 232-109/026-000 ]
Applicable wire size	AWG 28 to 12
Internal circuit	<p>Pin No.1 to 8</p> <p>Pin No.9 Common Input (GND)</p> <p>2kΩ</p> <p>P24</p> <p>VCC</p> <p>10mA Max</p> <p>G24</p>

## 2. Connection

### 2-4-3. Output signal connection

Locations and functions of individual output signal connector pins are as follows:



PIN No.	Name of terminal	Function of terminal
1	Working	The signal is output during workpiece attracting or releasing motion.
2	Releasing	The signal is output during workpiece releasing motion.
3	Error	The signal is output when an error is detected.
4	Unoccupied	Do not connect this terminal.
5	Internal + 24V output	Internal power supply + 24V output port ※When an external power source is used, do not connect this terminal.
6	Common output	Common output signal (GND)


2-4-4. Output signal specifications

Specifications for output signals are as follows:

Signal configuration	Photo Coupler insulation type, When External power supply is used: Minus common When Internal power supply is used: Plus common
Output points	4 points (Open collector type: DC 24V, 40 mA max. for attracting)
Connector	6P connector [ Cage Clamp Connector made by WAGO: 232-106/026-000 ]
Applicable wire size	AWG 28 to 12
Acceptable load	Internal 24V power supply: Max. output of 250 mA External 24V power supply: DC 22 to 27 V
Internal circuit	<p>The diagram illustrates the internal circuit of the device. A vertical dashed line separates the internal components from the external connections. On the left, Pin No.5 is labeled 'Internal Power + 24V output', Pin No.1 to 4 are labeled '40mA Max', and Pin No.6 is labeled 'Common Output (GND)'. On the right, the circuit includes a photo coupler with its input connected to Pin No.5 and its output connected to a transistor. The transistor's emitter is connected to Pin No.6 (GND) and is also labeled 'G24'. The transistor's collector is connected to Pin No.1 to 4 and is also labeled 'P24'. A VCC supply is connected to the collector of the transistor. The photo coupler's output is also connected to a diode, which is connected to Pin No.5 and is also labeled 'P24'.</p>

## 2-5. Wiring connection of I/O signal connectors

Wires for input and output signal connectors shall be connected as follows.

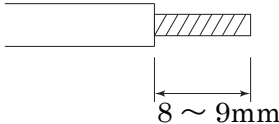


Precautions for Wiring

For wiring a spring-type connector, follow the instructions specified below; otherwise, electric shock, short circuit, wire break, or product damage could occur.

- Cut the end of each wire to the specified dimension shown below.
- Avoid “beard wires” at the end of strand wires.
- Do not apply solder plating to the end of wire.
- Do not connect any wire which size is not within the specified size.
- Fix wires properly to prevent the connector or wire contact portions from becoming stressed.

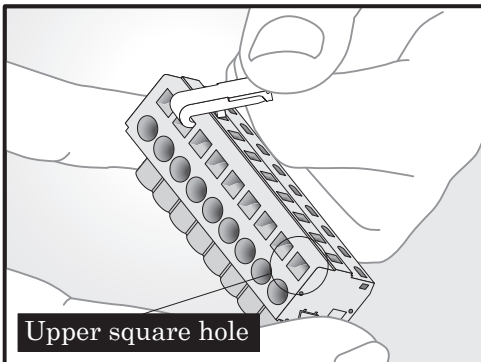
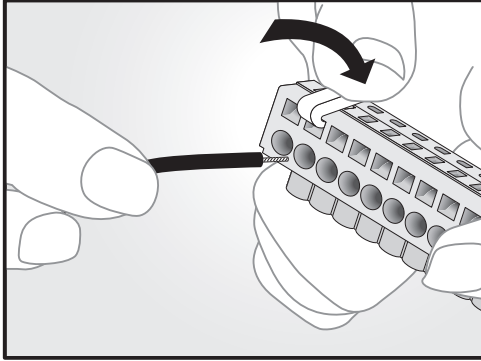
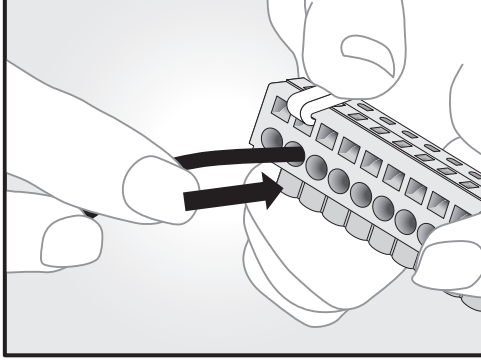
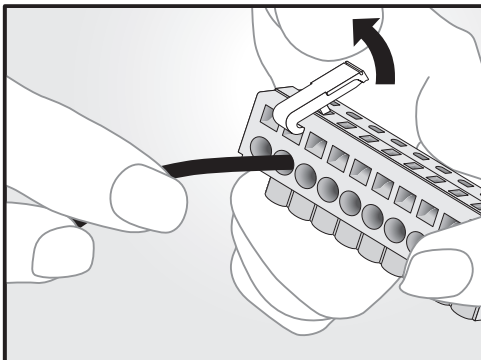
[ Applicable wire size and cut end dimension ]

Applicable wire size	Cut end dimension
For both input and output, AWG 28 to 12 Max. outer diameter of wire cover: $\phi 4.1$	 8 ~ 9mm

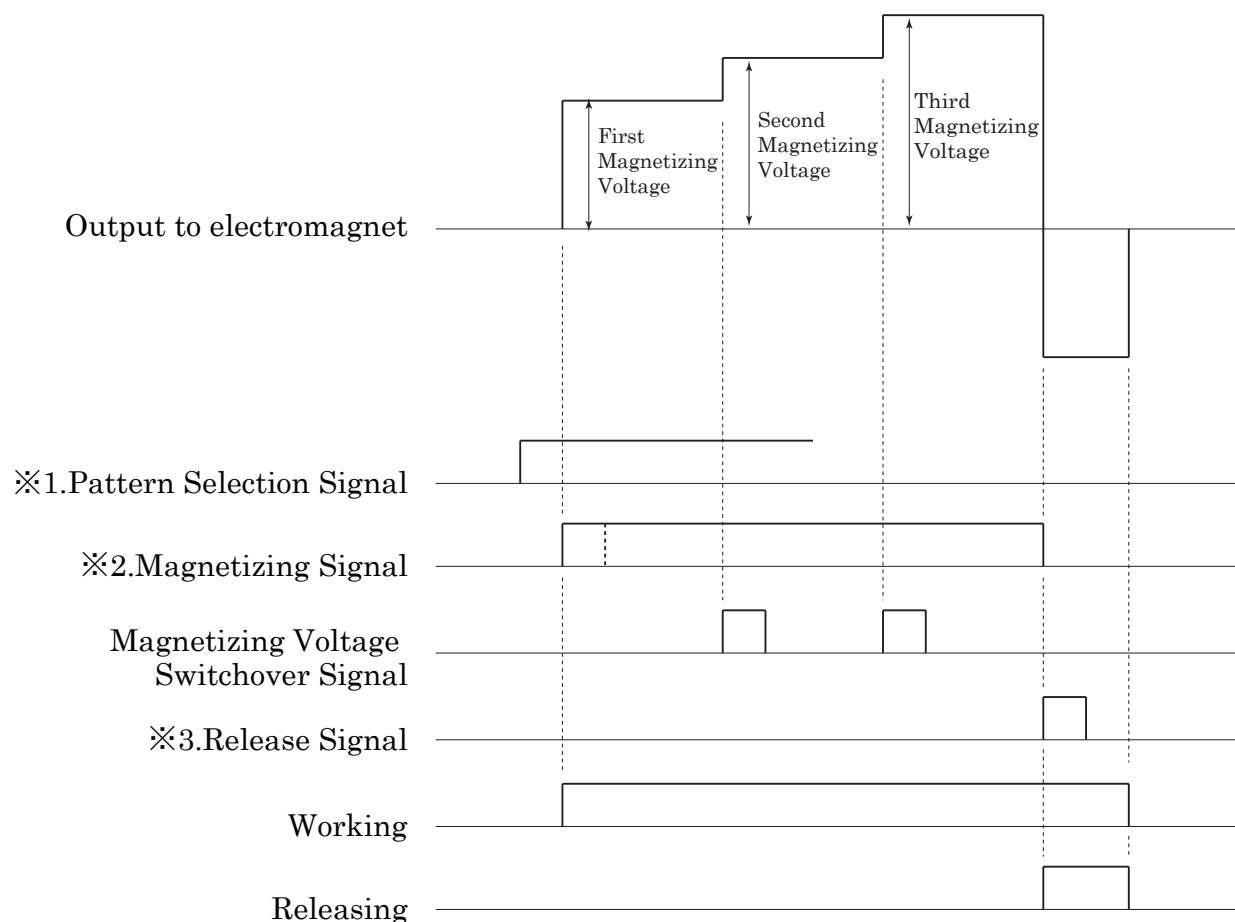


### [ Wiring connection procedure ]

When the connector wiring lever (accessory) is used for wiring, follow the procedure for wiring connection specified below.

 <p>Upper square hole</p>	<p>①Put the wiring lever into the upper square hole.</p>
	<p>②Push the wiring lever down by the finger.</p>
	<p>③Insert the wire into the round hole to the end, while keep pressing the wiring lever.</p>
	<p>④Then, release the wiring lever for automatic connection. For checking the connection, lightly pull the wire. (Do not pull it strongly.)</p>
<p>⑤After completing the wiring of connector, securely insert the connector into the connector port (Input or Output) of the controller. The connector can be inserted in only one direction.</p>	

The following time chart diagram indicates the relation between the output to electromagnet and the I/O signals.



#### [ ※1. Pattern Selection Signal ]

Keep the pattern selection signals ( $2^0$  to  $2^3$ ) until the Magnetizing signal is input and the Working output signal is switched on. The pattern selection signals cannot be switched over during working.

Ports used for pattern selection vary according to model.

For more details, refer to “2. Connection” on P. 11.

#### [ ※2. Magnetizing Signal ]

When the parameter No.9 for selection of the release signal receiving is set to “0” (invalid), set the magnetizing signal to the level signal until the start of release motion. When the parameter No.9 for selection of the release signal receiving is set to “1” (valid), input it with the level signal until the start of release motion or use the pulse signal of more than 50 msec.

For more details, refer to “4. Parameter Setting” on P. 18.

#### [ ※3. Release Signal ]

Receiving the release signal is valid only if the parameter No.9 “Selection of Release Signal Receiving” is set to “1” (valid).

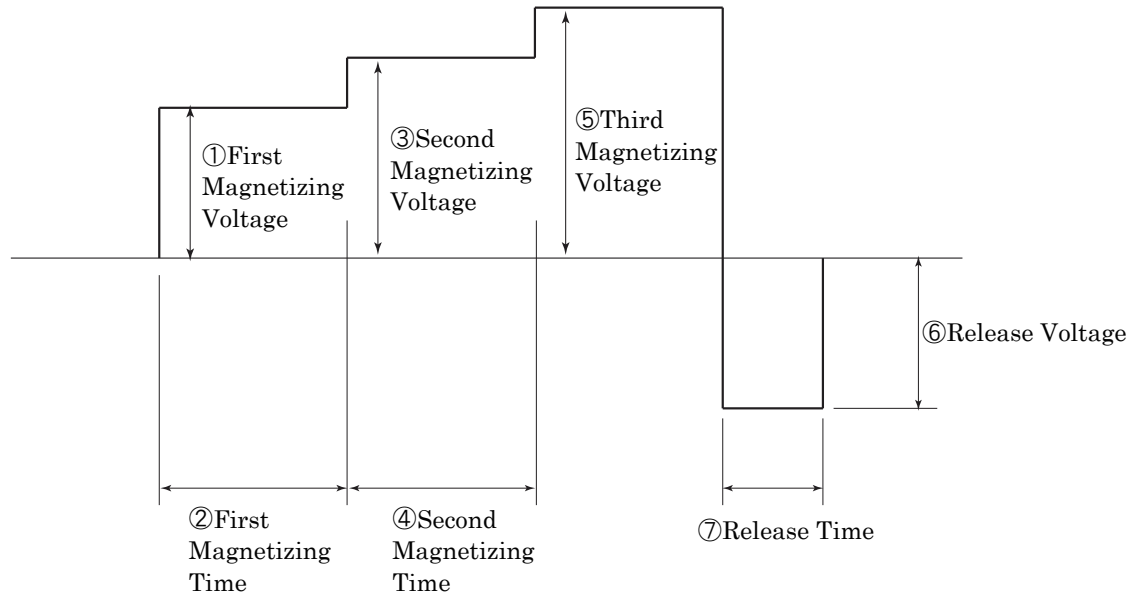
For more details, refer to “4. Parameter Setting” on P. 18.

## 4-1. Contents of parameters

Before using the electromagnetic controller, you need to set parameters.

The parameter items and setting range for each pattern are shown in the table below.

If you use two or more patterns, you have to set the parameters for those patterns to be used. At the time of delivery of this product, all parameters are set to “0.”



Parameter No.	Item	Setting range	Unit
1	First Magnetizing Voltage	0.0 to 99.9	%
2	First Magnetizing Time	0.0 to 99.9	sec
3	Second Magnetizing Voltage	0.0 to 99.9	%
4	Second Magnetizing Time	0.0 to 99.9	sec
5	Third Magnetizing Voltage	0.0 to 99.9	%
6	Release Voltage	0.0 to 99.9	%
7	Release Time	0.0 to 9.99	sec
8	Selection of Release Method	0: Ordinary reverse excitation 1: Reverse excitation attenuation 2: Alternate attenuation: 3 times 3: Alternate attenuation: 5 times	
9	Selection of Release Signal Receiving	0: Release signal receiving: “Invalid” 1: Release signal receiving: “Valid”	

## 4-2. Description of parameters

### ■ First magnetizing voltage

Parameter No.	Setting range	Unit
1	0.0 to 99.9	%

Set the first magnetizing voltage as follows.

The unit for setting is “%.” The setting value of “99.9%” will result in DC 24V output for the DC 24V type, and DC 90V output for the DC 90V type.

### ■ First magnetizing time

Parameter No.	Setting range	Unit
2	0.0 to 99.9	sec

Set the first magnetizing time as follows.

By using “second” as the unit for setting, set the first magnetizing time. After the set time passed, the second magnetizing voltage is applied.

If the set value is “0,” the second magnetizing voltage will not be activated. In that case, when the magnetizing voltage switchover signal (input signal) is input, the second magnetizing voltage will be activated according to that input signal.

If the magnetizing voltage switchover signal (input signal) is input within the set time, the priority will be given to the magnetizing voltage switchover signal, so the second magnetizing voltage will be activated according to that input signal.

### ■ Second magnetizing voltage

Parameter No.	Setting range	Unit
3	0.0 to 99.9	%

Set the second magnetizing voltage as follows.

The unit for setting is “%.” The setting value of “99.9%” will result in DC 24V output for the DC 24V type, and DC 90V output for the DC 90V type.

### ■ Second magnetizing time

Parameter No.	Setting range	Unit
4	0.0 to 99.9	sec

Set the second magnetizing time as follows.

By using “second” as the unit for setting, set the second magnetizing time. After the set time passed, the third magnetizing voltage is applied.

If the set value is “0,” the third magnetizing voltage will not be activated. In that case, when the magnetizing voltage switchover signal (input signal) is input, the third magnetizing voltage will be activated according to that input signal.

If the magnetizing voltage switchover signal (input signal) is input within the set time, the priority will be given to the magnetizing voltage switchover signal, so the third magnetizing voltage will be activated according to that input signal.

### ■ Third magnetizing voltage

Parameter No.	Setting range	Unit
5	0.0 to 99.9	%

Set the third magnetizing voltage as follows.

The unit for setting is “%.” The setting value of “99.9%” will result in DC 24V output for the DC 24V type, and DC 90V output for the DC 90V type.

### ■ Release voltage

Parameter No.	Setting range	Unit
6	0.0 to 99.9	%

Set the release voltage as follows.

The unit for setting is “%.” The setting value of “99.9%” will result in DC 24V output for the DC 24V type, and DC 90V output for the DC 90V type.

Also, if the parameter No.8 for selection of release method is set to “2”

(alternate attenuation: 3 times) or “3” (alternate attenuation: 5 times), the release voltage will be the first alternation voltage. For the second or later alternation, no voltage needs to be set.

### ■ Release time

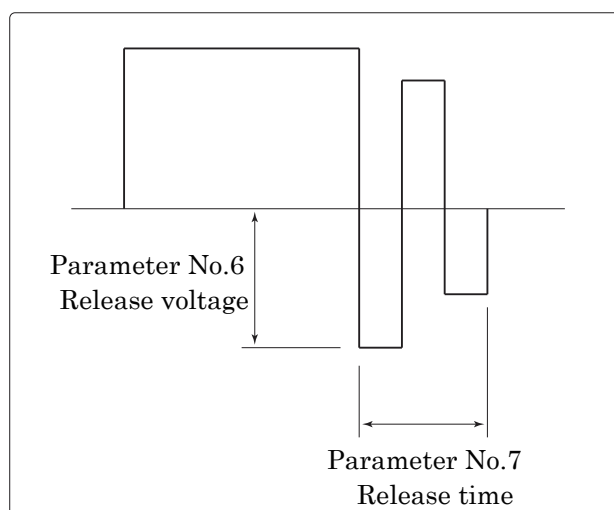
Parameter No.	Setting range	Unit
7	0.0 to 9.99	sec

Set the release time as follows.

By using “second” as the unit for setting, set the release time. After the set time passed, the release motion is finished.

If the parameter No.8 for selection of release method is set to “2”

(alternate attenuation: 3 times) or “3” (alternate attenuation: 5 times), alternate attenuation will be performed three times or five times within the set time, and then, the release motion will be finished.



## ■ Selection of release method

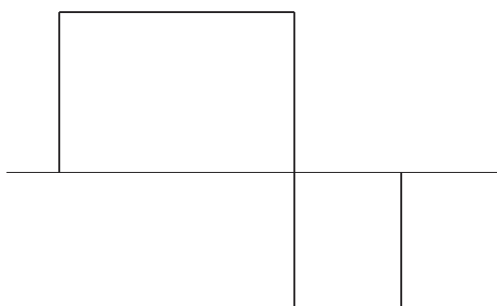
Parameter No.	Setting range	Unit
8	0: Ordinary reverse excitation 1: Reverse excitation attenuation 2: Alternate attenuation: 3 times 3: Alternate attenuation: 5 times	

Select the release method. Usually, set it to “0” (ordinary reverse excitation).

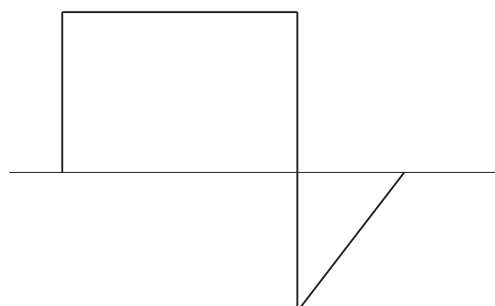
For workpiece release, change the release method according to the electromagnet used and the workpiece specifications (material, magnetic attraction area, etc.).

The release motions corresponding to the setting values “0” to “3” are as follows.

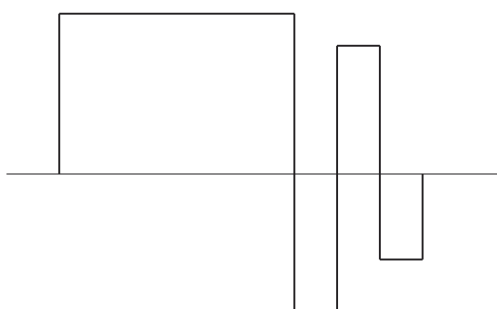
[ Setting value = 0: Ordinary reverse excitation ]



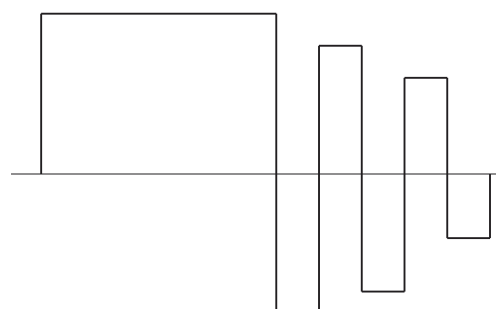
[ Setting value = 1: Reverse excitation attenuation ]



[ Setting value = 2: Alternate attenuation: 3 times ]



[ Setting value = 3: Alternate attenuation: 5 times ]



## ■ Selection of release signal receiving

Parameter No.	Setting range	Unit
9	0: Release signal receiving: “Invalid” 1: Release signal receiving: “Valid”	

Set the release signal receiving status to “invalid” or “valid.” At the time of delivery, it is set to “0” (Release signal receiving: “Invalid” ). When it is set to “0,” the release signal cannot be received. In that case, when the magnetizing signal is switched off, the release motion will start.

If it is set to “1” (Release signal receiving: “Valid” ), the release signal is receivable. In that case, when the release signal is switched on, the release motion will start.

## 4-3. Parameter setting procedure

Set the parameters according to the following procedure.

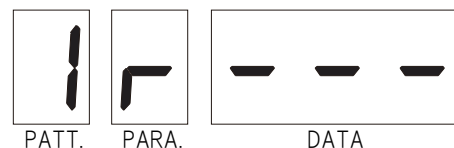
### 01 Turn on power.

Do not touch any key until the three items are displayed as shown in the right-hand figure.

At the time of power-on, the DATA display changes as follows: 3 → 2 → 1. And then, it is displayed as shown in the figure.

If the pattern selection signal has been input at the time of power-on, the selected pattern No. is displayed.

If the parameter setting is done after power-on, go to the step 02.




### 02 Keep pressing the key for three seconds or longer.


Then, the parameter mode is available. The data (the current setting value) on the parameter No.1 (First magnetizing voltage) is displayed in the DATA window. At this time, only the DATA display flashes.

※ During working in the operation mode, you cannot go to the parameter mode. To enable the parameter mode, set the operation mode to the Waiting status.



### 03 Select the pattern No. that needs to be changed by using the key located under the PATT.

When the  is pressed, the pattern No. will change as follows: 1.2.3... E.F → 1.2...

When the  is pressed, the pattern No. will change as follows: 1.F.E... 2.1 → F.E...

In the parameter mode, the priority is given to the key operation even if the pattern selection signal has been input.

The right-hand figure indicates the case where the pattern No.10 is selected.

The table shown below indicates the codes to be displayed in the PATT window corresponding to individual pattern numbers.

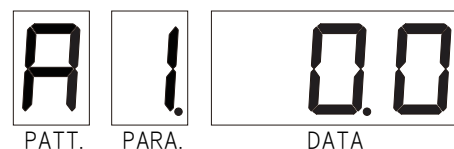
Pattern No.	1 to 9	10	11	12	13	14	15
Displayed code	1 to 9	A	B	C	D	E	F



The selectable pattern numbers differ according to the model.


FSC-\*\*\*\*-P1 ... 1 pattern


FSC-\*\*\*\*-P7 ... 7 patterns


FSC-\*\*\*\*-P15 ... 15 patterns



**04** Select the parameter No. that needs to be changed by using the   key located under the PARA.

When the  is pressed, the parameter No. will change as follows: 1.2.3... 8.9 → 1.2...



When the  is pressed, the parameter No. will change as follows: 1.9.8... 2.1 → 9.8...


Also, by using the  key, the parameter No. can be increased one by one.

The currently stored data corresponding to the selected parameter No. is displayed in the DATA window.


The right-hand figure indicates the case where the parameter No.6 (release voltage) is selected.



**05** Set the value by using the   key located under the DATA.

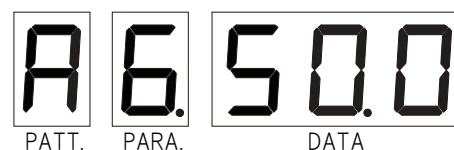
If the  is continuously pressed, the value will increase from “low speed” to “high speed” and stop at the upper limit of the setting range.

If you release the key once and then press it again, the value will return to “0.” And continuous pressing increases the value again.

If the  is continuously pressed, the value will decrease from “low speed” to “high speed” and stop at the lower limit of the setting range.

If you release the key once and then press it again, the value will return to the upper limit of the setting range. And continuous pressing decreases the value again.

The right-hand figure indicates the case where the parameter No.6 (release voltage) is set to 50.0.






**06** Press  key once.

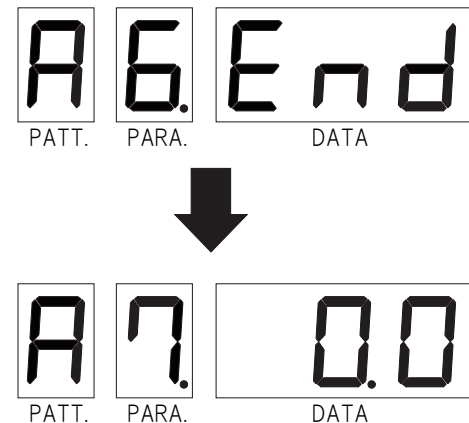
Then, “End” is displayed in the DATA window, and the set data is saved.

And the parameter No. will go up. If the parameter is set to No.9 (release signal receiving selection), the parameter will return to No.1 (first magnetizing voltage).


※ If the set value is the same with the currently stored data, “End” will not be displayed, and the parameter No. will just go up.

※ If the  key is continuously pressed

for more than three seconds, the setting mode will be shifted to the operation mode. Therefore, perform the key operation within three seconds.



**07** For other parameters, set them in accordance with the procedures specified in **03** through **06**.

**08** After setting the parameters, keep pressing  key for more than three seconds.

Then, the setting mode will be shifted to the operation mode (RUN mode). At that time, if a pattern selection signal has been input, the pattern No. selected with the pattern selection signal is displayed.

※ Before transition to the operation mode, check to make sure that the data has been properly set.



Thus, the parameter setting is completed.

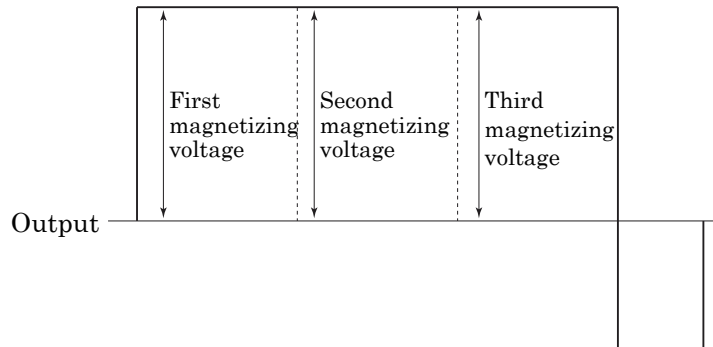
## 4-4. Examples of parameter setting

The following are some examples of parameter setting.

They are just examples, so please adjust the parameters according to the electromagnet(s), workpiece specifications, and equipment specifications that will be actually used or applied.

### Single workpiece pick-up, transfer and release

This is an example of magnetically attracting, transferring a single workpiece placed in a fixed position, and releasing it in a predetermined position one by one:



Parameter No.	Item	Set value
1	First Magnetizing Voltage	99.9%
2	First Magnetizing Time	0sec
3	Second Magnetizing Voltage	99.9%
4	Second Magnetizing Time	0sec
5	Third Magnetizing Voltage	99.9%
6	Release Voltage	Adjust
7	Release Time	0.2sec
8	Selection of Release Method	0
9	Selection of Release Signal Receiving	Optional

#### Point 1

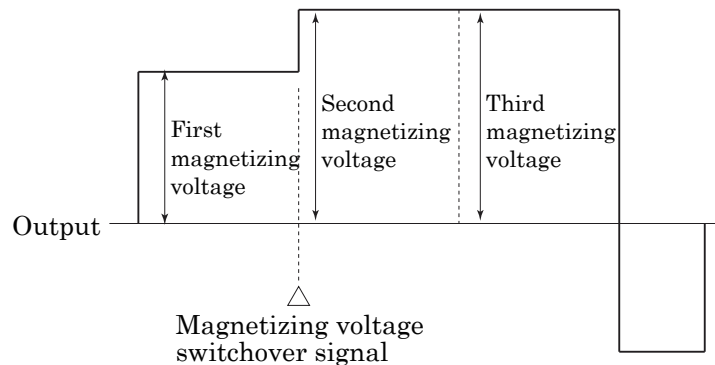
Magnetically pick-up and transfer of a workpiece is possible only by setting the first magnetizing voltage. If the magnetizing voltage switchover signal is input, however, the next magnetizing voltage will be activated according to that input signal. Therefore, it is recommended to set the first to third magnetizing voltages to the same value for the sake of safety.

#### Point 2

The workpiece release conditions may greatly vary according to the electromagnet to be used and the workpiece specification to be applied. Therefore, it is recommended to temporarily set the release time to 0.2 second, and then adjust the release voltage.

## One-by-one sheet /piece pick-up and transfer

This is an example of picking up and transferring a sheet of stacked thin plates or a piece of workpieces randomly placed in a mesh box pallet:



Parameter No.	Item	Set value
1	First Magnetizing Voltage	Adjust
2	First Magnetizing Time	0 sec or Adjust
3	Second Magnetizing Voltage	99.9%
4	Second Magnetizing Time	0sec
5	Third Magnetizing Voltage	99.9%
6	Release Voltage	Adjust
7	Release Time	0.2sec
8	Selection of Release Method	0
9	Selection of Release Signal Receiving	Optional

### Point 1

Set the first magnetizing voltage to the value that allows a single sheet or a single workpiece to be picked up.

### Point 2

Since the first magnetizing voltage is only for magnetically attracting a single sheet or piece, it may lead to misalignment or drop of the workpiece during transfer. Therefore, it is recommended to set the second and third magnetizing voltage to 99.9% (strong magnetic attraction).

### Point 3

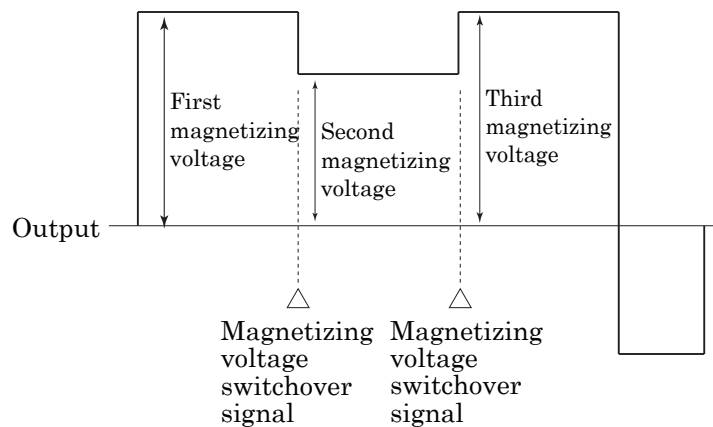
In transition from the first to the second magnetizing voltage, the magnetizing voltage switchover signal shall be input when the picked workpiece is moved away from other workpieces (e.g. upper end of the lift). Or, set the time that allows it to be distant from other workpieces.

### Point 4

The workpiece release conditions may greatly vary according to the electromagnet to be used and the workpiece specification to be applied. Therefore, it is recommended to temporarily set the release time to 0.2 second and then adjust the release voltage.

### Bulk parts pick-up and transfer

This is an example of magnetically attracting and transferring screws, bolts and other small parts in bulk:



Parameter No.	Item	Set value
1	First Magnetizing Voltage	99.9%
2	First Magnetizing Time	0 sec or Adjust
3	Second Magnetizing Voltage	Adjust
4	Second Magnetizing Time	0 sec or Adjust
5	Third Magnetizing Voltage	99.9%
6	Release Voltage	Adjust
7	Release Time	0.2sec
8	Selection of Release Method	0
9	Selection of Release Signal Receiving	Optional

#### Point 1

With the use of the first magnetizing voltage, workpieces are picked up. To release unstably attracted workpieces, the first voltage is switched to the second magnetizing voltage when they are slightly lifted.

After the unstably attracted workpieces have been released, the second magnetizing voltage is switched to the third magnetizing voltage (stronger magnetic attraction) to transfer the stably held workpieces.

#### Point 2

For switchovers from the first to second magnetizing voltage and from the second to third magnetizing voltage, input the magnetizing voltage switchover signal or set the switchover time.

#### Point 3

The workpiece release conditions may greatly vary according to the electromagnet to be used and the workpiece specification to be applied. Therefore, it is recommended to temporarily set the release time to 0.2 second, and then adjust the release voltage.

### 5-1. How to operate

#### [ Operation procedure ]


The operation procedure is as follows:

- ① Install and wire up the controller.
- ② Set the parameters. (Refer to “4. Parameter Setting” on P. 18.)  
※ Unless the parameters are set, voltage could not be output to the electromagnet.
- ③ Switch the parameter setting mode to the operation mode.
- ④ Select the pattern No. to be used for controlling the system with input signals, such as magnetizing signal. (For the output motions, refer to “3. Output Time Chart” on P. 17.)

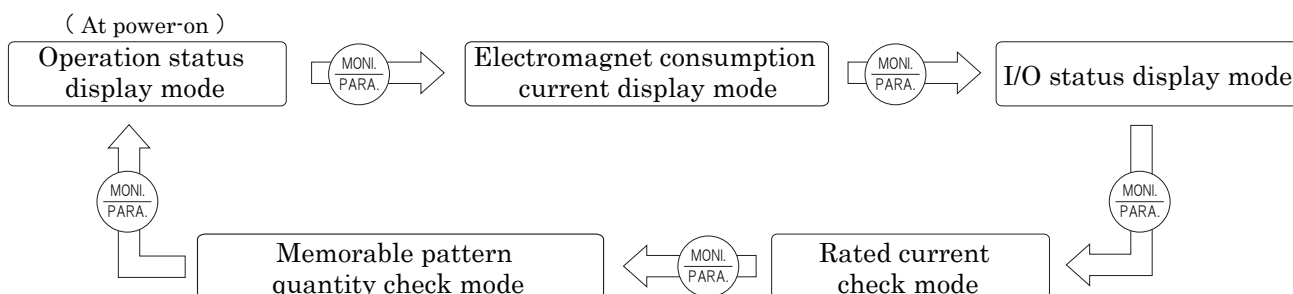
※ When power is turned on, the controller is in the operation mode.  
If the installation, wiring, and parameter setting have been finished, only the step ④ is required.

## 5-2. Monitoring function

In the operation mode, the following five monitoring functions can be switched over.

By pressing  key, the current monitor display can be shifted to other monitor displays.

When power is turned on, the controller is in the operation status display mode.



### Operation status display mode

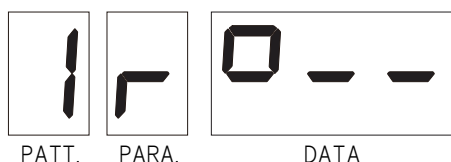
When power is turned on, the controller is in this model.

You can check the ongoing operational status of voltage output (magnetizing or release voltage). The operational status is displayed in the DATA window.

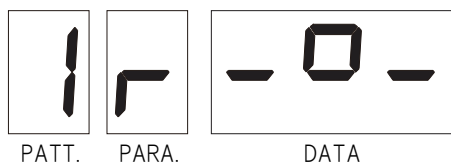
In this mode, each window is displayed as shown below.



- **Waiting for magnetizing signal**  
This display is maintained until a magnetizing signal is input.  
In the PATT. (pattern No.) window, the selected pattern No. is displayed.



- **During output of the first magnetizing voltage**  
This display is maintained during output of the first magnetizing voltage.



- **During output of the second magnetizing voltage**  
This display is maintained during output of the second magnetizing voltage.



- **During output of the third magnetizing voltage**  
This display is maintained during output of the third magnetizing voltage.



- **During output of the release voltage**  
This display is maintained during output of the release voltage.

## Electromagnet consumption current display mode

In this mode, you can check the electromagnet consumption current during magnetizing pick-up.

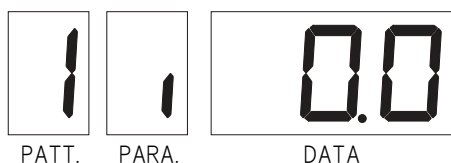
The consumption current is displayed in the DATA window, ranging from 0.1A.

※ The accuracy of the displayed electromagnet consumption current is  $\pm 0.1A$ .

If the rated current of electromagnet connected is less than 0.1A, an incorrect value may be displayed.

Also, electromagnet consumption current during releasing is not displayed.

In this mode, each window is displayed as shown below.



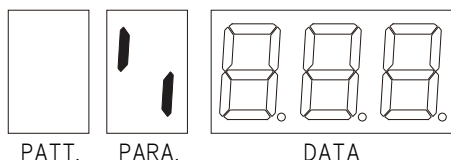
■ The left-hand figure indicates the case of “during waiting” or “during releasing.” During magnetizing pick-up, the consumption current in the electromagnet connected is displayed in the DATA window.

## I/O status display mode

In this mode, you can check the status of input or output signal.

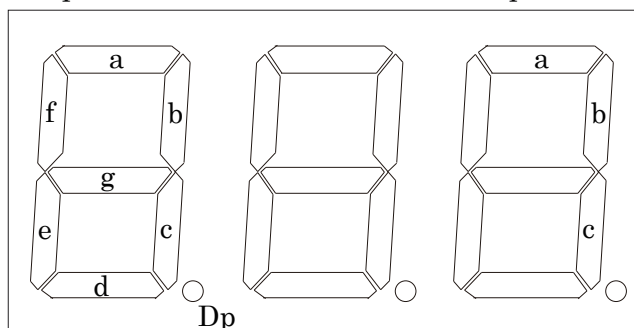
The input or output signal status is displayed in the DATA window, with the input status indicated on the left end and the output status on the right end in the three-digit display window.

In this mode, each window is displayed as shown below.



Input status

Output status



Input status		Output status	
Displayed code	Signal item	Displayed code	Signal item
a	Magnetizing signal	a	Working
b	Magnetizing voltage switchover signal	b	Releasing
c	Release signal	c	Error
d	Reset		
e	Pattern selection $2^0$		
f	Pattern selection $2^1$		
g	Pattern selection $2^2$		
Dp	Pattern selection $2^3$		

### Rated current check mode

In this mode, you can check the rated output current for your model.  
This is only for checking, and you cannot change it.  
The rated output current for your model is displayed in the DATA window.

In this mode, each window is displayed as shown below.



■ The left-hand figure indicates the case of using the model FSC-\*\*05-\*\* (5A).

### Memorable pattern quantity check mode

In this mode, you can check the number of memorable patterns for your model.  
This is only for checking, and you cannot change it.  
The number of memorable patterns for your model is displayed in the DATA window.

In this mode, each window is displayed as shown below.



■ The left-hand figure indicates the case of using the model FSC-\*\*\*\*-P15 (15P).



### CAUTION

If the controller's protection function (alarm) is activated, completely remove the cause before use; otherwise, unexpected motion may cause damage or burnout of inner parts.

If any failure is detected, the electromagnet output will be shutoff, and an error signal (output signal) will be provided.

And the corresponding error No. will be displayed in the DATA window.

The error numbers and items are defined as follows:

Error No.	Error item	Description
Er1	Overcurrent	<p>An instantaneous overcurrent has flown.</p> <ul style="list-style-type: none"> <li>· Check for loose connection of wires and the insulated conditions.</li> <li>· Check the electromagnet connected.</li> </ul>
Er2	Overload	<p>A higher current than the rated current capacity has flown for more than specified time.</p> <ul style="list-style-type: none"> <li>· Check for loose connection of wires and the insulated conditions.</li> <li>· Check the electromagnet connected.</li> </ul>
Er3	Grounding Fault	<p>The grounding fault has occurred.</p> <ul style="list-style-type: none"> <li>· Check the wires and the insulated conditions.</li> <li>· Check the electromagnet connected.</li> </ul>
Er4	Radiation Fin Overheat	<p>The radiation fin temperature has exceeded the overheating temperature.</p> <ul style="list-style-type: none"> <li>· Check to make sure that the cooling fan incorporated in the upper portion of the electromagnetic controller properly works.</li> <li>· Check to make sure that the ambient temperature is within the specified temperature range.</li> </ul>
Er5	Main Circuit Undervoltage	<p>The main circuit's voltage has decreased to an insufficient level during operation.</p> <ul style="list-style-type: none"> <li>· Check the primary power voltage.</li> </ul> <p>※ The main circuit undervoltage is not detected during waiting for operations.</p>

### ■ Resetting method

For resetting the system, input the reset signal (input signal) or turn on power again.

For the reset signal (input signal), use the pulse signal of more than 50 msec.

### Warranty Period and Coverage

If this product should break down due to our fault within the warranty period indicated below, the defective product can be repaired free of charge. However, if on-site repair is required domestically or abroad, the actual cost shall be borne by the customer.

In any event we will not assume the responsibility for doing on-site readjustment or trial operation after replacement.

#### [ Warranty Period ]

The warranty period of this product is 12 months (one year) after the date of delivery.

#### [ Coverage ]

- (1) The warranty coverage is limited to the main body of the electromagnetic controller.
- (2) The product warranty remains valid provided the product was properly installed and used under the environmental and use conditions stipulated in this manual and the cautions labels attached to the product, with the specified instructions strictly followed.
- (3) A product will not be warranted in the following situations even within the warranty period, and the relevant repair cost will be borne by the customer:
  - ① The product has been subjected to improper storage or handling, misuse, or abuse on the customer side, whether by accident or other cause.
  - ② The product has been modified or reworked without our consent.
  - ③ The product was damaged due to external accidental forces, such as fire and abnormal voltage, or resulting from natural disasters (such as earthquake, lightning, flood, typhoon, etc.).
  - ④ The product was damaged due to the unexpected failure that had not been predicted based on the technological level at the time of delivery.
  - ⑤ The product has been used for other purposes than the electromagnetic control.
  - ⑥ The product was damaged or broken due to a cause which we or the customer does not regard as the manufacturer's fault.

## 8. Parameter Setting Memo

FUJITA Co.,LTD.

· Please copy and use this sheet for daily operation.

Parameter No.	Item	Setting range	Unit	Set value
1	First Magnetizing Voltage	0.0 to 99.9	%	
2	First Magnetizing Time	0.0 to 99.9	sec	
3	Second Magnetizing Voltage	0.0 to 99.9	%	
4	Second Magnetizing Time	0.0 to 99.9	sec	
5	Third Magnetizing Voltage	0.0 to 99.9	%	
6	Release Voltage	0.0 to 99.9	%	
7	Release Time	0.0 to 9.99	sec	
8	Selection of Release Method	0: Ordinary reverse excitation 1: Reverse excitation attenuation 2: Alternate attenuation: 3 times 3: Alternate attenuation: 5 times		
9	Selection of Release Signal Receiving	0: Release signal receiving: "Invalid" 1: Release signal receiving: "Valid"		



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