

ELECTROMAGNETIC CONTROLLER

MODEL : FSCG

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.



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Safety Precautions (for safe use)

For safe use of the electromagnetic controller (hereinafter referred to as “the product”), be sure to read these “Safety Precautions” and Operation Manual packaged with the product before installation, operation, maintenance and inspection of it.

In this manual, the safety precautions are classified into “WARNING” and “CAUTION”.

 WARNING	Mishandling may cause hazardous situations resulting in death or serious injury.
 CAUTION	Mishandling may cause hazardous situations resulting in moderate disability, minor injury or property damage.

Even if an instruction is classified as “CAUTION”, failure to observe may lead to serious results, depending on the situation.

Since all the instructions are important, be sure to observe them.

Keep the Instruction Manual in a safe place for easy reference when necessary.

Be sure to deliver the Operation Manual to a final owner who use the product.

WARNING

General

■ Do not use the product for the following:

1. Medical devices concerning sustaining and control of human life and body;
2. Machinery and equipment for transfer and transportation of persons;
3. Important stocked parts for machinery.

Note that the product is not designed for purposes requiring high-level safety.

■ Do not use the product out of specified range. Failure to observe this may cause malfunction or damage of the product.

Installation

- Do not use the product in a place where hazardous materials such as ignitable materials, explosive materials, and inflammable materials. Failure to observe this may cause fire, explosion or ignition.
- When installing the product, be sure to fix it securely. Otherwise, drop or abnormal operation of it may cause injury.
- Avoid use of the product in a place where is exposed to droplets of water or oil.
- Be sure to provide Class D grounding. Otherwise, electric leakage may cause electric shock or malfunction.
- When connecting the product, always refer to the “Operation manual” to avoid miswiring. Failure to observe this may cause malfunction or abnormal operation.

Operation

- The product is not equipped with power failure protector. If the primary power supply is interrupted in the event of power failure or instantaneous power failure, the output voltage to the electromagnet is also interrupted. If power failure or instantaneous power failure may occur, be sure to additionally use a power failure protector (uninterruptible power system). Otherwise, attracted object may drop and cause injury. If an error is detected, the output to the electromagnet is interrupted. If an injury or mechanical damage may occur due to drop of attracted object, be sure to provide an anti-drop device.
- Avoid splash to the product. Splash or cleaning with water may cause abnormal operation and result in injury, electric shock or fire.
- Do not touch the terminal block and attach or detach I/O connector while the power is on. Otherwise, it may cause electric shock and/or abnormal operation.
- Make sure that an attracting signal is not inputted and then turn on the power. If the power is turned on while the attracting signal is inputted, the electromagnet may start attraction and it may cause injury.
- If the product produces abnormal heat, smoke or odor, turn off the power immediately. If you continue to use it, the product may be damaged or ignited.
- If the protection function (alarm) of the product is activated, eliminate the cause completely before use. Abnormal operation of the product may cause injury, damage or failure of the product.
- If the indicator (display) of the product does not light, turn off the power immediately.

Safety Precautions (for safe use)

Maintenance and inspection

- Do not disassemble or modify the product. Otherwise, abnormal operation may cause injury, electric shock or fire.
- Be sure to turn off the power before maintenance or inspection. Failure to observe this may cause injury, electric shock or fire.

Disposal

- Do not put the product into fire. Failure to observe this may result in damage of the product or emission of toxic gas.



CAUTION

General

- Do not touch the heat radiating fin. It will get hot and cause skin burn.

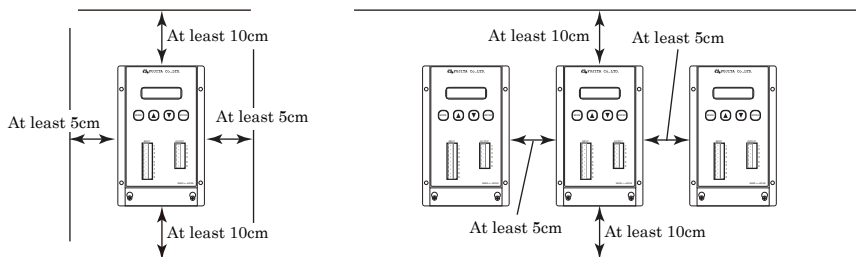
Installation

- Use the product under the following environmental conditions. Failure to observe this may cause malfunction or abnormal operation.

1. Ambient temperature: -10 to 40°C
2. Humidity: 10 to 90% RH (without condensation)
3. No corrosive gas, explosive gas, oil mist, dust or steam.
4. Vibration: 4.9m/s^2 (at vibration frequency of less than 20Hz), 9.8m/s^2 (vibration frequency of less than 50Hz)
5. Altitude: Not more than 1,000m

- Install the product on an indoor, well-ventilated location. For spacings from other equipment or in case of more than one unit used, refer to the drawing below.

Note that the spacings below are minimum. A cooling fan (※1) is incorporated at the top of the product.
To achieve good ventilation, keep the top and bottom spacings as wide as possible.



- ※1. The sensor of cooling fan monitors the temperature inside the product. When the temperature exceeds the set value, the fan starts rotation. It does not always rotate.

Request of selection

- Total current values of electromagnets which can be connected to the electromagnetic controller should be not more than 80% of the maximum output current of the controller.

If you intend to connect more than one electromagnet, refer to the following formula.

$$\text{Number of electromagnet capable of being controlled} = \frac{\text{Maximun output of electromagnetic controller}}{\text{Current value of electromagnet}} \times 0.8 (\text{margin})$$

1.Before Use

1-1. Product specification

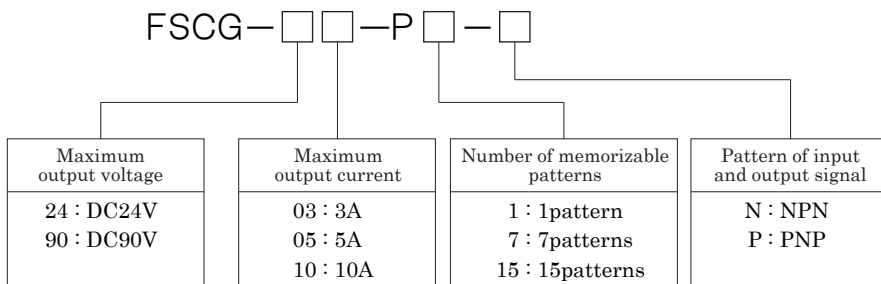
Power source	Rated input voltage	Single-phase, AC100 to 220V \pm 10%, 50/60Hz ※If the output current is 10A, the supply voltage is single-phase, AC100V \pm 10% at 50/60Hz.
	Allowable input voltage	Single-phase, AC90 to 242V, 50/60Hz ※ If the output current is 10A, the supply voltage is single-phase, AC90 to 110V , 50/60Hz.
	Input power supply efficiency	At least 90%
Output	Maximum output voltage	Max. DC24V (DC0V to DC24V) / DC90V (DC0V to DC90V)
	Maximum output current	Max. 3A / 5A / 10A
	Control type	PWM control
Operational specification	Number of memorizable patterns	1pattern / 7patterns / 15patterns
	Pattern of input and output signal	NPN (sink logic) or PNP (source logic)
	Input signal	Optocoupler-isolated type, DC24V, 10mA max. L-shaped 9-pin plug, suitable cable size of AWG 28 to 12
	Output signal	Open-collector type, DC24V, 40mA, attraction max. L-shaped 6-pin plug, suitable cable size of AWG 28 to 12 If internal 24V power supply used: maximum output of 250mA If external 24V power supply used: DC22 to 27V
	Protection circuit	For overcurrent, overload, ground fault, heat-radiating fin and undervoltage
Operating conditions	Ambient temperature	−10°C to 40°C
	Ambient humidity	10 to 90% RH without condensation
	Atmosphere	No corrosive or explosive gas, oil mist, dust or steam
	Vibration	Not more than 4.9m/s ² at vibration frequency of less than 20Hz, and not more than 9.8m/s ² at less than 50Hz
	Altitude	Not exceeding 1,000m
Weight		2.6Kg

1.Before Use

1-2. Model number of the electromagnetic controller

Refer to the product nameplate on the electromagnetic controller for model number.

The product nameplate is attached to the right side of the product's body.

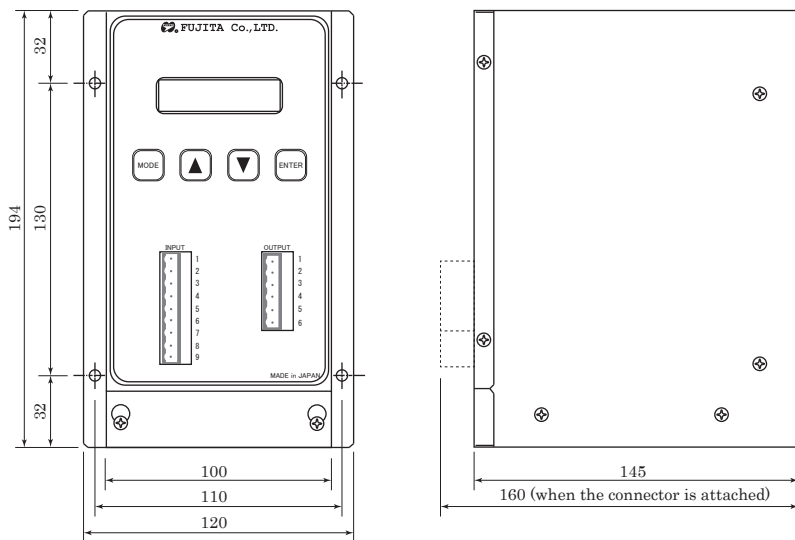


1-3. Accessories

The following accessories are packaged with the product. Make sure that nothing lacks.

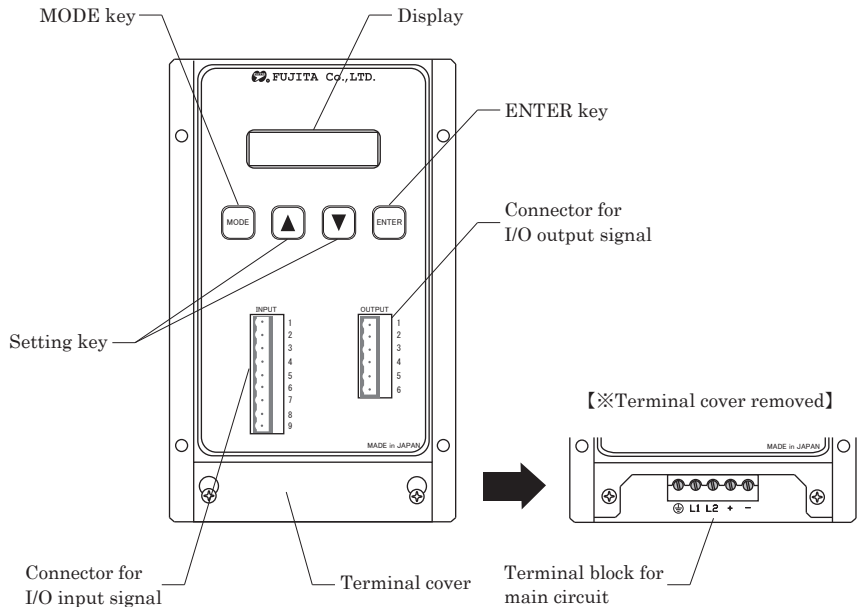
- Main unit of the product
- 9-pin connector for I/O input signal
[Cage clamp connector 232-109/026-000 manufactured by WAGO]
- 6-pin connector for I/O output signal
[Cage clamp connector 232-106/026-000 manufactured by WAGO]
- Connector control lever
[Push-button 231-131 manufactured by WAGO]
- Work procedure for connection of connector
- Operation manual [this document]

1-4. Outer dimensions



1.Before Use

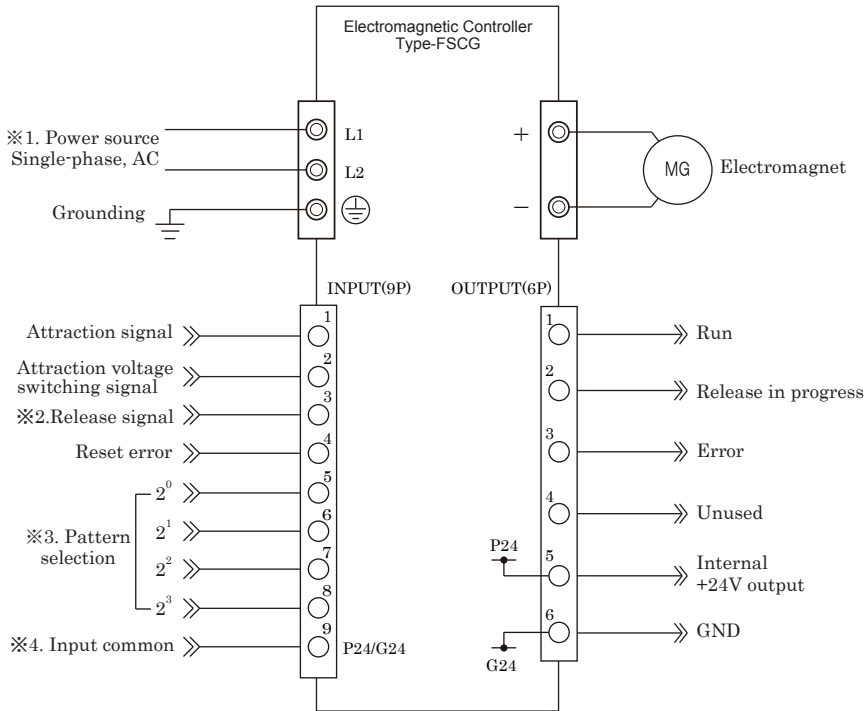
1-5. Name and function of each part



Name	Function
Display	Displays the operation in progress and parameters.
MODE key	Used for shifting to each mode.
ENTERkey	Used for finalizing in each mode, and so on.
Setting key	Used for selection or setting in each mode.
Connector for I/O input signal	For connection of connector for I/O input signal.
Connector for I/O output signal	For connection of connector for I/O output signal.
Terminal cover	A cover for terminal protection. Be sure attach it.
Terminal block for main circuit	For connection of grounding, power-source and the electromagnet.

2. Connection of equipment

2-1. Terminal connection diagram



[※1. Power source]

The supply voltage depends on the model.

【For maximum output current of 3A / 5A】

Single-phase AC100 to 220V $\pm 10\%$ at 50/60Hz

【For maximum output current of 10A】

Single-phase AC100V $\pm 10\%$ at 50/60Hz

[※2. Release signal]

Valid or invalid of detachment signal can be set by parameters.

Refer to Page 15, 4. Setting of parameters.

[※3. Pattern selection]

Port 2⁰ to 2³ for selection of pattern depends on the model.

Refer to Page 8, 2. Connection of equipment.

[※4. Input common]

The potential for input common depends on the model.

It is GND (G24) for signal pattern NPN and +24V (P24) for PNP.

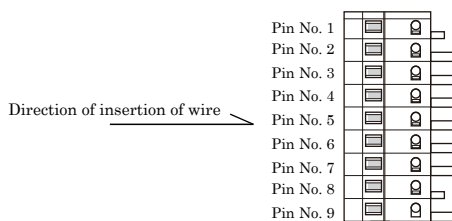
※When an external power source is used, do not connect the terminal P24.

2. Connection of equipment

2-2. Connection of control signal

2-2-1. Connection of input signal

Pin configuration of connector for input signal and each function are as follows.



Pin No.	Name	Function of terminal												
1	Attraction signal	Attraction starts when this signal is inputted and release starts when the signal is OFF. Input the pulse signal or level signal over 100msec. ※By setting of Parameter No.9, Selection of receipt of release signal, release starts when the release signal is inputted to Pin No.3. Refer to Page 15, 4. Setting of parameters.												
2	Attraction voltage switching signal	When this signal is inputted, the existing attraction voltage is switched to next attraction voltage. Input the pulse signal over 100msec. Even if a period is set to Parameter No.2, 1st attraction period or Parameter No.4, 2nd attraction period, this signal takes precedence. When it is inputted, the ongoing attraction voltage is switched to next attraction voltage. Refer to Page 15, 4. Setting of parameters.												
3	Release signal	When this signal is inputted, release starts. Input the pulse signal over 100msec. ※To make the receipt of this signal valid, setting to Parameter No. 9, Selection of receipt of release signal is required. Refer to Page 15, 4. Setting of parameters.												
4	Reset error	This is the error resetting signal. The input must be done with the pluse signal of more than 100msec.												
5	Pattern selection 2 ⁰	Signals for selection of patterns. Ports to be selected for model are as follows.												
6	Pattern selection 2 ¹	<table><tr><th>Model</th><th>Number of memorizable patterns</th><th>Port for which valid pattern is selected</th></tr><tr><td>FSCG-※※※※-P1</td><td>1 pattern</td><td>Pin No.5 [2⁰]</td></tr><tr><td>FSCG-※※※※-P7</td><td>7 patterns</td><td>Pin No.5/6/7 [2⁰/2¹/2²]</td></tr><tr><td>FSCG-※※※※-P15</td><td>15 patterns</td><td>Pin No.5/6/7/8 [2⁰/2¹/2²/2³]</td></tr></table>	Model	Number of memorizable patterns	Port for which valid pattern is selected	FSCG-※※※※-P1	1 pattern	Pin No.5 [2 ⁰]	FSCG-※※※※-P7	7 patterns	Pin No.5/6/7 [2 ⁰ /2 ¹ /2 ²]	FSCG-※※※※-P15	15 patterns	Pin No.5/6/7/8 [2 ⁰ /2 ¹ /2 ² /2 ³]
Model	Number of memorizable patterns	Port for which valid pattern is selected												
FSCG-※※※※-P1	1 pattern	Pin No.5 [2 ⁰]												
FSCG-※※※※-P7	7 patterns	Pin No.5/6/7 [2 ⁰ /2 ¹ /2 ²]												
FSCG-※※※※-P15	15 patterns	Pin No.5/6/7/8 [2 ⁰ /2 ¹ /2 ² /2 ³]												
7	Pattern selection 2 ²													
8	Pattern selection 2 ³	※Select the port before attraction signal is inputted. Even if the selection is changed during attraction or release, the Pattern No. does not change.												
9	Input common	Input signal common It is GND (G24) for signal pattern NPN and +24V (P24) for PNP. ※When an external power source is used, do not connect the terminal P24.												

2. Connection of equipment

2-2-2. Specification of input signal

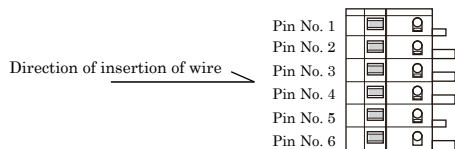
Specification of input signal is as shown below.

Type of input signal	Opto-coupler isolation type, NPN or PNP ※NPN or PNP depends on the model.
Number of input points	8 points (DC24V 10mA max.)
Connector	9-pin connector [Cage clamp 232-109/026-000 manufactured by WAGO]
Adapted cable size	AWG 28 to 12
Internal circuit	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; display: inline-block;">NPN</div>
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px; display: inline-block;">PNP</div>

2. Connection of equipment

2-2-3. Connection of output signal

Pin configuration of connector for output signal and each function are as follows.

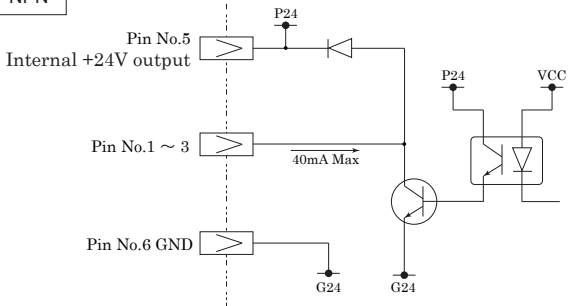
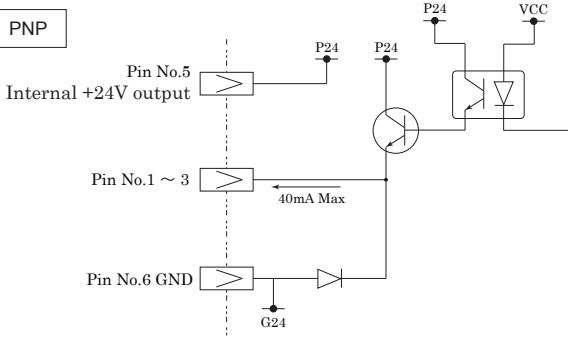


Pin No.	Name	Function of terminal
1	Run	Outputting a signal during attraction or release.
2	Release in progress	Outputting a signal during release.
3	Error	Outputting a signal when an error is detected.
4	Unused	Not for use. Do not connect a wire to this pin.
5	Internal +24V output	Internal power-supply +24V output port. ※Do not connect a wire to this pin if external power supply is used.
6	GND	GND (G24)

2. Connection of equipment

2-2-4. Specification of output signal

Specification of output signal is as shown below.

Type of output signal	Opto-coupler isolation type, NPN or PNP ※NPN or PNP depends on the model.
Number of output points	4 points (DC24V 40mA max. attraction)
Connector	6-pin connector [Cage clamp 232-106/026-000 manufactured by WAGO]
Adapted cable size	AWG 28 to 12
Allowable load	When internal 24V power supply is used: Maximum output 250mA When external 24V power supply is used: DC22 to 27V
Internal circuit	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">NPN</div>  <p>The NPN circuit diagram shows an internal +24V output connected to Pin No. 5. Pin No. 1 ~ 3 is connected to the output of an opto-coupler, which is also connected to Pin No. 6 GND. The output current is labeled as 40mA Max. The circuit is powered by an internal +24V supply and a G24 ground.</p>
	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">PNP</div>  <p>The PNP circuit diagram shows an internal +24V output connected to Pin No. 5. Pin No. 1 ~ 3 is connected to the output of an opto-coupler, which is also connected to Pin No. 6 GND. The output current is labeled as 40mA Max. The circuit is powered by an internal +24V supply and a G24 ground.</p>

2. Connection of equipment

2-3. Connection of wires to connectors for input and output signal

Connect a wire to the connector for input and output signal as follows.

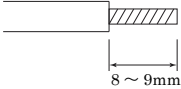


Cautions for wiring

Connect a wire to spring type connector properly in accordance with the following instructions. Failure to observe this may result in electric shock, short-circuit, breakage of wire, or damage of the product.

- Follow the specified dimension of cable for processing its termination.
- Avoid stray wire from termination of stranded wires.
- Do not solder the termination of wire.
- Do not connect any wire of specified size.
- Fix a wire without stress on a connector or a connection of wire.

[Adapted cable size and termination]

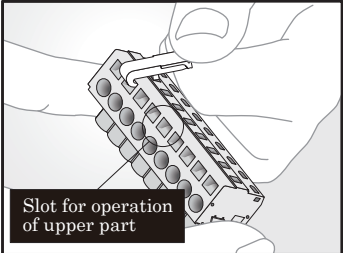
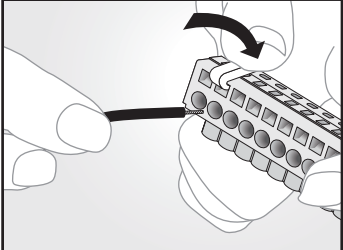
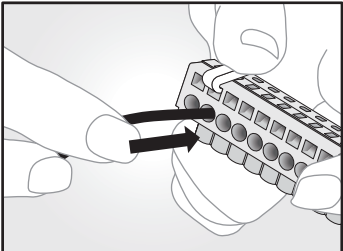
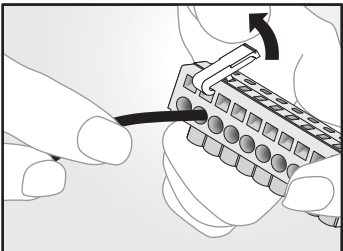
Adapted cable size	Dimension of termination
For both input and output AWG 28 to 12 Maximum outer diameter of sheath : $\Phi 4.1$	 8 ~ 9mm

2. Connection of equipment

[Procedure of wire connection]

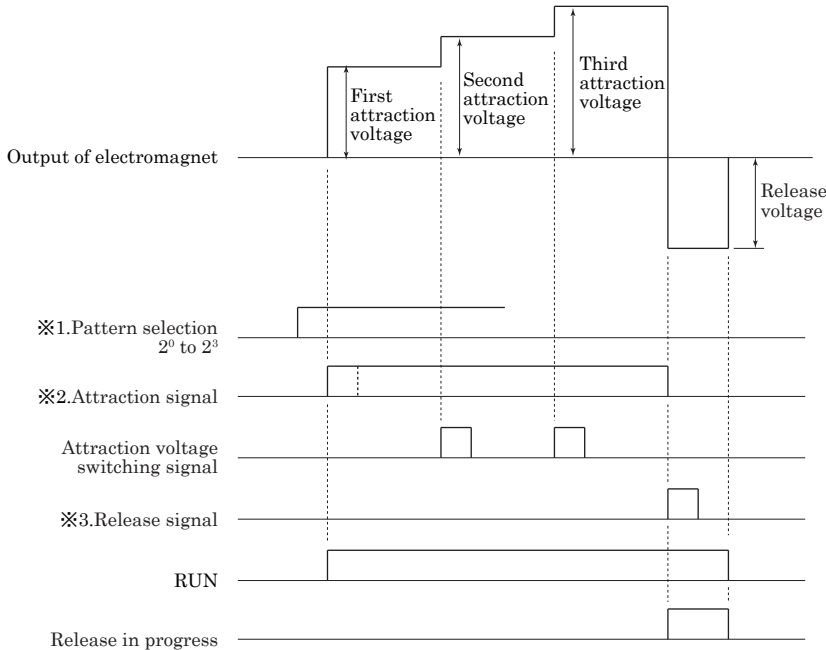
Carry out wire connection using the lever for wiring to connectors according to the following procedure.

Refer to attached Work instructions for wire connection for details.

	<p>① Insert the wiring lever into the slot for operation of upper part (square hole).</p>
	<p>② Push the wiring lever down by a finger.</p>
	<p>③ Push a wire into the entry hole (round hole) to the end while pushing the wiring lever.</p>
	<p>④ The wire is connected when you release the wiring lever. Pull the wire lightly for check (do not pull it too hard).</p>
<p>⑤ When the wiring to connector is completed, insert the connector to the connector section of the product (INPUT/OUTPUT) firmly. The connector can be inserted in only one direction.</p>	

3. Output time chart

The time chart for the output to the electromagnet and input and output signal is as shown below.



[※1. Pattern selection 2⁰ to 2³]

Hold the pattern selection signals (2⁰ to 2³) until the “RUN” output signal becomes ON after attraction signal is inputted.

Even if the pattern selection signal is changed during operation, it is not accepted.

Port for pattern selection signal differs depending on a model.

Refer to Page 7, 2. Connection of equipment.

[※2. Attraction signal]

If a release signal is refused with Parameter No.9, Selection of receipt of release signal, select level signal for attraction signal until the start of release.

If it is accepted with Parameter No.9, input the release signal as level signal until the start of release or as a pulse signal over 100msec.

Refer to Page 15, 4. Setting of parameters.

[※3. Release signal]

Receipt of release signal is valid only when the receipt is set as accepted to Parameter No.9, Selection of receipt of release signal.

Refer to Page 15, 4. Setting of parameters.

4. Setting of parameters

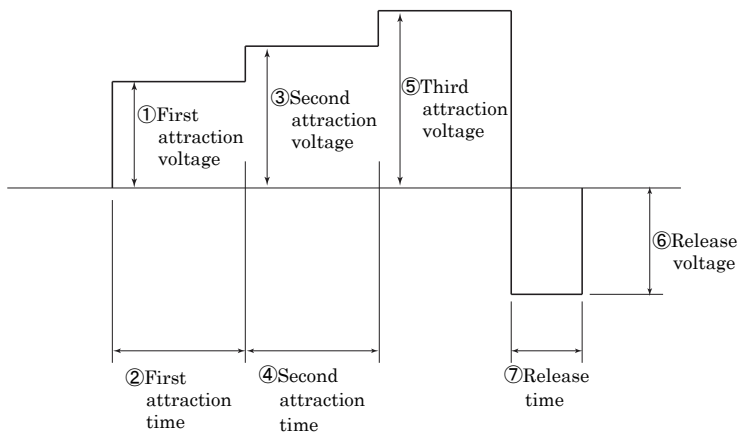
4-1. Details of parameters

It is necessary to set parameters to use the product.

Item and setting range for each parameter to one pattern are as shown below.

If you want to use more than one pattern, you need to set parameters for patterns you use.

All the set values of parameters are “zero (0)” as default.



Parameter No.	Item	Indication	Setting range	Unit [indication]
1	First attraction voltage	1st Volt	0.0 to 99.9	% [%]
2	First attraction time	1st Time	0.0 to 99.9	sec [s]
3	Second attraction voltage	2nd Volt	0.0 to 99.9	% [%]
4	Second attraction time	2nd Time	0.0 to 99.9	sec [s]
5	Third attraction voltage	3rd Volt	0.0 to 99.9	% [%]
6	Release voltage	Rel Volt	0.0 to 99.9	% [%]
7	Release time	Rel Time	0.0 to 9.99	sec [s]
8	Selection of release mode	Rel Meth	0: Normally reverse excitation 1: Decay of reverse excitation 2: Alternating decay for three times 3: Alternating decay for five times 4: Alternating decay for seven times 5: Alternating decay for nine times	
9	Selection of receipt of release signal	Rel Sign	0: Release signal invalid 1: Release signal valid	

4. Setting of parameters

Parameter No.	Item	Indication	Setting range
1	First attraction voltage	1st Volt	0.0 to 99.9%

This parameter is used for setting the first attraction voltage.

If the set value is 99.9%, about DC24V is outputted for DC24V type, and about DC90V is outputted for DC90V type.

Parameter No.	Item	Indication	Setting range
2	First attraction time	1st Time	0.0 to 99.9sec

This parameter is used for setting the first attraction time.

After the set time is elapsed, the setting shifts to the second attraction voltage.

If the set value is “zero (0)”, the setting does not shift to the second attraction voltage.

If the switching signal for attraction voltage of I/O input signal is inputted, the setting shifts to the second attraction voltage.

If the switching signal for attraction voltage of I/O input signal is inputted within the set time, the switching signal for attraction voltage takes precedence and the setting shifts to the second attraction voltage.

Parameter No.	Item	Indication	Setting range
3	Second attraction voltage	2nd Volt	0.0 to 99.9%

This parameter is used for setting the second attraction voltage.

If the set value is 99.9%, about DC24V is outputted for DC24V type, and about DC90V is outputted for DC90V type.

Parameter No.	Item	Indication	Setting range
4	Second attraction time	2nd Time	0.0 to 99.9sec

This parameter is used for setting the second attraction time.

After the set time is elapsed, the setting shifts to the third attraction voltage.

If the set value is “zero (0)”, the setting does not shift to the third attraction voltage.

If the switching signal for attraction voltage of I/O input signal is inputted, the setting shifts to the third attraction voltage.

If the switching signal for attraction voltage of I/O input signal is inputted within the set time, the switching signal for attraction voltage takes precedence and the setting shifts to the third attraction voltage.

4. Setting of parameters

Parameter No.	Item	Indication	Setting range
5	Third attraction voltage	3rd Volt	0.0 to 99.9%

This parameter is used for setting the third attraction voltage.

If the set value is 99.9%, about DC24V is outputted for DC24V type, and about DC90V is outputted for DC90V type.

Parameter No.	Item	Indication	Setting range
6	Release voltage	Rel Volt	0.0 to 99.9%

This parameter is used for setting release voltage.

If the set value is 99.9%, about DC24V is outputted for DC24V type, and about DC90V is outputted for DC90V type.

If alternating decay with the set value between two and five is selected to Parameter No.8, Selection of release mode, this voltage is for the first alternation.

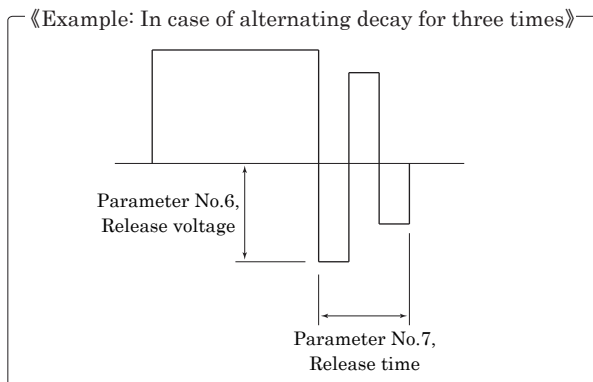
No voltage setting is required from the second alternation.

Parameter No.	Item	Indication	Setting range
7	Release time	Rel Time	0.0 to 9.99sec

This parameter is used for setting the release time.

After the set time is elapsed, the release is finished.

If alternating decay with the set value between two and five is selected to Parameter No.8, Selection of release mode, alternating decay is carried out within the set time and the release is finished.



4. Setting of parameters

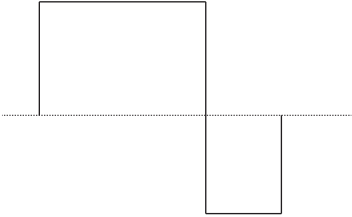
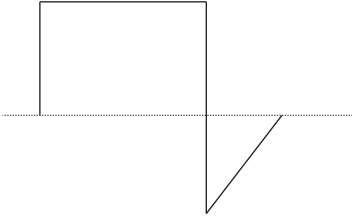
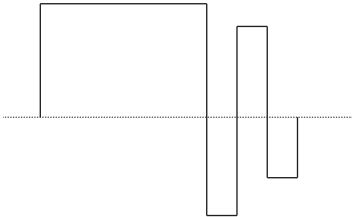
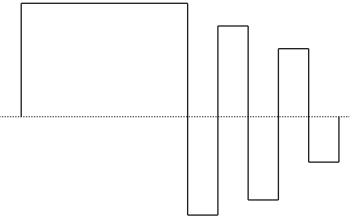
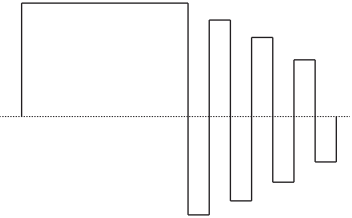
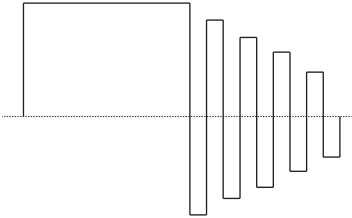
Parameter No.	Item	Indication	Setting range
8	Selection of release mode	Rel Meth	0 to 5

Select the release mode.

In general, select the set value “zero (0)” and normally reverse excitation.

Select the release mode according to the timing of attracted object, connected electromagnet, material of attracted object or attracted area.

The release motions corresponding to the setting values “0” to “5” are as follows.

Set value = 0 : Normally reverse excitation	Set value = 1 : Decay of reverse excitation
	
Set value = 2 : Alternating decay for three times	Set value = 3 : Alternating decay for five times
	
Set value = 4 : Alternating decay for seven times	Set value = 5 : Alternating decay for nine times
	

4. Setting of parameters

Parameter No.	Item	Indication	Setting range
9	Selection of receipt of release signal	Rel Sign	0 to 1

This parameter is used for invalid/valid of release signal of I/O input signal.

If the set value is “zero (0)”, the release signal of I/O input signal is not received.

When the attraction signal of I/O input signal is OFF, the release starts and ends.

If the set value is “one (1)”, the release signal of I/O input signal is accepted for receipt.

When the release signal of is inputted, the release starts and ends.

4. Setting of parameters

4-2. Procedure for setting parameters

- 01** Turn the power on.
 The display in Figure 1 changes to that in Figure 2.
 Do not operate any key until the display in Figure 2 appears.
 The upper part of Figure 1 shows the model of electromagnetic controller.
 The lower part of Figure 2 shows the Pattern No. selected from Pattern selection signals 2^0 to 2^3 of I/O input signal.
 If nothing is selected, "01" is displayed.

《Figure 1: When the power is turned on》

F	S	C	G	-	*	*	*	*	-	P	*	*	-	*	
F	U	J	I	T	A	C	o	.	.	L	t	d	.		

《Figure 2: RUN MODE STANDBY (WAIT)》

R	U	N		M	O	D	E					W	A	I	T
P	A	T	T	=	0	1									

- 02** Press key to display 《Selection of parameter mode》.

※The MODE key is not operable in case of RUN in RUN mode.

Set to WAIT and then operate the key.

Press key to set a parameter. ⇒ Go to **03**

Press key to cancel.

Then the setting shifts to Page 27 [Selection of JOG mode].

《Selection of parameter mode》

P	A	R	A		M	O	D	E				W	A	I	T
Y	=	E	N	T		N	=	M	O	D	E				

- 03** Press or key to select the Pattern No. you want to set.

※ Only the value of Pattern No. blinks.

If you press key, the Pattern No. increases by one,

and if you press key, the Pattern No. decreases by one.

The Pattern No. that can be selected differs depending on the model.

[FSCG-※※※※-P1-※] 01 only


[FSCG-※※※※-P7-※] 01 to 07


[FSCG-※※※※-P15-※] 01 to 15

《Parameter mode Pattern selection》

P	A	R	A		M				P	A	T	T	=	0	1

4. Setting of parameters

Press  key to finalize Parameter No. ⇒ Go to **04**


Press  key to cancel. ⇒ Go to **05**

04 Set the data of parameter as follows.

Parameter No.1, 1st attraction voltage is displayed and the presently saved data blinks.

《Setting of parameter data》

P	A	R	A	.	M	.		P	A	T	T	=	0	1
1	:	1	s	t	V	o	l	t	=	*	*	.	*	%

Press  or  key to select the value you want to set.

If you press  key for long time, the value acceleratedly increases and stops at the upper limit of setting range.

If you release it and then press it again for long time, the value returns to “zero (0)” and increases again.

If you press  key for long time, the value acceleratedly decreases and stops at the lower limit of setting range.

If you release it and then press it again for long time, the value returns to “zero (0)” and decreases again.

To save the data or shift to next parameter, press  key.

The data is saved and the Parameter No. increases by one.

In case of Parameter No.9, it returns to Parameter No.1.

《Setting of parameter data》

P	A	R	A	.	M	.		P	A	T	T	=	0	1
2	:	1	s	t	T	i	m	e	=	*	*	.	*	s

To set other parameter data subsequently, repeat this **04** .

To set the data of other Pattern No., press  key.

The display returns to **03** and you can select the Pattern No.

4. Setting of parameters

05 When the setting completed, the display returns to RUN mode standby (WAIT).

Press **MODE** key.

The display returns to 《Parameter mode Pattern selection》.

《Parameter mode Pattern selection》

P	A	R	A	.	M	.		P	A	T	T	=	0	1

Press **MODE** key again.

《Selection of RUN mode》 is displayed.

On the upper part, “RUN MODE?” blinks.

《Selection of RUN mode》

R	U	N		M	O	D	E	?						
Y	=	E	N	T		N	=	M	O	D	E			

If you press **ENTER** key, the display changes to 《RUN mode standby (WAIT)》.

《RUN mode standby (WAIT)》

R	U	N		M	O	D	E					W	A	I	T
P	A	T	T	=	0	1									

If you press **MODE** key, the display returns to **03** 《Parameter mode Pattern selection》.

《Parameter mode Pattern selection》

P	A	R	A	.	M	.		P	A	T	T	=	0	1

4. Setting of parameters

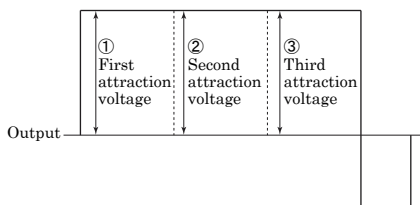
4-3. Target to set a parameter

Targets to set representative parameters are as follows.

Since they are just for reference, adjust the parameters according to the electromagnet you use, specification of workpiece or specification of equipment.

Attraction and transportation of single workpiece

This is the case where you want to transport and detach single workpiece at specified position.



Parameter No.	Item	Set value
1	First attraction voltage	99.9%
2	First attraction time	0sec
3	Second attraction voltage	99.9%
4	Second attraction time	0sec
5	Third attraction voltage	99.9%
6	Release voltage	Adjustment
7	Release time	0.2sec
8	Selection of release mode	0
9	Selection of receipt of release signal	Voluntary

Point 1

Attraction and transportation are possible only by the first attraction voltage.

But if switching signal for attraction voltage is inputted, next attraction voltage applies. For safety purpose, we recommend you to set the first to third attraction voltage to same value.

Point 2

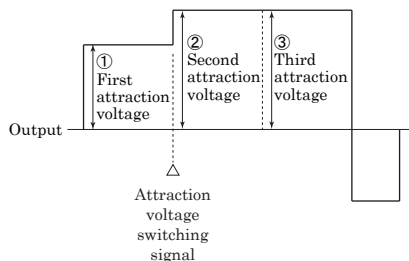
Release conditions may differ significantly depending on the electromagnet used and the specification of attracted workpiece.

We recommend you to temporarily set the release time to 0.2sec. and adjust the release voltage.

4. Setting of parameters

Attraction and transportation of one sheet/one workpiece

This is the case where one of piled sheets is attracted and transported and one workpiece is picked out.



Parameter No.	Item	Set value
1	First attraction voltage	Adjustment
2	First attraction time	Adjustment
3	Second attraction voltage	99.9%
4	Second attraction time	0sec
5	Third attraction voltage	99.9%
6	Release voltage	Adjustment
7	Release time	0.2sec
8	Selection of release mode	0
9	Selection of receipt of release signal	Voluntary

Point 1

Set the first attraction voltage to attracting force for one sheet or piece of workpiece.

Point 2

Since the first attraction voltage is set to attracting force for one sheet or piece of workpiece, the workpiece may become misaligned or drop. Therefore, we recommend you to set the second and third attraction voltage to 99.9% (strong magnetic force).

Point 3

For shifting from the first attraction voltage to the second attraction voltage, input attracting voltage switching signal at the position certainly separated from other workpiece after attraction, or set the time to separate from other workpiece reliably.

Point 4

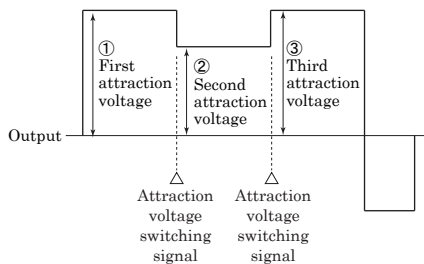
Release conditions may differ significantly depending on the electromagnet used and the specification of attracted workpiece.

We recommend you to temporarily set the release time to 0.2sec. and adjust the release voltage.

4. Setting of parameters

Collective attraction and transportation

This is the case where small parts such as screws and bolts are collectively attracted and transported.



Parameter No.	Item	Set value
1	First attraction voltage	99.9%
2	First attraction time	Adjustment
3	Second attraction voltage	Adjustment
4	Second attraction time	Adjustment
5	Third attraction voltage	99.9%
6	Release voltage	Adjustment
7	Release time	0.2sec
8	Selection of release mode	0
9	Selection of receipt of release signal	Voluntary

Point 1

The first attraction voltage causes attraction and lifting of workpiece with strong magnetic force. At the timing when the workpiece is lifted, the voltage is switched to the second attraction voltage and causes detachment of unstably attracted workpiece.

At the timing when detachment of unstable workpiece is completed, the voltage is switched to the third attraction voltage (strong magnetic force) and transportation is carried out.

Point 2

To switch the first attraction voltage to the second attraction voltage or switch the second attraction voltage to the third attraction voltage, input the attraction voltage switching signal or set the time to switch.

Point 3

Release conditions may differ significantly depending on the electromagnet used and the specification of attracted workpiece.

We recommend you to temporarily set the release time to 0.2sec. and adjust the release voltage.

5. Operation

【Operation procedure】

Operation procedure is as follows.

- ①Install the product and connect wires to it.
- ②Set the parameters. (refer to Page 15, 4. Setting of parameters)
※If the parameters are not set, no voltage is outputted to the electromagnet.
- ③Set to RUN mode.
- ④Select the Pattern No. for use and control the product by input signal such as attraction signal. (refer to Page 14, 3. Output time chart)

When the power is ON, the mode is RUN mode (WAIT).

If the installation and wire connection of the product and setting of parameters are completed, the procedure is ④ only.

《RUN mode RUN》

When attraction signal of I/O input signal is inputted, the display changes as follows.

R	U	N	M	O	D	E					R	U	N
P	A	T	T	=	0	1					O	U	T
											=	1	s
												t	V

Pattern No. in process

Name of outputting process

Name of outputting process is displayed on the right lower part.

Name of process corresponding to each indication is as shown in the table below.

Indication	Name of outputting process
1stV	The 1st attraction voltage being outputted
2ndV	The 2nd attraction voltage being outputted
3rdV	The 3rd attraction voltage being outputted
RelV	Release voltage being outputted

6. Other functions

6-1. JOG mode

JOG mode is a mode which enables running by panel key switches of the electromagnetic controller.

JOG mode enables running with saved Pattern No., attraction, switching of attraction voltage and release.

If you use JOG mode, be sure to set the parameter of Pattern No. used according to Page 15, 4. Setting of parameters.

※JOG mode is available only in RUN mode standby.

※In JOG mode, I/O input signal is not received.

【Procedure for running in JOG mode】

01 Press key and select 《Selection of JOG mode》 as follows.

Press key to start JOG mode.

Press key to cancel.

Then the display changes to 《Selection of I/O check mode》 in Page 30.

《Selection of JOG mode》

J	O	G	M	O	D	E	?			W	A	I	T
Y	=	E	N	T	N	=	M	O	D	E			

02 Select the Pattern No. for running.

Press or key to select the Pattern No. you want to set.

If you press key, the Pattern No. increases by one,

and if you press key, the Pattern No. decreases by one.

The Pattern No. that can be selected differs depending on the model.

[FSCG-※※※※-P1-※] 01 only

[FSCG-※※※※-P7-※] 01 to 07

[FSCG-※※※※-P15-※] 01 to 15

Press key to finalize the Pattern No.

The display changes to **03** 《JOG mode running standby》.

Press key to cancel.

The display changes to **05** 《Selection of RUN mode》.


《JOG mode Pattern No. selection》

J	O	G						P	A	T	T	=	0	1

6. Other functions

- 03** If you press  key, attraction starts.


Running starts according to the contents of selected Pattern No. and the display changes to **04** «JOG mode running».

Press  key to cancel.

The display returns to **02** «JOG mode Pattern No. selection».



«JOG mode running standby»

J	O	G						P	A	T	T	=	0	1
O	N	=	↑											

- 04** If you press  key, release starts and the display returns to **03** «JOG mode running standby».

If you press  key, the attraction voltage can be switched.

If the setting other than “zero (0)” is made to Parameter No.2, 1st attraction time and Parameter No.4, 2nd attraction time, the voltage changes to next attraction voltage after the above time is elapsed.

However, if  key is pressed even before the time is elapsed, the pressing of  key takes precedence and the voltage changes to next attraction voltage.

«JOG mode running»

Name of outputting process

J	O	G	*	*	*	*		P	A	T	T	=	0	1
O	F	F	=	↓	S	W	I	C	=	E	N	T		

«JOG mode running standby»

J	O	G						P	A	T	T	=	0	1
O	N	=	↑											

While attraction voltage and detachment voltage are outputted, the name of outputting process is displayed on the upper part of the display.

Name of process corresponding to each indication is as shown in the table below.

Indication	Name of outputting process
1stV	The 1st attraction voltage being outputted
2ndV	The 2nd attraction voltage being outputted
3rdV	The 3rd attraction voltage being outputted
RelV	Release voltage being outputted

6. Other functions

05 The display returns to RUN mode.

Press key.

The display returns to «JOG mode Pattern No. selection».

«JOG mode Pattern No. selection»

J	O	G						P	A	T	T	=	0	1

Press key again.

«Selection of RUN mode» is displayed.

On the upper part of the display, “RUN MODE?” blinks.

«Selection of RUN mode»

R	U	N		M	O	D	E	?						
Y	=	E	N	T		N	=	M	O	D	E			

If you press key, the display changes to «RUN mode standby (WAIT)».

If you press key, the display returns to «JOG mode Pattern No. selection».

«RUN mode standby (WAIT)»

R	U	N		M	O	D	E				W	A	I	T
P	A	T	T	=	0	1								

6. Other functions

6-2. I/O check mode

I/O check mode enables check of I/O input signal and forced outputting of output signal.

※I/O check mode is available only in RUN mode standby.

【Procedure of operation in I/O check mode】

01 Press **MODE** key and select 《Selection of I/O check mode》 as follows.

Press **ENTER** key to start I/O check mode.

Press **MODE** key to cancel.

The display changes to [Consumed current monitor] in Page 32.

《Selection of I/O check mode》

I	/	O	C	H	E	C	K	?		W	A	I	T
Y	=	E	N	T	N	=	M	O	D	E			

02 It enables forced output of input status of input signal and output signal.

[Input signal]

If input signal is normally inputted, a number corresponding to input signal Pin No. is displayed.

Items corresponding to input signal Pin No. are as shown in the table below.

《I/O check mode》

I	/	O	C	H	E	C	K				-	-	-
I	=	-	-	-	-	-	-	0	=	1	2	3	

└──────────┘
└──┘

Input signal
Output signal

Pin No.	Item
1	Attraction signal
2	Attraction voltage switching signal
3	Release signal
4	Reset error
5	Pattern selection 2 ⁰
6	Pattern selection 2 ¹
7	Pattern selection 2 ²
8	Pattern selection 2 ³

6. Other functions

【Procedure for forced output of output signal】

On the lower part of the drawing on the right, 1, 2 and 3 correspond to output signal Pin No.
Forced output for the blinking number is enabled.

At the beginning, “1” blinks.

Items corresponding to output signal Pin No. are as shown in the table below.

《I/O check mode》

I	/	O		C	H	E	C	K				-	-	-
I	=	-	-	-	-	-	-	-		0	=	1	2	3
Input signal										Output signal				


Pin No.	Item
1	Run
2	Release in progress
3	Error



Press  key to execute forced output for blinking number (Pin No.).

If the signal is forcibly outputted, a circle “○” is displayed above the number corresponding to the Pin No.

《Output signal Pin No.1 being outputted》

I	/	O		C	H	E	C	K				○	-	-
I	=	-	-	-	-	-	-	-		0	=	1	2	3
Input signal										Output signal				

If you want to change the number for output, press  key.

If you want to turn off forced output, select the number to turn off by  key,
and press  key.

05 The display returns to RUN mode.

Press  key.

《Selection of RUN mode》 is displayed.

On the upper part of the display, “RUN MODE?” blinks.

《Selection of RUN mode》

R	U	N		M	O	D	E	?						
Y	=	E	N	T		N	=	M	O	D	E			

If you press  key, the display changes to 《RUN mode standby (WAIT)》.

※All output signals being outputted become off.

《RUN mode standby (WAIT)》

R	U	N		M	O	D	E					W	A	I	T
P	A	T	T	=	0	1									

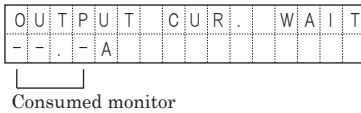
If you press  key, the display returns to 《I/O check mode》.

6. Other functions

6-3. Consumed current monitor

This is a mode to check consumed current of connected electromagnet.

The check is available in RUN mode standby and Running, and can be selected by MODE key.

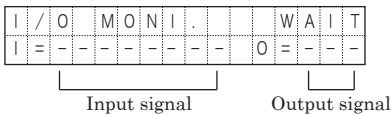


6-4. I/O monitor

This is a mode to check operating status of I/O input and output signal.

The check is available in RUN mode standby and Running, and can be selected by MODE key.

※Forced output of output signal is not available.



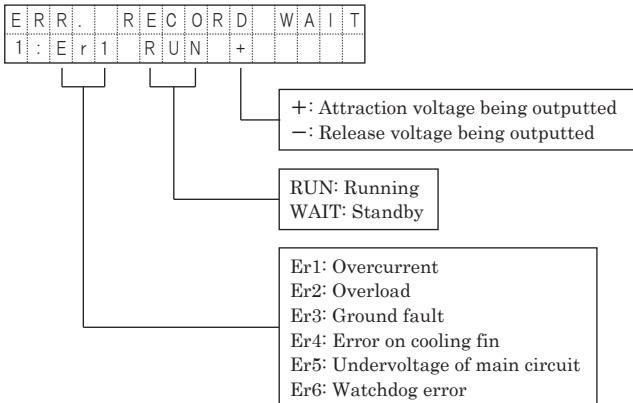
If input signal is inputted, the number corresponding to Pin No. to which a signal is inputted is displayed.

The number corresponding to output signal Pin No. to which the signal is being outputted is displayed.

6-5. Error record monitor

This is a mode to check the past errors.

The check is available in RUN mode standby and Running, and can be selected by MODE key.



The latest error is displayed in “1”.

Only 10 errors can be recorded and cannot be reset.

Since the product does not have clock function, only record is available.

Operate ▲ or ▼ key to check the past records.

6. Other functions

6-6. MODEL monitor

This is a mode to check the model number of the product and information of program version.

The check is available in RUN mode standby and Running, and can be selected by MODE key.

Program version No.

M	O	D	E	L		V	1	.	2		W	A	I	T
F	S	C	G	-	2	4	0	3	-	P	1	5	-	P

Model

7. Errors

CAUTION

After an error is reset, eliminate its cause completely before use.

If the product is used without eliminating the cause completely, it may result in damage of internal parts or burnout.

If an error is detected, the output to the electromagnet is interrupted, I/O output signal error is outputted.

Items and details of errors corresponding to Error No. are as shown in the table below.

Error No.	Indication	Item
Er1	ERROR1 Over Current	Overcurrent

[Details]

Excessive current was flown.

《Action》

Make sure the connected electromagnet is normal.

In addition, make sure that there is no short-circuit or contact failure of wire.

Error No.	Indication	Item
Er2	ERROR2 Over Load	Overload

[Details]

The current exceeding the rated current was flown for a certain period.

《Action》

Make sure the connected electromagnet is normal.

In addition, make sure that the total value of consumed current of the connected electromagnet exceeds the used current which can be outputted.

Error No.	Indication	Item
Er3	ERROR3 Ground Fault	Ground fault

[Details]

Ground fault occurred.

《Action》

Make sure the connected electromagnet is normal.

In addition, make sure that there is no short-circuit or contact failure of wire.

7. Errors

Error No.	Indication	Item
Er4	ERROR4 Over Heat	Error on cooling fin

[Details]

The temperature of cooling fin exceeded the limit of overheat temperature.

《Action》

Make sure that the cooling fan at the top of the product operates.

In addition, make sure that the ambient temperature is within the specified range of temperature.

Error No.	Indication	Item
Er5	ERROR5 Under Voltage	Undervoltage of main circuit

[Details]

During operation, the supply voltage of main circuit lacked.

《Action》

Check the primary supply voltage.

Error No.	Indication	Item
Er6	ERROR6 WatchDog	Watchdog error

[Details]

Error of internal CPU.

《Action》

Repair or replace the product.

Procedure to reset an error

Before error resetting, input error resetting signal of I/O input signals.

Input a pulse signal of at least 100msec for error resetting signal, or turn on the power again.

8. Warranty

Period and coverage of the warranty

If any fault of the product attributable to Fujita occurs during the warranty period, we shall repair the product free of charge.

If on-site repair is required domestically or overseas, however, we charge actual expenses.

We shall not be liable for re-adjustment on-site or commissioning in connection with replacement of faulty product.

[Warranty period]

The warranty period for the product is 12months after it is delivered.

[Coverage of warranty]

- (1) The coverage of warranty shall be limited to the main unit of the product.
- (2) The warranty shall be limited to normal use where conditions, usages and environment, etc. comply with the conditions and precautions described in the Operation Manual, caution labels on the main unit of the product, etc.
- (3) Even during the warranty period, we shall charge for repair in the following cases:
 - ① faults due to improper storage or handling, carelessness, mistake by the customer;
 - ② faults due to modification of the product by the customer without our consent;
 - ③ faults due to external factors due to force majeure such as fire, abnormal voltage, and due to natural disasters such as earthquake, lightning, wind and flood;
 - ④ faults by reasons which cannot foreseen at the level of science when the product is shipped from us;
 - ⑤ faults where the product is used for functions (uses) of the product;
 - ⑥ other faults beyond our liability or deemed beyond our liability by the customer.

9. Notes on parameter setting

Copy this page and use it freely.

Parameter No.	Item	Indication	Setting range	Set values
1	First attraction voltage	1st Volt	0.0 to 99.9%	
2	First attraction time	1st Time	0.0 to 99.9sec	
3	Second attraction voltage	2nd Volt	0.0 to 99.9%	
4	Second attraction time	2nd Time	0.0 to 99.9sec	
5	Third attraction voltage	3rd Volt	0.0 to 99.9%	
6	Release voltage	Rel Volt	0.0 to 99.9%	
7	Release time	Rel Time	0.0 to 9.99sec	
8	Selection of release mode	Rel Meth	0: Normally reverse excitation 1: Decay of reverse excitation 2: Alternating decay for three times 3: Alternating decay for five times 4: Alternating decay for seven times 5: Alternating decay for nine times	
9	Selection of receipt of release signal	Rel Sign	0: Release signal invalid 1: Release signal valid	

[illegible]



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