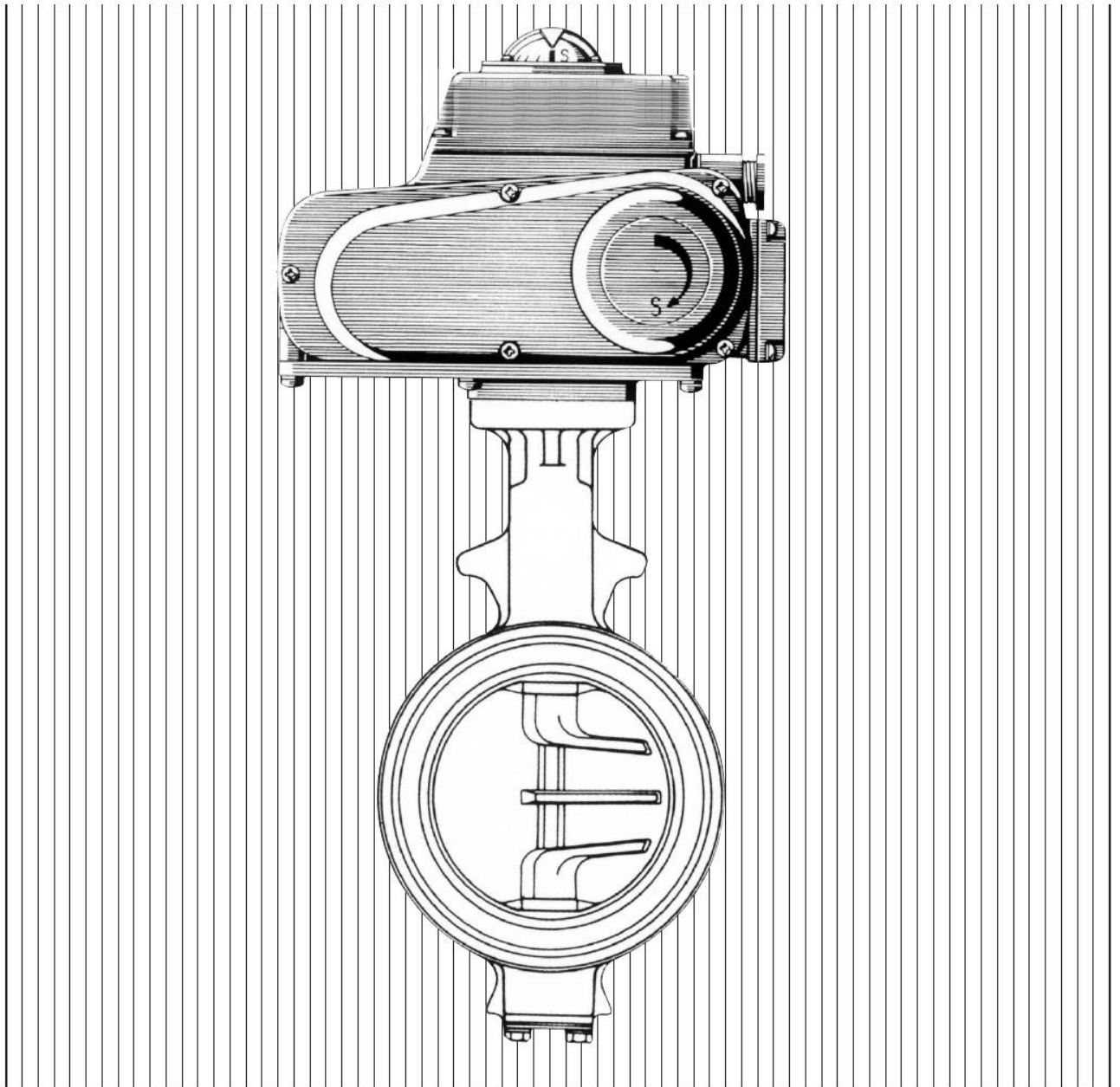




Small Motorized Actuator

**INSTRUCTION MANUAL**

**New ELMY**® (4I) with servo unit



**TOMOE VALVE CO.,LTD.**

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# For Your Safe Usage

## Please Observe the Following Safety Precautions

Note that the items listed here are meant to promote the correct usage of New ELMY (4I) with servo unit (hereinafter "this product") and to help prevent injury or damage. Carefully read this instruction manual in its entirety then proceed to use the product correctly while adhering to the safety precautions. Additionally, please be sure to also read the safety precautions for handling valves.

The levels of danger and damage that may occur when displayed advisories are ignored and the product is used incorrectly are classified and described below.



This display denotes that "death or serious injury may occur".



This display denotes that "injury or damage just to property may occur".

The types of advisories to be observed are classified and indicated below. (Below are examples of symbols.)



This symbol indicates that the content which follows is "Prohibited".



This symbol indicates that the content which follows is "Compulsory".

### Introduction


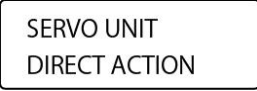

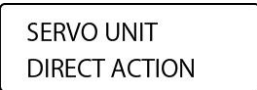
- Carefully read this instruction manual before transporting, storing, attaching pipes, operating, or performing maintenance.
- This instruction manual was not written with the intention of comprehensively covering transportation, storage, piping attachment, operation, and maintenance of this product; if there are any unclear points, please do not hesitate to contact our sales representative.
- Standard and limit values of operations, maintenance, and inspection specified in this instruction manual were set with consideration for maintenance management of this product. Please operate in compliance with the reference value (standard value) and limit value.
- Use this product by connecting only to a valve with open-close angle of 90 degrees or below.
- Be sure to store this instruction manual in a readily accessible place for future reference after installation and operation start. If staff in charge is changed, information on the storage place of the instruction manual and operation should be transferred to the next staff.
- If dents or scratches are made due to shock, stop using the product for safety and replace the product.

\* The contents of this instruction manual are subject to change without notice.

# 1. Identification and Features of the Product

## 1-1. Product Identification

The New ELMY (4I) (Type 0 to 4) specified in this instruction manual is classified into two kinds of products whose adjustment procedure is different according to the date of delivery. The product type can be identified by the difference in the specification plate (whether or not the outer frame of the plate is included).

Electric Actuator Type	Specification Plate	Explanatory name
Type 0 to 2.5		Dip switch adjustment type
		Trimmer adjustment type
Type 3 and 4		Dip switch adjustment type
		Trimmer adjustment type

## 1-2. Product Features

This product is an electric actuator designed to control the opening of the butterfly valve which rotates 90 degrees with a 4-20mA instrumentation control signal. The product has the following features.

### 1. Opening control with input of a 4-20mA instrumentation analog signal

The compact body houses the electrical part of a servo unit with a positioner controlled by the input of a 4-20mA instrumentation analog signal. The product can also be connected to a general controller in order to control fluid.

### 2. Equipped with 4-20mA analog signal output circuit for opening feedback as standard

A function to feedback the current valve opening using a 4-20mA analog signal is provided as standard. This allows checking of valve opening in the intermediate position, etc.

### 3. Easy setting of working conditions

For the dip switch adjustment type New ELMY (4I), the operating direction (Reverse action, Direct action), position of the operation opening, and hysteresis for the analog input signal current are all configurable using the dip switches on the circuit board.

For the trimmer adjustment type New ELMY (4I), the operating direction (Reverse action, Direct action) can be configured by changing the connector used on the upper surface of the circuit board. Operation position setting of operation opening and hysteresis adjustment are configurable using the trimmers on the upper surface of the circuit board.

### 4. High output torque and compact in size

High output torque is achieved with a compact design. The compact body allows easy installation and installation space saving.

### 1-3. Product Specification Outline

Product name	New ELMY (4I) with servo unit																		
Product overview	An electric actuator which is comprised of an electrical part of a servo unit and the electric actuator New ELMY (4I), and can be controlled with a 4-20mA instrumentation analog input signal																		
Product functions	<ul style="list-style-type: none"> <li>- Function to control the opening of a butterfly valve which rotates 90 degrees with a 4-20mA analog input signal.</li> <li>- Valve opening zero/span adjustment function</li> <li>- Analog output signal zero/span adjustment function</li> <li>- Contact output function at full-close/full-open position</li> </ul>																		
Applicable standards	- Equivalent to outdoor specifications IP65 (JIS C0920:2003)																		
Product sizes and types	<table style="border: none; width: 100%;"> <tr> <td style="width: 30%;">New ELMY (4I)</td> <td style="width: 20%;">0 Type</td> <td style="width: 50%;">70Nm</td> </tr> <tr> <td></td> <td>1 Type</td> <td>98Nm</td> </tr> <tr> <td></td> <td>2 Type</td> <td>196Nm</td> </tr> <tr> <td></td> <td>2.5 Type</td> <td>333Nm</td> </tr> <tr> <td></td> <td>3 Type</td> <td>980Nm</td> </tr> <tr> <td></td> <td>4 Type</td> <td>1960Nm</td> </tr> </table>	New ELMY (4I)	0 Type	70Nm		1 Type	98Nm		2 Type	196Nm		2.5 Type	333Nm		3 Type	980Nm		4 Type	1960Nm
New ELMY (4I)	0 Type	70Nm																	
	1 Type	98Nm																	
	2 Type	196Nm																	
	2.5 Type	333Nm																	
	3 Type	980Nm																	
	4 Type	1960Nm																	
Main part material	Main body: Aluminum die cast ADC12																		

## 1-4. Control Unit Standard Specifications

Analog input signal	4-20mA DC (Impedance 250Ω)
Analog output signal	4-20 mA DC.(Allowable load impedance 300Ω or below)
No-voltage contact output	Full-close/Full-open position output when stopped (Contact capacity 250VAC-10A, 24VDC-1A)
Positioning accuracy	±2% (For operation range of 90°, Analog input signal amplitude of 16 mA during linear operation.)
Analog input signal Resolution	1/50 (For operation range of 90°, Analog input signal amplitude of 16 mA.)
Electric actuator operating direction corresponding to analog input signal current	The operating direction can be selected as follows. <ul style="list-style-type: none"> <li>- Reverse action: Full-close when analog input signal current is 4mA</li> <li>- Direct action: Full-close when analog input signal current is 20mA</li> </ul>
Analog input signal off mode	Operating position when the set analog input signal minimum value (4mA) or less is input When the analog input operating direction setting is <ul style="list-style-type: none"> <li>- Reverse action: The actuator makes the valve close fully and then stops operation.</li> <li>- Direct action: The actuator makes the valve open fully and then stops operation.</li> </ul>
Zero position adjustment range Span adjustment range	0° to 20° 60° to 90°
Analog input signal Hysteresis adjustment	Analog input signal hysteresis 2% (±1%) to 10% (±5%) <ul style="list-style-type: none"> <li>- Dip switch adjustment type Type 0 to 4: Setting in the following units using the dip switches on the circuit board 2% (±1%), 3% (±1.5%), 4% (±2%), 6% (±3%), 8% (±4%), 10% (±5%)</li> <li>- Trimmer adjustment type Type 0 to 4: Stepless adjustment using the trimmer on the circuit board</li> </ul>
Protection function	Electronical stopper: Full-close/Full-open position limit switch system Mechanical stopper: Full-close/Full-open adjusting bolt system
Ambient temperature/humidity	-10°C to 50°C / 95%RH (Without air frost)
Storage temperature/Humidity	-20°C to 60°C / 95%RH (Without air frost)
Vibration environment	Vibration frequency: 48Hz (The acceleration should be 19.6 m/s <sup>2</sup> or less.)
Available option	Microload specifications - no-voltage contact output Contact capacity 30DC-100mA

## 1-5. Motorized Actuator Standard Specifications

Model	Type 0	Type 1	Type 2	Type 2.5	Type 3	Type 4
Output torque	70N·m	98 N·m	196 N·m	333 N·m	981 N·m	2000 N·m
Motor power source	100VAC, 200VAC, 220VAC (Voltage regulation ±10%) Single phase 50/60Hz					
Motor capacity	8W	20W	30W		90W	
Operation range	0° to 90°					
Opening/Closing time (50/60Hz)	25/20 seconds			37/30 seconds	55/50 seconds	125/105 seconds
Time rating	30 minutes					
Insulation type	Class E (JIS C4003-1998)					
Operation frequency rate	50%ED or less (at room temperature and rated voltage)					
Number of inching operation	60 times/min. or less (at room temperature and rated voltage)					
Operating noise	80db or less <sup>*1</sup>					
Motor protection	Thermal protector Full-open/Full-close position limit switch					
Stopper	Mechanical stopper (Full-close/Full-open adjusting bolt method)					
Conduit connections	G1/2 (PF1/2) at two ports					
Manual handle	Normally equipped (Detach-able)		Normally equipped (Round handle with a built-in automatic clutch)			

\*1: The operating noise level and characteristics of the operating noise may differ depending on the operating direction.

## 1-6. Standard Factory Settings

Setting Item	Standard Settings (Unless otherwise specified)
Electric Actuator operating direction corresponding to analog input signal current	Reverse action
Analog input signal hysteresis	Dip switch adjustment type: 4% (±2%) Trimmer adjustment type: 2% (±1%)

## 2. Precautions for use

### 2-1. Safety Measures



#### 2.1.1 Handling of this product

Ensure that only personnel with sufficient knowledge and experience handle this product.

- (1) Ensure that only personnel who have carefully read the instruction manual (hereinafter "this document") and understand the contents well, assemble, operate, maintain, etc. machines and equipment that utilize pneumatic equipment
- (2) Before wiring this product, check the power voltage to be supplied and the voltage on the nameplate. If the voltages are different, the product may burn out.
- (3) Connect the earth terminal of this product to an earth specified as Class D or higher. Incomplete earthing may cause an electric shock or failure of this product.
- (4) This product does not include protective equipment. For safety, install protective measures (fuse, breaker, etc.) in the building (control panel).
- (5) When wiring, be sure to meet Indoor Wiring Regulations and Technical Standards for Electrical Equipment specified for the location, factory, and equipment where the product is installed.
- (6) Do not touch the terminal block wiring while the power is on. Otherwise, an electric shock may occur.
- (7) Manual operation of this product should be performed only after power to the product is turned off. If manual operation is performed while the power is on, the manual handle may turn suddenly.

#### 2.1.2 Safety Check

Never attempt to handle machines or equipment, or remove machinery, before safety is ensured.

Equipment should only be dismantled after the following points have been checked

- (1) Safety precautions for this product, such as prevention against falling of parts, material or other accidental happenings, have been taken.
- (2) The surface temperature of this product is a temperature where the surface can be touched.
- (3) The power to this product and the system has been shut off.
- (4) No fluid flows in the pipelines.

Confirm the following items before restarting the equipment.

- (1) This product is fixed to a valve securely.
- (2) There is no failure or damage on the appearance of this product, or loss of parts.
- (3) Tools have not been left on this product.
- (4) Nothing hinders operation of this product (operation of the electric actuator, opening/closing of the valve).
- (5) There is no electrical leakage.

#### 2.1.3 Fail-safe Design



This produce is developed, designed, and manufactured for use in general equipment. When this product is used for applications which would require safety, use the product taking efforts (fail-safe design, redundancy design, conducting periodic inspection, etc.) to ensure the security of the system and the whole equipment.






	<p><b>2.1.4 Water Hammer</b></p> <p>Design should be performed in consideration of water hammer. Water hammer may occur even within the open-close time in the range of the product specifications, depending on the pipeline conditions or valve operating conditions.</p>
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## 2-2 Transportation and Storage

 <b>CAUTION!</b>	<p><b>2.2.1 Mass</b></p> <p>Products with greater weight (approx. 20 kg) cannot be moved by human power alone, and will require tools and machines to transport. Please confirm a product's mass in our catalog or by checking a product drawing. Forklifts, cranes and slinging must be operated and performed by certified workers, and please be sure follow laws and regulations, as well as your business' safety codes.</p>
 <b>WARNING!</b>	<p><b>2.2.2 Dropping</b></p> <p>Handle the product properly when loading/unloading and double handling to prevent damage from dropping.</p> <p><b>2.2.3 Dust Prevention, Water-proofing</b></p> <p>Do not remove the aluminum gland plug (tentative seal plug) connected to the piping connection until air piping work is to commence. If dust-prevention and water-proofing measures are not taken, rubbish, particles, rainwater, etc. enter this product, which causes malfunction.</p> <p><b>2.2.4 Storage</b></p> <p>Please follow the storage guidelines below to avoid contamination, discoloration, and material degradation of this product.</p> <ol style="list-style-type: none"> <li>(1) Do not store in high heat, high humidity places. Store in places without dust particles and moisture away from direct sunlight.</li> <li>(2) Keep this product in the factory packaging, or utilize similar protective measures.</li> <li>(3) After one year in storage, it is necessary to inspect the product's operating condition, and if any abnormalities are discovered it will be necessary to disassemble and inspect, then exchange any warped or degraded parts.</li> </ol>

## 2-3 Installation and Working Environment

 <b>WARNING!</b>	<p><b>2.3.1 Obtaining Space for Installation Site</b></p> <p>For installation sites, obtain work space around this product. If work space cannot be obtained, parts may not be removed at maintenance.</p> <p><b>2.3.2 Installation Sites and Working Environment</b></p> <p>If installing at a site or working environment that requires special support for functional specification compliance, regulatory compliance, etc. – as noted in the following – please contact our sales representative before adopting usage of this product on any unclear points.</p> <ol style="list-style-type: none"> <li>(1) When there is a unique working environment that is not listed in the specifications.</li> <li>(2) When great risk to personnel, property, or the environment are predicted in the event of product failure.</li> </ol> <p>e.g.:Facilities related to High Pressure Gas Safety Act, facilities related to Industrial Safety and Health Act, Nuclear power related facilities, vehicles, medical facilities, etc.</p>
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### 2.3.3 Atmosphere of Installation Site

Take following measures depending on the atmosphere of the site where this product will be installed. This product should not be submerged.

- (1) Avoid installation at sites that may expose this product to gas containing salt, corrosive gas, chemical fluids, organic solvents and vapor. However, there are certain environmental conditions where corrosion prevention is possible; if this case applies, please contact our sales representative.
- (2) If there is a possibility of direct exposure to radiant heat or chemicals, ensure protection of the product and ancillary devices by covering it.



### 2.3.4 Temperature of Installation Site

Take the following measures depending on the temperature of the site where this product is installed.

Using the product out of the specified temperature range causes thermal degradation or hardening of the O-ring, as well as cause malfunction by difference of thermal expansion, thermal shrinkage of components, electric leakage by rainwater penetrating..

- (1) The ambient temperature of the installation site should be based on the specifications.
- (2) If the product is exposed to direct sunlight, the working temperatures of this product and ancillary devices should not exceed the upper limit.
- (3) Keep this product away from heat sources, and install in a site where the temperature is within the specified temperature range.

### 2.3.5 Vibration and Shock at Installation Site

Take the following measures if there is vibration or shock at the site where this product is installed.

- (1) If this product is to be used under the following conditions, confirm vibration and shock conditions (particularly the acceleration value) then contact our sales representative for consultation.
  - 1) In sites where excessive vibration or shock is exerted
  - 2) In sites where vibration or shock is exerted continuously
- (2) Ensure that locks are applied to the product's attachments and connectors, and are securely fastened.  
This is important especially when opening/closing in high-frequency, and to consider fatigue resistance and fasten accordingly.
- (3) Take vibration isolation measures to reduce vibration or shock on the machine. Pipelines should be fixed with supports, or vibration isolation material should be installed.
- (4) It is important to conduct periodic inspections of fasteners to ensure that no loosening or warping has occurred, and make sure to tighten bolts or replace parts in the event of abnormal conditions. If the fastening bolts are removed, this product may drop off or actuate in an unexpected direction.

### 2.3.6 This Product and Valve Attachments Design

Confirm the following items when attachments between a valve and this product are designed.

- (1) No thrust load and lateral load has jointed to the product's output shaft.
- (2) To prevent axial movement of the valve stem on the valve from occurring, install an independent stopper. If the output shaft of this product is used as a stopper for the valve stem of the valve, the valve stem may eject out due to fluid pressure when this product is removed.



- (3) Secure adequate dimension to fit the output shaft of this product and the valve stem of the valve. Please refer to separate dimensional outline drawings for appropriate fit dimension. If the fit dimension is inadequate, strength at fitting section may become insufficient, resulting in damage.

### 2.3.7 Precautions for Electric Wiring Work

When connecting electric wiring to this product, pay attention to the following points while performing the work. If any impact dents or scratches are caused, stop using the product and replace it to ensure safety.

- (1) For safety, only those with professional qualifications in electrical/instrumentation work should be permitted to connect wiring to this product.
- (2) Before commencing any wiring work, be sure to turn off the power. Otherwise, electric shock may be caused.
- (3) Prior to wiring, check the voltage of the power source against the voltage on the ID plate. Non-matched voltages could cause fire within the product.
- (4) Before shipment, aluminum plugs (temporary sealing plugs) are attached temporarily to the conduit connections to prevent contamination by foreign substances. Remove all these plugs when setting up the product and replace them with waterproof sealing plugs and waterproof wire plugs intended for sealing.
- (5) Prior to wiring, remove shavings, cutting oil, dust, etc. from the inside of the conduit.
- (6) When the cable plug is screwed in, ensure that small pieces of debris from the piping screws and sealant do not get into the electric actuator. Applying excessively strong force may cause damage to female screw receptors. Therefore, only specified tools may be used.
- (7) Ensure that wiring is properly installed according to the circuit diagrams. After installing wiring, be sure to check the connection before turning on the power supply.
- (8) To prevent rainwater from leaking in at the conduit connections, ensure a watertight seal is made and check it afterwards. Rainwater ingress could cause failure, burning out, or electrical leakage.
- (9) To prevent entry of damp air through the wire entry port in the conduit connections, use putty, etc., to ensure a watertight internal seal. Otherwise, damp air cooling inside the electric actuator could cause condensation.
- (10) Covers are sealed with O-rings or rubber packing. Be careful not to damage the sealing components during wiring and inspection. Otherwise, seal efficiency may be degraded, resulting in failure.
- (11) When connecting a conduit with no stopper mechanism (such as a parallel tube) to a conduit connection, leave a gap measuring 1 mm or more between the conduit and the circuit board. Otherwise, the conduit may come into contact with the circuit board, which could cause damage to the circuit board and electrical leakage.

## 2-4 Use and Adjustment



### 2.4.1 Power Source

The voltage of the power supplied to this product should comply with the specifications.

### 2.4.2 Voltage Drop

For power wiring such as the power source, the voltage required for the equipment may not be supplied due to voltage drop caused by resistance between current flow and the power line. Please design appropriate wiring at the planning phase to secure the supply voltage to the product.



### 2.4.3 Operation Confirmation

When this product is purchased separately, confirm operation according to the following procedure.

- (1) Confirm that there is no flaw in the appearance, failure or loss of parts.
- (2) Verify that the product itself is not malfunctioning.
- (3) After connecting to the valve, adjust the valve opening.
- (4) Confirm valve opening/closing operation.

When this product integrated with a valve (hereinafter "finished product") is purchased, confirm operation according to the following procedure.

- (1) Confirm that there is no flaw in the appearance, failure or loss of parts.
- (2) Confirm that pipelines for electric signals are connected.
- (3) Confirm that there is no electric leakage.
- (4) Confirm valve opening/closing operation.



### 2.4.4 Valve Opening Adjustment

Adjust the valve opening while paying attention to the following points.

- (1) Before adjusting, ensure that the procedure for making the adjustment is fully understood.
- (2) When finished products are purchased, the stopper bolts at the closing side should not be loosened. If the stopper bolts at the closing side are loosened, the valve full-close position changes on manual operation, and valve seat leakage may occur.
- (3) Before adjustment, shut off the power supply to this product. Otherwise, operation may start unexpectedly during the adjustment process.
- (4) Check valve opening/closing operation.



### 2.4.5. Manual Operation

When power is supplied, do not operate with the manual operation lever (for Types 00 and 0), and do not operate while the clutch has been engaged by pulling the handle (for <Type 1 to 4>). Otherwise, the product may be damaged or the operator may be injured.



### 2.4.6 Modifications

Never modify this product, as reduction in durability or breakage of this product may pose a danger to the environment.

## 2-5. Maintenance



### 2.5.1 Maintenance and Inspection of This Product

Maintenance and inspection should be performed according to Point 8, Maintenance, in this document. During maintenance and inspection of this product, attention should be paid to the following items.

- (1) Shut off the power of this product at inspection. Otherwise, there is a danger that unexpected operation may cause injury.
- (2) Before starting work, stop operation of equipment which uses the valve. Otherwise, unexpected operation may cause shutdown or failure of the equipment.

### 2.5.2 Periodic Inspection

Periodic inspection of this product should take place and include the following items:

- (1) After 30,000 open/closing operations or 1 year of use, whichever is sooner, every bolt should be inspected for looseness. The bolts should be retightened and consumables should be replaced as needed.
- (2) Electrical leakage, etc. should be checked for when the above inspection is performed.

(3) From the second year, the above-mentioned inspection should be made every year.



### **2.5.3 Removal and Installation**

- (1) If this product is to be removed from the valve, it is necessary to shut off the power and compressed air, and ensure that all residual pressure has been exhausted from the machinery and piping before commencing. Otherwise a jet of compressed air or unexpected operation may occur.
- (2) When two or more valves and this product are removed, put numbers or marks on the valves and the product to identify the valve and the product which have been connected before the removal. Wrong installation may cause failure or malfunction of the equipment.
- (3) Make match marks on the top plates of this product and the valve to indicate the installation orientation of this product. Wrong installation orientation may cause malfunction.
- (4) Please loosen the hexagon bolts which fix this product on the valve to remove this product. If joints are included in the valve, please be careful not to lose them. Loss of them may cause malfunction.
- (5) When this product is removed, the valve full closing position may be changed. Check valve seat leak. In the event of leak, adjust the full closing position.
- (6) At installation, confirm that opening of the valve and the opening of this product are the same. If the openings are not the same, opening and closing operation is performed in the reverse way.



### **2.5.4 Adjustment**

Adjustment should be performed in a clean environment which is free from dust and dirt.

### **2.5.5 Lubricating**

As the sliding parts of the inside of this product are lubricated, supply air lubrication is not needed. Do not disassemble.



### **2.5.6 Confirming Safe Conditions**

When performing maintenance or inspections, be sure to keep all workers well informed about the shut off of power and turning on the power again.

### **2.5.7 Disposal**

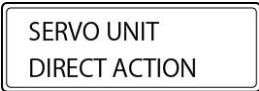
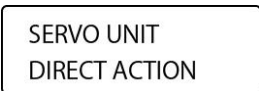
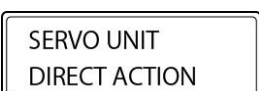
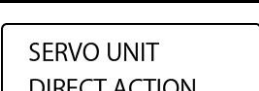
Dispose of this product while paying attention to the following items.

- (1) Do not dispose of this product by incineration. There is a possibility of generation of toxic gas and burst.
- (2) Dispose of this product according to laws and regulations.

### 3. Parts Names

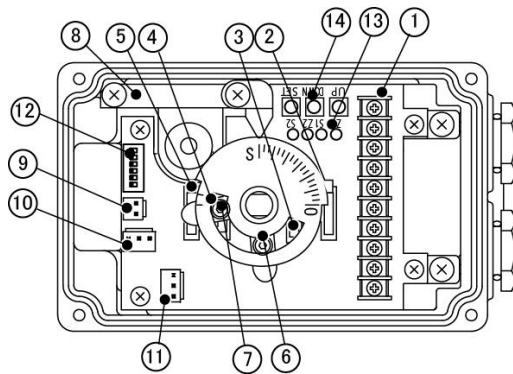
#### **3-1. Product Identification (Dip Switch Adjustment Type and Trimmer Adjustment Type)**

The new ELMY (4I) (Type 0 to 4) with a servo unit which is specified in this instruction manual is classified into two kinds of products whose adjustment procedure is different according to the date of delivery. The product type can be identified by the difference in the specification plate (whether or not the outer frame of the plate is included).

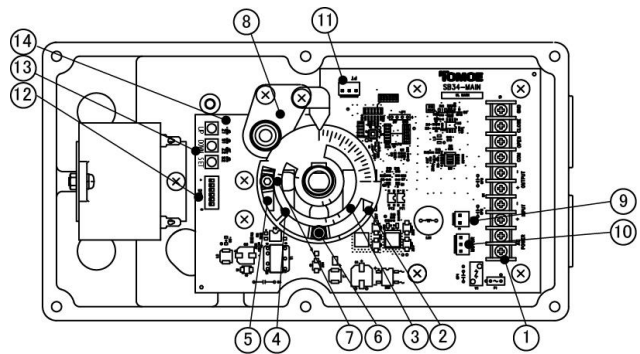
Electric Actuator Type	Specification Plate	Explanatory name
Type 0 to 2.5		Dip switch adjustment type
		Trimmer adjustment type
Type 3 and 4		Dip switch adjustment type
		Trimmer adjustment type

The adjustment procedures are different depending on the electric actuator type. Before performing adjustment, identify the electric actuator types and understand the difference between the adjustment procedures.

### 3-2. Dip Switch Adjustment Type New ELMY (4I) Type 0, Type 1, Type 2, Type 2.5, Type 3, Type 4 Parts Names on Circuit Board



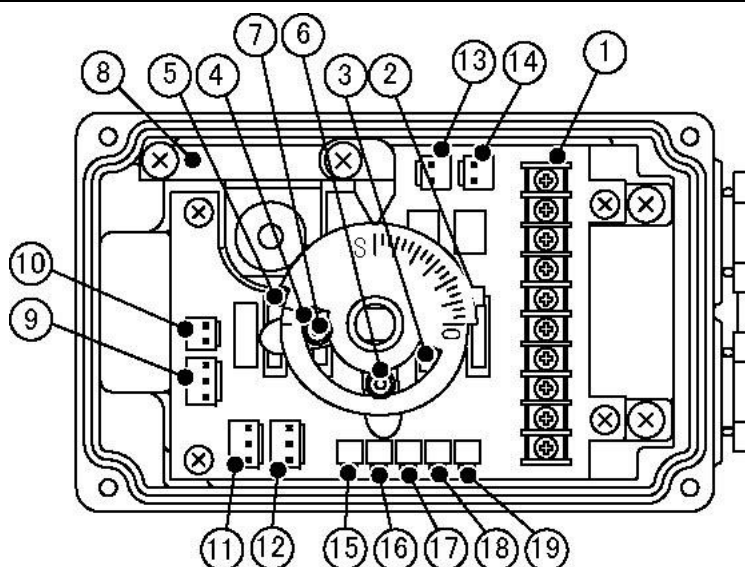
Type 0, Type 1, Type 2, Type 2.5



Type 3, Type 4

No.	Name	Description
1	Wiring terminal block	Terminals to connects the power source terminal, analog signals, contact input and output signal wires
2	Full-open position stop limit switch	Limit switch for full-open stop position detection
3	Full-open position output limit switch	Limit switch for full-open position output
4	Full-close position output limit switch	Limit switch for full-close position output
5	Full-close position stop limit switch	Limit switch for full-close stop position detection
6	Full-open limit switch dog	Determines the positions of the full-open position stop limit switch and the full-open position output limit switch.
7	Full-close limit switch dog	Determines the positions of the full-close position stop limit switch and the full-close position output limit switch.
8	Potentiometer	For detecting opening
9	Capacitor connector base	Connector to the wires from the motor capacitor
10	Motor connector base	Connector to the wires from the motor
11	Potentiometer connector	Connector to the wires from the potentiometer
12	Dip switch	Dip switches to set the operating direction and hysteresis corresponding to the analog input signal, and to set the valve opening zero/span in the setting mode.
13	LED	Indicates the setting status in the setting mode.
14	Adjustment push button	Push button switch for setting, in the setting mode

### 3-3. Trimmer Adjustment Type New ELMY (4I) Type 0, Type 1, Type 2, Type 2.5 Parts Names on Circuit Board



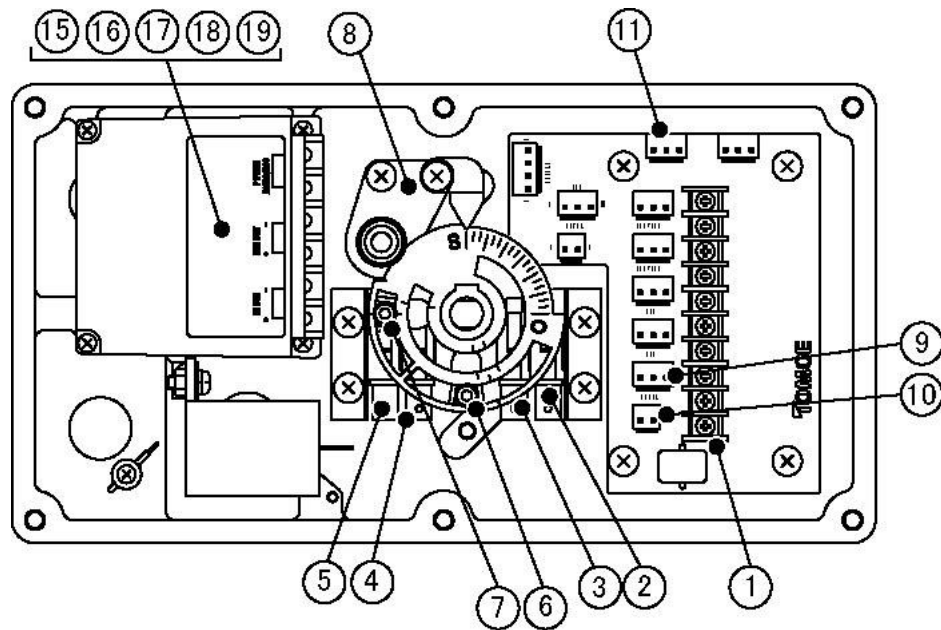
No.	Name	Description
1	Wiring terminal block	Terminals to connect the power source terminal, analog signals, contact input and output signal wires
2	Full-open position stop limit switch	Limit switch for full-open stop position detection
3	Full-open position output limit switch	Limit switch for full-open position output
4	Full-close position output limit switch	Limit switch for full-close position output
5	Full-close position stop limit switch	Limit switch for full-close stop position detection
6	Full-open limit switch dog	Determines the positions of the full-open position stop limit switch and the full-open position output limit switch.
7	Full-close limit switch dog	Determines the positions of the full-close position stop limit switch and the full-close position output limit switch.
8	Potentiometer	For detecting opening
9	Motor connector base	Connector to the wires from the motor
10	Capacitor connector base	Connector to the wires from the motor capacitor
11	RA: Potentiometer connector	Connector to the wires from the potentiometer at reverse action
12	DA: Potentiometer connector	Connector to the wires from the potentiometer at direct action
13	RA: Wiring connector	Connector to the wires (red, brown) at reverse action
14	DA: Wiring connector	Connector to the wires (red, brown) at direct action
15	DB	Adjusts the hysteresis corresponding to the analog input signal current. Turning clockwise increases the hysteresis.
16	S1	Adjusts the span position of the valve body.
17	Z1	Adjusts the zero reference position of the valve body.
18	S2	Adjusts the span value of the analog output signal
19	Z2	Adjusts the zero reference value of the analog output signal

Note: When Z1 is adjusted, be sure to adjust S1.

Note: When Z2 is adjusted, be sure to adjust S2.



### 3-4. Trimmer Adjustment Type New ELMY (4I) Type 3, Type 4 Parts Names on Circuit Board

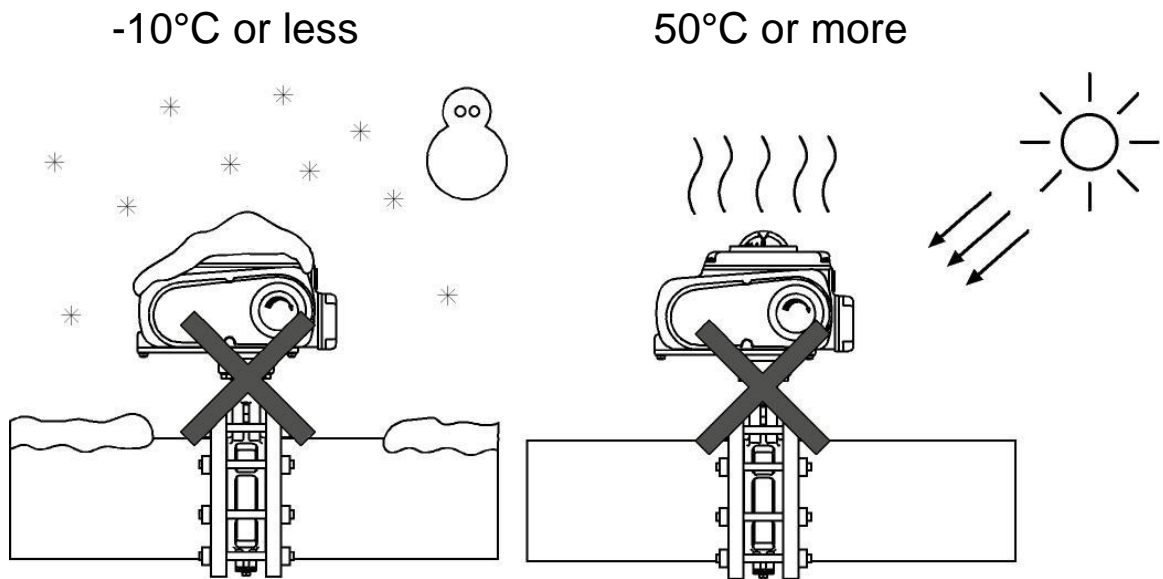


No.	Name	Description
1	Wiring terminal block	Terminals to connect the power source terminal, analog signals, contact input and output signal wires.
2	Full-open position stop limit switch	Limit switch for full-open stop position detection
3	Full-open position output limit switch	Limit switch for full-open position output
4	Full-close position output limit switch	Limit switch for full-close position output
5	Full-close position stop limit switch	Limit switch for full-close stop position detection
6	Full-open limit switch dog	Determines the positions of the full-open position stop limit switch and the full-open position output limit switch.
7	Full-close limit switch dog	Determines the position of the full-close position stop limit and the full-close position output limit switch
8	Potentiometer	For detecting opening
9	Motor connector base	Connector to the wires from the motor
10	Capacitor connector base	Connector to the wires from the motor capacitor
11	Potentiometer connector	Connector to the wires from the potentiometer
15	DB incorporated in the unit	Adjusts the hysteresis corresponding to the analog input signal. Turning clockwise increases the hysteresis.
16	S1 incorporated in the unit	Adjusts the span position of the valve body.
17	Z1 incorporated in the unit	Adjusts the zero reference position of the valve body.
18	S2 incorporated in the unit	Adjusts the span value of the analog output signal.
19	Z2 incorporated in the unit	Adjusts the zero reference value of the analog output signal.

Note: When Z1 is adjusted, be sure to adjust S1.

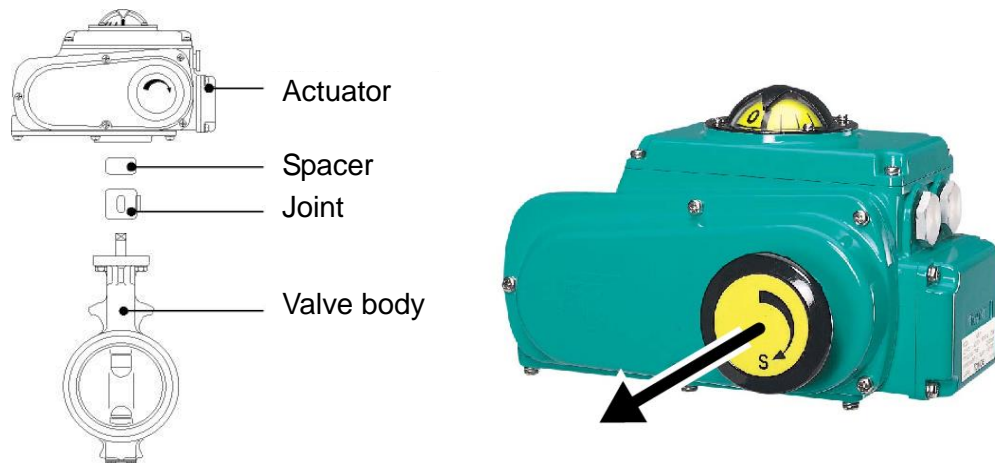
Note: When Z2 is adjusted, be sure to adjust S2.

#### 4. Precautions for Installation



- (1) For the installation location, the ambient temperature should be within the range from  $-10^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ , and the humidity should be 95%RH or less (without air frost).
- (2) Avoid installation in a dangerous atmosphere.
- (3) At installation, secure a cover for connecting wires and a maintenance space for manual operation.
- (4) When there is a possibility that the working temperatures of this product could exceed the upper limit due to direct sunlight, etc., protect the product using a protective cover, etc.
- (5) Do not use this product in environments which are exposed to gases containing salt, corrosive gases, chemical solutions, organic solvents, steam, etc. When there is a possibility that this product could be directly exposed to corrosive fluids, protect the product using a protective cover, etc.
- (6) Do not use this product in conditions where the vibration frequency is 48Hz and the acceleration is over  $19.6\text{m/s}^2$ .

## 5. Connection with Valve



- (1) Move the valve manually and check that there is no abnormality. Then set the valve to the full-close position.
- (2) Operate the manual handle on motor main body so that the memory opening gauge indicates "S" position.

### **[For New ELMY (4I) Type 0]**

Turn the seal cap on the front of the main body counterclockwise with the manual operation lever (secured on the back of the main body) and remove the seal cap. Then turn the manual operation lever in the "S" direction. At this point, be careful not to lose the seal cap and the O-ring of the seal cap. After the operation, turn the seal cap clockwise and secure it firmly, and secure the manual operation lever to the back of the main body.

### **[For New ELMY (4I) Type 1 – Type 4]**

For these types, a method where the handle is turned while the handle is pulled toward you to disengage the clutch once is adopted for improvement of operability and safety of the handle. Turn the handle in the "S" direction while pulling the handle toward you fully.

- (3) Attach the joint to the valve stem, place the spacer on the joint upper part, and insert the valve into the shaft.
- (4) Secure the valve body and the motor (valve mounting base) with four mounting bolts.
- (5) Turn the manual handle of the motor main body and check that the shaft moves smoothly.
- (6) After the manual operation, check that the manual handle is returned to its original position and perform electric operation check.

### **[Caution]**

<Type 1 to Type 4> During electric operation, the clutch of the manual handle is disengaged and the handle turns free. Therefore, the handle may turn due to vibrations, etc. But it is not an abnormal state.

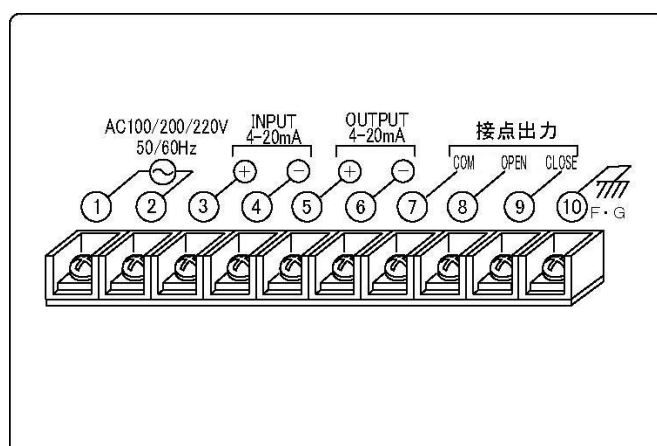
In addition, to prevent danger, when the power is supplied, do not operate with the manual operation handle for Type 00 and 0, and do not perform operation while the clutch is engaged by pulling the handle for <Type 1 to 4>. Otherwise, the devices may be damaged or the operator may be injured.

## 6. Wiring Connection

### 6-1. Precautions for Wiring Connection

- (1) For safety, only those with professional qualifications in electrical/ instrumentation work should be permitted to connect wiring to this product.
- (2) Before commencing any wiring work, be sure to turn off the power. Otherwise, electric shock may be caused.
- (3) Prior to wiring, check the voltage of the power source against the voltage on the ID plate. Non-matched voltages could cause fire within the product.
- (4) Before shipment, aluminum plugs (temporary sealing plugs) are attached temporarily to the conduit connections to prevent contamination by foreign substances. Remove all these plugs when setting up the product and replace them with waterproof sealing plugs and waterproof wire plugs intended for sealing.
- (5) Prior to wiring, remove shavings, cutting oil, dust, etc. from the inside of the conduit.
- (6) When the cable plug is screwed in, ensure that small pieces of debris from the piping screws and sealant do not get into the electric actuator. Applying excessively strong force may cause damage to female screw receptors. Therefore, only specified tools may be used.
- (7) Ensure that wiring is properly installed according to the circuit diagrams. After installing wiring, be sure to check the connection before turning on the power supply.
- (8) To prevent rainwater from leaking in at the conduit connections, ensure a watertight seal is made and check it afterwards. Rainwater ingress could cause failure, burning out, or electrical leakage.
- (9) To prevent entry of damp air through the wire entry port in the conduit connections, use putty, etc., to ensure a watertight internal seal. Otherwise, damp air cooling inside the electric actuator could cause condensation.
- (10) Covers are sealed with O-rings or rubber packing. Be careful not to damage the sealing components during wiring and inspection. Otherwise, seal efficiency may be degraded, resulting in failure.
- (11) When connecting a conduit with no stopper mechanism (such as a parallel tube) to a conduit connection, leave a gap measuring 1 mm or more between the conduit and the circuit board. Otherwise, the conduit may come into contact with the circuit board, which could cause damage to the circuit board and electrical leakage.

### 6-2. External Connection Diagram



- Note 1) Analog input signal (INPUT) and analog output signal (OUTPUT) are not insulated electrically.  
Contact output
- Note 2) The F•G terminal is for earth. Connect to the ground upper than D class.
- Note 3) When insulation resistance is measured, the applied voltage for the measurement should be DC500V or less.

## 7. Settings and Adjustment Procedure

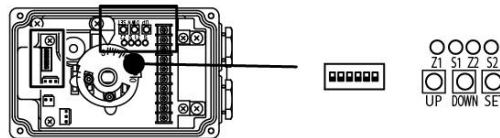
### 7-1. Product Identification and Positions of the Parts for Adjustment

The mounted circuit boards types are different depending on the type of New ELMY (4I). Valve opening zero/span adjustment procedure, analog output signal zero/span adjustment procedure, and hysteresis setting procedure depend on the mounted circuit board. Therefore, you should check the type of New ELMY (4I) you are using before performing any setting or adjustment.

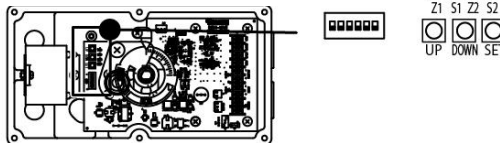
Electric Actuator Type	Adjustment Procedure	Description
Dip switch adjustment type New ELMY (4I) Type 0, 1, 2, 2.5, 3, 4	Adjustment using dip switches, UP/DOWN/SET buttons	Refer to Chapter 7-2.
Trimmer adjustment type New ELMY (4I) Type 0, 1, 2, 2.5	Adjustment using adjustment trimmers	Refer to Chapter 7-3.
Trimmer adjustment type New ELMY (4I) Type 3, 4	Adjustment using adjustment trimmers	Refer to Chapter 7-4.

Dip switches or adjustment trimmers are used for valve opening zero/span adjustment, analog output signal zero/span adjustment, and hysteresis setting.

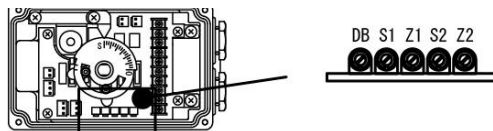
Dip switch adjustment type  
New ELMY (4I) Type 0, 1, 2, 2.5,



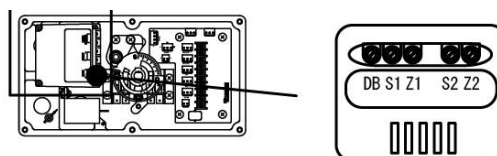
Dip switch adjustment type  
New ELMY (4I) Type 3, 4



Trimmer adjustment type  
New ELMY (4I) Type 0, 1, 2, 2.5



Trimmer adjustment type  
New ELMY (4I) Type 3, Type 4



## 7-2. Dip Switch Adjustment Type, New ELMY (4I) Type 0, Type 1, Type 2, Type 2.5, Type 3, Type 4 Various Settings and Adjustment

### 7-2-1. Operation Mode and Setting Mode

Dip switches and push button switches are used for function settings and internal settings.

There are two modes for this product, as shown below. When choosing settings, check which mode the settings are for.

Switching between operation mode and setting mode can be done by selecting ON/OFF, dip switch No. 6, and resetting operation (ON→OFF, dip switch No. 5). For setting when in the setting mode, refer to 7-2-2, Basic Setting in Setting Mode. For setting when in the operation mode, refer to 7-2-5, Operating Direction Setting and Analog Input Signal Hysteresis Setting.

Mode Name	Setting Item	Setting Description
Operation Mode	<ul style="list-style-type: none"> <li>- Electric actuator operating direction with analog input signal (Direct/Reverse action setting)</li> <li>- Hysteresis setting</li> </ul>	Operation settings for normal operation
Setting Mode	<ul style="list-style-type: none"> <li>- Full-close/Full-open position setting</li> <li>- Analog output signal zero/span setting</li> </ul>	Basic parameter settings for electric actuator operation

## 7-2-2. Basic Setting in Setting Mode

In the setting mode, valve opening zero-span, analog input signal zero-span, and analog output signal zero-span of the motor can be set. When the motor is installed to the valve at the time of shipment, basic settings have already been completed. However, respective settings are required in the following cases.

- When the combination of the motor and the valve is changed.
- When the potentiometer in the motor is removed or attached
- When the control circuit board is removed or replaced
- When the full-close/full-open position is displaced or adjusted
- When the analog input signal zero-span is deviated or adjusted
- When the analog output signal zero-span is deviated or adjusted

To switch to the setting mode, while the power is on, set dip switch 6 to ON and then set dip switch 5 to OFF→ON→OFF.

To return to the operation mode, while the power is on, set dip switch 6 to OFF and then set dip switch 5 to OFF→ON→OFF.

### Setting Description and Switch Positions in Setting Mode

Setting Item	Dip Switch						
	1	2	3	4	5	6	
Valve opening zero/span setting							
Full-open zero position adjustment/setting *1 *3 *4	ON	OFF	OFF	OFF	OFF	ON	Z1-LED illuminated
Full-open span position adjustment/setting *2*3 *5	ON	OFF	OFF	ON	OFF	ON	S1-LED illuminated
Analog output signal zero/span setting							
Minimum analog output signal position adjustment/setting*6*7	OFF	OFF	ON	OFF	OFF	ON	Z2-LED illuminated
Maximum analog output signal position adjustment/setting*6*8	OFF	OFF	ON	ON	OFF	ON	S2-LED illuminated

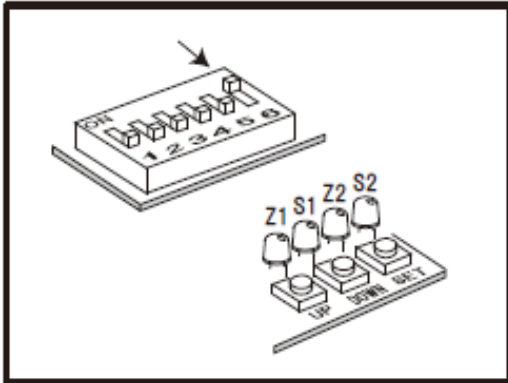
- \*1: For the zero position, perform zero position setting while the minimum value of the analog input signal is input.
- \*2: For the span position, perform span position setting while the maximum value of the analog input signal is input.
- \*3: When the push button switch DOWN is pressed, the valve stem rotates in the full-close direction. When the push button switch UP is pressed, the valve stem rotates in the full-open direction.
- \*4: To complete the setting, press the push button switch SET for 1 second. When Z1-LED blinks three times, the setting is completed. If the LED blinks once, there is an error.
- \*5: To complete the setting, press the push button switch SET is pressed for 1 second. When S1-LED blinks three times, the setting is completed. If the LED blinks once, there is an error.
- \*6: When the push button switch DOWN is pressed, the analog output signal value decreases. When the push button switch UP is pressed, the signal value increases.
- \*7: To complete the setting, press the push button switch SET for 1 second. When Z2-LED blinks three times, the setting is completed. If the LED blinks once, there is an error.
- \*8: To complete the setting, press the push button switch SET for 1 second. When S2-LED blinks three times, the setting is completed. If the LED blinks once, there is an error.

### 7-2-3. Valve Opening Zero/Span (Full-close/Full-open Position Adjustment)

Save the settings for the full-close and full-open positions when the minimum and maximum values of the analog input signal are input in memory on the control board in the electric actuator. Supply power and input the input signal (4mA), and then check that the LED blinks.

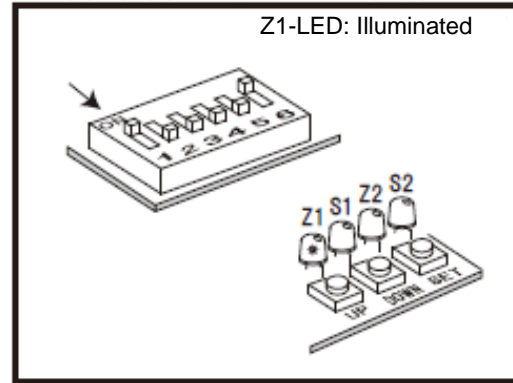
#### 7-2-3-1. Valve opening zero setting (Full-close position setting)

1. Switching to the setting mode



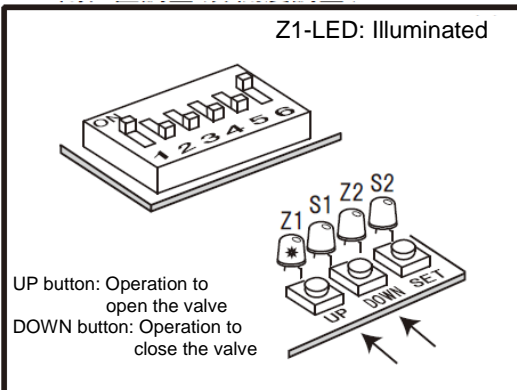
Set dip switch 6 to ON, and the dip switches 1, 2, 3, 4, and 5 to OFF, and then perform reset (Dip switch 5 ON→OFF).

2. Full-close position adjustment (Dip switch change)



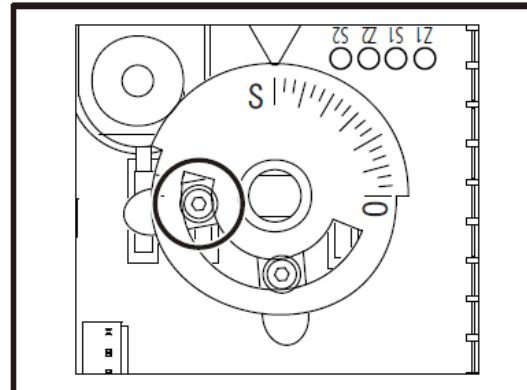
Set dip switches 1 and 6 to ON, and the dip switches 2, 3, 4, and 5 to OFF. Input the minimum analog input signal value (4mA) to the terminal block.

3. Full-close position adjustment (Valve opening adjustment)



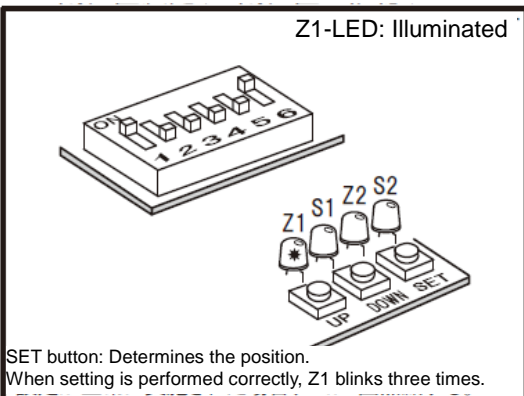
Adjust the full-close position with the UP/DOWN buttons. At this point, if operation is limited by the limit switch dog or the stopper, loosen the limit switch dog and the stopper.

4. Securing the full-close limit switch dog



Adjust the close-side limit switch dog and secure it at the position where the two limit switches are activated. After the securing, check the stop position with the UP/DOWN buttons.

5. Full-close position set (Save of full-close position)



SET button: Determines the position. When setting is performed correctly, Z1 blinks three times.

Determine the full-close position and the minimal analog input signal value (4mA) with the SET button. LED (Z1) blinks three times, and setting is completed.

6. Securing the full close stopper



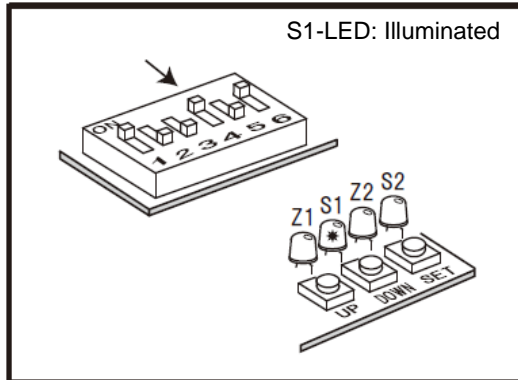
Turn the stopper bolt clockwise until it stops. Then turn it 1/4 turn counterclockwise from the stop position and secure the hexagonal nut.



### 7-2-3-2. Valve opening span setting (Full-open position) setting

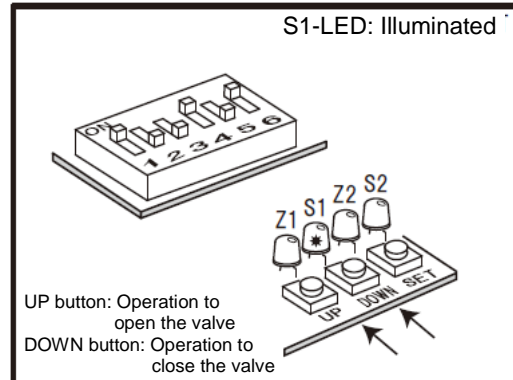
\* Be sure to set the valve opening to zero before setting the valve opening span.

#### 7. Full-open position adjustment (Dip switch change)



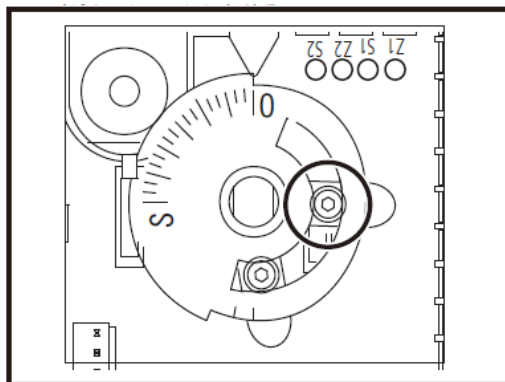
Set dip switches 1, 4, and 6 to ON, and dip switches 2, 3, and 5 to OFF. Input the maximum analog input signal value (20mA) to the terminal block.

#### 8. Full-open position adjustment (Valve opening adjustment)



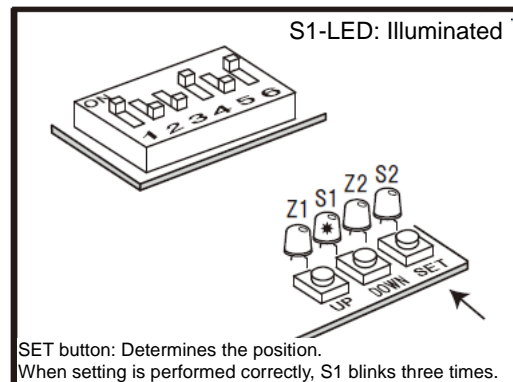
Adjust the full-open position with the UP/DOWN buttons. At this point, if operation is limited by the limit switch dog or the stopper, loosen the limit switch dog and the stopper.

#### 9. Securing the full-close limit switch dog



Adjust the open-side limit switch dog and secure it at the position where the two limit switches are activated. After securing, check the stop position with the UP/DOWN buttons.

#### 10. Full-open position set (Save of full-open position)



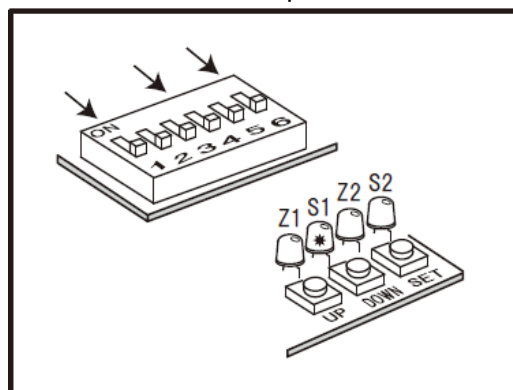
Determine the full-close position and the maximum analog input signal value (20mA) with the SET button. LED (S1) blinks three times, and setting is completed.

#### 11. Securing the full open stopper



Turn the stopper bolt clockwise until the bolt is stopped. Then turn it 1/2 turn counterclockwise from the stop position and secure the hexagonal nut.

#### 12. Return to control operation



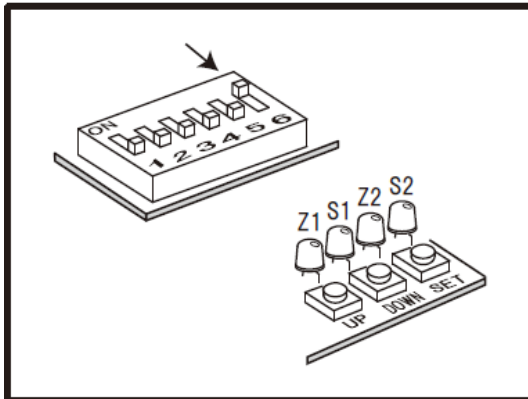
Set all the dip switches to OFF, and then perform reset (Dip switch 5 ON→OFF).

## 7-2-4 Analog Output Signal Zero-span

Save the minimum value (zero: 4mA) and the maximum value (zero + span value: 20mA) of the output analog output signal in memory on the control board in the electric actuator.

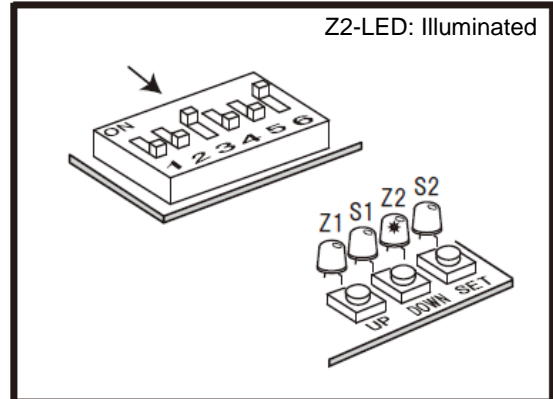
### 7-2-4-1. Analog output signal zero setting (Output min current value)

1. Switching to the setting mode



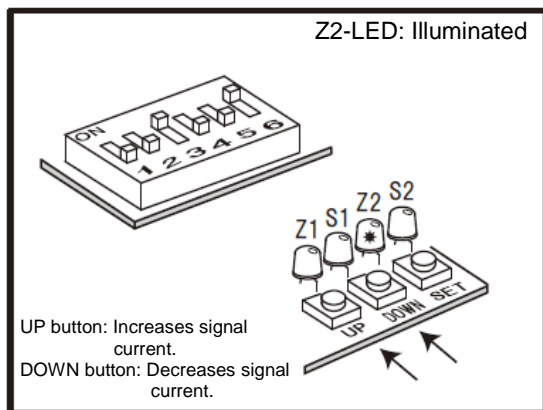
Set dip switch 6 to ON, and dip switches 1, 2, 3, 4, and 5 to OFF, and then perform reset (Dip switch 5 ON→OFF).

2. Minimum analog output signal adjustment (Dip switch change)



Set dip switches 3 and 6 to ON, and the dip switches 1, 2, 4, and 5 to OFF.

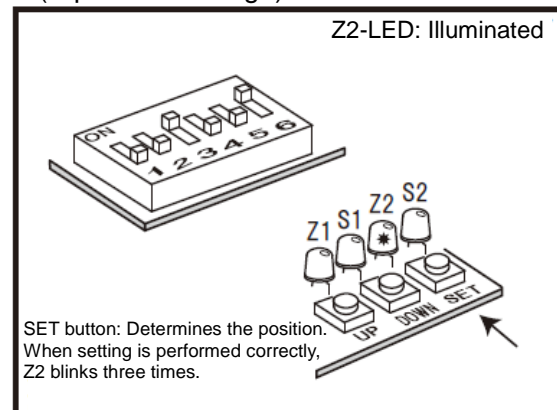
3. Minimum analog output signal adjustment



UP button: Increases signal current.  
DOWN button: Decreases signal current.

Connect a tester to the terminal block and adjust the analog output signal with the UP/DOWN buttons so that the value is within the range between 3.80mA and 3.91mA.

4. Minimum analog output signal set (Dip switch change)



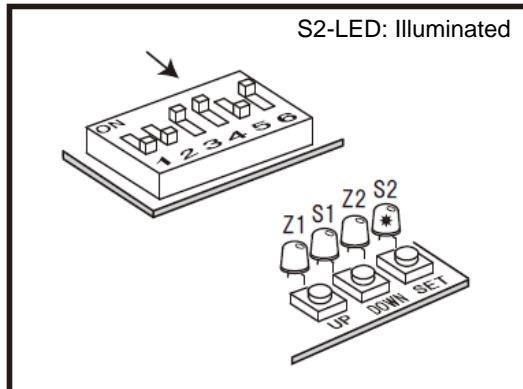
SET button: Determines the position. When setting is performed correctly, Z2 blinks three times.

Determine the minimum analog input signal value with the SET button. LED (Z2) blinks three times, and setting is completed.

7-2-4-2. Analog output signal span setting (Output maximum current value)

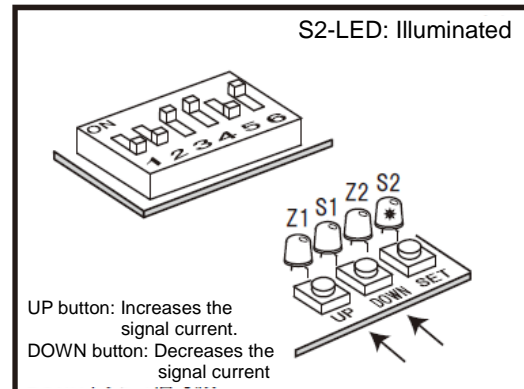
\* Be sure to set the analog output signal to zero before setting the maximum current.

5. Maximum analog output signal adjustment (Dip switch change)



Change dip switches 3, 4, and 6 to ON and the dip switches 1, 2, and 5 to OFF.

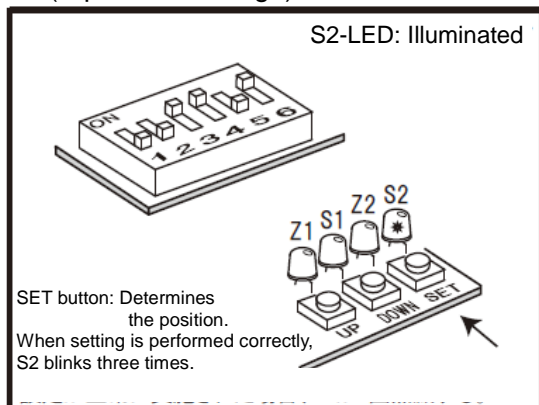
6. Maximum analog output signal adjustment



UP button: Increases the signal current.  
DOWN button: Decreases the signal current

Connect a tester to the terminal block and adjust the analog output signal with the UP/DOWN buttons so that the value is within the range 20.09mA to 20.20mA.

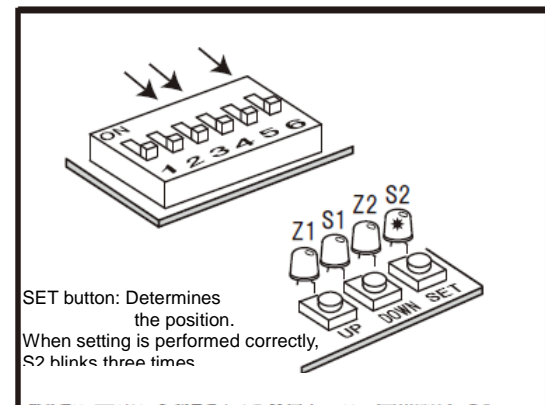
7. Maximum analog output signal set (Dip switch change)



SET button: Determines the position.  
When setting is performed correctly, S2 blinks three times.

Determine the maximum analog output signal value with the SET button. LED (S2) blinks three times, and setting is completed.

8. Return to control operation



Set all the dip switches to OFF, and then perform reset (Dip switch 5 ON→OFF).

The output range of the analog output signal after adjustment is as shown below.

[Analog output signal zero adjustment side]

- Between 3.80mA and 4.10mA

[Analog output signal span adjustment side]

- Between 19.90mA and 20.20mA

## 7-2-5. Operating Direction Setting and Analog Input Signal Hysteresis Setting

Operating direction setting and analog input signal hysteresis setting of this product can be achieved by setting a combination of the dip switches on the circuit board.

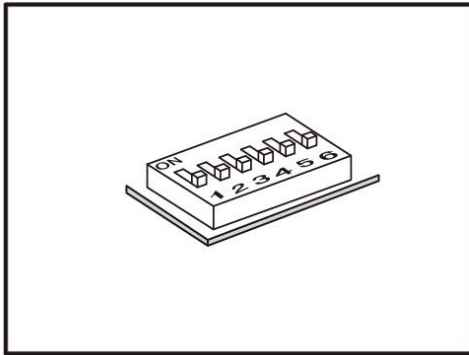
### Dip Switch Positions for Operating Direction Setting and Analog Input Signal Hysteresis Setting

Setting Item	Dip Switch					
	1	2	3	4	5	6
Electric actuator operating direction at the input of the analog signal						
<b>Reverse action *1</b>	<b>OFF</b>	---	---	---	---	<b>OFF</b>
Direct action	<b>ON</b>	---	---	---	---	<b>OFF</b>
Analog input signal hysteresis						
Hysteresis 2% ( $\pm 1.0\%$ )	---	<b>ON</b>	OFF	<b>ON</b>	---	OFF
Hysteresis 3% ( $\pm 1.5\%$ )	---	<b>ON</b>	OFF	OFF	---	OFF
<b>Hysteresis 4% (<math>\pm 2.0\%</math>) *1</b>	---	<b>OFF</b>	<b>OFF</b>	<b>OFF</b>	---	<b>OFF</b>
Hysteresis 6% ( $\pm 3.0\%$ )	---	OFF	OFF	<b>ON</b>	---	OFF
Hysteresis 8% ( $\pm 4.0\%$ )	---	OFF	<b>ON</b>	OFF	---	OFF
Hysteresis 10% ( $\pm 5.0\%$ )	---	OFF	<b>ON</b>	<b>ON</b>	---	OFF

\*1 : Factory setting

Refer to Examples of Operating Direction Setting and Analog Input Signal Hysteresis Setting in the next section. To put the new settings into effect, a reset (Dip switch 5 ON→OFF) is required after the dip switch positions are changed.

## 7-2-6. Examples of Operating Direction Setting and Analog Input Signal Hysteresis Setting

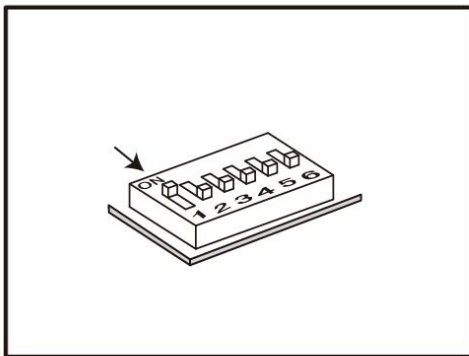


### Setting Example 1

Operating direction setting: Reverse action  
Hysteresis setting value: 4% ( $\pm 2.0\%$ )

### Setting Procedure

Set dip switches 1, 2, 3, 4, 5, and 6 to OFF.  
Perform reset (Dip switch 5 ON→OFF).

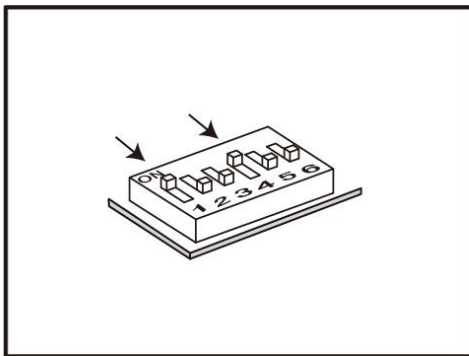


### Setting Example 2

Operating direction setting: Direct action  
Hysteresis setting value: 4% ( $\pm 2.0\%$ )

### Setting Procedure

Set dip switch 1 to ON.  
Set dip switches 2, 3, 4, 5, and 6 to OFF.  
Perform reset (Dip switch 5 ON→OFF).



### Setting Example 3

Operating direction setting: Direct action  
Hysteresis setting value: 6% ( $\pm 3.0\%$ )

### Setting Procedure

Set dip switch 1 and 4 to ON  
Set dip switches 2, 3, 5, and 6 to OFF.  
Perform reset (Dip switch 5 ON→OFF).

## 7-3. Trimmer Adjustment Type New ELMY (4I) Type 0, Type 1, Type 2, Type 2.5 Various Settings and Adjustment

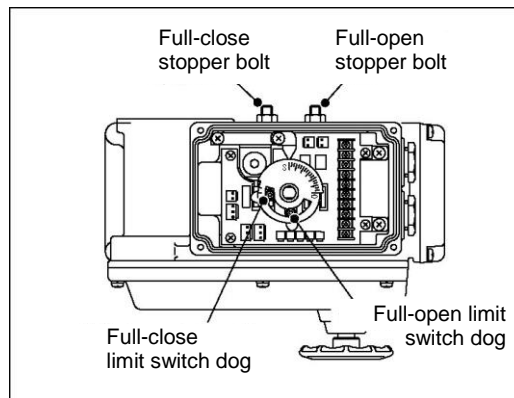
### 7-3-1. Valve Opening Zero/Span Adjustment for Reverse Action (Full-close/Full-open Position Adjustment)

For full-close/full-open position adjustment of the electric actuator for reverse action, perform the work referring to the procedure below.

#### 1. Releasing the full-close and full-open limit switch dogs

Loosen the full-close and full-open limit switch dogs with a hexagonal wrench. Slide the full-close limit switch dog counterclockwise and the full-open limit switch dog clockwise. Then secure them temporarily.

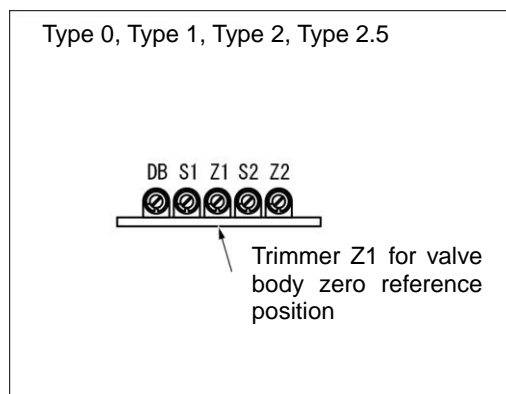
Note: When the limit switch dog activates the limit switch on the circuit board, the motor stops.



#### 2. Turning on the power while inputting a current of 4mA and adjusting the full-close position

Input a current of 4mA to the analog input signal terminals (terminal blocks No. 3, 4) and turn on the power to the electric actuator. In this state, the stop position at 4mA input (Full-close position) can be adjusted by adjusting the Z1 trimmer with a precision screwdriver. At this point, if the electric actuator is not stable (due to hunching), adjust the hysteresis first.

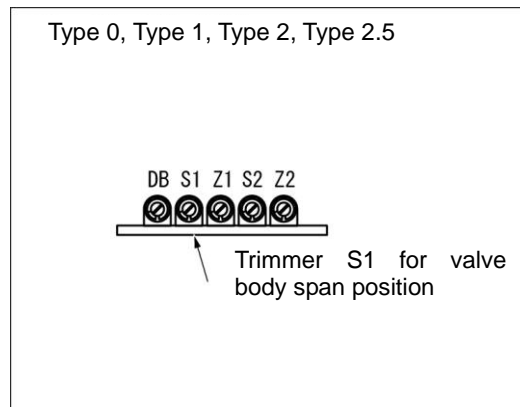
Note: If adjustment cannot be made with the trimmer, check the potentiometer value (Green - White) at full-close (15Ω).



After determining the full-close position with the Z1 trimmer adjustment, slide the full-close limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/4 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-close stopper bolt.

### 3. Inputting a current of 20mA and adjusting the full-open position

Input a current of 20mA to the analog input signal terminals (terminal blocks No. 3, 4). In this state, the stop position at 20mA input can be adjusted by adjusting the S1 trimmer with a precision screwdriver.



After determining the full-open position with the S1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-open stopper bolt clockwise until the bolt is stopped. Then turn it 1/2 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.

### 4. Check of limit switches and operation

Input the full-close and full-open signals to the analog input signal terminals (terminal blocks No. 3, 4). Check for contact outputs using a tester, etc. at full-close stop and at full-open stop positions.

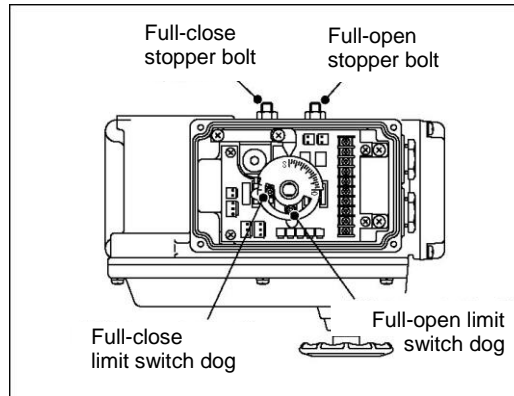
### 7-3-2. Valve Opening Zero/Span Adjustment (Full-close/Full-open Position Adjustment) for Direct Action

For full-close/full-open position adjustment of the electric actuator for direct action, perform the work referring to the procedure below.

#### 1. Releasing the full-close and full-open limit switch dogs

Loosen the full-close and full-open limit switch dogs with a hexagonal wrench. Slide the full-close limit switch dog counterclockwise and the full-open limit switch dog clockwise. Then secure them temporarily.

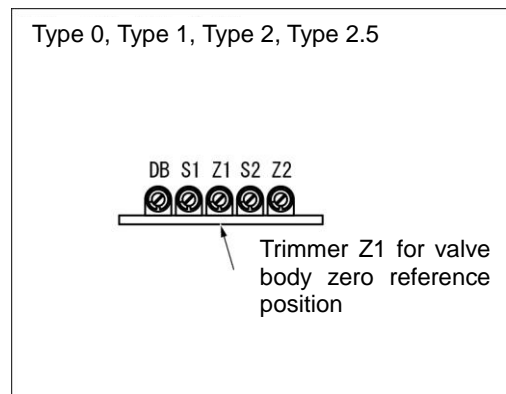
Note: When the limit switch dog activates the limit switch on the circuit board, the motor stops.



#### 2. Turning on the power while inputting a current of 4mA and adjusting the full open position

Input a current of 4mA to the analog input signal terminals (terminal blocks No. 3, 4) and turn on the power to the electric actuator. In this state, the stop position at 4mA input (Full-open position) can be adjusted by adjusting the Z1 trimmer with a precision screwdriver. At this point, if the electric actuator is not stable (due to hunching), adjust the hysteresis first.

Note: If adjustment cannot be made with the trimmer, check the potentiometer value (Green - White) at full-close ( $15\Omega$ ).

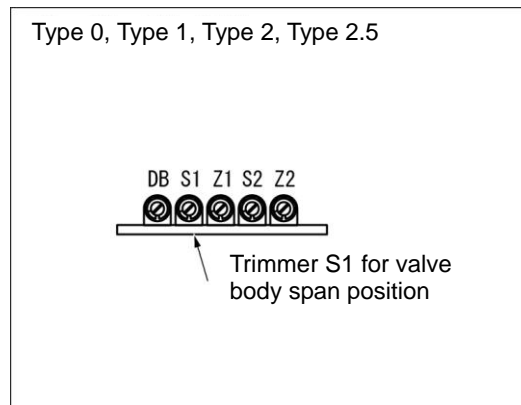


After determining the full-open position with the Z1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/2 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.



### 3. Inputting a current of 20mA and adjusting the full-close position

Input a current of 20mA to the analog input signal terminals (terminal blocks No. 3, 4). In this state, the stop position at 20mA input can be adjusted by adjusting the S1 trimmer with a precision screwdriver.



After determining the full-close position with the S1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/4 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.

### 4. Check of limit switches and operation

Input the full-close and full-open signals to the analog input signal terminals (terminal blocks No. 3, 4). Check for contact outputs using a tester, etc. at full-close stop and at full-open stop.

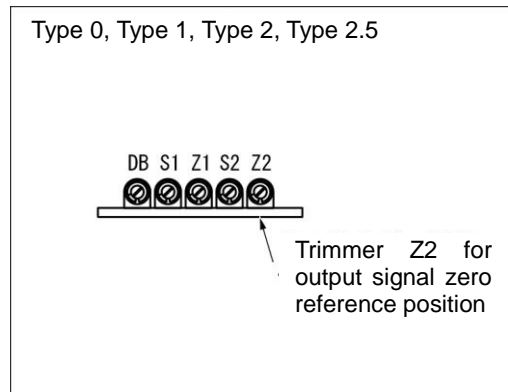
### 7-3-3. Analog Output Signal Zero/Span Adjustment

For the analog output signal zero/span adjustment of the electric actuator, perform the work referring to the procedure below.

#### 1. Analog output signal zero adjustment

Connect a tester to the analog output signal terminals (terminal blocks No. 5, 6) and input a 4mA analog signal to the analog input signal terminals (terminal blocks No 3, 4). The analog output signal at 4mA input can be adjusted by adjusting the Z2 trimmer with a precision screwdriver while checking the current value at the analog output signal terminals with a tester.

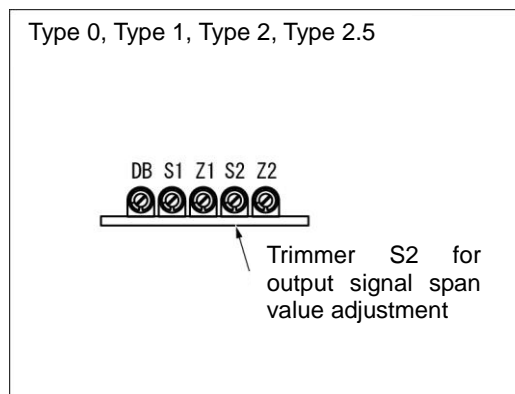
Note: The valve body position at 4mA signal input depends on setting of the electric actuator operating direction (Reverse action/Direct action).



#### 2. Analog output signal span adjustment

Input a 20mA analog signal to the analog input signal terminals (terminal blocks No. 3, 4). The analog output signal at 20mA input can be adjusted by adjusting the S2 trimmer with a precision screwdriver while checking the current value at the analog output signal terminals with a tester.

Note: The valve body position at 20mA signal input depends on setting of the electric actuator operating direction (Reverse action/Direct action).

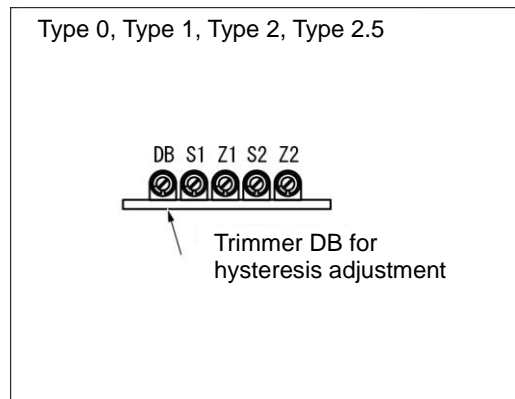


**7-3-4. Hysteresis Adjustment (Adjustment of Operation Sensitivity to Analog Input Signal)**

Perform hysteresis adjustment referring to the following procedure.

**1. Adjustment to maximum sensitivity (Maximum sensitivity without self-hunching of the electric actuator)**

1. Turn the trimmer DB clockwise to reduce the operation sensitivity.
2. Input a 12mA analog signal to the analog input signal terminals (terminal blocks No. 3, 4) to move the valve body to the intermediate position.
3. Turn the trimmer DB counterclockwise slowly to increase the operation sensitivity gradually until self-hunching (repeat of opening and closing operations) occurs.
4. Turn the trimmer DB clockwise a little from the point where self-hunching occurred. The position where self-hunching stops is the adjustable maximum sensitivity.
5. Change the analog input signal from 4mA to 8mA, 16mA, and 20mA, and check that self-hunching does not occur when the electric actuator is stopped.



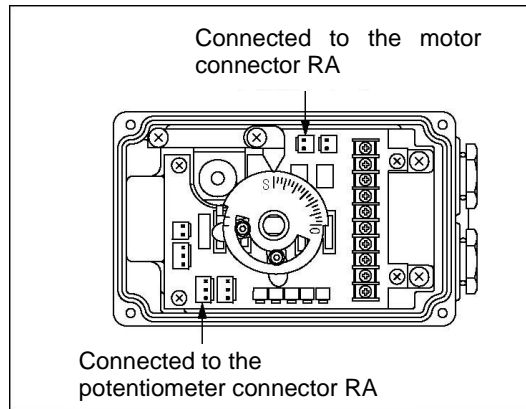
**Note:** When hysteresis is adjusted to match the adjustment of the customer's PID controller in the existing equipment or to prevent hunching of the PID controller, move the valve body to the intermediate position, and then start the hysteresis adjustment from step 3 in the above-mentioned procedure. If hunching is not prevented even though the trimmer DB is turned clockwise to the maximum (the operation sensitivity is the lowest), adjustment of the parameter of the customer's PID adjustment system is required.

### 7-3-5. Operation Change from RA (Reverse Action) to DA (Direct action)

For operation change from reverse action to direct action on electric actuators Type 0 to Type 2.5, perform the work referring to the procedure below.

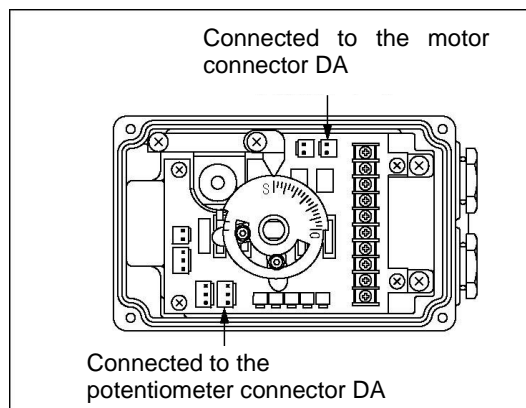
#### 1. Connector check

Remove the top cover and check the connector positions (motor connector, potentiometer connector) on the circuit boards. When the operating direction is set to reverse action, the motor connector and the potentiometer connector are connected to the RA side connectors.



#### 2. Connector change

Check that the electric actuator power source is turned off, and then remove these connectors and connect them to the DA side connectors.



#### 3. Operation check

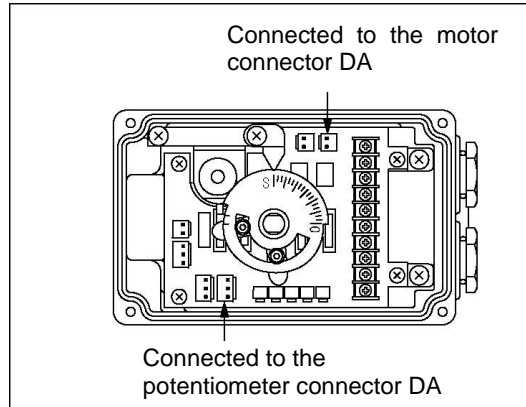
Turn on the power to the electric actuator, and check that the valve can be opened/closed normally with the analog input signal. If the full-close/full-open position is displaced, perform 7-3-2. Valve Opening Zero/Span Adjustment for Direct Action and 7-3-3. Analog Output Signal Zero/Span Adjustment.

### 7-3-6. Operation Change from DA (Direct Action) to RA (Reverse Action)

For operation change from direct action to reverse action on electric actuators Type 0 to Type 2.5, perform the work referring to the procedure below.

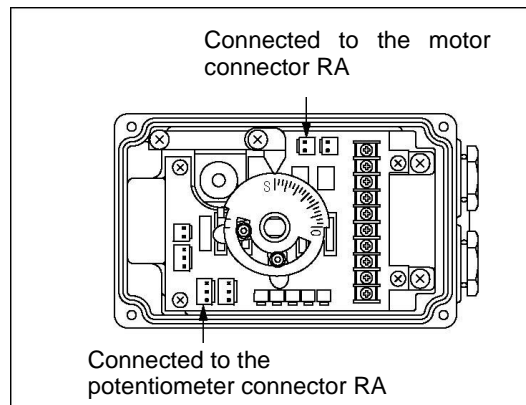
#### 1. Connector check

Remove the top cover and check the connector positions (motor connector, potentiometer connector) on the circuit boards. When the operating direction is set to direct action, the motor connector and the potentiometer connector are connected to the DA side connectors.



#### 2. Connector change

Check that the electric actuator power source is turned off, and then remove these connectors and connect them to the RA side connectors.



#### 3. Operation check

Turn on the power to the electric actuator, and check that the valve can be opened/closed normally with the analog input signal. If the full-close/full-open position is displaced, perform 7-3-1. Valve Opening Zero/Span Adjustment for Reverse Action and 7-3-3. Analog Output Signal Zero/Span Adjustment.

## 7-4. Trimmer Adjustment Type New ELMY (4I) Type 3, 4 Various Setting and Adjustment

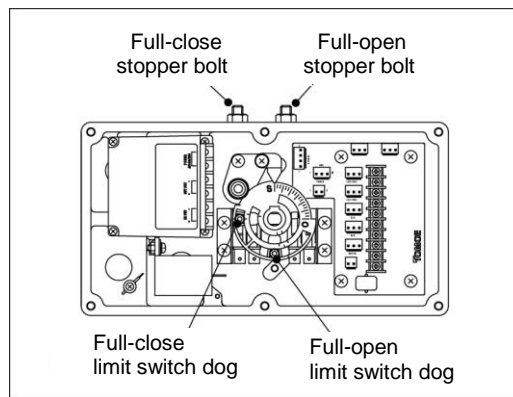
### 7-4-1. Valve Opening Zero/Span Adjustment (Full-close/Full-open Position Adjustment) for Reverse Action

For full-close/full-open position adjustment of the electric actuator for reverse action, perform the work referring to the procedure below.

#### 1. Releasing the full-close and full-open limit switch dogs

Loosen the full-close and full-open limit switch dogs with a hexagonal wrench. Slide the full-close limit switch dog counterclockwise and the full-open limit switch dog clockwise. Then secure them temporarily.

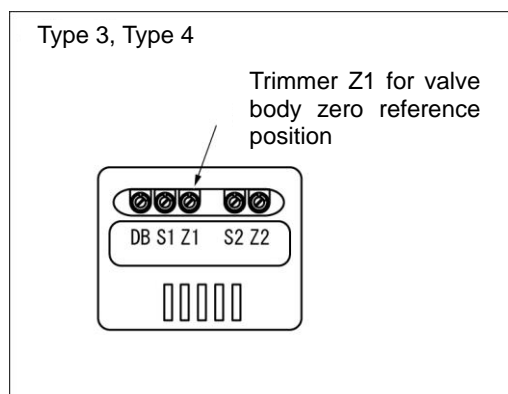
Note: When the limit switch dog activates the limit switch on the circuit board, the motor stops.



#### 2. Turning on the power while inputting a current of 4mA and adjusting the full-close position

Input a current of 4mA to the analog input signal terminals (terminal blocks No. 3, 4) and turn on the power to the electric actuator. In this state, the stop position at 4mA input (Full-close position) can be adjusted by adjusting the Z1 trimmer with a precision screwdriver. At this point, if the electric actuator is not stable (due to hunching), adjust the hysteresis first.

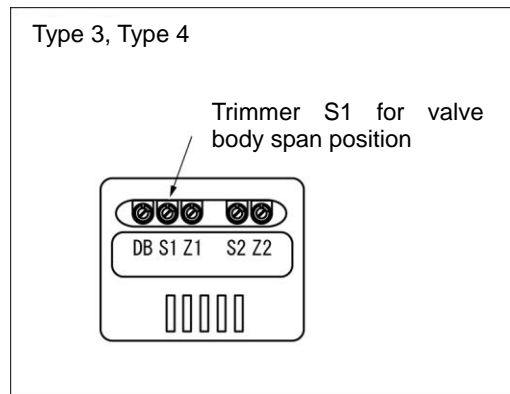
Note: If adjustment cannot be made with the trimmer, check the potentiometer value (Green - White) at full-close (15Ω).



After determining the full-close position with the Z1 trimmer adjustment, slide the full-close limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/4 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-close stopper bolt.

### 3. Inputting a current of 20mA and adjusting the full-open position

Input a current of 20mA to the analog input signal terminals (terminal blocks No. 3, 4). In this state, the stop position at 20mA input can be adjusted by adjusting the S1 trimmer with a precision screwdriver.



After determining the full-open position with the S1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-open stopper bolt clockwise until the bolt is stopped. Then turn it 1/2 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.

### 4. Check of limit switches and operation

Input the full-close and full-open signals to the analog input signal terminals (terminal blocks No. 3, 4). Check for contact outputs using a tester, etc. at full-close stop and at full-open stop.

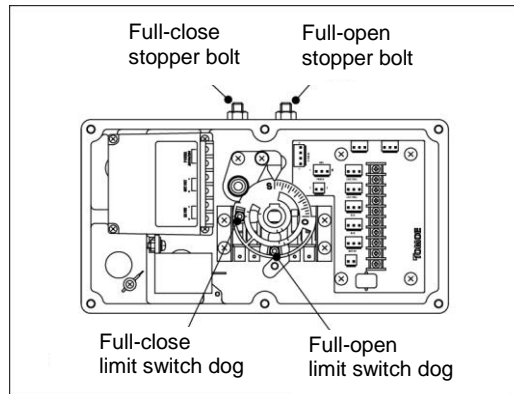
## 7-4-2. Valve Opening Zero/Span Adjustment (Full-close/Full-open Position Adjustment) for Direct Action

For full-close/full-open position adjustment of the electric actuator for direct action, perform the work referring to the procedure below.

### 1. Releasing the full-close and full-open limit switch dogs

Loosen the full-close and full-open limit switch dogs with a hexagonal wrench. Slide the full-close limit switch dog counterclockwise and the full-open limit switch dog clockwise. Then secure them temporarily.

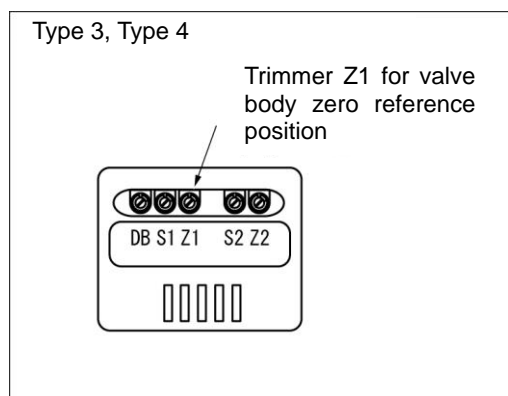
Note: When the limit switch dog activates the limit switch on the circuit board, the motor stops.



### 2. Turning on the power while inputting a current of 4mA and adjusting the full-open position

Input a current of 4mA to the analog input signal terminals (terminal blocks No. 3, 4) and turn on the power to the electric actuator. In this state, the stop position at 4mA input (Full-open position) can be adjusted by adjusting the Z1 trimmer with a precision screwdriver. At this point, if the electric actuator is not stable (due to hunching), adjust the hysteresis first.

Note: If adjustment cannot be made with the trimmer, check the potentiometer value (Green - White) at full-close (15Ω).

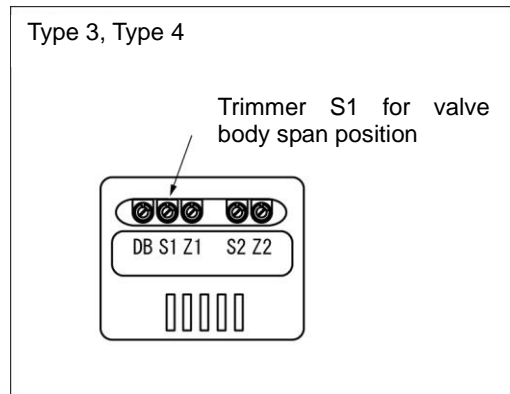


After determining the full-open position with the Z1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/2 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.



### 3. Inputting a current of 20mA and adjusting the full-close position

Input a current of 20mA to the analog input signal terminals (terminal blocks No. 3, 4). In this state, the stop position at 20mA input can be adjusted by adjusting the S1 trimmer with a precision screwdriver.



After determining the full-close position with the S1 trimmer adjustment, slide the full-open limit switch dog to the position where the dog contacts the two limit switch rollers, and then tighten the hexagon socket head cap screw. Next, turn the full-close stopper bolt clockwise until the bolt is stopped. Then turn it 1/4 turn counterclockwise from the stop position and secure the hexagon nut intended for securing the full-open stopper bolt.

### 4. Check of limit switches and operation

Input the full-close and full-open signals to the analog input signal terminals (terminal blocks No. 3, 4). Check for contact outputs using a tester, etc. at full-close stop and at full-open stop.

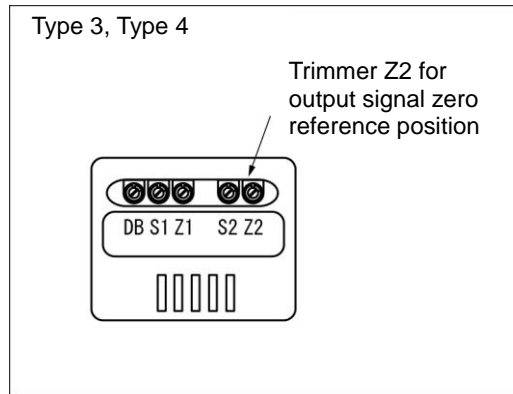
### 7-4-3. Analog Output Signal Zero/Span Adjustment

For the analog output signal zero/span adjustment of the electric actuator, perform the work referring to the procedure below.

#### 1. Analog output signal zero adjustment

Connect a tester to the analog output signal terminals (terminal blocks No. 5, 6) and input a 4mA analog signal to the analog input signal terminals (terminal blocks No 3, 4). The analog output signal at 4mA input can be adjusted by adjusting the Z2 trimmer with a precision screwdriver while checking the current value at the analog output signal terminals with a tester.

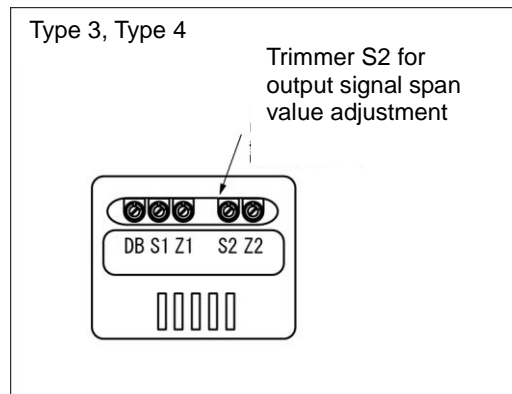
Note: The valve body position at 4mA signal input depends on setting of the electric actuator operating direction (Reverse action/Direct action).



#### 2. Analog output signal span adjustment

Input a 20mA analog signal to the analog input signal terminals (terminal blocks No. 3, 4). The analog output signal at 20mA input can be adjusted by adjusting the S2 trimmer with a precision screwdriver while checking the current value at the analog output signal terminals with a tester.

Note: The valve body position at 20mA signal input depends on setting of the electric actuator operating direction (Reverse action/Direct action)

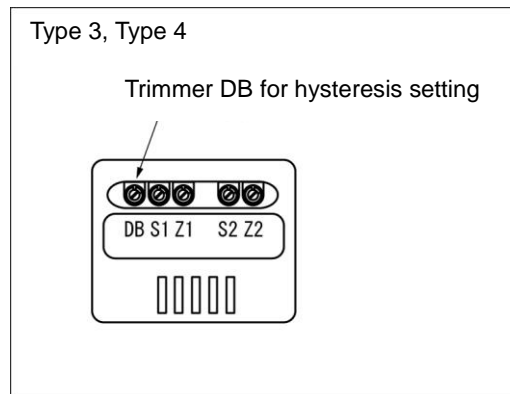


**7-4-4. Hysteresis Adjustment (Adjustment of Operation Sensitivity to Analog Input Signal)**

Perform hysteresis adjustment referring to the following procedure.

**1. Adjustment to the maximum sensitivity (Maximum sensitivity without self-hunching of the electric actuator)**

1. Turn the trimmer DB clockwise to reduce the operation sensitivity.
2. Input a 12mA analog signal to the analog input signal terminals (terminal blocks No. 3, 4) to move the valve body to the intermediate position.
3. Turn the trimmer DB counterclockwise slowly to increase the operation sensitivity gradually until self-hunching (repeat of opening and closing operations) occurs.
4. Turn the trimmer DB clockwise a little from the point where self-hunching occurred. The position where self-hunching stops is the adjustable maximum sensitivity.
5. Change the analog input signal from 4mA to 8mA, 16mA, and 20mA, and check that self-hunching does not occur when the electric actuator is stopped.



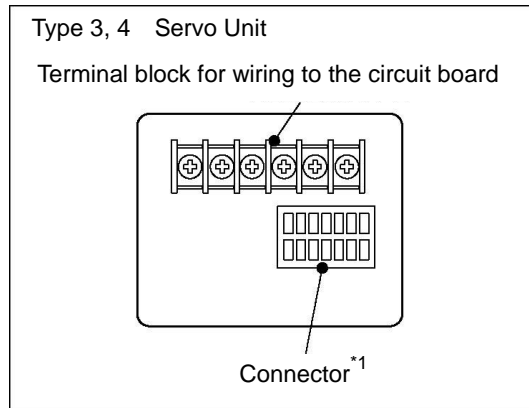
Note: When hysteresis is adjusted to match the adjustment of the customer's PID controller in the existing equipment or to prevent hunching of the PID controller, move the valve body to the intermediate position, and then start the hysteresis adjustment from step 3 in the above-mentioned procedure. If hunching is not prevented even though the trimmer DB is turned clockwise to the maximum (the operation sensitivity is the lowest), adjustment of the parameter of the customer's PID adjustment system is required.

## 7-4-5. Operation Change from RA (Reverse Action) to DA (Direct action)

For operation change from RA (reverse action) to DA (direct action) on electric actuators Type 3 and Type 4, perform the work referring to the procedure below.

### 1. Connector check

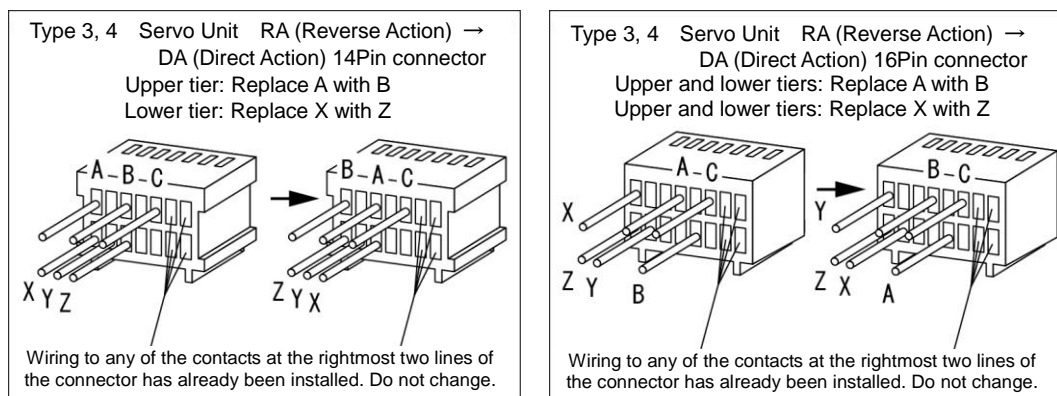
Remove the top cover and check the connector positions of the servo unit



\*1: Wiring to any of the contacts at the rightmost two lines of the connector has already been installed. Do not change.

### 2. Connector change

Check that the power to the electric actuator is turned off. Remove the connector and replace the wires which have been inserted into the connector referring to the figure below. The claw of the wiring contact is engaged with the connector when the wiring is removed from the connector. Therefore remove the wire while pushing the claw using a precision driver, etc. Insert the wire into the connector and check that the claw of the wiring contact is engaged with the connector. Then put the connector back to the original position. There are 14Pin and 16Pin types. The type depends on the date of delivery.



### 3. Operation check

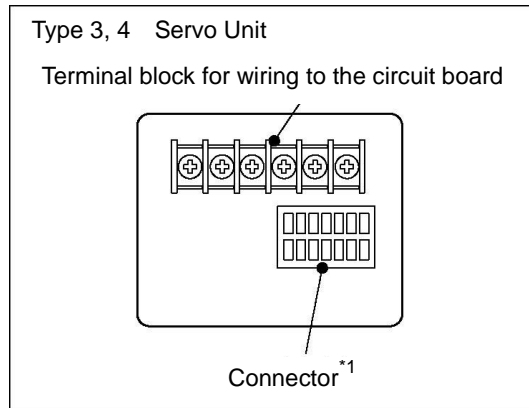
Turn on the power to the electric actuator, and check that the valve can be opened/closed normally with the analog input signal. If the full-close/full-open position is displaced, perform 7-4-2, Valve Opening Zero/Span Adjustment for Direct Action and 7-4-3, Analog Output Signal Zero/Span Adjustment.

## 7-4-6. Operation Change from DA (Direct Action) to RA (Reverse Action)

For operation change from DA (direct action) to RA (reverse action) on electric actuators Type 3 to Type 4, perform the work referring to the procedure below.

### 1. Connector check

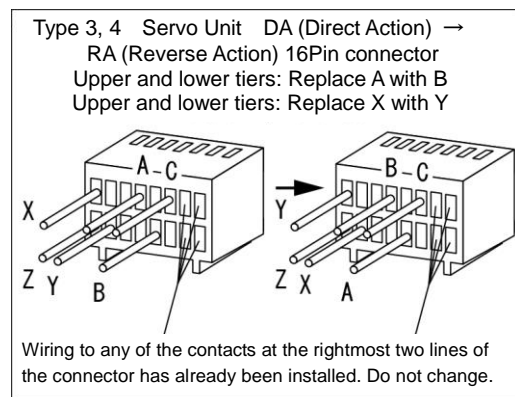
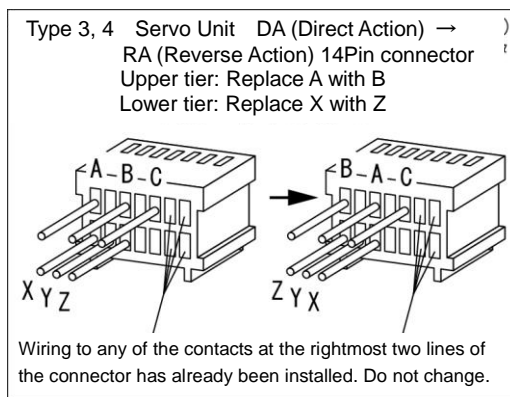
Remove the top cover and check the connector positions of the servo unit



\*1: Wiring to any of the contacts at the rightmost two lines of the connector has already been installed. Do not change.

### 2. Connector change

Check that the power to the electric actuator is turned off. Remove the connector and replace the wires which have been inserted into the connector referring to the figure below. The claw of the wiring contact is engaged with the connector when the wiring is removed from the connector. Therefore remove the wire while pushing the claw using a precision driver, etc. Insert the wire into the connector and check that the claw of the wiring contact is engaged with the connector. And then put the connector back to the original position. There are 14Pin and 16Pin types. The type depends on the date of delivery.



### 3. Operation check

Turn on the power to the electric actuator, and check that the valve can be opened/closed normally with the analog input signal. If the full-close/full-open position is displaced, perform 7-4-1. Valve Opening Zero/Span Adjustment for Reverse Action and 7-4-3. Analog Output Signal Zero/Span Adjustment.

## 8. Maintenance

### **8-1. Lubrication**

As needed grease has been applied using molybdenum disulfide (MoS<sub>2</sub>) grease excellent in pressure resistance with long life, lubrication is not needed as a rule.

### **8-2. Periodic operation**

When the valve is not opened/closed for a long period of time, check that there is no abnormality by making a plan and operating the valve for a fixed period of time (recommended: once per a week).

### **8-3. Removal of soiling**

When soiling of the motor is noticeable, wipe it off with alcoholic degreasing solution. Please read the precautions for use of the degreasing solution before its use.

## 9. Troubleshooting

Failure Causes and Countermeasures		
Failure Description	Cause	Countermeasures
Operation does not start.	The power is not turned on. (The power source LED at the lower circuit board is not illuminated.)	Check the power source.
	The mode is setting mode.	Set the dip switch 6 to OFF.
	The analog input signal is not input.	Check the analog input signal wire.
	Foreign substances are caught in the valve.	Move the valve body with the manual handle and remove foreign substances, and then push the reset button.
	Motor thermal protector has operated due to high frequency operation	Check the control parameters of the controller
	Defective potentiometer	Re-adjust or replace the potentiometer.
	The analog input signal is not input correctly.	Check the signal value of the device which outputs the analog signal.
Stop at near full-open The valve is not fully opened.	Stopper bolt adjustment failure Limit switch dog, full-open position setting error	Re-adjust the stopper bolt. Re-adjust the limit switch dog. Re-set the full-open position.
	The analog input signal is not input correctly.	Check the signal value of the device which outputs the analog signal.
Stop at near full-close The valve is not fully closed.	Stopper bolt adjustment failure Limit switch dog, full-close position setting error	Re-adjust the stopper bolt. Re-adjust the limit switch dog. Re-set the full-close position.
	Valve torque increase	Inspect the valve and adjust the full-close position.
	The analog input signal is not input correctly.	Check the signal value of the device which outputs the analog signal.

- ◎ The specifications are subject to change without notice. Please consult us for the latest specifications.
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