



# Instruction manual

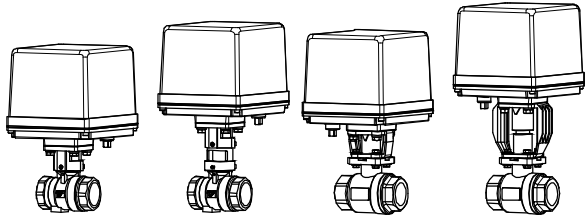
**Please read this manual before installation and use.**

### GENERAL

Threaded-end ball valve with high-power electric actuator.

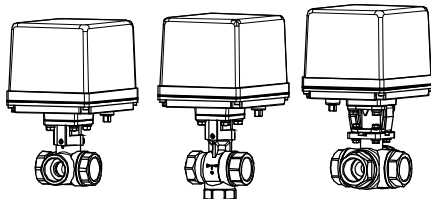
#### Actuator

- AE1 : For AC power
- AE2 : For AC / DC power



#### Valve

- E type For general use.
- EG type For high temp. (up to 1 MPa)
- SR type For food / Corrosive fluid.
- SH type For high temp. (up to 2 MPa)
- EL type For general use.
- TV type For diversion flow and mixing.
- ST type 4 seats, 3 way. (with flow paths)
- SL type 4 seats, 3 way.



### PRODUCT CODE

E type (Brass)	( ) ( )	E - ( ) ( )	5	Y	Y	F	( ) ( ) ( )	( ) ( )			
(Stainless)	( ) ( )	E - ( ) ( )	5	U	U	T	( ) ( ) ( )	( ) ( )			
EG type	( ) ( )	E G ( ) ( )	5	U	U	P	( ) ( ) ( )	( ) ( )			
SR type	( ) ( )	S R ( ) ( )	5	U	U	T	( ) ( ) ( )	( ) ( )			
SH type	( ) ( )	S H ( ) ( )	5	U	U	F	( ) ( ) ( )	( ) ( )			
EL type	( ) ( )	E L ( ) ( )	5	U	U	T	( ) ( ) ( )	( ) ( )			
TV type	( ) ( )	T V ( ) ( )	5	T	T	P	( ) ( ) ( )	( ) ( )			
ST type	( ) ( )	S T ( ) ( )	5	U	U	F	( ) ( ) ( )	( ) ( ) - ( )			
SL type	( ) ( )	S L ( ) ( )	5	U	U	F	( ) ( ) ( )	( ) ( ) - ( )			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

(1) Actuator AE1 AE2	(4) Sizing code 0 : Standard 1 : Light 2 : Heavy	(7) Ball material Y : C3771BE / C3604BD U : SCS14A / SUS316 T : SCS13A / SUS304	(10) Option L0 : Auxiliary limit SW L2 : Auxiliary limit SW
(2) Valve E- EG SR SH EL TV ST SL	(5) Connection 5 : Threaded End Rc	(8) Seat material F : F-PTFE T : PTFE P : R-PTFE	(11) Flow paths (ST) a to d : 3 way valve flow
(3) Voltage 1 : 100 / 110 V AC 2 : 200 / 220 V AC 0 : 24 V DC	(6) Body material Y : C3771BE U : SCS14A T : SCS13A	(9) Size [mm] ex. 25 A → 025	

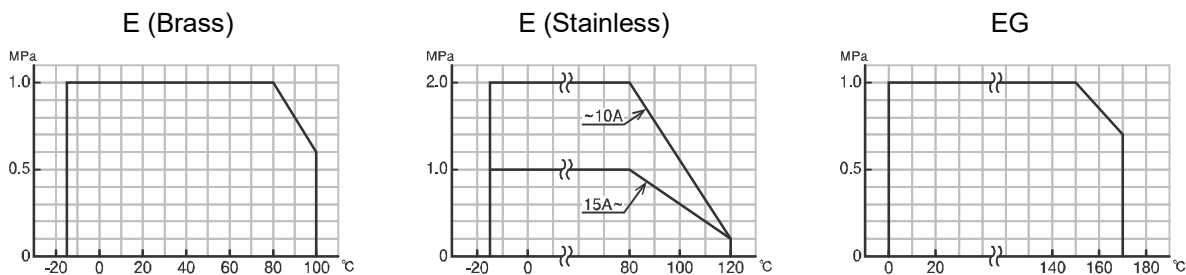
**VALVES SPECIFICATIONS**

Water 
 Oil 
 Air, Gas 
 Steam 
 Chemicals 
 Sea water 
 Slurry 
 Negative pressure

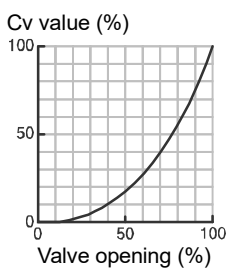
E EG Type

Valve type	E (Brass)		E (Stainless)			EG
Design	2 way, Standard port		2 way, Standard port			2 way, Standard port
Connection	Threaded End Rc		Threaded End Rc			Threaded End Rc
Fluid						
Max pressure	1 MPa		2 MPa	1 MPa		1 MPa
Size [mm]	015 to 025	032 to 050	008 to 010	015	020 to 050	015 to 050
Material	Body	C3771BE (Plated)		SCS14A		
	Ball	C3604BD (Plated)	C3771BE (Plated)	SUS316		SCS14A
	Seat	F-PTFE		PTFE		
Stem seal	O-ring	FKM		FKM		Steam resistant FKM

**PRESSURE & TEMPERATURE RATING**










**INHERENT FLOW CHARACTERISTIC**










Range ability 30:1

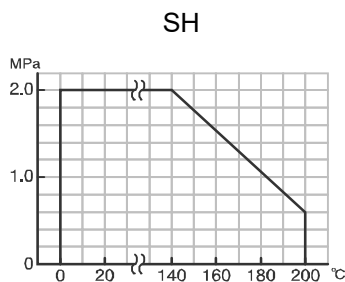
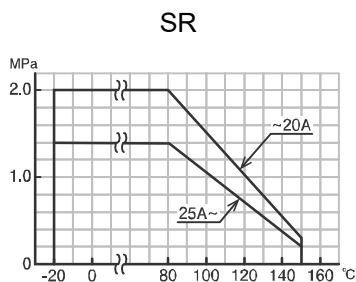
**VALVES SPECIFICATIONS**

 Water 
  Oil 
  Air, Gas 
  Steam 
  Chemicals 
  Sea water 
  Slurry 
  Negative pressure

SR SH type

Valve type	SR		SH
Design	2-way, Full port		2-way, Full port
Connection	Threaded End Rc		Threaded End Rc
Fluid	   		  
Max pressure	2 MPa	1.4 MPa	2 MPa
Size [mm]	015 to 020	025 to 040	015 to 032
Material	Body	SCS14A	
	Ball	SCS14A	
	Seat	PTFE	
Stem seal	Packing	F-PTFE	
	O-ring	-	
			R-PTFE
			Steam resistant FKM



**PRESSURE & TEMPERATURE RATING**



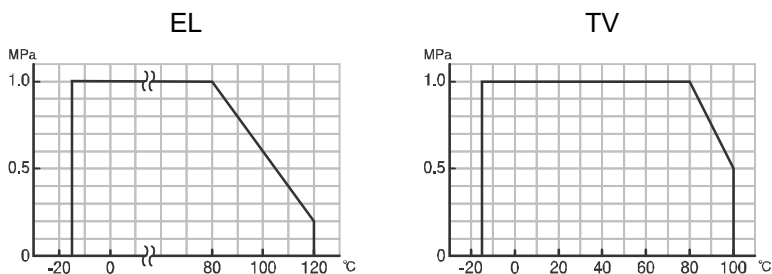
**VALVES SPECIFICATIONS**

 Water 
  Oil 
  Air, Gas 
  Steam 
  Chemicals 
  Sea water 
  Slurry 
  Negative pressure

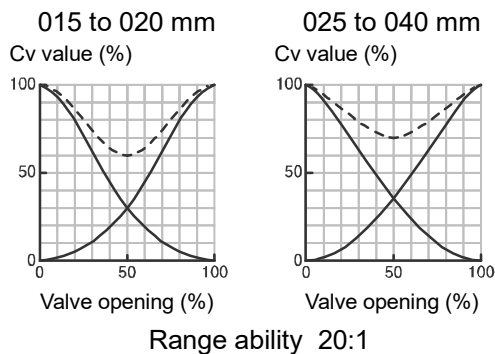
EL TV type

Valve type	EL		TV		
Design	3 way, Standard port		3 way, Standard port		
Connection	Threaded End Rc		Threaded End Rc		
Fluid					
Max pressure	1 MPa		1 MPa		
Size [mm]	008 to 015	020 to 050	015 to 025	032 to 040	
Material	Body	SCS14A		SCS13A	
	Ball	SUS316	SCS14A	SUS304	SCS13A
	Seat	PTFE		R-PTFE	
Stem seal	O-ring	FKM		FKM	

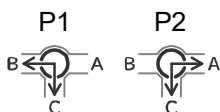
**PRESSURE & TEMPERATURE RATING**



**INHERENT FLOW CHARACTERISTIC (TV)**



**FLOW PATHS (Position① / P1) (Position② / P2)**



Note) When a closed path is exposed to high pressure, it may leak slightly to an open path.

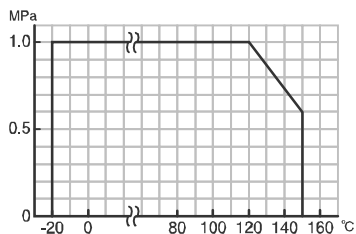
**VALVES SPECIFICATIONS**

Water 
 Oil 
 Air, Gas 
 Steam 
 Chemicals 
 Sea water 
 Slurry 
 Negative pressure

ST SL type

Valve type	ST SL	
Design	3 way, Standard port	
Connection	Threaded End Rc	
Fluid		
Max pressure	1 MPa	
Size [mm]	015 to 032	
Material	Body	SCS14A
	Ball	SCS14A
	Seat	F-PTFE
Stem seal	Packing	F-PTFE

**PRESSURE & TEMPERATURE RATING**



**FLOW PATHS (Position ① / P1) (Position ② / P2)**

ST				SL
Code: a	Code: b	Code: c	Code: d	
 P1 P2 B → A B → A C C	 P1 P2 A → B A → B C C	 P1 P2 A → B A → B C C	 P1 P2 A → B A → B C C	 P1 P2 A → B A → B C C
A-B ⇔ B-C	A-C ⇔ A-B	B-C ⇔ A-B-C	A-B-C ⇔ A-C	B-C ⇔ A-C

Note) When a closed path is exposed to high pressure, it may leak slightly to an open path.

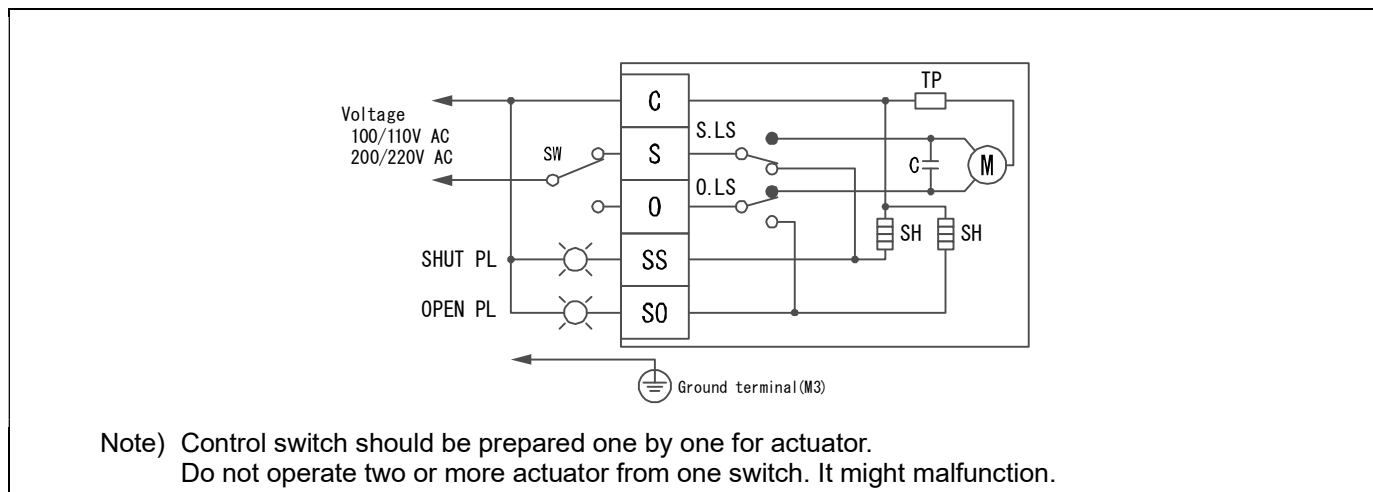
**ELECTRIC ACTUATOR SPECIFICATIONS**

3 way valve: SHUT / Position①, OPEN / Position②

AE1 type

Actuator type (□:Voltage code)	AE1-120-□	AE1-360-□	AE1-700-□	AE1-02K-□	AE1-06K-□
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)				
Rated torque [N·m]	12	36	70	200	600
Operation time [s]	10 / 8.5 (50/60 Hz)	7.2 / 6 (50/60 Hz)	15 / 12 (50/60 Hz)	30 / 25 (50/60 Hz)	
Power consumption [VA]	19	60		110	350
Motor	Synchronous motor	Reversible motor		Reversible motor self-contained mechanical brake	
Overload protection	Thermal protector				
Method of operation	Transfer input type				
Operation	Power to S → SHUT (SHUT PL is lit.) Power to O → OPEN (OPEN PL is lit.)				
Output signal rating	Resistance load 3 A 250 V AC (Minimum 0.1 A)				
Duty cycle	20 % 15 min.				
Ambient temperature	-20 to 55 °C				
Space heater	3 W				
Manual operation	Manual shaft				
Enclosure	Equivalent to IP65 (IEC 60529)				
Housing material	Aluminum alloy diecast (acrylic resin baking finish)				
Wire connection	Terminal Block: M3, Ground terminal: M3				
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.				

**WIRING**



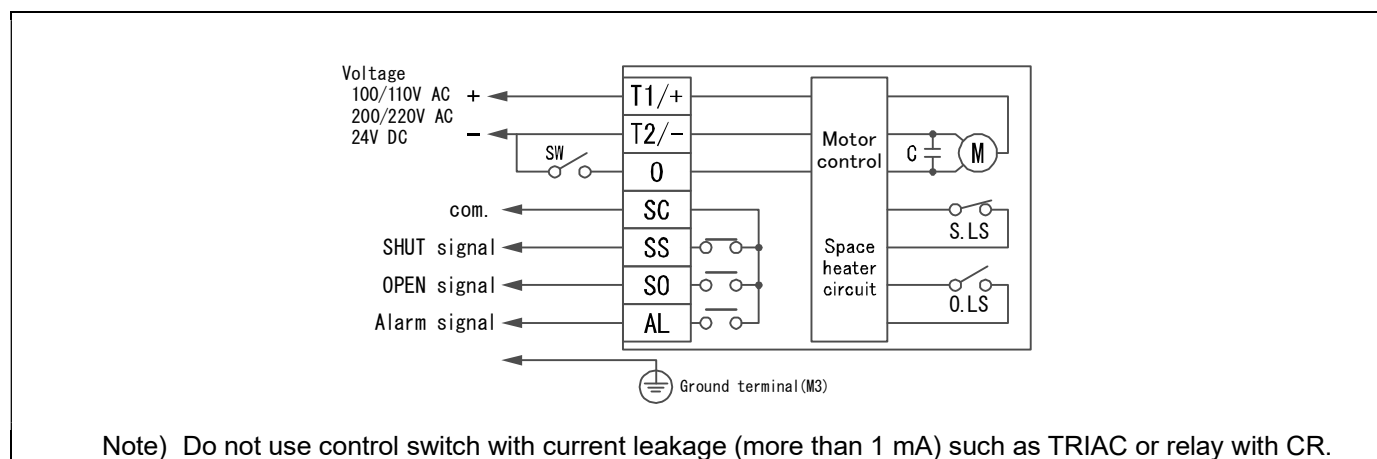
**ELECTRIC ACTUATOR SPECIFICATIONS**

3 way valve: SHUT / Position①, OPEN / Position②

## AE2 type

Actuator type (□:Voltage code)	AE2-120-□	AE2-360-□	AE2-700-□	AE2-02K-□	AE2-06K-□	AE2-120-0	AE2-360-0
Voltage	100 / 110 V AC ±10 % 50/60 Hz (Code: 1) 200 / 220 V AC ±10 % 50/60 Hz (Code: 2)					24 V DC (Code: 0)	
Rated torque [N·m]	12	36	70	200	600	12	36
Operation time [s]	11 / 9.5 (50/60 Hz)	8.2 / 7 (50/60 Hz)	16 / 13 (50/60 Hz)	31 / 26 (50/60 Hz)		3 to 4.5	9 to 14
Power consumption [VA]	26	60		110	350	Max 24	
Motor	Synchro- nous motor	Reversible motor		Reversible motor self-contained mechanical brake		DC motor	
Overload protection	Timer					Current limiter	
Method of operation	a-contactinput type, with built-in relay						
Operation	SW is OFF → SHUT (SHUT signal is output. ) SW is ON → OPEN (OPEN signal is output. ) Overtorque → Alarm signal is output						
Input signal current	9 mA (O-terminal) Leakage current in SW: less than 1 mA						
Output signal rating	Resistance load 0.5 A 125 V AC 1 A 24 V DC Micro load 1 mA 5 V DC						
Alarm signal	Output when the motor protection circuit operates by the overload. (it returns by power supply OFF or reverse operating signal)						
Duty cycle	20 % 15 min.						
Ambient temperature	-20 to 55 °C						
Space heater	3 W						
Manual operation	Manual shaft						
Enclosure	Equivalent to IP65 (IEC 60529)						
Housing material	Aluminum alloy diecast (acrylic resin baking finish)						
Wire connection	Terminal Block: M3, Ground terminal: M3						
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.						

## WIRING



**ELECTRIC ACTUATOR SPECIFICATIONS**

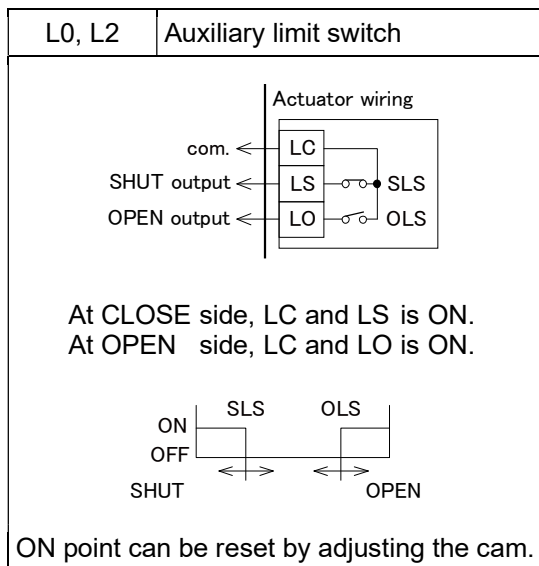
3 way valve: SHUT / Position①, OPEN / Position②

**OPTIONAL PARTS**

Specifications	Code No.	AE1	AE2	Remarks	
Auxiliary limit switch	Select limit switch depending on the load	L0	○	○	For standard signal
		L2	○	○	For micro load signal

\*Auxiliary limit switch: Please refer to the specifications.

**WIRING (OPTION)**



**DIMENSIONS**

**AE1, AE2**

AE-120, 300, 360: 145 (width), 122 (height), 60 (depth), 2-G1/2 (port)

AE-600, 700: 145 (width), 122 (height), 60 (depth), 2-G1/2 (port)

AE-02K: 175 (width), 160 (height), 63 (depth), 2-G1/2 (port)

AE-06K: 220 (width), 195 (height), 75 (depth), 2-G1/2 (port)

Parts name

1	Body	5	Terminal block	9	Manual shaft
2	Motor cover	6	Limit switch	10	Rubber packing
3	Motor	7	SW setting cam		
4	Control board	8	Drive shaft		



## INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

### HANDLING & STORAGE

#### ①HANDLING

Do not drop or throw the product as it may break.

#### ②STORAGE

- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.

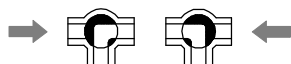
#### ③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.

### INSTALLATION

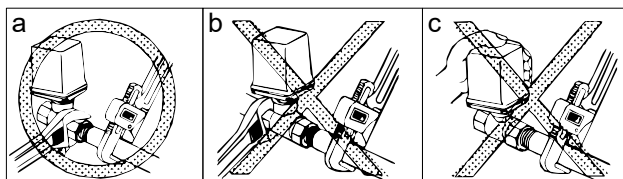
#### ①PRECAUTIONS

- Flush the pipeline carefully before installing the valve. Foreign particles, such as sand or pieces of welding electrode, will damage the ball and seats.
- For valves with specified flow direction (EG, SH) or with ST / SC option, check the arrows on the product before piping.
- When the flow path is subjected to a high pressure from arrow, it may leak slightly to the low pressure port. (EL, TV, ST, SL)



#### ②PIPING

- Using a pipe with too long a thread will damage the valve.
- If sealing tape or sealant gets inside the valve, the valve seat leaks or malfunctions.
- To prevent the valve from being damaged by stress, always hang a wrench on the end of the valve on the side where the pipe is to be connected when screwing in the pipe or when unscrewing it after correcting the angle (Fig a and b) and do not use a pipe wrench on the valve. Do not apply force to the actuator when working on the piping. (Fig. c)



- Refer to the recommended tightening torque table and do not apply excessive torque.

Valve size [mm]	Torque [N·m]
008 to 010	15 to 20
015	25 to 35
020	40 to 50
025	50 to 60
032	60 to 80
040	75 to 85
050	90 to 110

#### ③ENVIRONMENT

- Do not install in place where corrosive gas is present or where vibration is heavy (0.5 G or more).
- When radiant heat causes the surface temperature of the control unit to exceed 55 °C, provide an appropriate shielding plate.
- If there is a possibility that the fluid and drive part freeze, please take measures to prevent freezing.

#### ④POSITIONING

Should be positioned through 90° upward from horizontal. Provide space around the product to allow manual operation, inspection and replacement work.

Maintenance space for upper part of actuator.

AE (120 / 360 / 700)	More than 105 mm
AE (02K / 06K)	More than 120 mm

#### ⑤OTHER NOTES

Until the wiring is completed there must be no condensation or flooding in the interior of the actuator, after piping. Protective caps on the cable gland are not waterproof.

**INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS****WIRING****①PRECAUTIONS**

- Remove the actuator cover before wiring.
- Two G1/2 electrical connections are provided with a cable gland and plug. Usable cable size is  $\Phi 6$  to 12 mm.
- When using a flexible tube, dew condensation may occur inside the actuator due to respiration from the inside of the tube and malfunction may result. Seal the flexible tube connector part with a sealant.
- Sealants that affect the electrical contacts should not be used inside the electric actuator.
- If long distance wiring or low voltage operation, check that terminal voltage is in the proper range.

**②CONNECTION**

- Do not wiring outdoors on a rainy day.
- Check the power supply and voltage. Connect the signal as shown in the wiring diagram. Do not connect unnecessarily terminal.
- Actuator should be electrically grounded. Use the terminal marked ( $\oplus$ ) inside the actuator.

**PREVENT DEW CONDENSATION**

- When installing the cover after wiring, perform the bolt by the temporary tightening procedure and the permanent tightening procedure to tightly and securely tighten the rubber packing so that water does not enter from the outside.
- Tighten the cable gland nut so that there is no leakage from the wire entrance.

**CONTROL****①AE1**

Each control switch should be prepared one by one. Do not operate two or more from one switch at the same time.

**②AE2**

When using control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR, it can cause malfunction.

**③DC POWER SUPPLY (AE2)**

- Battery or full wave rectification can be used.
- Consider an inrush current of motor. (It is 1.5 to 3 times of consumed current.)
- When using a DC voltage, be selected the wire thickness by the wiring distance.
- Do not use power supply that require more than 1 second with rise and fall time.

**④USE OF OPEN/SHUT SIGNALS**

Use signals within the capacity of output signal rating.

**OPERATION****①TESTING**

- Make sure that power supply voltage is correct. Also check operating position, wiring, speed and signals.
- During trial operation, check that valve movement and OPEN and SHUT signals are correct.

**②DUTY CYCLE**

Confirm that the operation frequency is within the specified duty cycle.

Use beyond the load time rate range will affect product life. Also, it may cause burnout.

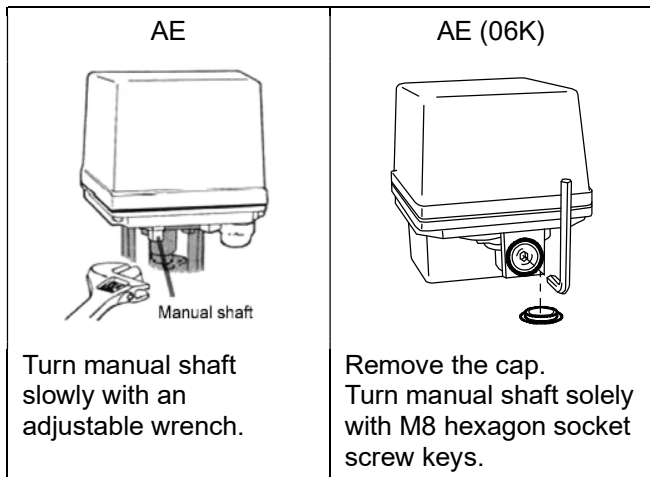
Duty cycle is a value that regulates the opening / closing frequency of the actuator. The meaning of 20 % 15 minutes for Duty cycle is that 3 minutes (20 % of 15 minutes) operation is possible. The calculated value obtained by dividing 3 minutes by the operation time is the number of times of operation within 15 minutes.

**③ATTENTION**

- Keep power supplied for built-in space heater to prevent condensation inside actuator.
- Do not touch the moving parts of actuator in operation.
- Do not insert a reverse signal during operation. It may shorten the life of product.
- Never put anything on the actuator or make it into a foothold.

**INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS****MANUAL OPERATION****① PRECAUTIONS**

- Be sure to turn off the power before manual operation.
- Operate manually with reference to the opening degree label. Do not turn beyond the fully open / fully closed position. Operation failure may occur during automatic operation.

**② THE WAY OF OPERATION**

Before automatic operation, be sure to remove wrench.

**MAINTENANCE**

- To prevent electric shock, be sure to turn off the power when removing the actuator cover.
- Do the routine maintenance at least once in half a year.

**Inspection items**

- Confirm operation of opening and closing.
- Confirm that an actuator is not hot excessively.
- Confirm existence of abnormal noise and vibration during operation.
- Confirm whether screws are loose or not.
- Confirm that water or condensation no remains in the actuator.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.

**INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS****TROUBLE SHOOTING**

Problem	Cause	Solution
Actuator does not move.	Faulty wiring.	Correct the wiring.
	No voltage is coming.	Check the voltage.
	Incorrect voltage.	When it's burned out by excess voltage, replace the actuator.
	Short the circuit, contact failure.	Review wires and connection.
	Motor is too old.	Replace the actuator. Repair in our factory.
Operation is unstable.	Excess surge or voltage was applied.	<ul style="list-style-type: none"> <li>• Replace the control board or limit switch. (Repair in our factory)</li> <li>• Replace the actuator.</li> </ul>
	Rainwater entered the actuator.	<ul style="list-style-type: none"> <li>• Dry the inside.</li> <li>• Replace the actuator.</li> </ul>
	Added high harmonics noise from an inverter.	Attachment a filter for each inverter maker option.
	Effect of high level noise.	Use the shielded wire and ground the wiring. Separate signal wire from power line.
	Two or more valves operated by the same switch. AE1	Each control switch should be prepared one by one.
	Switch leakage current is large. AE2	Current leakage should be less than 1 mA.

Problem	Cause	Solution
Stop in the mid position.	<ul style="list-style-type: none"> <li>• Biting of valve seat.</li> <li>• The scale has adhered to the valve ball.</li> </ul>	Remove a foreign object.
	Overload protector runs because of over-torque.	Turn off the power for about 3 minutes to remove a heat from motor protection circuit. AE1
Received the alarm signal. AE2		Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again. AE2
Leakage from valve body	<ul style="list-style-type: none"> <li>• Valve cap get loose.</li> <li>• Valve body is damaged.</li> </ul>	Replace the valve.
Leakage from valve seat	Seat is worn or damaged.	
Leakage from valve stem	Stem packing is worn or distorted.	

For more information contact  
NIPPON VALVE CONTROLS, INC. for consultation.