NIPPON VALVE CONTROLS, INC.

Instruction manual

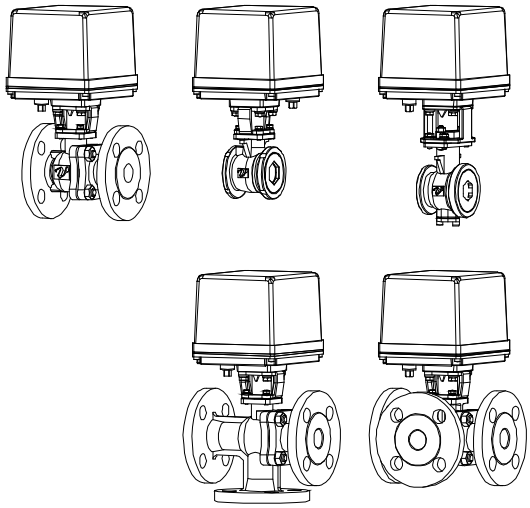
Electric Actuated Ball Valve BR BS GS TR LR T3 L3

SP-1531

Please read this manual before installation and use.

GENERAL

Ultra-high capacity electric double-layer capacitor.
In case of power failure, electric discharge form built-in capacitor allows continued valve to operation.



Actuator

ECR : For AC power

Valve

BR type For various fluids and general use.
BS type For Wafer.
GS type For Wafer. (JIS 10K / 20K)
TR type For mixing / dividing.
LR type For mixing / dividing.
T3 type Trunnion structure. (with flow paths)
L3 type Trunnion structure.

PRODUCT CODE

			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BR type			E	C	R	B	R	□	□	□	□	□	□	-	□□□	-	□□	-	□	
BS type			E	C	R	B	S	□	□	1	□	□	□	-	□□□	-	□□	-	□	
GS type	(V-port)		E	C	R	G	S	□	□	3	U	U	□	V	□□□	-	□□	-	□	
	(Full port)		E	C	R	G	S	□	□	3	U	U	□	-	□□□	-	□□	-	□	
	(Standard port)		E	C	R	G	S	□	□	3	U	U	□	R	□□□	-	□□	-	□	
TR type			E	C	R	T	R	□	□	1	T	T	P	-	□□□	-	□□	-	□	
LR type			E	C	R	L	R	□	□	1	T	T	P	-	□□□	-	□□	-	□	
T3 type			E	C	R	T	3	□	□	1	T	T	G	-	□□□	-	□□	-	□	- □
L3 type			E	C	R	L	3	□	□	1	T	T	G	-	□□□	-	□□	-	□	

(1) Actuator
ECR

(2) Valve
BR BS GS
TR LR T3 L3

(3) Voltage
1 : 100 / 110V AC
2 : 200 / 220V AC

(4) Sizing code
0 : Standard
1 : Light
2 : Heavy

(5) Connection
1 : JIS 10K
3 : JIS 20K

(6) Body material
T : SCS13A
U : SCS14A

(7) Ball material
T : SUS304 / SCS13A
U : SCS14A

(8) Seat material
F : F-PTFE
G : R-PTFE
R : R-F-PTFE
K : PEEK
I : API
C : R-PEEK
M : SUS316 + Stellite
P : R-PTFE

(9) Size [mm]
ex. 25 A → 025

(10) Option
ST : Seat for abnormal pressure rise
X6 : Heat isolation
X2 : Heat isolation

(11) Operation mode
Nil : Mode A
Q : Mode B

(12) Flow paths (T3)
a to d : 3 way valve flow

VALVES SPECIFICATIONS

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

BR BS type

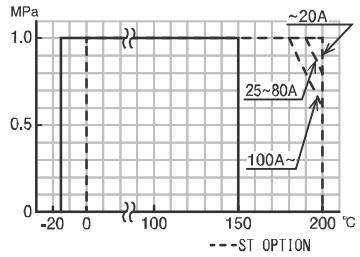
Valve type		BR			BS	
Design		2-way, Full port			2-way, Wafer	
Connection		JIS10K Flanged-end		JIS20K Flanged-end	JIS Flanges 10K	
Fluid						
Max pressure		1 MPa		2 MPa	1 MPa	
Size [mm]		015 to 050		015 to 050	015 to 050	
Material	Body	SCS14A	SCS13A	SCS13A	SCS13A	SCS14A
	Ball	SCS14A	SCS13A	SCS13A	SCS13A	SCS14A
	Seat	F-PTFE R-PTFE R-F-PTFE			F-PTFE R-PTFE R-F-PTFE	
Stem seal	Packing	R-PTFE			R-PTFE	
	O-ring	FKM			FKM	

The optional for steam fluids.

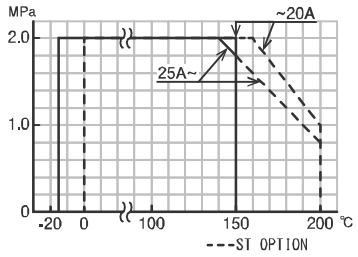
Valve type	Option code	O-ring
BR BS	ST	Replace (Steam resistant FKM)

PRESSURE & TEMPERATURE RATING

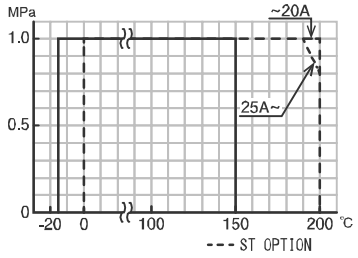
BR (JIS 10K)



BR (JIS 20K)



BS



Note) Insulation options are required for use with fluids more than 150 °C.

VALVES SPECIFICATIONS

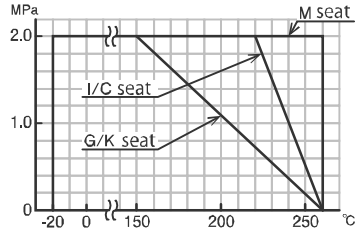
Water Oil Air, Gas Steam Chemicals Sea water Slurry Negative pressure

GS type

Valve type		GS		
Design		2-way, Wafer		
		V-port	Full port	Standard port
Connection		JIS Flanges 10K / 20K		
Fluid				
Max pressure		2 MPa		
Size [mm]		V015 to V032	015 to 080	R040 to R150
Material	Body	SCS14A		
	Ball	SCS14A (HCr plated)		
	Seat	R-PTFE PEEK API R-PEEK SUS316 + Stellite		
Stem seal	Packing	R-PTFE		

Note) API cannot be used with steam fluid.

PRESSURE & TEMPERATURE RATING

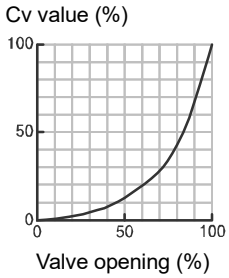


Note) • Option for use in fluid temperature more than 170 °C.
• We prefer to K seat depends on pressure or environmental conditions. Please consult us for your specifications.

SEAT LEAKAGE VOLUME (JIS B 2005-4)

	Seat material	Leakage rate	Remarks
G	R-PTFE	None	
K	PEEK		
I	API		
C	R-PEEK	10^{-4} × rated Cv value × 10^{-3} or less.	Class IV × 10^{-3} or less.
	R-PEEK (V-port)	10^{-4} × rated Cv value × 10^{-3} × 8 or less.	Class IV × 10^{-3} × 8 or less.
M	SUS316 + Stellite	10^{-4} × rated Cv value or less.	Class IV or less.
	SUS316 + Stellite (V-port)	10^{-4} × rated Cv value × 8 or less.	Class IV × 8 or less.

INHERENT FLOW CHARACTERISTIC



Range ability

GS-3UU□ V 015 to 032	50:1	(V-port)
GS-3UU□ - 015 to 080	200:1	(Full port)
GS-3UU□ R 040 to 150	100:1	(Standard port)

VALVES SPECIFICATIONS

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

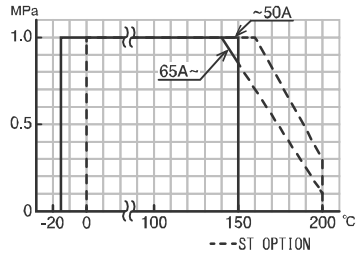
TR LR type

Valve type		TR LR	
Design		3-way, Full port	
Connection		JIS10K Flanged-end	
Fluid			
Max pressure		1 MPa	
Size [mm]		020 to 040	050
Material	Body	SCS13A	
	Ball	SUS304	SCS13A
	Seat	R-PTFE	
Stem seal	Packing	R-PTFE	
	O-ring	FKM	

The optional for steam fluids.

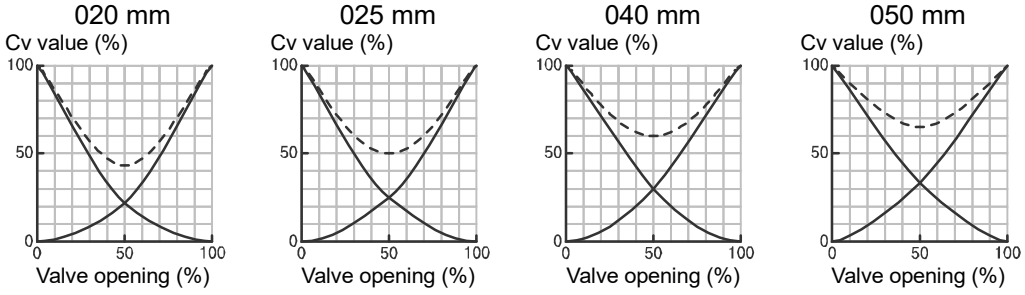
Valve type	Option code	O-ring
TR LR	ST	Replace (Steam resistant FKM)

PRESSURE & TEMPERATURE RATING



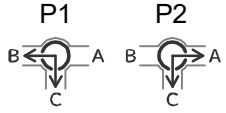
Note) Insulation options are required for use with fluids more than 150 °C.

INHERENT FLOW CHARACTERISTIC



Range ability 20:1

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



B-C ⇔ A-C

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

T3 L3 type

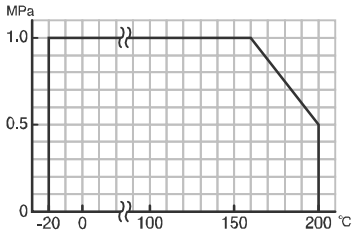
Valve type		T3	L3
Design		3-way, Full port	
Connection		JIS10K Flanged-end	
Fluid			
Max pressure		1 MPa	
Size [mm]		025 to 040	025 to 050
Material	Body	SCS13A	
	Ball	SCS13A	
	Seat	R-PTFE	
Stem seal	Packing	PTFE	

The optional for steam fluids.

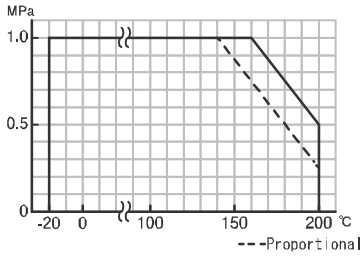
Valve type	Option code	O-ring
T3 L3	ST-VF	Add (Steam resistant FKM)

PRESSURE & TEMPERATURE RATING

T3



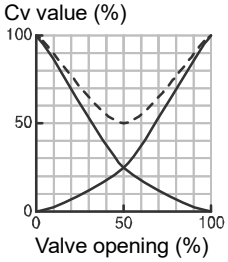
L3



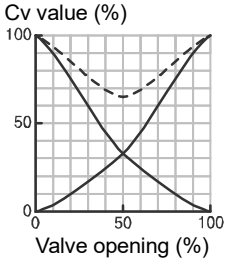
Note) Insulation options are required for use with fluids more than 170 °C.

INHERENT FLOW CHARACTERISTIC (L3)

025 mm

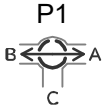
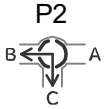
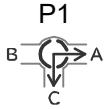
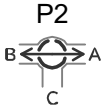
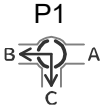
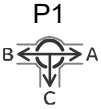
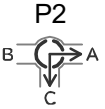
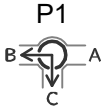
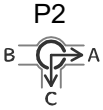


040 to 050 mm



Range ability 30:1

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

T3								L3	
Code: a		Code: b		Code: c		Code: d			
P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
									
A-B ⇔ B-C		A-C ⇔ A-B		B-C ⇔ A-B-C		A-B-C ⇔ A-C		B-C ⇔ A-C	

ELECTRIC ACTUATOR SPECIFICATIONS

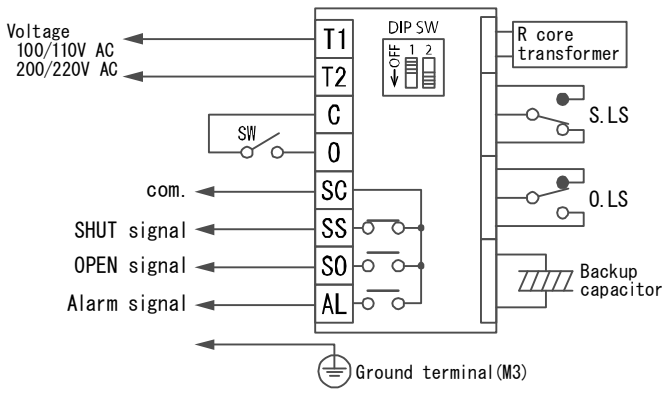
3 way valve: SHUT / Position②, OPEN / Position②

ECR type

Actuator type (☐:Voltage code)	ECR-120-☐	ECR-360-☐
Voltage	100 / 110 AC V ±5 % 50/60 Hz (Code: 1) 200 / 220 AC V ±5 % 50/60 Hz (Code: 2)	
Rated torque [N·m]	12	36
Operation time [s]	3 to 6	7 to 14
	When power is turned on, operation starts about 30 seconds after capacitor is charged.	
Charging Time [s]	30	90
	When the power is just turned on.	
Power consumption [VA]	In motion: 30 max. Charging: 50 max. Stop: 2.5	
Motor	DC motor	
Overload protection	Timer	
Method of operation	a-contactinput type, with built-in relay	
Operation *1	[Mode A] SW is OFF → SHUT , SW is ON → OPEN. (Standard) [Mode B] SW is ON → SHUT , SW is OFF → OPEN. (Option: Q)	
Power failure	[Mode A] SHUT [Mode B] OPEN	
Built-in power supply	Electric double layer capacitor	
Input signal current	6 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.	
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 50 ºC	
Space heater	Built in to the control board	
Manual operation	Manual shaft	
Enclosure	Equivalent to IP65 (IEC 60529)	
Housing material	Aluminum alloy diecast (acrylic resin baking finish)	
Terminal block	For bare wire 0.2 to 1.5 mm² (AWG 26 to 16) Ground terminal: M3	
Conduct port	2-G1/2 Attachments: Cable gland (for Φ6 to 12 mm cable), plug.	

*1 Change by DIP switch. (Standard → Mode B)

WIRING



Setting with DIP SW

Mode A (Standard) Mode B

Output signal (Common in mode A / B)

Closed the valve → SHUT signal
Open the valve → OPEN signal
Overtorque → ALARM signal

Note) Do not use control switch with current leakage (more than 1 mA) such as TRIAC or relay with CR.

ELECTRIC ACTUATOR SPECIFICATIONS

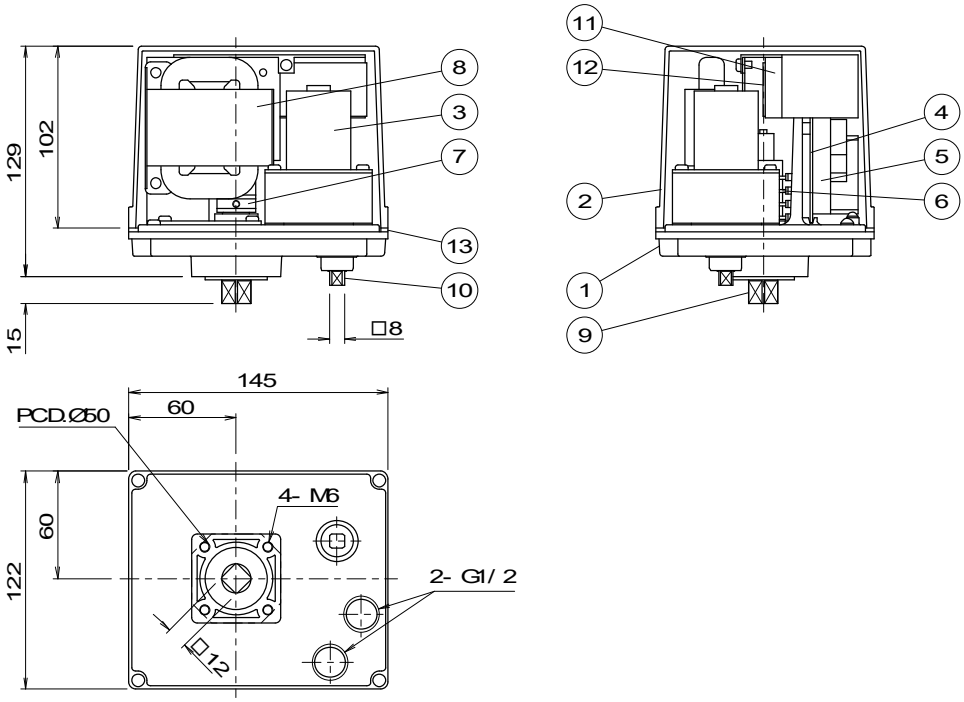
3 way valve: SHUT / Position①, OPEN / Position②

OPTIONAL PARTS

Specifications		Code No.	Remarks
Operation mode	SW is OFF → SHUT , SW is ON → OPEN.	Nil	Mode A (Standard)
	SW is ON → SHUT , SW is OFF → OPEN.	Q	Mode B

DIMENSIONS

ECR



Parts name

1	Body	6	Limit switch	11	Capacitor
2	Motor cover	7	SW setting cam	12	Capacitor control board
3	Motor	8	Transformer	13	Rubber packing
4	Control board	9	Drive shaft	14	
5	Terminal block	10	Manual shaft	15	

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.

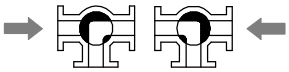
③CHECKING

- Check the product code, power supply, and voltage before installation.
- Make sure that the bolts are not loose.
- The DIP switch should be set up before the power is turned on. Do not touch unnecessary switches.

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 (GS) 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. (TR, LR)



②PIPING FLANGES

- Gasket should be selected appropriately to suit the fluid, pressure and temperature. Use spring washer to prevent from decreasing surface pressure gasket when the temperature change happens frequently.
- Tighten all bolts using crossover method to load the joint evenly.
- Wafer type ball valve is put between two seats of flanged-end and tightened with long bolts. (BS, GS)

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 50 °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.

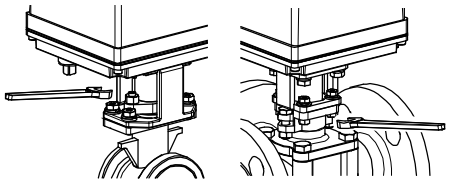
Maintenance space for upper part of actuator.	
ECR	More than 105 mm

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.

⑥CAUTIONS FOR MAINTENANCE (GS, T3, L3)

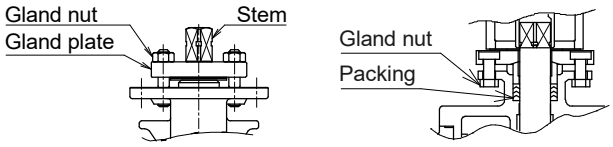
Do not keep warm for maintenance of the valve gland.



GS T3, L3

TIGHTEN THE GLAND NUTS (GS, T3, L3)

- Check that there is no leakage from the gland packing.
- If it leakage, tighten gland nuts by alternately. Do not over-tighten the gland nuts.



GS T3 L3

Valve size [mm]					Recommended torques [N·m]
GS			T3	L3	
V015 V020	015 020	-	-	-	2
V025 V032	025 032	R040	025	025	3.5
-	040 050	R050 R065	040	040 050	7

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 Φ6 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 (⏚) 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

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

CAUTION

Since this actuator is designed for electric shut off, even the power is turned off it may still operate for about 30 minutes after power shuts off. Please follow instructions when adjusting opening angle of the valve or replacing parts.

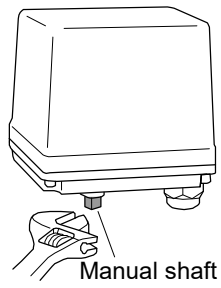
MANUAL OPERATION

①PRECAUTIONS

- Manual operation should be a temporary operation.
- Be sure to turn off the power before manual operation.
- Actuator may operate for 15 minutes after power shuts off for ECR-120, and 30 minutes for ECR-360. When manual operation is required, follow steps below.

1) Turn manual shaft slowly with a smooth-jawed wrench.
2) When limit switch leaves from SW setting cam, actuator's motor starts. Keep it in that position.
3) In about 30 seconds, motor protect circuit starts and the motor stops. Go ahead and operate manually.

②THE WAY OF OPERATION



Turn manual shaft slowly with an adjustable wrench.

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.
- Turn off the power and check if the valve operates normally with built-in capacitor.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.
- Confirm the bolt tightening torque.

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.
	Capacitor is too old.	
Operation is unstable.	Excess surge or voltage was applied.	
	Rainwater entered the actuator.	• Dry the inside. • Replace the actuator.
	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.
	Switch leakage current is large.	Current leakage should be less than 1 mA.

Problem	Cause	Solution
Stop in the mid position.	• Biting of valve seat. • The scale has adhered to the valve ball.	Manually operate an actuator and remove a foreign object.
	Overload protector runs because of over-torque.	Motor protection circuit returns by the signal of operation of an opposite direction. Turn on the power again.
Received the alarm signal.		
Leakage from valve body	• Valve cap get loose. • Valve body is damaged.	Replace the valve.
Leakage from valve seat	Seat is worn or damaged.	Replace the valve.
		Replace the valve seat.
Leakage from valve stem	Stem packing is worn or distorted.	Replace the valve. Replace the packing.
Leakage from valve gland	Gland packing is worn or distorted.	Tighten the gland nut.
GS T3 L3		Replace the gland packing.

For more information contact
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