

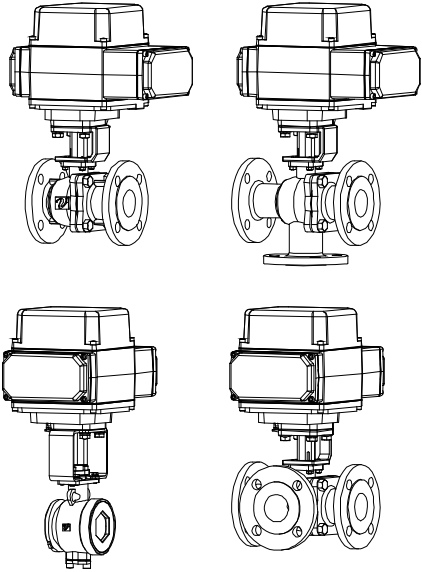


Instruction manual

Please read this manual before installation and use.

GENERAL

The actuator operates at the time of power loss by the built-in high-performance shielded battery.
 Built-in battery life is 8 to 9 years at 25 °C.
 It's possible to use for a wide range of temperature (ambient temperature: -20 to +50 °C).
 The battery composed by dry type structure the maintenance of saving water is not necessary.



ACTUATOR

- ABR : For AC / DC power
- HBR : For AC / DC power (High speed)

Valve

- BR type For various fluids and general use.
- 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







BR type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GS type (V-port)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	U	U	<input type="checkbox"/>	V	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Full port)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	U	U	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(Standard port)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3	U	U	<input type="checkbox"/>	R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TR type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	T	T	P	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LR type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	T	T	P	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T3 type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	T	T	G	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L3 type	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	T	T	G	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	

(1) Actuator ABR HBR	(4) Sizing code 0 : Standard 1 : Light 2 : Heavy	(7) Ball material T : SCS13A / SUS304 U : SCS14A / SUS316	(10) Option M0 : Manual lever handle
(2) Valve BR GS TR LR T3 L3	(5) Connection 1 : JIS 10K 3 : JIS 20K	(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	(11) Operation mode Nil : Mode A Q : Mode B
(3) Voltage 1 : 100 / 110 V AC 2 : 200 / 220 V AC 0 : 24 V DC	(6) Body material T : SCS13A U : SCS14A	(9) Size [mm] ex. 25 A → 025	(12) Power failure Nil : Response mode Z : Standby mode S : Hold the valve position
			(13) Flow paths (T3) a to d : 3 way valve flow

VALVES SPECIFICATIONS

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

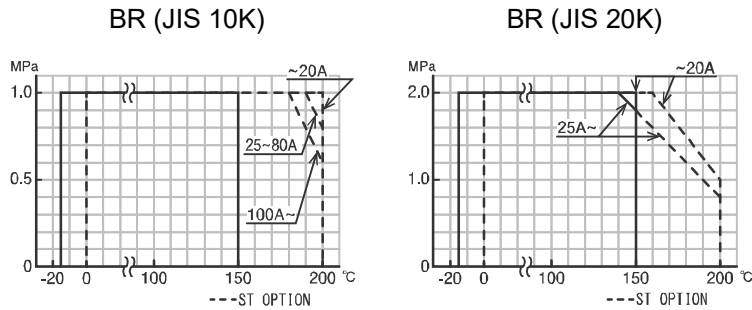
BR type

Valve type		BR		
Design		2-way, Full port		
Connection		JIS10K Flanged-end	JIS20K Flanged-end	
Fluid		     		
Max pressure		1 MPa	2 MPa	
Size [mm]		015 to 150	015 to 080	
Material	Body	SCS13A	SCS14A	SCS13A
	Ball	SCS13A SUS304	SCS14A SUS316	SCS13A
	Seat	F-PTFE R-PTFE R-F-PTFE		
Stem seal	Packing	R-PTFE		
	O-ring	FKM		

The optional for steam fluids.








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

PRESSURE & TEMPERATURE RATING








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

VALVES SPECIFICATIONS

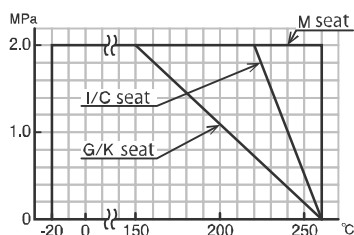
 Water
  Oil
  Air, Gas
  Steam
  Chemicals
  Sea water
  Slurry
  Negative pressure

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

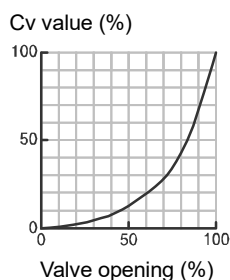


- Note) • Option for use in fluid temperature more than 170 °C.
 • We prefer to K seat depends on pressure or environmental conditions. Please consult us for your specifications.

SEAT LEAKAGE VOLUME (JIS B 2005-4)

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

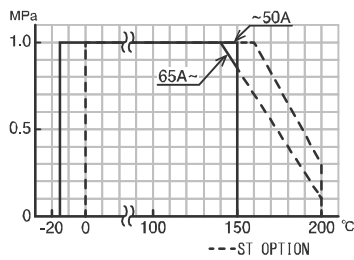
TR LR type

Valve type	TR LR	
Design	3-way, Full port	
Connection	JIS10K Flanged-end	
Fluid		
Max pressure	1 MPa	
Size [mm]	020 to 040	050 to 100
Material	Body	SCS13A
	Ball	SUS304 SCS13A
	Seat	R-PTFE
Stem seal	Packing	R-PTFE
	O-ring	FKM

The optional for steam fluids.

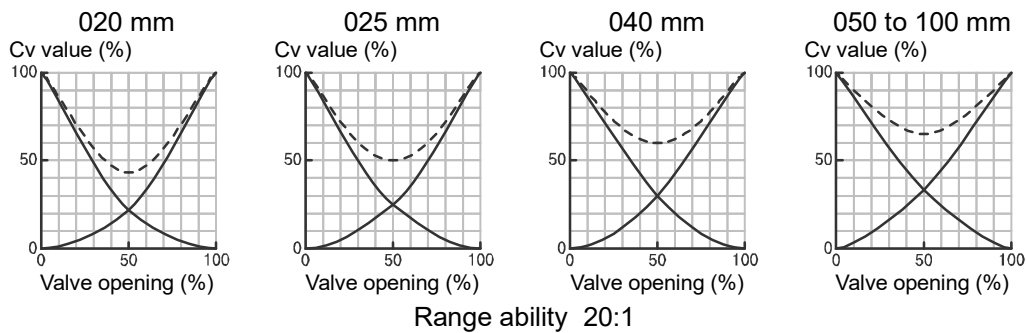
Valve type	Option code	O-ring
TR LR	ST	Replace (Steam resistant FKM)

PRESSURE & TEMPERATURE RATING

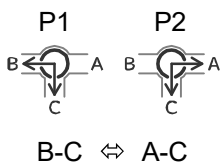


Note) Insulation options are required for use with fluids more than 150 °C.

INHERENT FLOW CHARACTERISTIC



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

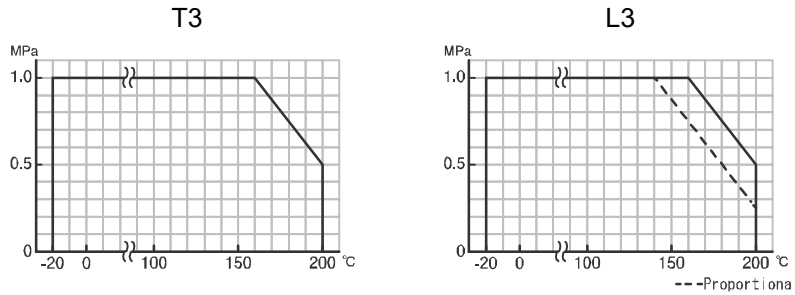
T3 L3 type

Valve type	T3 L3	
Design	3-way, Full port	
Connection	JIS10K Flanged-end	
Fluid		
Max pressure	1 MPa	
Size [mm]	025 to 150	
Material	Body	SCS13A
	Ball	SCS13A
	Seat	R-PTFE
Stem seal	Packing	PTFE

The optional for steam fluids.

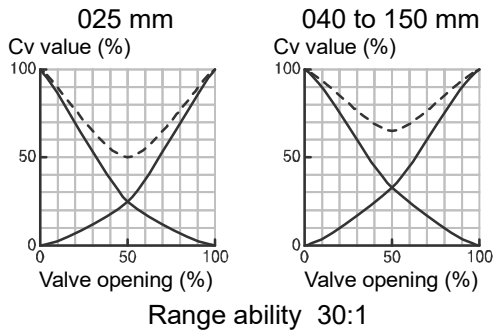
Valve type	Option code	O-ring
T3 L3	ST-VF	Add (Steam resistant FKM)

PRESSURE & TEMPERATURE RATING



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

INHERENT FLOW CHARACTERISTIC (L3)



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

T3				L3
Code: a	Code: b	Code: c	Code: d	
<p>A-B ⇔ B-C</p>	<p>A-C ⇔ A-B</p>	<p>B-C ⇔ A-B-C</p>	<p>A-B-C ⇔ A-C</p>	<p>B-C ⇔ A-C</p>

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

Actuator type (□: Voltage code)	ABR-300-□	ABR-700-□	HBR-300-□	HBR-700-□	HBR-02K-□	HBR-06K-□
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)		Note) Cannot use a half or full-wave DC power.			
Rated torque [N·m]	30	70	30	70	200	600
Operation time [s]	3 to 4	6 to 10	1 to 2	3 to 5	AC: 8 to 15 DC: 12 to 17	AC: 24 to 45 DC: 36 to 50
Power consumption (Max) [VA]	AC power 100 DC power 80		AC power 150 DC power 120			
Motor	DC motor					
Overload protection	Current limiter					
Control switch	a-contact input 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 *2	[Response mode] (Standard) Mode A: SHUT (End of operation) Mode B: OPEN (End of operation) [Standby mode] (Option: Z) After power failure, waiting for an external signal input to the switch in a fixed period. Waiting time of power failure: more than 50 hours (It becomes short due to the influence of use environment.) Shift the valve to OPEN / SHUT (or HOLD) by battery out. Stop waiting for the external input signal.					
Battery	Compact seal lead acid battery: 12 V, 2.5 Ah * It is recommend to exchange a battery for every 5 years (at 25 °C).					
Charge system	Constant voltage charge current					
Input signal current	2.5 mA 12 V DC (O-terminal) Leakage current in SW: less than 0.5 mA					
Output signal rating	Resistance load 0.5 A 120 V AC 0.6 A 24 V DC Micro load 1 mA 5 V DC					
Alarm signal	Overtorque : It returns by power supply OFF or reverse operating signal. Battery out : The contacts turn on as battery consumption progresses.					
Duty cycle	20 % 15 min.					
Ambient temperature	-20 to 50 °C					
Space heater	Built in to the control board					
Manual operation	Manual over-ride with clutch. (Direct operation / 06K: Operation by manual shaft.)					
Enclosure	Equivalent to IP65 (IEC 60529)					
Housing material	AC4C Aluminum alloy castings (acrylic resin baking finish)					
Terminal block	For bare wire 0.2 to 2.5 mm ² (AWG 24 to 12) , 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)

*2 Change by DIP switch. (Standard → Standby mode)

OPERATION / POWER FAILURE

Operation	Input signal		Power failure	Battery out	Factory settings	Option code
	OFF	ON				
Mode A (Standard)	SHUT	OPEN	SHUT (End of operation)	-	Response mode	Standard (Nil)
			Hold the current valve position (Waiting for an external signal)	SHUT	Standby mode	Option: Z
				HOLD		Option: Z-S
Mode B (Option: Q)	OPEN	SHUT	OPEN (End of operation)	-	Response mode	Option: Q
			Hold the current valve position (Waiting for an external signal)	OPEN	Standby mode	Option: Q-Z
				HOLD		Option: Q-Z-S

ELECTRIC ACTUATOR SPECIFICATIONS

3 way valve: SHUT / Position①, OPEN / Position②

WIRING

ABR, HBR

NOTE) Leakage current in SW: less than 0.5 mA.

DIP switches S1-2 and S1-3 are for changing ABR / HBR (factory setting only), so do not change the settings.

ABR

HBR

SETTING WITH DIP SW

	DIP SW			Operation				Option code	
	S2-1	S1-1	S1-4	Input signal		Power failure	Battery out		
	Power failure	Mode A / B	Battery out	OFF	ON				
Response mode (Standard)	ON OFF	ON OFF	ON OFF	SHUT	OPEN	SHUT		Standard (Nil)	
		ON OFF			OPEN	SHUT	OPEN		Option: Q
Standby mode (Option: Z)	ON OFF	ON OFF	ON OFF	SHUT	OPEN	HOLD	SHUT	Option: Z	
			ON OFF				HOLD	Option: Z-S	
		ON OFF	ON OFF	ON OFF	OPEN	SHUT		OPEN	Option: Q-Z
			ON OFF					HOLD	Option: Q-Z-S

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
Manual lever handle	Mounted on the drive shaft.	M0	Except HBR-06K.

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

HANDLING & STORAGE

①HANDLING

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

②STORAGE

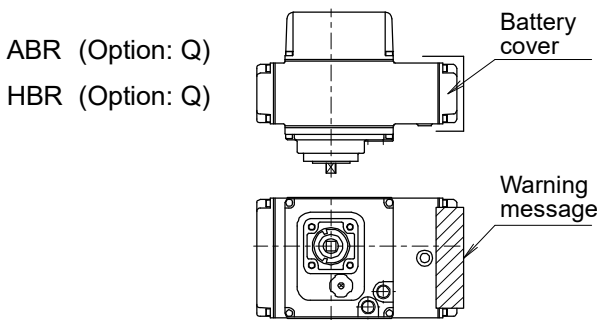
- Store away from dust, moisture and direct sunlight. If possible, store in the original package.
- Do not remove a dust proof cap until the piping.
- If it is not used more than 30 days, remove a battery from actuator and keep it in a place with little humidity.

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.

④BATTERY CONNECTOR (Power failure: OPEN)

- For the following models, Battery connector is not connected before shipment. Please connect before use.

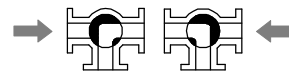


- It may move unexpectedly by connecting the battery connector. Please be careful.

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. (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.
- Be sure to enough space around the actuator for battery replacement.

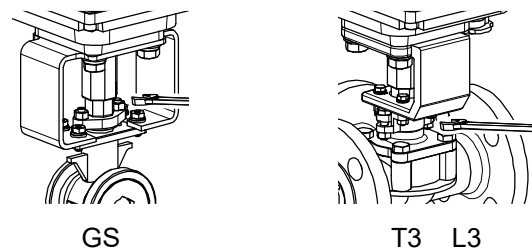
Maintenance space for upper part of actuator.	
ABR HBR	More than 70 mm

⑤CAUTION AFTER PIPING

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.

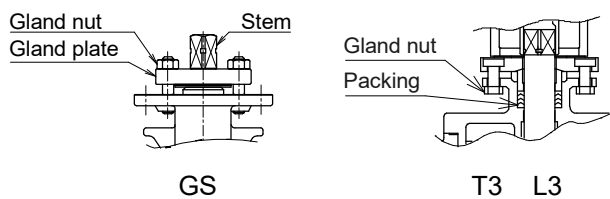
⑥CAUTIONS FOR MAINTENANCE (GS, T3, L3)

Do not keep warm for maintenance of the valve gland.



INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS**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.



Valve size [mm]					Recommended torques [N·m]
GS		T3	L3		
V015	015	-	-	-	2
V020	020	-	-	-	
V025	025	R040	025	025	3.5
V032	032				
-	040	R050	040	040	7
	050	R065		050	
-	065	R080	050	065	10
	080	R100	065	080	
-	-	R125	080	100	14
		R150	100	125	
-	-	-	125	150	20
			150		

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.
- Do not remove the body cover lower screw.

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**①CONTROL OF SWITCHING**

When using control switch with current leakage (more than 0.1 mA) such as TRIAC or relay with CR, it can cause malfunction.

②DC POWER SUPPLY

- Cannot use a half or full-wave power supply.
- 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.

③USE OF OPEN/SHUT SIGNALS

Use signals within the capacity of output signal rating.

OPERATION**①ABR-Q and HBR-Q (Power failure: OPEN)**

Battery connector is not connected before shipment. Please connect before use.

②TESTING

- Before operation, charge of 24 hours or more is performed.
- 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.

③DUTY 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.

④ATTENTION

- Be sure to set the DIP-SW before turning on the power supply.
- 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

BATTERY

① HANDLING

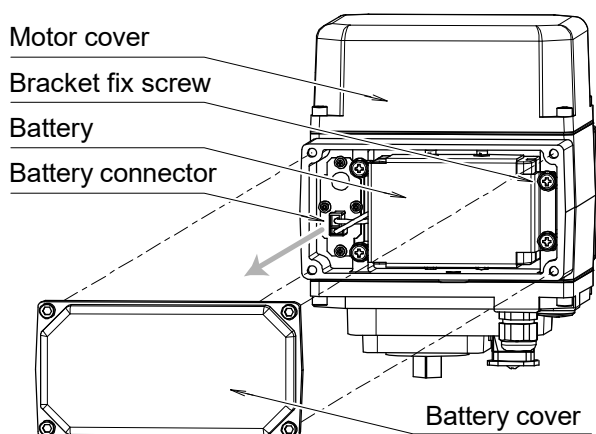
- The battery can be expected a service life over 8 to 9 years at 25 °C.
- Built-in battery should be keep reliability of operation, we recommend you to exchange every 5 years.

② AFTERCARE

- Battery exchange can use during the power supplying.
- Please follow the attachment exchange manual or procedure with battery.
- Dispose of used batteries in the correct way. Order industrial waste disposers, or send them back to us.

BATTERY REPLACEMENT

① Remove the battery cover.



② Remove the battery connector.

Hold the connector body and pull it straight forward. Do not pull electric wire by any means.

③ Remove the bracket fix screw and battery.

④ New battery is attached with a bracket fix screw.

⑤ Insert the battery connector.

Please be sure to plug it straight in all the way.

⑥ Attach the battery cover.

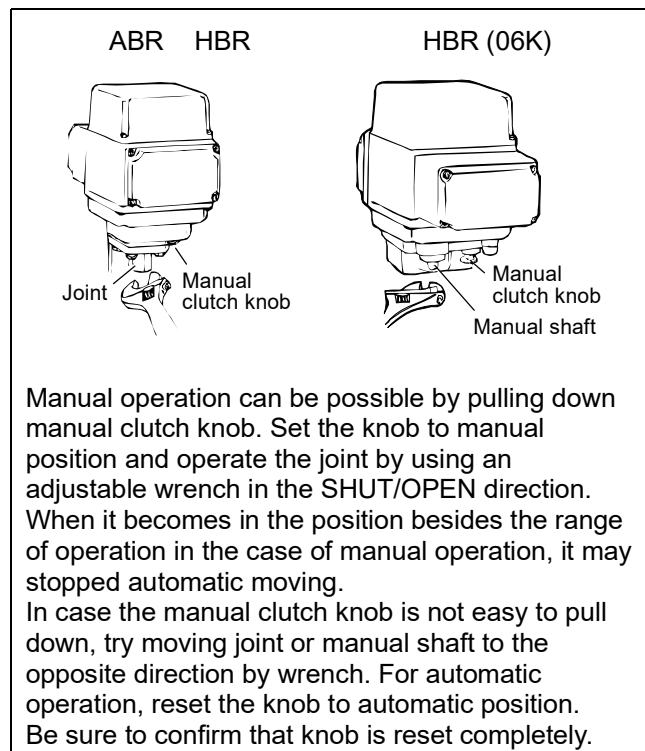
⑦ Make sure that operation by battery is securely performed.

MANUAL OPERATION

① PRECAUTIONS

- Remove the battery connector before manual operation for safety. (Refer the battery replacement)
- Manual operation should be a temporary operation.
- 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.
- Turn off the power and check if the valve operates normally with built-in battery.
- Confirm the fluid temperature or pressure.
- Confirm the leak from valve stem.
- Confirm the bolt tightening torque.

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.
	Battery lifetime.	Replace the battery.
Operation is unstable.	Excess surge or voltage was applied.	<ul style="list-style-type: none"> • Replace the control board or limit switch. (Repair in our factory) • Replace the actuator.
	Rainwater entered the actuator.	<ul style="list-style-type: none"> • 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 0.5 mA.

Problem	Cause	Solution
Stop in the mid position.	<ul style="list-style-type: none"> • Biting of valve seat. • The scale has adhered to the valve ball. 	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.
	Battery is worn out.	Replace the battery.
	Received the alarm signal.	
Stop automatic moving after manual operation.	Manual clutch knob is not reset.	Reset manual clutch knob.
	Out of operating range. (06K)	Reset by manual operation.
Leakage from valve body	<ul style="list-style-type: none"> • 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.
		Replace the gland packing.
GS T3 L3		

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