OKM

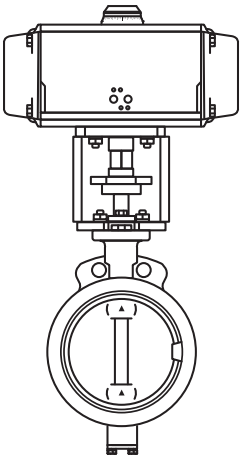
Pioneering the future with high-tech valves

NOx, SOx Regulation Compliant

High-temperature Butterfly Valve for Emission Control

Instruction Manual

OKUMURA ENGINEERING corp.



Safety Precautions-Strict Observance Required

Thank you for purchasing this product.
To ensure long-term safe use of this product, make sure to read this entire instruction manual (hereinafter referred to as "this manual") and follow all instructions.
The precautions shown below are intended to ensure that the High Performance Butterfly Valve EXV (hereinafter referred to as "the product") is used correctly to prevent injury and damages.

Symbols

In this manual, the levels of injury or damages that could occur due to ignoring instructions or mistaken operation of the product are divided into categories which are represented by the following symbols.

WARNING	This symbol indicates the "possibility of death or serious injury."
Caution	This symbol indicates the "possibility of malfunctions or physical damages only."

Instructions in this manual that must be followed are divided into categories which are represented by the following symbols.

Prohibited	This symbol indicates "prohibited" actions.
Mandatory	This symbol indicates "mandatory" actions that must be carried out.

Notes

- Make sure to read this entire manual before transporting, storing, connecting piping, operating, or performing maintenance and inspection.
- This manual does not contain all possible information related to transporting, storing, connecting piping, operating, or performing maintenance and inspection of the product. Contact a sales representative if you have any questions.
- The operating, maintenance, and inspection reference and limit values specified in this manual were determined with maintenance of the product in mind. Use the product within the reference and limit values.
- Only use the product with the included dedicated actuator. Do not use any other actuators.
- Store this manual in a location where it can be referenced at any time, particularly during installation and initial operation. Make sure to transfer the manual and operating procedures to the next person in line when a new person is assigned to handle operation.
- From a safety standpoint, you should stop use and replace the product if it is struck and dented or damaged in any way.
- The content of this manual may be changed without prior notice.

1. Product Features

1.1 Product information

This is a double eccentric butterfly valve which controls fluid by rotating the valving element 90°.
In addition to fully open and fully closed, the flow rate can also be controlled via an intermediate opening angle.

1.2 Standard specifications

■ EXV standard specifications (Table 1)

Valve type		ExVLL	
Body shape		Double eccentric wafer	
Valve type		80A, 100A, 125A, 150A, 200A, 250A, 300A, 350A, 400A, 450A, 500A, 600A, 700A, 800A, 900A, 1000A, 1200A, 1400A, 1600A	
Maximum operating pressure		1.0 bar	
Allowable valve seat leakage		Flow rate × 0.1%	
Pressure direction (Direction of flow)		Stem pressurization (Recommended)	
Applicable standards	End-to-end dimensions	EN558 (20 series)	
	Applicable flange connection	JIS 5K	
	Top flange	ISO 5211 compliant (80A - 600A) OKM self-imposed measurement (700A - 1600A)	
Standard materials	Body	SCS13A	SCS14A
	Valving element	SCS13A	SCS14A
	Valve stem	SUS316	
	Seat ring	SUS316	
	Gland packing	Graphite	
Fluid temperature range		0 ℃ – 450℃	
Ambient temperature range		-10℃ – 60℃	
Test pressure	Body pressure resistance	Pneumatic pressure: 1.5 bar	
	Valve seat leakage	Pneumatic pressure: 1.0 bar	
Actuator	Pneumatic cylinder	Single acting type	80A – 800A
		Double acting type	80A – 1600A
Application limit (limit value) of average fluid velocity in pipe		30 m/s or less (Valve fully open, continuous operation)	
Coating		Unpainted for both SCS13A and SCS14A (Actuator is manufacturer standard)	

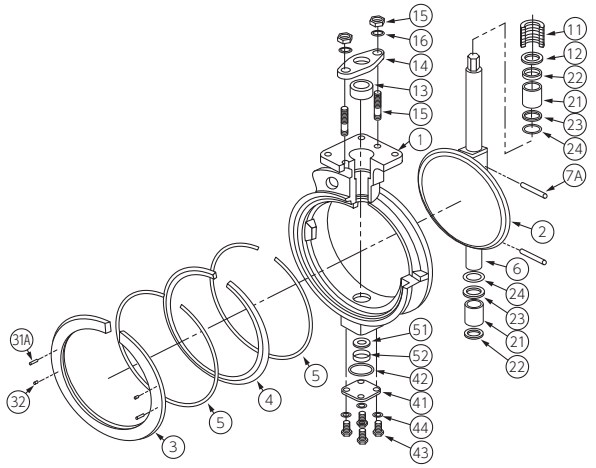
■ EXV standard specifications (Table 2)

Valve type		ExVHH	
Body shape		Double eccentric wafer	
Valve type		80A, 100A, 125A, 150A, 200A, 250A, 300A, 350A, 400A, 450A, 500A, 600A, 700A, 800A, 900A, 1000A, 1200A, 1400A, 1600A	
Maximum operating pressure		3.5 bar	
Allowable valve seat leakage		Size squared × 0.001 (L/min)	
Pressure direction (Direction of flow)		Stem pressurization (Recommended)	
Applicable standards	End-to-end dimensions	EN558 (20 series)	
	Applicable flange connection	JIS 10K / ISO PN10	
	Top flange	ISO 5211 compliant (80A - 600A) OKM self-imposed measurement (700A - 1600A)	
Standard materials	Body	SCS13A	SCS14A
	Valving element	SCS13A	SCS14A
	Valve stem	SUS316	
	Seat ring	SUS316	
	Gland packing	Graphite	
Fluid temperature range		0 ℃ – 550℃	
Ambient temperature range		-10℃ – 60℃	
Test pressure	Body pressure resistance	Pneumatic pressure: 5 bar	
	Valve seat leakage	Pneumatic pressure: 3.0 bar	
Actuator	Pneumatic cylinder	Single-acting type	80A – 400A
		Double-acting type	80A – 1600A
Application limit (limit value) of average fluid velocity in pipe		30 m/s or less (Valve fully open, continuous operation)	
Coating		Unpainted for both SCS13A and SCS14A (Actuator is manufacturer standard)	

Structural Drawing

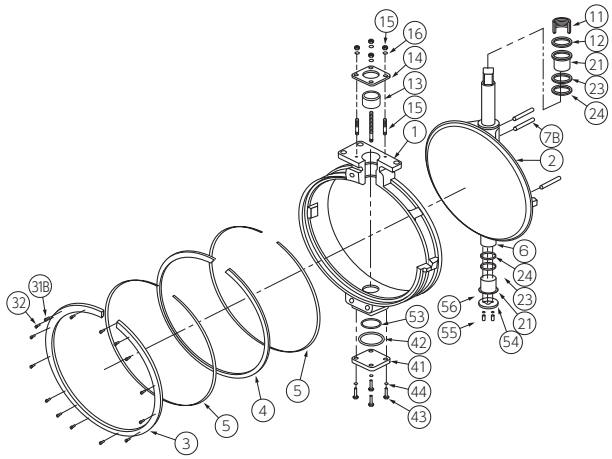
2.1 Exploded view and part names

80A–600A



[Figure 1]

700A–1600A



[Figure 2]

Parts List (80A–600A)

No.	Parts Name	Qty.	Consum-ables set	Spare packing set
1	Body	1		
2	Disc	1		
3	Set ring	1		
4	Seat ring	1	○	
5	Seat gasket	2	○	
6	Stem	1		
7A	Taper pin	1set		
11	Gland paking	1set	○	☆
12	Paking washer	1		
13	Gland	1		
14	Gland flange	1		
15	Gland bolt, nut	2		
16	Spring washer	2		
21	Bush	2		
22	Spacer	1set		
23	Paking	2		
24	Ring	2		
31A	Set pin	1set	○	
32	Draw out screw	1set	○	
41	Cover	1		
42	Gasket	1	○	☆
43	Cover bolt	4		
44	Cam lock washers	4		
51	Spring	4		
52	Guide ring	1	350A, 600A only	

Parts List (700A–1600A)

No.	Parts Name	Qty.	Consum-ables set	Spare packing set
1	Body	1		
2	Disc	1		
3	Set ring	1		
4	Seat ring	1	○	
5	Seat gasket	2	○	
6	Stem	1		
7B	Pin	1set		
11	Gland paking	1set	○	☆
12	Paking washer	1		
13	Gland	1		
14	Gland flange	1		
15	Gland bolt, nut	4		
16	Spring washer	4		
21	Bush	2		
23	Paking	2		
24	Ring	2		
31B	Set screw	1set	○	
32	Draw out screw	1set	○	
41	Cover	1		
42	Gasket	1	○	☆
43	Cover bolt	4		
44	Cam lock washers	4		
53	Thrust bush	1		
54	Adpter	1		
55	Adpter bolt	2		
56	Cam lock washers	2		

The consumable set contains parts marked ○ .
The spare packing set contains parts marked with ☆ .

Consumables set contains parts marked with ○ .
Spare packing set contains parts marked with ☆ .

NOTE)The components marked with a ☆ in the note column are consumables. Both the seat ring set and the spare packing set are bundled sales.

3. Precautions

3.1 Safety precautions

WARNING 3.1.1 Product handling

1. Only a person who has thoroughly read and sufficiently understands the content of this manual should assemble, operate, and maintain the product.
2. Follow legal and business regulations and wear protective gear such as a helmet, safety harness, safety glasses, work gloves, and safety shoes when carrying out any work.
3. Do not climb onto or place heavy objects on the product. Doing so will not only damage the product, but could also result in falling and other accidents.

WARNING 3.1.2 Safety check

Before removing the device, check the following items to ensure that it can be removed safely.

1. Have you taken measures to prevent the product from falling or rolling away?
2. Are the product, flange, and piping surface temperatures cool enough to touch?
3. Is the pressure inside the pipe the same as atmospheric pressure, and has the fluid been purged?
4. Have sufficient safety measures been taken if the fluid inside the pipe is toxic, flammable, or corrosive?
5. Have relevant power sources, air sources, and other energy sources been shut off?
6. Are there any fluids harmful to humans stuck to the surface of the product or surrounding pipes?

Check the following items when restarting the device.

1. Are the product and the actuator securely fastened?
2. Is the exterior damaged or are there any missing parts?
3. Are there any tools attached to the product or piping?
4. Is there anything that could hinder the operation of the product (lever or handle operation, valve opening/closing)?
5. Is it possible to safely evacuate in case of unexpected operation or leaks?

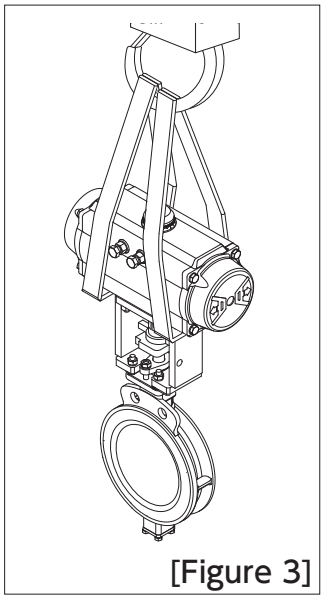
3.2 Transportation and storage

WARNING 3.2.1 Transportation

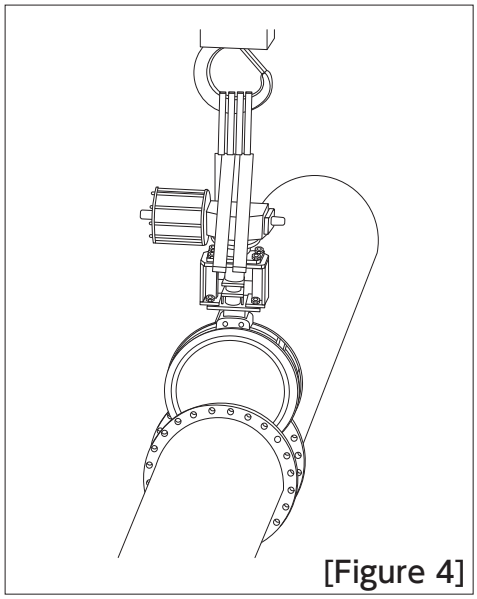
1. Heavy products (approximately 20 kg or more) should be moved using equipment or machinery rather than relying on a person's strength alone. Check the catalog or product drawing issued by OKM for information on the weight of the product.
2. Works such as forklifts, cranes, and slings should only be operated by certified individuals within the confines of legal and business safety regulations. Also make sure to follow Item 3.2.2.
3. When transporting the product, take sufficient measures, such as resting, to ensure that it is not scratched or damaged. Scratches and other damage can result in leaks and corrosion.
4. Use a container when transporting the product via sea routes. Sea breeze can corrode the product if a container is not used.
5. Use a box car or other enclosed vehicle when transporting the product via land to protect it from wind and rain. Cover the product with a sheet when transporting it in an uncovered vehicle.
6. Do not throw the product or place heavy loads on top of it.

WARNING 3.2.2 Falls

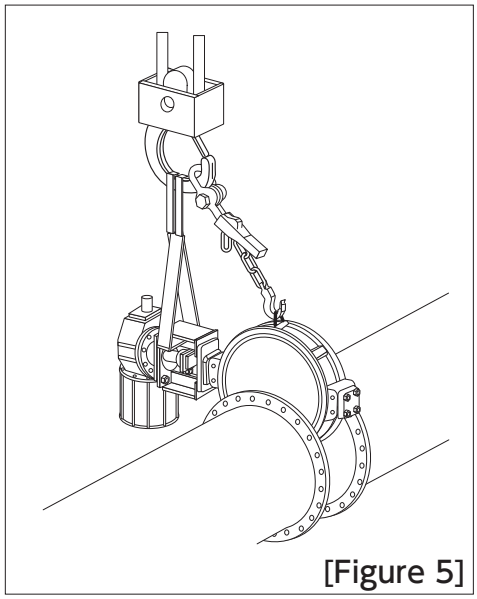
1. Before hoisting or lifting with a sling, carefully check the weight of the product and use equipment and machinery that is capable of handling the weight. Take sufficient safety measures to ensure that no one enters the area underneath the suspended load.
2. Secure a safe foothold with sufficient lighting during transportation and avoid working on unstable piping.
3. Properly secure the product during loading and unloading or shifting to prevent it from being dropped and damaged.
4. Do not use hooks on the handle to hoist or lift the product. Doing so is extremely dangerous, and can result in damage or dropping the product. Use a nylon sling or other material that will not damage the product and place it in a balanced position under the valve body neck when lifting the product.



[Figure 3]



[Figure 4]



[Figure 5]

WARNING 3.2.3 Packaging

Other than the Air to closed single acting type cylinder, the product is shipped fully closed according to actuator specifications. Take care not to scrach the edges of valve element, seat ring, or flange.

Mandatory 3.2.4 Unpacking

1.Only unpack the product directly before attaching piping. To protect the product from dust and other harmful substances and to avoid deterioration due to ozone and ultraviolet rays, do not leave the product unpackaged and exposed for long periods of time. Doing so could result in a drop in performance, contamination, discoloring, and deteriorated materials.
2. When opening the packaging with a knife, etc., take care not to scratch or damage the product.

Mandatory 3.2.5 Mandatory

To avoid a drop in performance, contamination, discoloration, and deteriorated materials, store the product in the following ways.

1. Do not store the product in direct sunlight, places subject to high temperatures and humidity, dusty or wet locations.
2. When storing the product, leave the cardboard packaging and protective packaging on the valve body and store it indoors (Temperature: 0˚C to 50˚C, humidity: 70% or less).
3. Humidity can weaken cardboard packaging, causing it to rip, resulting in damage to the product. Take care to ensure that the packaging does not become wet.
4. Do not store the product in areas with corrosive gas in the air. Doing so could corrode parts, resulting in poor performance.
5. During storage, do not allow the product to be dropped, tipped over, or shaken, and do not place heavy loads on top of it. Doing so could result in poor performance.
6. Do not stack the product during storage. Doing so could cause it to tip over, injuring others or damaging the product. (See Item 3.2.2)
7. Store the product in a fully closed state, and open and close it once every three months.
8. Do not store the product with heavy loads placed on the actuator. Doing so could result in poor performance.
9. When storing the product for a long period of time, coat plated parts (opening plate, bolts, nuts, etc.) with anti-rust spray.
10. Do not remove parts from valves during temporary storage.

3.3 Installation and usage environment

WARNING 3.3.1 Installation site and usage environment

Make sure you have sufficient work space in the installation site for actuator operation and wiring, and other anticipated work such as pipe fitting and maintenance.
In the following installation sites and usage environments, special arrangements may be necessary to comply with functional specifications and legal requirements. Contact a sales representative if you have any questions during the planning phase.

1. Special usage environments not included on the specifications sheet
2. Example of a location which could result in significant damages to persons, property, or the environment if the product malfunctions: High Pressure Gas Safety Act related equipment, Industrial Safety and Health Law related equipment, nuclear power related equipment, medical equipment, vehicles, etc.

Caution 3.3.2 Installation site environment

Implement the following measures depending on the environment of the installation site.

1. Avoid locations exposed to gas that includes salt content, corrosive gas, liquid chemicals, organic solvents and steam, and seawater.
2. If there is a possibility that the product could come into contact with radiant heat, cover the product and included equipment to protect them.
3. Do not submerge the product. When installed in a location where it could become wet at any time, cover the product and included equipment to protect them.
4. When installed on the deck of a boat, etc., take measures to protect the product from salt damage.

Mandatory 3.3.3 Installation site and usage environment temperature

When used outside the permissible temperature range, the seat ring and O-ring can be subject to heat degradation and hardening, and differences in thermal expansion or contraction of parts can result in malfunction, etc.

1. The ambient temperature of the installation site should remain within the ambient temperature range of product specifications (Section 1.2).
2. When left in direct sunlight, ensure that the product and actuator do not exceed the maximum permissible temperature.
3. Keep the product away from heat sources and install it in a location that remains within the ambient temperature range. When used in particular near motors or engines, air compressors, boilers, etc., the ambient temperature range may be exceeded.
4. Pay attention to heat transfer from the support bracket, etc.

Caution 3.3.4 Installation site vibration and shocks

Implement the following measures if the installation site is subject to vibration and shocks.

1. If the product is used in the following conditions, confirm the vibration, shock acceleration, etc. and contact a sales representative.

Locations expected to be subject to excessive vibration or shock, exceeding 2G (0 - 150 Hz)

2. Securely tighten mountings and connections to keep them from becoming loose.
3. Implement anti-vibration measures to lessen vibration and shocks to equipment. Install piping supports and anti-vibration materials.
4. Periodically inspect connections to ensure that they have not become loose or warped. Tighten bolts or replace parts if there are any problems. If bolts come off, the product may fall out of its mounting or rotate in an unexpected direction.

Prohibited 3.3.5 Removing and replacing the product and actuator

1. The actuator full close adjustment mechanism on the product determines the performance of the valve seat seal. Therefore, when removing the actuator, mark it to ensure that the position remains the same after reassembly by the method such as putting a matchmark.
2. Do not modify the product by removing the actuator and replacing it with a different type of actuator. The product is not guaranteed if the actuator is replaced or modified.

WARNING 3.3.6 Precautions when installing insulation

During test operation or normal operation, gland packing stress relaxation can result in decreased tightening force leading to external fluid leaks. To prevent leaks from occurring, install insulation as long as it does not interfere with gland bolt tightening. [Figure 3]

WARNING 3.3.7 Condensation

A difference in external and internal temperature can result in condensation forming on the actuator.

WARNING 3.3.8 Selection precaution

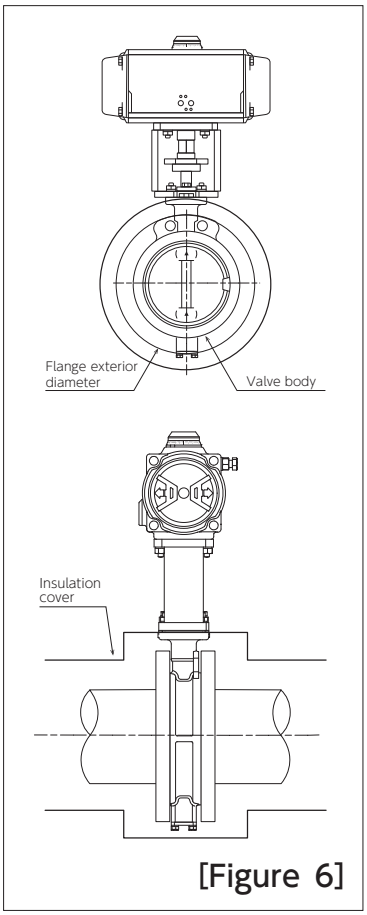
During the pipe fitting process, remember that there is a recommended pressure direction (direction of flow) for the product.

WARNING 3.3.9 How to use the lock bolt

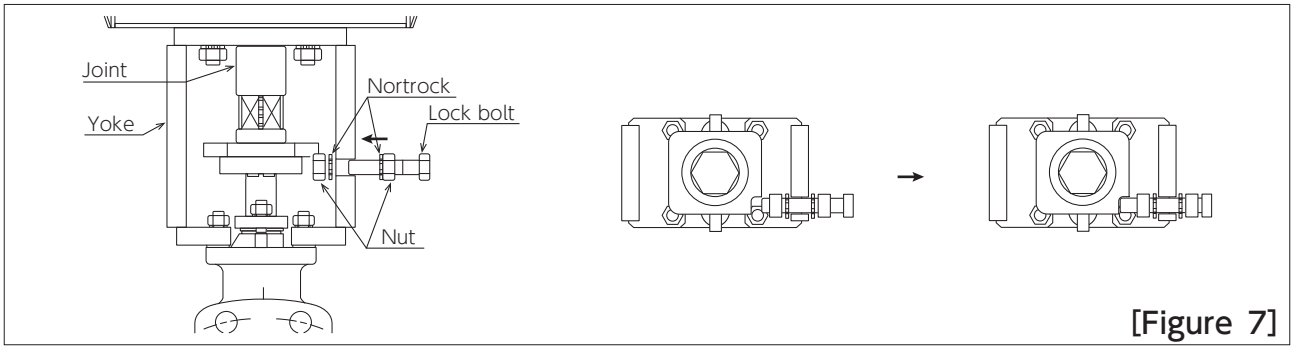
The lock bolts (including the normal lock and nut) on the yoke section are used to fix the valve body to the fully open position during maintenance or other work requiring disassembly. The installation procedures and usage methods for the products are described below. Be careful in working with safety.

1. Fully open the valve with air supply.
2. Attach the nut and the nut to the bolt deeply, insert the bolt into a hole drilled in the side of the yoke from the outside, and attach the nut and the nut from the inside.
3. Tighten the nuts on both sides with the bolt pushed in against the recess of the joint.

This fixes the venture in full open condition.
Please follow the reverse procedure above to remove the device.



[Figure 6]



[Figure 7]

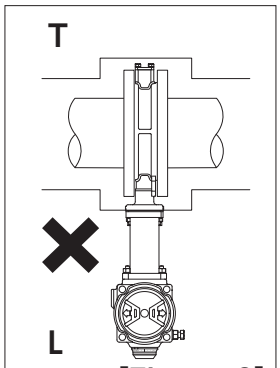
3.4 Pipe fitting precautions

Mandatory 3.4.1 Precautions before beginning pipe fitting

1. The material of the seat ring and valving element limits the working pressure, fluid, and temperature range of the product. Before beginning pipe fitting, make sure to check the specifications of the valve on the nameplate, in the catalog, and on the drawings.
2. Make sure there are sufficient footholds and lighting in the work space at the installation site.
3. Secure the pipes with supports as necessary to ensure that excessive loads are not placed on the piping due to the dead weight of the product or due to other tasks.
4. Use a standardized flat face or raised face flange as indicated in product specifications (Section 1.2).
5. Use carbon steel pipe, carbon steel pressure pipe, or stainless steel pipe greater than the "minimum pipe diameter" shown in Section 6.1.

Mandatory 3.4.2 Precautions during pipe fitting

When connecting piping, pay attention to the following items.
From a safety standpoint, you should stop use and replace the product if it is struck and dented or damaged in any way.



[Figure 8]

1. Thoroughly wash piping to remove any cutting chips, cutting oil, and any other debris from inside the pipe before installation.
2. Do not apply strong force to, hit with objects, or strike the product or piping. Rough handling can warp or damage the product, leading to leaks and malfunction.
3. The product has a designated pressure direction (direction of flow). During pipe fitting, make sure to align the pipes in the direction of the arrows marked on the body.
4. Avoid a piping configuration where the actuator is pointing downward.
5. Do not climb onto or hit the product in order to insert it into piping.
6. Always use a gasket between the pipe flange and valve. Use a joint sheet gasket or spiral gasket. See the table in Section 6.2 for details on pipe gasket dimensions.
7. The product seals in fluid when the pipe flange compresses the set ring using the compression force of the gasket. To properly hold the set ring in place during pipe fitting, make sure the product and the center of the flange are aligned. Utilize the centering sections on the top and bottom of the product body during piping for easier centering. Operating the product while it is off-center can result in damage, malfunction, outside leakage, and valve seat leakage.
8. Check the following precautions when tightening pipe bolts. See Item 4.1.1 for instructions on tightening.

Caution

Impact Lench Usage

If a high-output impact wrench is used to perform piping work on the butterfly valve or retighten the piping bolts, the valve body, seal ring, piping flange, piping bolts, etc., may be deformed or damaged depending on the model and usage of the impact wrench. When using an impact wrench, use a model whose maximum output is equal to or less than the "maximum allowable value" shown in the table below..

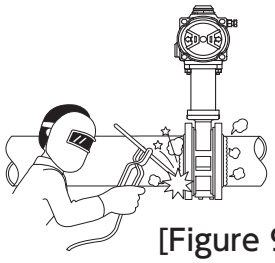
[Table-3] Maximum allowable torque for metal flange (unit: Nm)

Bolt type	M16	M20	M22	M24	M27	M30	M33	M36	M39	M45
Impact torque (Nm)	250	500	650	850	1200	1700	2300	3000	3900	6000

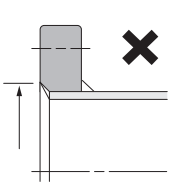
3.4 Pipe fitting precautions (Continued)

Prohibited

9. Never weld a pipe while it is connected. Immediately attaching the product to a pipe flange directly after welding can cause heat damage to the seat ring and seriously affect the product. Wait until the temperature has cooled sufficiently and remove welding spatter before attaching the product and piping. [Figure 4]
10. If the flange surface contacts the product seat ring as shown in [Figure 5], the flange may leak.

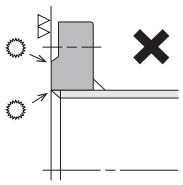


[Figure 9]



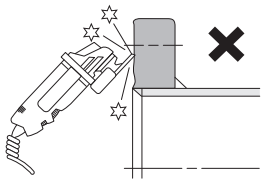
● **Excessive weld penetration or chamfering**

A larger interior diameter can result in a leaky flange.



● **Sharp edge**

A sharp corner or burr can damage the surface of the flange.



● **Rough finish**

An uneven seal surface can result in a leaky flange.

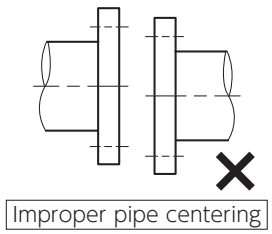
[Figure 10]

Prohibited

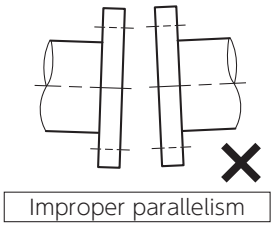
11. Accurately center the primary and secondary pipes and check for parallelism and make sure there is no warping. Imprecise centering can result in outside leakage, valve seat leakage, and malfunction. [Figure 6]

Mandatory

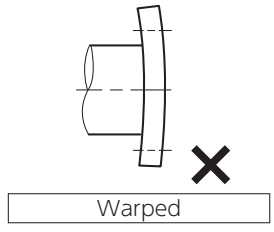
12. When attaching the product to a check valve or flexible coupling, insert a shortened pipe in the space between. Failure to insert a short pipe can result in the valving element contacting the check valve or coupling during operation, resulting in malfunction, outside leakage, and valve seat leakage. See Section 6.1 for valving element protrusion dimensions.
13. Connect the product to the primary side of the curved pipe (elbow or T). If it must be connected to the secondary side, ensure a straight pipe distance that is five times greater than the diameter of the pipe from the curved pipe. Connect the product so that the fluid velocity is the same on the left and right sides in relation to its valve stem. Unbalanced torque caused by fluid velocity or pressure distribution on the valving element may occur when connected to the secondary side in the direct vicinity of a curved pipe, adversely affecting the increased operational ability, product performance, and product lifetime.
14. After piping is complete, open the product fully and confirm that the valving element and flange interior are not contacting one another.



Improper pipe centering



Improper parallelism



Warped

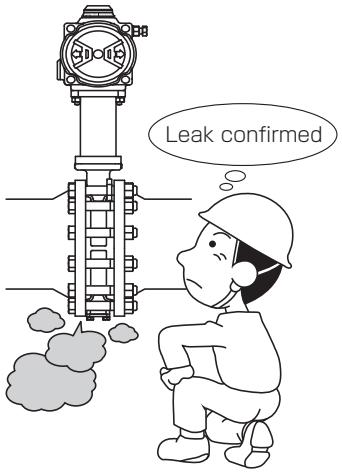
[Figure 11]

3.5 Handling precautions after piping is complete

Mandatory 3.5.1 Handling precautions after piping is complete

After connecting piping, pay attention to the following items and conduct a final check. Failure to conduct a check can result in damage to the product or serious accidents.

1. Before beginning operation, remove any foreign objects from inside and outside the pipes and clean the product.
2. Increase the internal pipe pressure before beginning operation and make sure there are no leaks from the flange, gland, or lower sections. When doing so, make sure the internal pressure does not exceed the rated pressure of the valve.



[Figure 12]

Caution

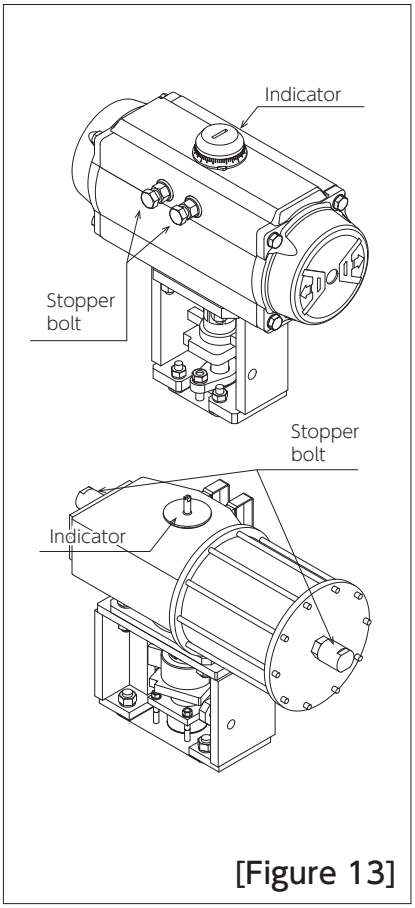
3. After the test operation bolts will be lengthened due to heat expansion so retighten the bolts and nuts after pressure is lowered. See 4.1.1 - 10 "Pipe bolt tightening procedures" for instructions on how to tighten the bolts. If you find a leak from the bottom of the product, check if the hexagon bolts are loose. If you find a leak from the gland section, tighten the gland section nuts. If you cannot stop the leak, completely release the pipe internal pressure, remove the product from the piping, and replace the consumable parts of the gland section or lower section.

Mandatory

4. When conducting a pipe pressure resistance test that includes the product, open the valve fully and conduct the test below the rated pressure.
5. If operations are ceased for a long period of time after piping is completed, open and close the valve once every two weeks.
6. Do not fully close the product as an alternative to a blind flange.
7. After the test operation or after a certain period of use, re-tighten the pipe bolts and nuts after pressure is lowered. High-temperature fluids in particular result in pipe gasket stress relaxation, which loosens bolts and can result in leaky flanges.

WARNING 3.5.2 Product operation precautions

1. Never tighten the product bolts, pins, or pipe bolts when the pipe interior is pressurized. Doing so is dangerous, and could result in fluid spraying out of the product or pipes.
2. Do not remove the actuator from the product when the pipe interior is pressurized. Doing so could result in fast, unexpected valve operation or cause the valve stem to fly out.
3. When using the product while it is partially opened (aperture), make sure to leave it open to 30° or more. Closing it to 30° or less during continuous use can increase the jet flow speed, resulting in seat damage, pipe damage, vibration, and noise.



[Figure 13]

Prohibited

4. Do not loosen the stopper bolts on the actuator. The fully closed position can be misaligned, causing a valve seat leak. If the stopper bolts have been moved, follow Section 5.2 "Guidelines for adjusting valve body fully closed position" to readjust the fully closed position.

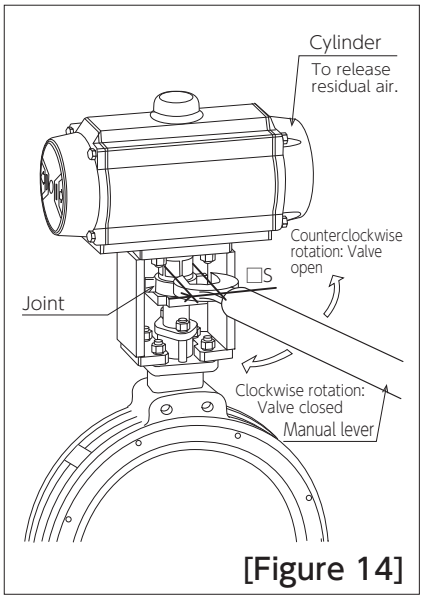
Caution

5. After piping is completed and before beginning operation, open and close the valve once or twice.
6. After the test operation or after a certain period of use, re-tighten the pipe bolts and nuts after pressure is lowered. High-temperature fluids in particular result in pipe gasket stress relaxation, which loosens bolts and can result in leaky flanges.

WARNING 3.5.3 Manual operation procedure

Follow the procedure below to perform manual operation.

1. Stop the supply air to release residual air in the cylinder.
2. Operate the joint with the manual lever.
   Clockwise rotation: Valve closed
   Counterclockwise rotation: Valve open
   If the air cylinder operates during manual operation work, it is extremely dangerous.
   Be sure to check that the supply air is stopped before starting work.
   In addition, operation cannot be performed when residual air in the cylinder is not released.



[Figure 14]

[Table 4]

SIZE		80A	100A	125A	150A	200A	250A	300A	350A	400A	450A	500A	600A	700A	800A	900A	1000A	1200A	1400A	1600A
□ S[mm]	Double-acting								36	50	50	63	72	75	80	80	100	120	150	150
	Single acting type	22	22	27	27	36	36	46	46	58										

3.6 Maintenance and inspection

Mandatory 3.6.1 Daily inspection

Conduct the following during daily inspections.

[Table 4] Daily inspection

Inspection details	Inspection location	Inspection instructions	Solution
External fluid leak	Pipe connection	Visual	Tighten pipe bolts
			Valve and pipe centering/re-tightening
	Bottom, valve surface	Visual	Disassemble for maintenance (Replace consumable parts*1)
			Replace valve
	Gland	Visual	Tighten bolts
Noise or vibration	Valve/ actuator exterior, pipe around valve, bolts/nuts	Visual, touch	Change opening angle, review flow rate and pressure
			Tighten bolts/nuts, remove source of vibration
			Disassemble for maintenance (Check if any parts are damaged)
Bolts/nuts loose	Bolts/nuts	Visual, touch	Tighten bolts/nuts
			Tighten after reducing pressure parts
Valve seat leakage	Is there any leakage from secondary side? (Flow meter, pressure gauge, drain)	Auditory, Visual, measurement	Check via indicator to confirm if open/close position is correct
			Remove foreign objects by flushing with water while fully open (Item 3.6.6)
			Remove from piping (Item 3.6.7), inspect and clean
			Replace consumable parts*1
Check valve operation	Check open/close position, Manual valve: Operability, Auto valve: Operation	Visual, Operating feel	Check via indicator to confirm if open/close position is correct
Check for valve damage	Valve surface	Visual	Immediately stop use and replace valve if damaged

*1 Consumable parts should be replaced after approximately two years of operating time. They may need to be replaced earlier depending on the operating environment, however, you should use this time period as a reference for replacing consumable parts (See Section 2.1 Exploded view).

Mandatory 3.6.2 Periodic inspection

Conduct a periodic inspection of the following items every two years.

[Table 5] Periodic inspection instructions

Inspection details	Inspection location	Inspection instructions	Solution
Valving element corrosion or damage	Valving element	Remove from pipe, visual	Replace valve
Seat ring wear and damage	Seat ring	Remove from pipe, visual	Clean valving element and seat ring (Item 3.6.3) Replace consumable parts*1 Replace valve
Valve operation status	Valve and actuator	Open/close operation	Replace actuator, replace valve

*1 Consumable parts should be replaced after approximately two years of operating time. They may need to be replaced earlier depending on the operating environment, however, you should use this time period as a reference for replacing consumable parts (See Section 2.1 Exploded view).

WARNING 3.6.3 Safety measures during inspections

When putting your hand inside the valve, disconnect the air source and take measures to prevent the drive from moving. It is very dangerous if your hand is caught in a suddenly closed venture. Especially for single-acting cylinders, it is necessary not only to disconnect the air source, but also to check that the operation air is being discharged.

Mandatory 3.6.4 Valve seat and body stopper cleaning

When using a pneumatic cylinder or electric motor, make sure to turn off the air source and power source and absolutely ensure that the actuator is not moving before inserting your hand into the valve interior. It is extremely dangerous if your hand is caught in a suddenly closing valving element. For single acting cylinders in particular, you must make sure that the air source is off and the operating air pressure has been purged.

1. When removing the product from piping for cleaning during periodic inspections, use a clean waste cloth/ sponge and neutral detergent or alcohol to clean the seat ring without damaging it.
2. Use a waste cloth to clean the periphery of the flanging element.
3. Make sure there are no scratches or wear on the inside of the seat ring and the periphery of the valving element.
4. Make sure there are no foreign objects stuck to the body stopper.

Mandatory 3.6.5 Replacing consumable parts

Always disassemble and reassemble the product in a clean location free of garbage and dust. For types and replacement procedure of consumable parts, see Section 2.1 "Exploded view and part names" and Chapter 5 "Maintenance."

Mandatory 3.6.6 Rust prevention

Make sure to use the following designated rust-prevention agents.

[Table 6] Rust prevention

Application site	Rust-prevention agent
Plated sections Opening plate, bolts, nuts	Rust-prevention agent

WARNING 3.6.7 Precautions for treatment

1.Follow legal and business regulations and wear protective gear such as a helmet, safety harness, safety glasses, work gloves, and safety shoes when carrying out any work.

2.Take sufficient safety measures if the fluid inside the pipe is toxic, flammable, or corrosive.

WARNING 3.6.8 Action at occurrence of abnormality

1. Before tightening the pipe flange, always lower the pressure inside the pipe to return it to atmospheric pressure. Also make sure that the pipe is sufficiently cool before tightening.
2. If operation is abnormal, foreign objects could be clogging the product, or the seat ring could be damaged. Using the product without addressing the problem can result in damage to the product or serious accidents. Follow the steps below to check the product.
   (1) Fully open the valving element to rinse away the foreign objects.
   (2) If step (1) above does not solve the problem, the seat ring could be damaged. Remove the product from piping and inspect and clean it.

WARNING 3.6.9 Removing from/attaching to pipes

1. Before removing the product from piping, make sure to purge all remaining pressure and fluid from the equipment and piping. Failure to do so can result in fluid spraying out of the product or unpredictable operation.
2. Take necessary measures to prevent fluid from mistakenly flowing into the applicable pipe.
3. If necessary, wait a while to ensure that internal fluid does not leak out when removing the product.
4. Fully close the product to ensure that the valving element does not come out from the interface before removing it from or attaching it to the pipes. (For detailed procedures, see Item 4.1.1.)
5. Leave the bottom nuts and bolts on and remove the valve. Attaching jack bolts between the flanges can make the task easier.

WARNING 3.6.10 Disposal

1. Dispose of the product as general industrial waste. It does not contain any materials that cannot be processed as general industrial waste.
2. When separating materials for disposal, refer to the materials on the drawings for guidelines.
3. Dispose of the product according to national laws, local government and business regulations.

4. Piping

4.1 Piping guidelines

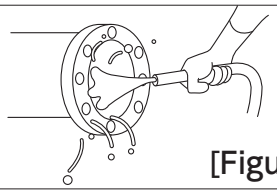
4.1.1 Piping procedures

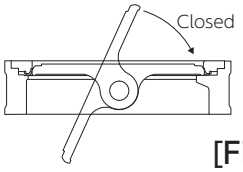
Thoroughly read Section 3.4 "Pipe fitting precautions" before beginning piping procedures, and follow the steps below.

Caution

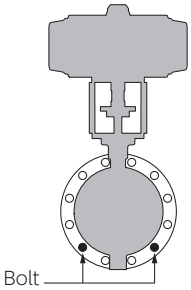
When attaching the product to a check valve, pump, or flexible coupling, insert a shortened pipe in the space between. Failure to do so could result in the pipe hitting the valve element during operation, resulting in malfunction or leaks.

1. Clean the flange surface that comes into contact with the product. Remove any rust or foreign objects if present, and clean the product with an appropriate solution (alcohol or neutral detergent). [Figure 9] Remove all foreign objects from inside pipes before connecting the product.
2. Fully close the product before installing or removing it. [Figure 10]
3. After aligning the center of both flanges, insert pipe bolts as shown in the drawing and secure the product so that it does not fall. [Figure 11]
4. Set jack bolts as shown in the drawing and increase the distance between flanges. Keep the flange distance approximately 6 to 10 mm from the valve interface width. Do not remove the jack bolts until all pipe bolts have been attached. [Figure 12] [Figure 13]
5. Do not use hooks on the handle to hoist the product. Use a nylon sling or other material that will not damage the body and place it in a balanced position under the product when lifting the product. [Figure 13]
6. The product has a designated pressure direction (direction of flow). During pipe fitting, make sure to align the valve pressure direction in the direction of the arrows marked on the body. Take care not to scratch the surface of the valve flange. Forcing the flanges when attaching pipes can damage the flange surface, resulting in leaks. Always use jack bolts, etc. to secure sufficient distance between flanges when inserting the product. [Figure 13]
7. Insert a pipe gasket between both ends of the valve and the pipe flange surfaces.
8. After the product is fully inserted, insert pipe bolts as shown in the piping guide. [Figure 14, 15]
9. Remove the jack bolts after all pipe bolts have been attached.

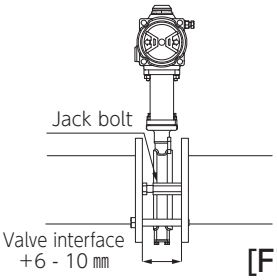

[Figure 15]



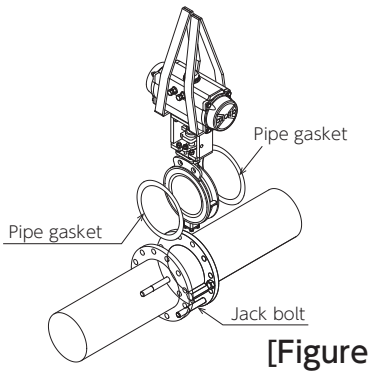
[Figure 16]



[Figure 17]



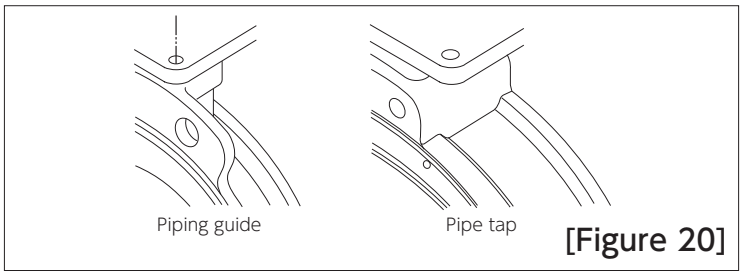
[Figure 18]



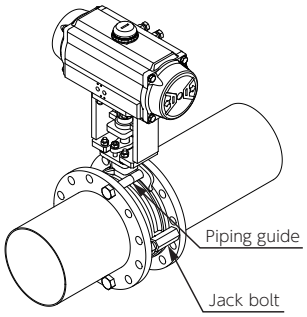
[Figure 19]

4.1 Piping guidelines (Continued)

10. Follow the procedures below to tighten pipe bolts so that the flange and the product are properly centered and to prevent uneven tightening. The product seals in fluid when the pipe flange compresses the seat ring using the compression force of the gasket. To properly hold the seat ring in place during pipe fitting, make sure the product and the center of the flange are aligned. Utilize the centering ribs during piping for easier centering. Operating the product while it is off-center can result in damage, malfunction, outside leakage, and valve seat leakage.
    ※ When using an impact wrench, make sure to refer to Item 3.4.2.



[Figure 20]



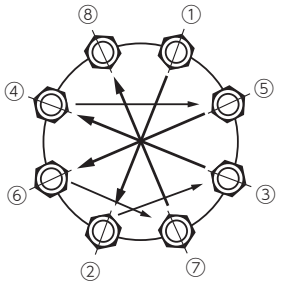
[Figure 21]

⚠ Caution

Pipe bolt tightening procedures

If there are no appropriate in-house tightening procedures, tighten the nuts and bolts as shown below.

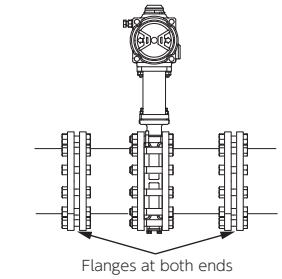
1. Clean each nut and bolt and apply lubricant. (Do not use rusted or damaged nuts or bolts.)
2. Tighten the nuts and bolts by hand in no particular order.
3. Tighten bolts in any order using approximately 20% torque.
4. In diagonal order (See Figure on right), tighten bolts using approximately 70% torque.
5. Tighten bolts in diagonal order using100% torque.
6. Again, tighten bolts in diagonal order using100% torque.
7. Tighten bolts in clockwise order using100% torque. Pipe gasket stress relaxation can cause bolts to loosen once they have been tightened. Always re-tighten 6 and 7 and repeat until all bolts are evenly tightened.



Example of bolt tightening order

[Figure 22]

11. Temporarily tighten the flanges at both ends, and fully tighten the product so that the flange and the product are properly centered. [Figure 17]
12. After piping is complete, open and close the product to make the operation from fully open to fully closed is smooth.


Flanges at both ends

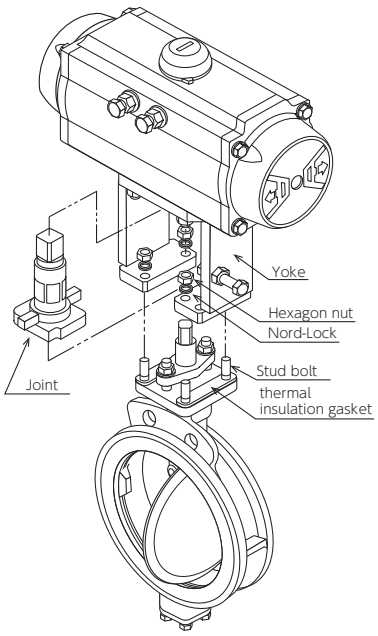
[Figure 23]

5. Maintenance

5.1 Guidelines for removing and assembling the valve body and actuator

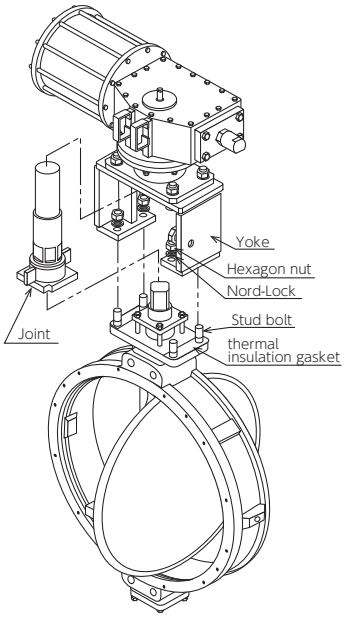
Caution Before attaching and removing the actuator while the product is attached to piping, confirm that the internal pipe pressure is equal to atmospheric pressure, and that internal fluid has been purged.

80A – 600A



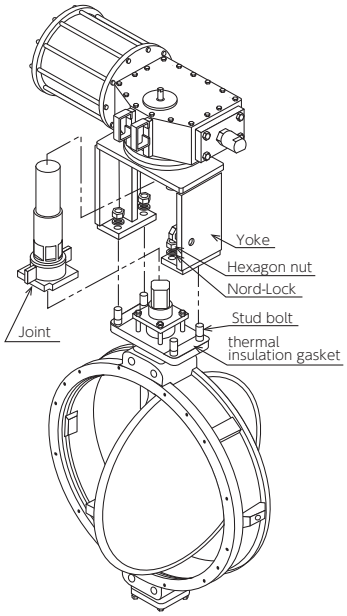
[Figure 24]

700A – 1000A



[Figure 25]

1200A – 1600A



[Figure 26]

5.1.1 How to remove the actuator

Thoroughly read Section 3.4 "Pipe fitting precautions" before beginning piping procedures, and follow the steps below.

1. Secure the bottom of the body with a vice or press. When doing so, make sure not to scratch the flange surfaces.
2. Remove the hexagon nuts securing the body and yoke.
3. Lift the actuator up and remove it from the body. When doing so, the joint may also be pulled up with the yoke, so take care not to drop the joint.

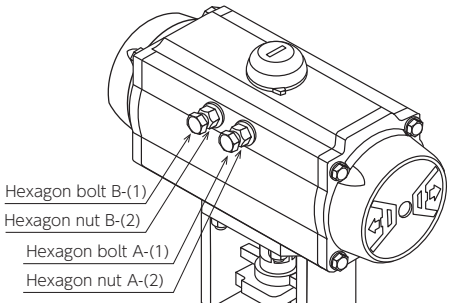
5.1.2 How to assemble the actuator

1. Secure the bottom of the body with a vice or press and set the opening angle to the fully open position. When doing so, make sure not to scratch the flange surfaces.
2. Set the actuator to the fully open position.
3. Attach an insulating gasket to the body where the stud bolts are screwed in.
4. Insert the joint between the body and yoke, attach the actuator, and secure with hexagon nuts and Nord-Lock washers. When doing so, take care to make sure the joint index matches the angle of the valving element.
5. Follow Section 5 "Guidelines for adjusting fully closed position" to adjust the fully closed position.

5.2 Guidelines for adjustingthe valve body fully closed position

5.2.1 Guidelines for adjusting fully closed position (80A - 600A)

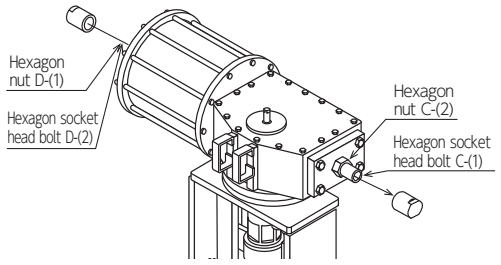
1. Set the valve to the fully open position.
2. Loosen hexagon nut A-(2) and hexagon bolt A-(1).
3. Fully close the valve and make sure that hexagon bolt A-(1) is free. (If not, further loosen hexagon bolt A-(1).)
4. Tighten it until it lightly touches hexagon bolt A-(1). (Do not use excessive force to tighten with a tool such as a wrench.)
5. Set the valve to the fully open position.
6. Tighten hexagon bolt A-(1) 1/4 turn.
7. Tighten hexagon nut A-(2) so that hexagon bolt A-(1) does not rotate.



[Figure 27]

5.2.2 Guidelines for adjusting fully closed position (700A - 1600A)

1. Set the valve to the fully open position.
2. Loosen hexagon nut C-(2) and hexagon socket locking screw C-(1).
3. Fully close the valve and make sure that hexagon socket locking screw C-(1) is free. (If not, further loosen hexagon bolt and hexagon socket locking screw C-(1).)
4. Tighten it until it lightly touches hexagon socket locking screw C-(1). (Do not use excessive force to tighten with a tool such as a wrench.)
5. Set the valve to the fully open position.
6. Tighten hexagon socket locking screw C-(1) 1/4 turn.
7. Tighten hexagon nut C-(2) so that hexagon socket locking screw C-(1) does not rotate.

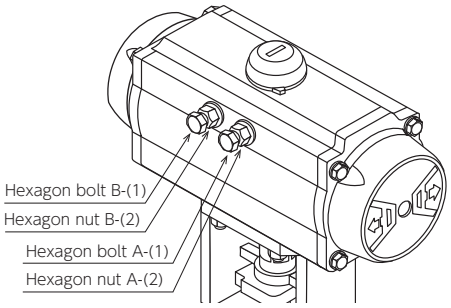


[Figure 28]

5.3 Guidelines for adjusting valve body fully open position

5.3.1 Guidelines for adjusting fully open position (80A - 600A)

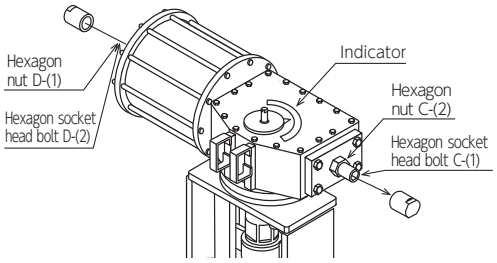
1. Set the valve to the fully close position.
2. Loosen hexagon nut B-(2) and hexagon bolt B-(1). Turn hexagon bolt B-(1) clockwise to make the fully open position shallower, and turn it counterclockwise to make it deeper.
3. Set the valve to the fully open position.
4. Check the indicator position to make sure it is turned 90° from the fully closed position. If the fully open angle is misaligned, return to step 1 and repeat adjustment procedures.
5. Set the valve to the fully close position.
6. Tighten hexagon nut B-(2) so that hexagon bolt B-(1) does not rotate.



[Figure 29]

5.3.2 Guidelines for adjusting fully open position (700A - 1600A)

1. Set the valve to the fully close position.
2. Loosen hexagon nut D-(2) and hexagon bolt D-(1). Turn hexagon bolt D-(1) clockwise to make the fully open position shallower, and turn it counterclockwise to make it deeper.
3. Set the valve to the fully open position.
4. Check the indicator position and check to make sure it is turned 90° from the fully closed position. If the fully open angle is misaligned, return to step 1 and repeat adjustment procedures.
5. Set the valve to the fully close position.
6. Tighten hexagon nut D-(2) so that hexagon socket head bolt D-(1) does not rotate.



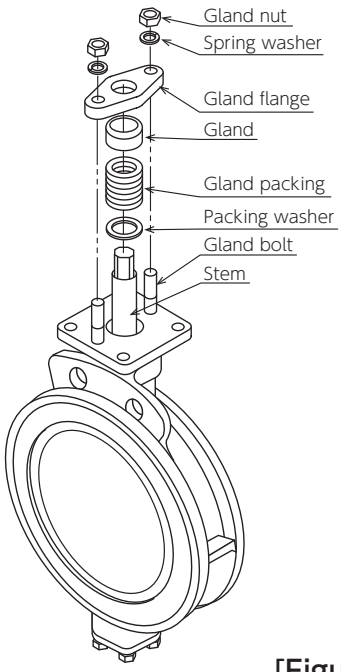
[Figure 30]

5.4 Gland disassembly and assembly guidelines

⚠ Caution

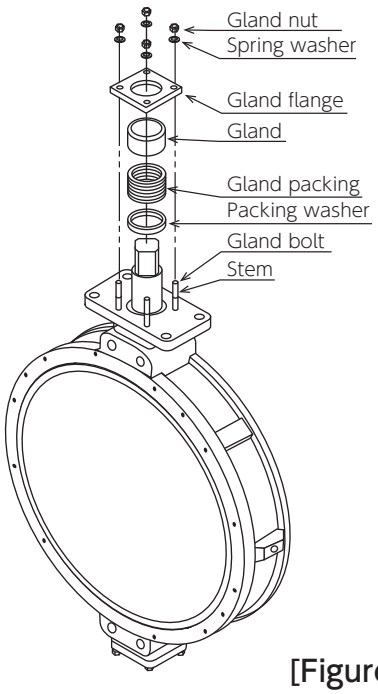
Before replacing this component, make sure the pressure inside the pipe is equal to atmospheric pressure, and that the interior of the pipe is at room temperature. Also, do not replace the component until you can confirm that any fluid left in the device is not harmful to human health.

80A – 600A



[Figure 31]

700A – 1600A

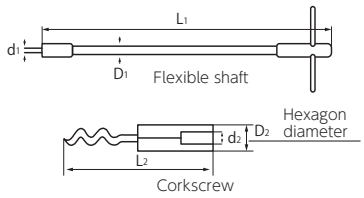


[Figure 32]

5.4.1 Disassembly

1. Remove the valve actuator.
2. Remove the gland nut, gland flange, and gland.
3. Remove the gland packing. [Figure 27]
   (Use a gland packing removal tool, etc. to remove the packing.)
4. Use a cloth to clean the stem, inside the body gland box, and the washer.

Gland packing removal tool

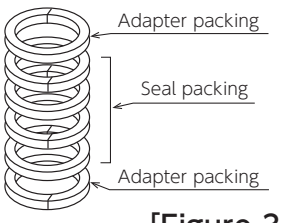


[Figure 33]

5.4.2 Assembly

1. Insert the packing washer.
2. Insert gland packing by pushing the seal packing with the adapter packing. Make sure the cuts in the packing alternate sides. Take care not to scratch the packing.
3. Attach the gland and gland flange, and tighten the gland nut to the designated torque. (See Table 7)
   When finishing, take care not to allow tightening to become uneven.
4. Attach the actuator. If there are any leaks or once the temperature increases, tighten the bolts as necessary.

Gland packing detail drawing



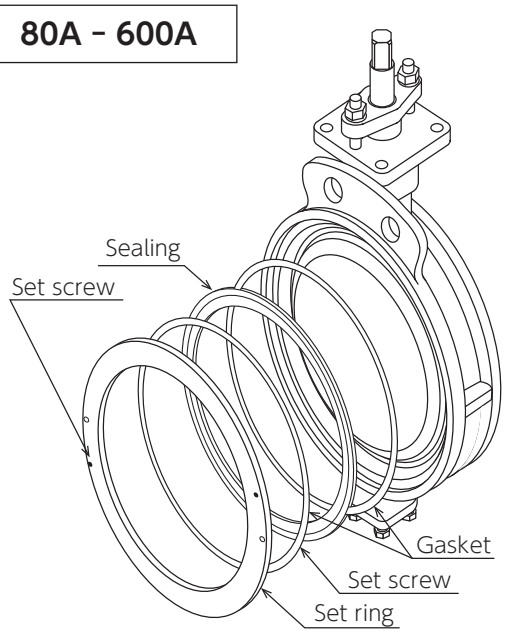
[Figure 34]

[Table 7] Initial tightening torque table

Nominal diameter	80A	100A	125A	150A	200A	250A	300A	350A	400A	450A	500A	600A	700A	800A	900A	1000A	1200A	1400A	1600A
Tightening torque N·m	7	7	12	12	17	25	28	51	57	78	111	129	63	86	90	95	135	220	250

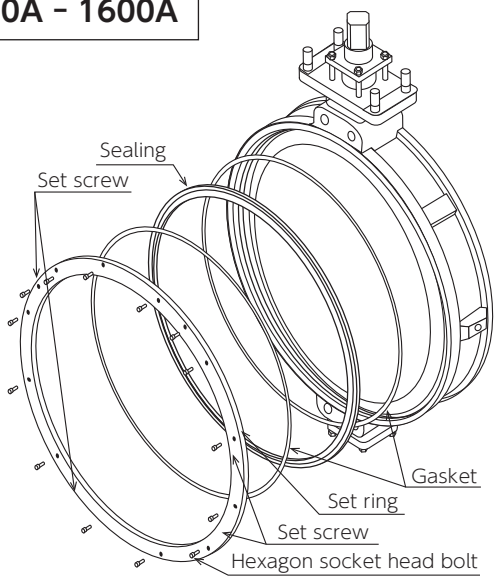
5.5 Seat ring disassembly and assembly guidelines

80A – 600A



[Figure 35]

700A – 1600A



[Figure 36]

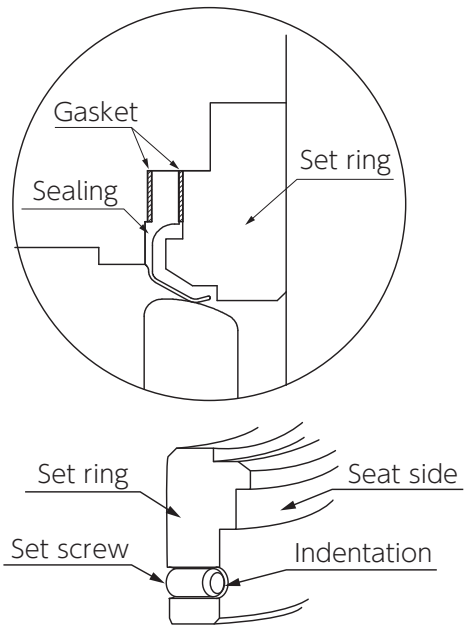
Caution For safety purposes, never operate the valve using the actuator during this task.

5.5.1 Disassembly

1. Keep the valve slightly more open than the fully closed position.
2. [80A - 300A] Tighten the two set screws on the set ring with a hexagon wrench, and pull out the set ring. For 350A - 1600A, after removing the set ring hexagon socket head bolts, tighten the set screw and pull out the set ring.
3. Remove the seat ring and gasket.

5.5.2 Assembly

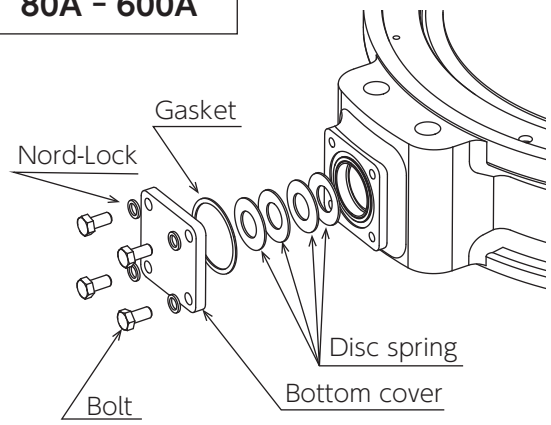
1. Set the valve to the fully closed position.
2. Attach the gasket, seat ring, and gasket to the valve body in that order.
3. For 80A - 300A, align the valve body set pin with the set ring set pin hole position and attach the set ring. For 350A - 1600A, after attaching the set ring, tighten the hexagon socket head bolt.
4. Screw the hexagon socket locking screw into the set ring hole.
5. Make sure the set screw is not sticking out from the set ring.



[Figure 37]

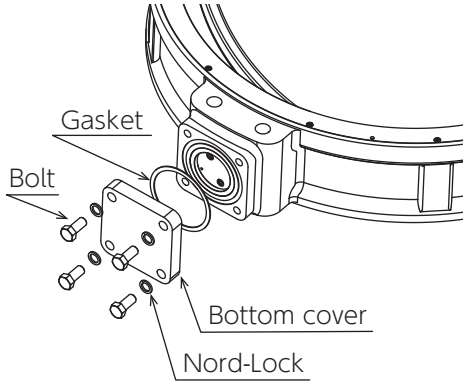
5.6 Replace bottom gasket

80A - 600A



[Figure 38]

700A - 1600A



[Figure 39]

⚠ Caution

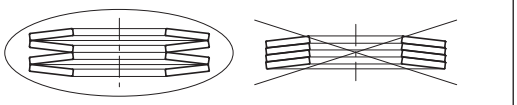
Before replacing this component, make sure the pressure inside the pipe is equal to atmospheric pressure, and that the interior of the pipe is at room temperature.
Also, do not replace the component until you can confirm that any fluid left in the device is not harmful to human health.

1. Loosen the bolts and replace them along with the Nord-Lock washers.
2. Remove the gasket and bottom cover.
3. Clean the body and bottom cover, and remove all debris.
4. Put a new gasket onto the body.
   (If the disc spring is also removed, insert it in series in combination with the body.)
5. Attach the bottom cover to the body.
   Attach and tighten the hexagon bolts and Nord-Lock washers.

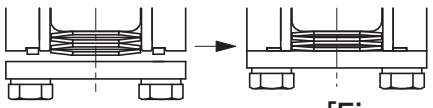
<Disc spring information>

1. Make sure all disc spring combinations are "in series."

In series (Face-to-face) In parallel (Same direction)



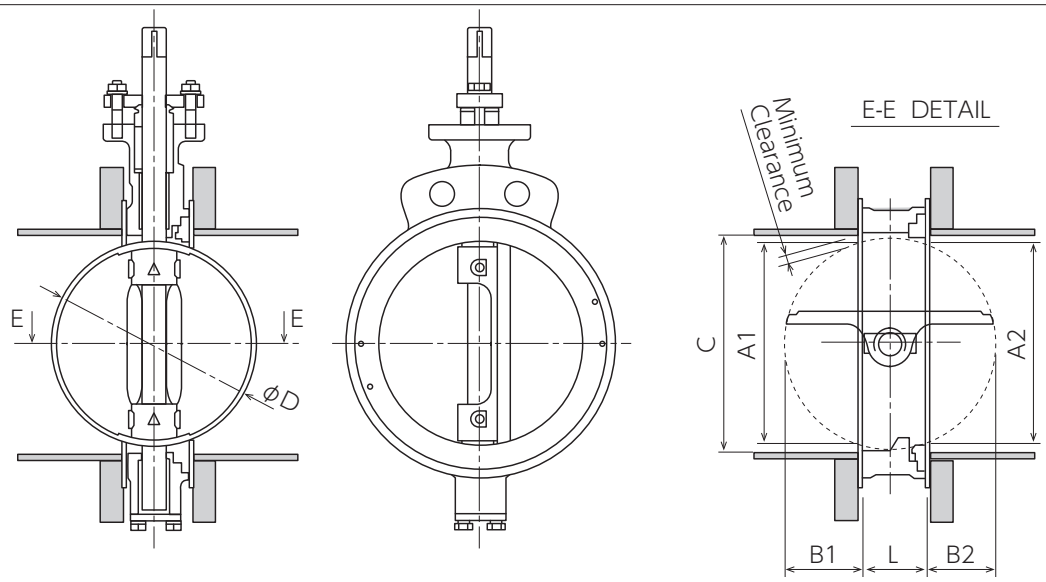
2. Disc springs increase tightening force, however, keep tightening until there are no gaps.



[Figure 40]

6. Piping data

6.1 Minimum inner piping diameter and valving element protrusion dimensions when fully open



[Figure 41]

Size	Face to Face L	Disc Diameter D	A1	B1	A2	B2	Minimum Clearance	Min.Pipe I.D. C
80A	46	72	64	17	52	13	2	69
100A	52	93	79	21	79	23	2	84
125A	56	120	109	33	108	34	2	113
150A	56	144	135	45	135	46	2	139
200A	60	193	189	72	184	64	3	195
250A	68	243	239	92	235	86	3	245
300A	78	292	288	114	283	104	3	294
350A	78	327	323	131	319	121	3	330
400A	102	365	360	140	353	128	3	366
450A	114	414	408	157	403	148	3	414
500A	127	462	456	177	449	164	3	462
600A	154	569	562	219	555	203	3	569
700A	165	675	668	267	661	250	6.5	682
800A	190	771	762	301	757	287	6.5	776
900A	203	873	867	350	858	328	6.5	880
1000A	216	973	967	395	958	370	6.5	980
1200A	254	1174	1162	473	1157	455	6.5	1175
1400A	279	1373	1363	566	1355	536	6.5	1377
1600A	318	1573	1566	653	1553	612	6.5	1579

※ Minimum Clearance conform to JIS B 2032 (80A – 600A) , Large diameter is OKM standards (700A – 1600A) .
※ Piping Gasket shall be spiral wound gasket nominal thickness 4.5 mm (3.2 mm after tightening) .

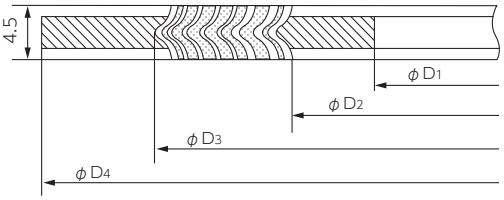
Note: The butterfly valve valving element protrudes into piping when fully open. When using piping or a flange that is less than the minimum inner diameter, insert a spacer, etc. in between the product and flanges.

6.2 Pipe gasket dimensions

Always use the following dimensions for EXV series butterfly valve pipe gaskets.

※ Remember that caution is needed as dimensions differ from general standardized items.

- When selecting a spiral gasket type, use a gasket with inner and outer rings.
- Use high-strength alloy steel SNB-7 or above for pipe bolts.
- Materials: (Valqua brand) V#6596, V#8596 or equivalent items



[Figure 42]

JIS 10K flange/PN10 flange **Unit : mm**

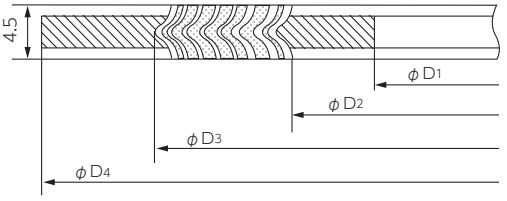
Nominal diameter	D1	D2	D3	D4	
				JIS 10K	PN10
50	61	69	90	104	109
65	74	82	104	124	129
80	85	93	120	134	144
100	111	119	139	159	164
125	136	144	174	190	194
150	158	170	203	220	220
200	211	224	250	270	275
250	256	278	313	332	330
300	316	329	358	377	380
350	354	366	400	422	440
400	400	417	457	484	491
450	443	470	518	539	541
500	500	520	570	594	596
600	600	620	670	700	698
700	698	726	776	810	813
800	800	828	878	920	920
900	902	931	981	1020	1020
1000	1003	1033	1083	1124	1127
1200	1206	1240	1302	1344	1344
1400	1408	1444	1508	–	1551
1600	1608	1648	1720	–	1775

6.2 Pipe gasket dimensions (Continued)

Always use the following dimensions for EXV series butterfly valve pipe gaskets.

※ Remember that caution is needed as dimensions differ from general standardized items.

- When selecting a spiral gasket type, use a gasket with inner and outer rings.
- Use high-strength alloy steel SNB-7 or above for pipe bolts.
- Materials: (Valqua brand) V#6596, V#8596 or equivalent items



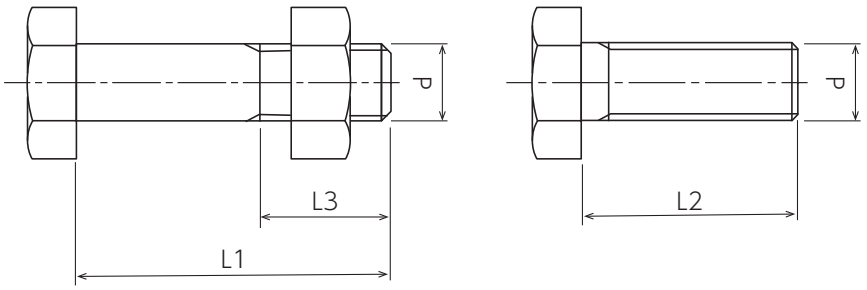
[Figure 43]

JIS 5K flange **Unit : mm**

Nominal diameter	D1	D2	D3	D4
				JIS 10K
50	61	69	83	93
65	74	82	104	118
80	85	93	119	129
100	111	119	139	149
125	136	144	174	184
150	158	170	203	214
200	211	224	250	260
250	256	278	313	325
300	316	329	358	370
350	354	366	400	413
400	400	417	457	473
450	443	470	517	533
500	500	520	567	583
600	600	620	670	691
700	698	726	776	796
800	800	828	878	900
900	902	931	981	1000
1000	1003	1033	1080	1100
1200	1206	1240	1300	1320

6.3 Pipe bolt dimensions

ExVHH (JIS 10K)

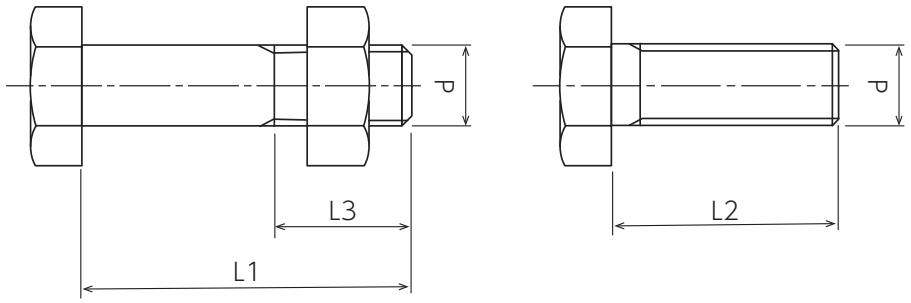


[Figure 44]

FLENGE	JIS10K STEEL FLANGE				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
80A	M16 × 110 × 38	8	–	–	2.0
100A	M16 × 120 × 38	8	–	–	2.2
125A	M20 × 130 × 52	8	–	–	3.7
150A	M20 × 140 × 52	8	–	–	3.9
200A	M20 × 140 × 52	12	–	–	5.8
250A	M22 × 160 × 56	12	–	–	7.8
300A	M22 × 170 × 56	12	M22 × 055	8	10.0
350A	M22 × 170 × 56	12	M22 X 055	8	10.0
400A	M24 × 200 × 60	12	M24 X 055	8	13.7
450A	M24 × 220 × 73	16	M24 X 060	8	18.6
500A	M24 × 230 × 73	16	M24 X 060	8	19.2
600A	M30 × 270 × 85	20	M30 X 070	8	44.3
700A	M30 × 280 × 85	20	M30 X 075	8	46
800A	M30 × 310 × 85	24	M30 X 075	8	58
900A	M30 × 330 × 85	24	M30 X 080	8	61
1000A	M36 × 350 × 97	24	M36 X 085	8	96
1200A	M36 × 400 × 97	28	M36 X 090	8	122
1400A	–	–	–	–	–
1600A	–	–	–	–	–

Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

6.3 Pipe bolt dimensions ExVHH (JIS 5K)



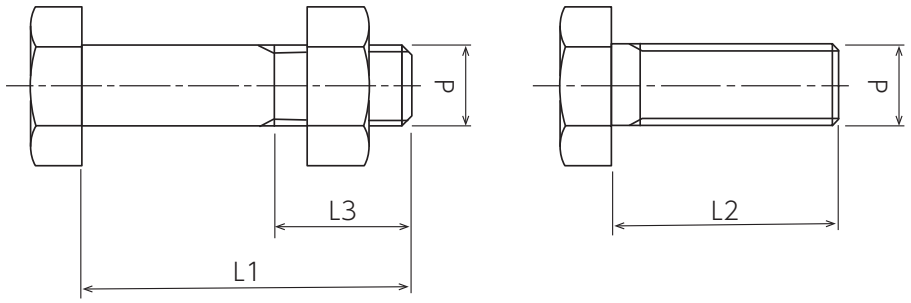
[Figure 45]

FLENGE	JIS5K STEEL FLANGE				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
80A	M16 × 110 × 38	4	–	–	1.0
100A	M16 × 120 × 38	8	–	–	2.2
125A	M16 × 120 × 38	8	–	–	2.2
150A	M16 × 120 × 38	8	–	–	2.2
200A	M20 × 140 × 52	8	–	–	3.9
250A	M20 × 150 × 52	12	–	–	6.1
300A	M20 × 160 × 52	8	M20 × 045	8	5.6
350A	M22 × 170 × 56	8	M22 × 050	8	7.2
400A	M22 × 190 × 56	12	M22 × 050	8	10.6
450A	M22 × 200 × 56	12	M22 × 055	8	11.1
500A	M22 × 220 × 69	16	M22 × 055	8	15.1
600A	M24 × 250 × 73	16	M24 × 060	8	20.3
700A	M24 × 260 × 73	20	M24 × 060	8	25.5
800A	M30 × 300 × 85	20	M30 × 065	8	47.6
900A	M30 × 310 × 85	20	M30 × 070	8	49.0
1000A	M30 × 330 × 85	24	M30 × 070	8	60.7
1200A	M30 × 370 × 85	28	M30 × 075	8	77.0
1400A	–	–	–	–	–
1600A	–	–	–	–	–

Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

6.3 Pipe bolt dimensions

ExVHH (ISO7005-1 PN10)

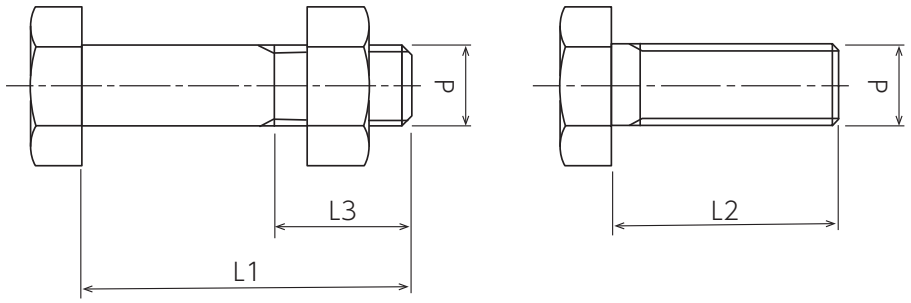


[Figure 46]

FLENGE	ISO7005-1 PN10 STEEL FLANGE TYPE12				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
80A	M16 × 120 × 38	8	–	–	2.2
100A	M16 × 130 × 44	8	–	–	2.3
125A	M16 × 130 × 44	8	–	–	3.3
150A	M20 × 140 × 52	8	–	–	3.9
200A	M20 × 150 × 52	8	–	–	4.1
250A	M20 × 160 × 52	12	–	–	6.4
300A	M20 × 170 × 52	8	M20 × 055	8	6.0
350A	M20 × 170 × 52	12	M20 × 055	8	8.3
400A	M24 × 200 × 60	12	M24 × 055	8	13.7
450A	M24 × 210 × 60	16	M24 × 060	8	18.1
500A	M24 × 230 × 73	16	M24 × 060	8	19.2
600A	M27 × 270 × 79	16	M27 × 070	8	28.7
700A	M27 × 270 × 79	20	M27 × 070	8	35
800A	M30 × 310 × 85	20	M30 × 070	8	49
900A	M30 × 320 × 85	24	M30 × 075	8	59
1000A	M33 × 340 × 91	24	M33 × 075	8	73
1200A	M36 × 390 × 97	28	M36 × 085	8	119
1400A	M39 × 420 × 103	32	M39 × 090	8	173
1600A	M45 × 480 × 115	36	M45 × 100	8	297

Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

6.3 Pipe bolt dimensions ExV (JIS 10K)

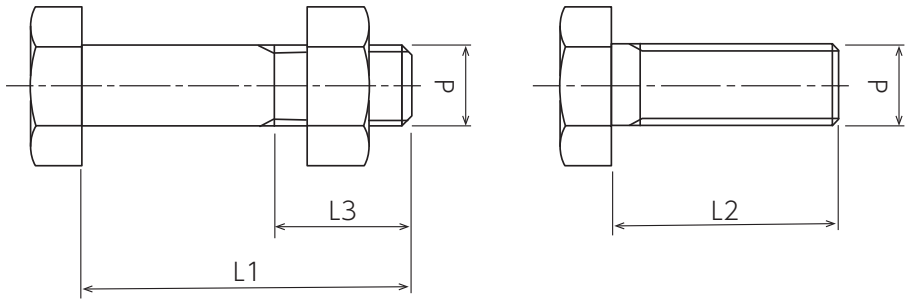


[Figure 47]

FLENGE	JIS10K STEEL FLANGE				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
80A	M16 × 110 × 38	8	–	–	2.0
100A	M16 × 120 × 38	8	–	–	2.2
125A	M20 × 130 × 52	8	–	–	3.7
150A	M20 × 140 × 52	8	–	–	3.9
200A	M20 × 140 × 52	12	–	–	5.8
250A	M22 × 160 × 56	12	–	–	7.8
300A	M22 × 170 × 56	12	M22 × 050	8	9.9
350A	M22 × 170 × 56	12	M22 × 050	8	9.9
400A	M24 × 200 × 60	12	M24 × 055	8	13.7
450A	M24 × 220 × 73	16	M24 × 060	8	18.6
500A	M24 × 230 × 73	16	M24 × 060	8	19.2
600A	M30 × 270 × 85	20	M30 × 065	8	44.1
700A	M30 × 280 × 85	20	M30 × 070	8	45.4
800A	M30 × 310 × 85	24	M30 × 075	8	58.1
900A	M30 × 330 × 85	24	M30 × 080	8	61.2
1000A	M36 × 350 × 97	24	M36 × 080	8	95.5
1200A	M36 × 400 × 97	28	M36 × 085	8	121.6
1400A	–	–	–	–	–
1600A	–	–	–	–	–

Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

6.3 Pipe bolt dimensions ExVLL

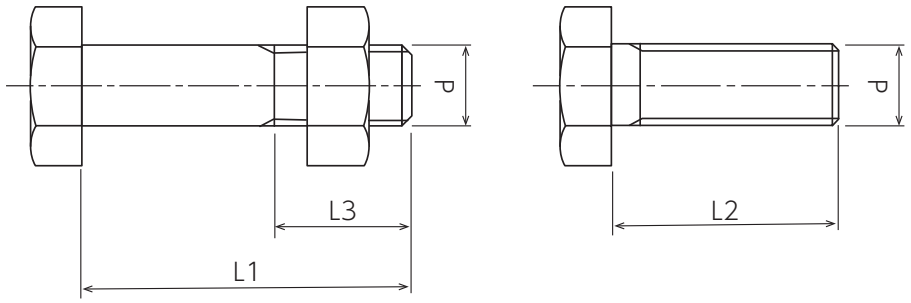


[Figure 48]

FLENGE	JIS5K STEEL FLANGE				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
250A	M20 × 150 × 52	12	–	–	6.1
300A	M20 × 160 × 52	12	–	–	6.4
400A	M22 × 190 × 56	16	–	–	11.8
500A	M22 × 220 × 69	16	M22 × 055	8	15.1

Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

6.3 Pipe bolt dimensions ExV (ISO7005-1 PN10)



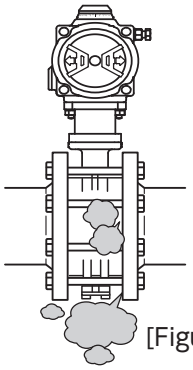
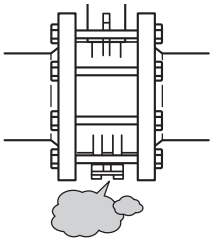
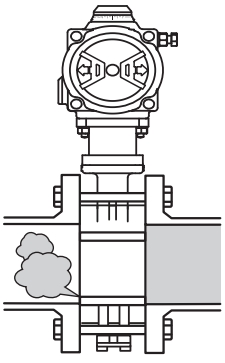
[Figure 49]

FLENGE	ISO7005-1 PN10 STEEL FLANGE TYPE12				
MATERIAL	Hex-Bolt : SNB7, NUT : S45C				
Nominal Size DN	Hex-Bolt • Nut		Hex-Bolt		Weight (kg)
	d × L1 × L3	Q'ty	d × L2	Q'ty	
80A	M16 × 120 × 38	8	–	–	2.2
100A	M16 × 130 × 44	8	–	–	2.3
125A	M16 × 130 × 44	8	–	–	2.3
150A	M20 × 140 × 52	8	–	–	3.9
200A	M20 × 150 × 52	8	–	–	4.1
250A	M20 × 160 × 52	12	–	–	6.4
300A	M20 × 170 × 52	8	M20 × 050	8	5.9
350A	M20 × 170 × 52	12	M20 × 050	8	8.2
400A	M24 × 200 × 60	12	M24 × 055	8	13.7
450A	M24 × 210 × 60	16	M24 × 060	8	18.1
500A	M24 × 230 × 73	16	M24 × 060	8	19.2
600A	M27 × 270 × 79	16	M27 × 065	8	28.5
700A	M27 × 270 × 79	20	M27 × 065	8	34.7
800A	M30 × 310 × 85	20	M30 × 070	8	49.0
900A	M30 × 320 × 85	24	M30 × 075	8	59.5
1000A	M33 × 340 × 91	24	M33 × 075	8	72.9
1200A	M36 × 390 × 97	28	M36 × 080	8	119.0
1400A	M39 × 420 × 103	32	M39 × 085	8	172.2
1600A	M45 × 480 × 115	36	M45 × 095	8	296.1

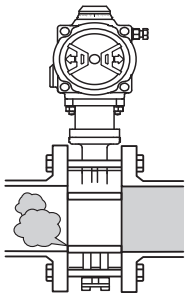
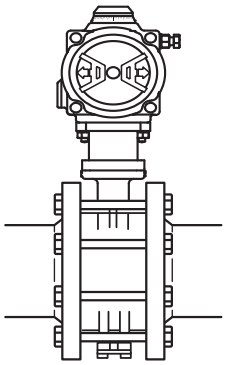
Remark
※ A hexagon nut uses a Heavy hex Nut.
※ A Piping gasket uses a spiral gasket.
※ A Piping gasket is calculated by nominal thickness 4.5 mm (tightening thickness 3.3 mm).

7. Troubleshooting

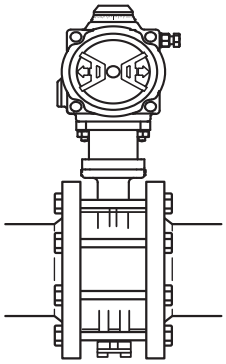
7.1 Malfunctions and solutions

Symptom	Main cause	Solution
1. Leak from body and pipe flange  [Figure 50]	Pipe bolts are loose or only partially tightened	After lowering the pressure, loosen the pipe bolts, and re-tighten them evenly in a diagonal pattern. (Item 4.1.1-10 "Pipe bolt tightening procedures")
	Pipe flange surface scratched, debris or foreign objects attached	Remove the valve and repair or clean the pipe flange surface. After cleaning, reattach the valve. (Item 3.4.2-1)
	Misaligned flange or piping	Remove the valve, and make the pipe flange center and parallel. (Item 3.4.2-6,10)
	Valve improperly centered	Loosen the bolts, and recenter the valve. (Item 3.4.2-6,10)
	Forgot to put in pipe gasket or used the wrong type/ dimensions	Insert the proper gasket between the pipe flange and valve. (Item 3.4.2-5)
2. Leaks from gland bottom  [Figure 51]	Gland bolt loose Gland packing worn/ deteriorated	Tighten the gland bolts. Replace the gland packing if this does not solve the problem.
	Bottom bolt loose Bottom gasket deteriorated	If the hexagon bolts are loose, re-tighten them. Replace the bottom gasket if this does not solve the problem.
	Body/valve stem warped	The body may become warped if there is external force on, or a support is securing the valve body. Also make sure the valve stem is not warped with a visual check. If it is, the valve must be replaced.
	Body damage	If the body is cracked or damaged, immediately cease use and replace the valve.
3. Valve seat leakage  [Figure 52]	Component corrosion due to mistaken material selection according to fluid specifications	Replace the valve with one that uses the appropriate materials. Contact a sales representative for details.
	Product specifications and fluid specifications are not compatible	Use the product within the scope of specifications (temperature, pressure, flow rate, fluid type).
	The valving element and seat ring are damaged due to foreign objects caught in the pipe	Replace the seat ring if it is damaged. Replace the valve if you can see something wrong on the edge of the valving element.
	Misaligned valving element fully closed position (actuator mounting bolt loose, etc.)	Clean the valve seat and body stopper (Item 3.6.3) and secure the proper fully closed position (Section 5.5). Also, make sure that actuator output is correct.

7.1 Malfunctions and solutions (Continued)

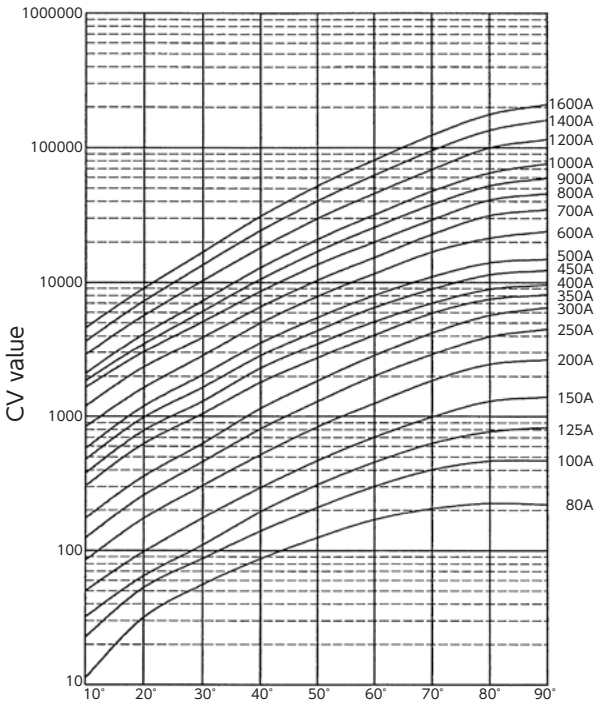
Symptom	Main cause	Solution
3. Valve seat leakage  [Figure 53]	Valve stem twisted due to increase in opening/closing torque	Replace the valve.
	Uneven compression between seat ring and valving element due to partially tightened pipe bolts	Loosen pipe bolts, check valve and flange centering, and re-tighten the bolts. (Item 4.1.1-10 "Pipe bolt tightening procedures")
	Seat ring wear and deterioration due to long-term usage/frequent opening/closing	Replace the seat ring.
4. Valve does not operate Abnormal operation  [Figure 54]	Valving element is interfering with piping or other device	Insert a short pipe or spacer between the valve and flange to avoid interference. (Section 6.1) Because of the high possibility of damage to the valving element seal in this case, remove it and perform a check.
	Valve warped/damaged	Check the exterior to make sure there is no warping, denting, scratch, or corrosion on the body, valving element, or valve stem. Replace the valve if you can see any of these signs.
	Actuator component damage	See the actuator instruction manual for details.
	Pipe bolts are loose or only partially tightened, valve is improperly centered, pipe flange is off center/ parallel or warped	If the bolt tightening force or contact surface is uneven, the valve seat pressure will be uneven, resulting in increased torque. Loosen the bolts and re-tighten them diagonally. **(Items 3.4.2-6, 10 and 4.1.1-10 "Pipe bolt tightening procedures")**
	Increased torque due to foreign objects caught in pipe	Fully open the vale to rinse away the foreign objects. (Item 3.6.6-4) Because of the high possibility of damage to the valving element seal in this case, remove it and perform a check.
	Powdered foreign matter inside the pipe is stuck in bearings	If there is rust powder or other powdered foreign matter inside the pipe, it can prevent the valve stem from rotating if it becomes stuck in the bearings. If you suspect this is the case, remove and clean the valve.
	Product specifications and fluid specifications are not compatible	When using an automatic valve, select the actuator size according to your usage conditions (temperature, pressure, flow rate, fluid type). When usage conditions change, insufficient actuator torque can result in the product not functioning. Contact a sales representative.

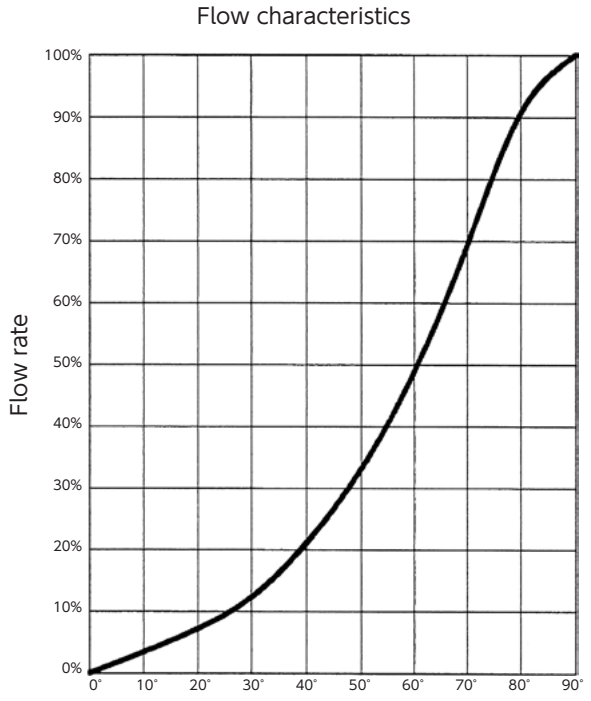
7.1 Malfunctions and solutions (Continued)

Symptom	Main cause	Solution
4. Valve does not operate Abnormal operation  [Figure 55]	Not achieving the actuator rated output (For an automatic valve)	Check the following for a cylinder. 1. Are the rated air pressure and supply amount being secured? 2. Is the bypass valve closed? 3. Is the operating air stop valve open? 4. Is the speed controller opening correctly? 5. Did you remember to remove the exhaust port plug? Check the following for an electric motor. 1. Is the power supply voltage rated as specified? 2. Is the motor receiving the correct voltage? 3. Is the thermal protector functioning? 4. Are two or more actuators running on one switch? 5. Is there water inside the electric motor? See each actuator instruction manual for details.
	Abnormal force on the valve causing it to warp	If a support is attached to the valve neck or actuator, it may have enough force to warp the valve. Remove the support and check. Also, if the product is interfering with other equipment or the building, ensure that it does not do so.
	Valving element abnormal interference due to seat ring damage or warping	Replace the seat ring. Replace the valve if you can see something wrong on the edge of the valving element.
	Damage to parts of valving element, valve stem, body, joint, etc.	If none of the above applies, valve parts may be damaged. Contact a sales representative, as some parts may need to be replaced.
5. Such a movement occurs when opening from full closure Make a lot of sounds	Phenomenon when the valve body and the seat come off	This happens because of the structure of the valves. If it is severe or you want to make it as small as possible, readjust the fully closed position. (5.2 Section)
6. Shack-like movement There is a slip-stick phenomenon.	Generated when the opening/ closing torque of the valve is large.	There is a possibility that the grand packing may be tightened too much. Loosen the gland bolt equally 1/4 turn.
7. Sliding noise is generated from gland packing part.	Gland packing: Due to the characteristics of expanded graphite	There is no problem if only sliding sound is used. Use the product as it is.
8. The main body and the valves are colored.	Discoloration caused by heat being applied to the chromium component of stainless steel	A phenomenon in which chromium on the surface of stainless steel material forms a thin film of chromium oxide due to high heat, and is visible due to its interference color. It is called Temper Color. Chromium oxide does not deteriorate corrosion resistance, abrasion resistance, etc. Use the FOMA phone as it is.

8. Technical Documentation

8.1 Technical documentation Valve CV value





Nominal diameter	Cv value								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
80A	11	32	56	87	125	170	205	225	220
100A	23	53	87	140	210	300	400	465	470
125A	32	65	110	195	310	455	630	770	830
150A	50	98	175	295	470	700	990	1300	1400
200A	85	175	305	520	840	1250	1850	2450	2650
250A	125	260	460	810	1300	2000	2900	3950	4500
300A	175	360	630	1150	1850	2850	4200	5700	6500
350A	305	630	1050	1800	2750	4050	5900	7500	8100
400A	380	790	1300	2300	3500	5100	7000	8900	9600
450A	480	990	1650	2850	4400	6500	8900	11400	12300
500A	580	1200	2050	3550	5500	8000	11000	14000	14900
600A	840	1650	2850	5000	7900	11600	16800	21300	23900
700A	1200	2350	3900	6600	10400	15300	22700	31300	34700
800A	1650	3050	5100	8600	13600	19900	29100	40800	45600
900A	1850	3500	6100	10600	17000	25600	37700	52000	59400
1000A	2100	4150	7300	12900	20900	31700	47400	64900	76000
1200A	2900	5700	10300	18100	29800	45600	68700	99500	115100
1400A	3650	7300	13500	24300	40200	62300	94900	134300	160500
1600A	4600	9100	16800	31000	52000	80700	123400	176300	209200

8.2 Technical documentation Actuator documentation

Valve Type	Valve Size	Cylinder Size	M.O.P (bar) ※1	Air Volume (NL) ※2	Air Consumption (NL) ※2, 3
ExVHH	80A	AT201U-S12A	8	0.35	2.5
	100A	AT251U-S12A	8	0.55	4.0
	125A	AT301U-S12A	8	0.75	5.0
	150A	AT351U-S12A	8	1.20	8.5
	200A	AT451U-S12A	8	2.45	17.0
	250A	AT501U-S12A	8	3.15	22.0
	300A	AT551U-S12A	8	4.30	29.5
	350A	AT601U-S12A	8	5.95	41.5
	400A	AT651U-S12A	8	10.0	69.5
	450A	AT601U-DA	8	15.5	110
	500A	AT601U-DA	8	15.5	110
	600A	AT651U-DA	8	25.5	175
	700A	EPTS108-240-DA	12	19.5	135
	800A	EPTS108-295-DA	10	29.5	205
	900A	EPTS108-340-DA	7.5	39.0	270
	1000A	EPTS110-340-DA	10	46.5	320
	1200A	EPTS130-385-DA	12	77.0	535
	1400A	EPTS160-485-DA	10	148	1025
	1600A	EPTS160-535-DA	8.5	180	1250

ExVLL	80A	AT201U-S12A	8	0.35	2.5
	100A	AT251U-S12A	8	0.55	4.0
	125A	AT301U-S12A	8	0.75	5.0
	150A	AT351U-S12A	8	1.20	8.5
	200A	AT401U-S12A	8	1.55	11.0
	250A	AT501U-S12A	8	3.15	22.0
	300A	AT551U-S12A	8	4.30	29.5
	350A	AT551U-S12A	8	4.30	29.5
	400A	AT601U-S12A	8	5.95	41.5
	450A	AT651U-S12A	8	10.0	69.5
	500A	AT701U-S12A	8	14.5	105
	600A	AT751U-S12A	8	20.0	140
	700A	EPTS106-240-DA	8	15.0	105
	800A	EPTS108-240-DA	12	19.5	135
	900A	EPTS108-295-DA	10	29.5	205
	1000A	EPTS110-295-DA	12	35.0	245
	1200A	EPTS110-340-DA	10	46.5	320
	1400A	EPTS110-435-DA	6	75.5	525
	1600A	EPTS130-435-DA	10	98.0	680

Note:
※1 M.O.P - Maximun Operating Pressure.
※2 The above air volime and consumption are for one reciprocation (cycle).
(Double acting : open and shut , Single acting : open or shut)
※ 3 Air supply pressure 6bar.

MEMO

MEMO

The warranty period for the delivered products is 18 months from the shipment to our factory and 12 months after the start of trial operation, whichever occurs earlier.
(Please contact our sales representative if an extension is required.)

Warranty

TIf a failure occurs during the warranty period due to our responsibility, we will supply the replacement product to the repair or delivery place free of charge.
However, if the following applies, we will pay a fee.

1. In the event that the product is used outside the scope of use, or in the event of a failure due to a deviation from the cautionary statement described in the user's manual that governs the handling of this product.
2. The cause of the failure is due to reasons other than the delivered product.
3. In the case of breakdowns caused by natural disasters such as fires, floods, earthquakes, lightning, and stones.
4. In the case of failure caused by use under conditions that were not given as design specification conditions for valves, etc., or events that could not be predicted from given conditions.
5. For breakdowns due to modifications or repairs by persons other than us.
6. The fault is caused by the power supply or air source.
7. In the case of a failure caused by the influx of foreign substances, such as garbage, into the product.

※ Note that the guarantee here refers to the guarantee of the delivered items on a non-consolidated basis.
Damage caused by a failure of the delivered product is not warranted.

Paid repair and parts supply of discontinued products

The product may be discontinued or improved without notice. Please note that for products that have been manufactured or discontinued, we may be unable to provide the product, supply parts, repair, etc. five years after discontinuation.

Replacement timing of consumables

The replacement of consumables is intended for 3000 times of opening and closing in normal temperature with static water (open-close-open once) or for 2 years of operation. Depending on the environment in which you are using the product, it may be accelerated. However, please replace the consumable parts with this as a rule.

Conditions for

When this product is exported overseas, please confirm in accordance with the laws and regulations stipulated by the Ministry of Economy, Trade and Industry (such as the Foreign Exchange and Foreign Trade Law).

OKUMURA ENGINEERING corp.

For details, please visit the following website.

TD-HIGHTE-BDJB-E-CC