azbil

Specification

Control Valve 6000 Series
Top-Guided Single-Seated Valve
Model AS_11
Pressure-Balanced Cage Valve
Model AC_11

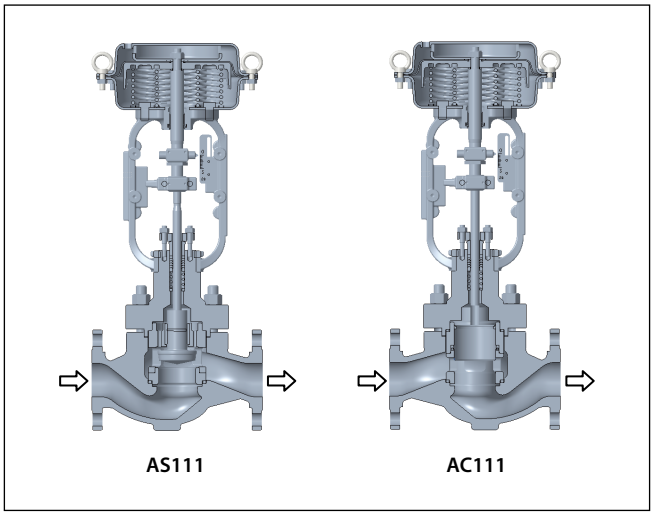
Overview

The 6000 Series globe control valves, models AS_11 and AC_11, are designed for a wide range of process control applications. Two types of valve configurations are available: single-seated valves and cage valves. Both are capable of controlling high differential pressure fluids with minimal operating force.

The AS_11 top-guided single-seated valve has a contoured plug designed for easy flow and an expanded control range, improving controllability.

In the AC_11 pressure-balanced cage valve, a seal ring structure and a Elastic seat structure using the slit metal technique are used for the trim, achieving IEC seat leakage Class IV and V.

These high-performance 6000 Series control valves can be widely used in process control that requires dynamic stability, a wide flow rate control range, and low seat leakage.



Features

- High rated Cv value: The adoption of an optimized design based on three-dimensional fluid analysis, along with a stabilizer-equipped structure (patent pending), has achieved much higher rated Cv than our conventional models.
- Wide rangeability: Achieving Rb (Rangeability) 100:1 with full port
- Highly accurate flow rate data: IEC standard-compliant flow rate test method is used to obtain data on rated Cv and inherent flow characteristics.
- Low seat leakage: The top-guided single-seated valves and pressure-balanced cage valves are both compliant with IEC Class IV and V.
- Compact and high shutoff performance: By increasing the output of the diaphragm actuator, shutoff performance is improved while downsizing the valve.
- Guaranteed sealing performance: Low-emission models are available that have been third-party certified to the international standard ISO 15848-1, which defines the sealing performance of glands and gaskets.

Basic model No. selection

The basic model No. indicates the valve type and operating temperature range, as shown in Table 1. The valve type is determined by its size and pressure rating. (Table 2)

Example If the valve size is 3 inches, the pressure rating is class 150, and the operating temperature is 100 °C, select model AS111, single-seated valve for normal temperature use.

Table 1. Basic model No. configuration

1st & 2nd digits	3rd digit	4th & 5th digits	Description	
AS			Valve type	Single-seated valve
AC				Cage valve
	1		Operating temperature range	For normal temp. use: −17 °C ≤ t ≤ +230 °C
	2			For high temp. use: 230 °C < t ≤ 400 °C
	3			For low temp. use: −45 °C ≤ t < −17 °C
		11	Fixed value	

Table 2. Valve types by size and pressure rating

Pressure rating / Valve size (inches)	class 150	class 300	class 600
1/2	Single-seated valve	Single-seated valve	Single-seated valve
3/4	Single-seated valve	Single-seated valve	Single-seated valve
1	Single-seated valve	Single-seated valve	Single-seated valve
1-1/2	Single-seated valve	Single-seated valve	Cage valve
2	Single-seated valve	Cage valve	Cage valve
2-1/2	Single-seated valve	Cage valve	Cage valve
3	Single-seated valve	Cage valve	Cage valve
4	Single-seated valve	Cage valve	Cage valve
6	Cage valve	Cage valve	Cage valve
8	Cage valve	Cage valve	Cage valve

Table 3. Pressure rating classification

Class	Pressure rating
class 150	JIS10K ASME150 JPI150 HG/T20615class150(PN20)-2009* HG/T20592PN10-2009* HG/T20592PN16-2009*
class 300	JIS16K JIS20K JIS30K ASME300 JPI300 HG/T20615class300(PN50)-2009* HG/T20592PN25-2009* HG/T20592PN40-2009*
class 600	ASME600 JPI600 HG/T20615class600(PN110)-2009* HG/T20592PN63-2009* HG/T20592PN100-2009*

** These pressure ratings cannot be ordered from within Japan.*

Specifications

Valve body

Structure:

Straight-through cast globe valve
See Figure 4 and Figure 5 for the structure.

Valve size (inches):

½, ¾, 1, 1-½, 2, 2-½, 3, 4, 6, 8

Port diameter:

See Figure 4 and Figure 5.

Pressure rating:

- JIS B2220-2012
  JIS10K, 16K, 20K, 30K
- JPI-7S-15-2011 Class 150, 300, 600
- ASME B16.5-2020 Class 150, 300, 600
- HG/T20592-2009 PN10, 16, 25, 40, 63, 100*
- HG/T20615-2009 Class 150(PN20), 300(PN50), 600(PN110)*

Connection method:

RF flange

Body material:

ASTM A216 WCB / JIS SCPH2
ASTM A351 CF8 / JIS SCS13A
ASTM A351 CF8M / JIS SCS14A

Bonnet

Bonnet type	Operating temperature range
Plain	−17 °C ≤ t ≤ +230 °C
Extension type 1 (high temp. bonnet 1)	230 °C < t ≤ 350 °C
Extension type 1 (high temp. bonnet 2)	350 °C < t ≤ 400 °C
Extension type 1 (low temp. bonnet)	−45 °C ≤ t < −17 °C

Bonnet structure:

Integrated. For 6- and 8-inch valves: Separated
See Figure 4 and Figure 5 for the structure.

Bonnet material:

Single-seated valve, model AS_11
ASTM A216 WCB / JIS SCPH2
ASTM A351 CF8 / JIS SCS13A
ASTM A351 CF8M / JIS SCS14

Cage valve, model AC_11

ASTM A216 WCB / JIS SCPH2ÚSTM
A351 CF8 / JIS SCS13AÚSTM A351
CF8M / JIS SCS14A
ASTM A105
ASTM A182 F304
ASTM A182 F316
For combinations of body and bonnet materials, see Table 6 and Table 8.

Trim

Valve plug:

Contoured single-seated plug (single-seated valves)
Pressure-balanced cage (cage valves)

Seat:

Metal seat (see Table 4 and Table 5 for flow characteristics)

Trim material:

Single-seated valve, model AS_11
ASTM A479 316
ASTM A479 316 + CoCr-A seat
JIS G4303 316 + CoCr-A face

Cage valve, model AC_11
ASTM A351 CF8M
ASTM A351 CF8M + CoCr-A seat
ASTM A747 CB7Cu-1

For combinations of body material, trim material, plug, and seat ring, see Table 7 and Table 9.

Note: The fluid conditions that require CoCr-A seat are shown in Figure 6.

Gland packing

Gland packing material:

- P4519
- PTFE
- P6617CL + P6720
- P6610CH + M8590
- P4519 + P6720

See , "Gland packing," for details.

Gasket

- Serrated gasket
- Spiral gasket

See , "Gasket," for details.

Actuator

Multi-spring diaphragm actuator, model PA_ _:

For the specifications of the actuator, see document No. SS2-PAM100-0100. The operating force required for the actuator to fully close the valve is calculated using the following formula.

Operating force required for full closure = Unbalanced force due to fluid pressure + resistance to sliding of the gland packing + seating force + resistance to sliding of sealing parts (cage only)

The required operating force is determined individually according to the specific fluid conditions and valve specifications. Please contact us for detailed information.

Actuators compatible with single-seated valves:

Actuator model	Valve size (inches)							
	1/2	3/4	1	1-1/2	2	2-1/2	3	4
PA2	✓	✓	✓	✓	✓	-	-	-
PA3	✓	✓	✓	✓	✓	✓	✓	✓
PA4	-	-	-	✓	✓	✓	✓	✓
PA5	-	-	-	✓	✓	✓	✓	✓

✓: supported, - : Not suppoted

Actuators compatible with cage valves:

Actuator model	Valve size (inches)						
	1-1/2	2	2-1/2	3	4	6	8
PA2	✓	✓	-	-	-	-	-
PA3	✓	✓	✓	✓	✓	-	-
PA4	✓	✓	✓	✓	✓	-	-
PA5	✓	✓	✓	✓	✓	✓	✓

✓: supported, -: Not suppoted

Valve action

Direct action (use in combination with a direct-action actuator)

Reverse action (use in combination with a reverse-action actuator)

Optional device (mounted upon request)

Positioner, pressure regulator with air filter, side hand-wheel, limit switch, solenoid valve, booster relay, lock-up valve, etc.

Note: For the specifications of each device, see the specifications sheet and installation diagram for the device.

Additional specifications (available upon request)

- Oil-free and water-free treatment
- Salt-resistant coating
- Copper-free treatment
- Vacuum service

Performance

Rated Cv:

See Table 4.

Flow characteristics:

Linear (LN), equal percentage (EQ)

Inherent rangeability:

See Table 4.

Valve seat leakage rate (Seat leakage):

IEC60534-4:2006
JIS B2005-4:2012 Class IV, V
GB/T 17213.4(2015)
GB/T 4213(2024)

Class IV:

0.01 % or less of rated Cv

Class V:

Gas: 10.8 × 10−6 × port size (mm) Nm^3/h

Basic model No.	AS111	AS211	AS311	AC111	AC211	AC311
Class IV	✓	✓	✓	✓	✓*1	✓
Class V	✓	✓	✓	✓*2	-	-

✓: supported, -: Not suppoted

1. The valve seat leakage rate varies depending on the valve size. See Table 5.

2. 6- and 8-inch valves do not support Class V.

Face-to-face length:

See Table 12 and Figure 7.

Dimensions:

See Table 13 and Figure 7.

Weight:

See Table 14.

Mounting orientation:

See Figure 8.

Finish:

Silver (Standard), Blue (Munsell M10 5/10)
Accessories (positioners, pressure regulators with air filters, solenoid valves, etc.): standard color specified by the manufacturer

Gland type:

- Bolted gland
- Low-emission gland packing system (ISO third-party certified)
- See Figure 2 and Figure 3 for the gland structure.

Gland packing:

Model AS111/AC111 (for normal temperature use)

- General

Grand packing	Gland packing operating temperature (°C)	Gland packing pressure rating	Application	Oil-free treatment
P4519	−17 ≤ t ≤ +230	Class 600 or under		Available
P4519 + P6720 *2	−17 ≤ t ≤ +230	Class 600 or under		
P6617CL + P6720 *2	−45 ≤ t ≤ +350	Class 600 or under		
PTFE	−45 ≤ t ≤ +230	Class 300 or under		
PTFE (direct + reversed)	−45 ≤ t ≤ +230	Class 300 or under	Vacuum*1	
PTFE (for high pressure)	−45 ≤ t ≤ +230	Class 600	High pressure	

- ISO 15848-1-compliant low-emission gland packing*3

Grand packing	Gland packing operating temperature (°C)	Gland packing pressure rating	Application	Oil-free treatment
P4519 + P6720	5 ≤ t ≤ +230	Class 300 or under		Not available
P6617CL + P6720	5 ≤ t ≤ +350	See Figure 1.		

Model AS211/AC211 (for high temperature use)

- General

Grand packing	Gland packing operating temperature (°C)	Gland packing pressure rating	Application	Oil-free treatment
P6617CL + P6720 *2	−45 ≤ t ≤ +350	Class 600 or under		Not available
P6610CH + M8590 *4	350 < t ≤ 400	Class 600 or under		

- ISO 15848-1-compliant low-emission gland packing*3

Grand packing	Gland packing operating temperature (°C)	Gland packing pressure rating	Application	Oil-free treatment
P6617CL + P6720	5 ≤ t ≤ +350	See Figure 1.		Not available

Model AS311/AC311 (for low temperature use)

- General

Grand packing	Gland packing operating temperature (°C)	Gland packing pressure rating	Application	Oil-free treatment
P6617CL + P6720 *2	−45 ≤ t ≤ +350	Class 600 or under		Available
PTFE	−45 ≤ t ≤ +230	Class 300 or under		
PTFE (direct + reversed)	−45 ≤ t ≤ +230	Class 300 or under	Vacuum*1	
PTFE (for high pressure)	−45 ≤ t ≤ +230	Class 600	High pressure	

1. Vacuum level: 2.7 kPa (20 torr) or higher
2. It can also be used as a low-emission gland packing.
3. For the specifications of the low-emission gland packing, see document No. SS2-SSL100-0100.
4. Select an appropriate grease.

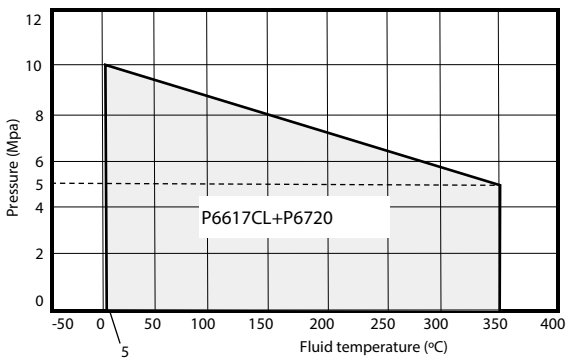


Figure 1. Pressure and fluid temperature for ISO 15848-1-compliant low-emission gland packing

Grease

If the P6610CH + M8590 gland packing for high temperature is used, select an appropriate grease.

Name	Characteristics	Allowed fluids	Prohibited fluids
PS6	High temperature and water resistant	Hot water High-temperature steam	LPG, mineral oil Diesel oil, gasoline, etc.
650	Gas resistant Fuel resistant Oil resistant	Natural gas, LPG Combustible gas, mineral oil Gasoline, diesel oil Jet fuel	Aromatic hydrocarbons Alkaline fluid Solvents, etc.
400	Acid resistant Alkali resistant Alcohol resistant Chloride resistant	Hydrochloric acid, alkaline liquid Sulfur, ammonia Water, chlorine Oxidizing agent	LPG, mineral oil Diesel oil, gasoline Jet fuel, etc.
800	Solvent resistant Fuel resistant	Propylene, benzene Butadiene, xylene Styrene, kerosene Jet fuel, naphtha	Alkaline fluid

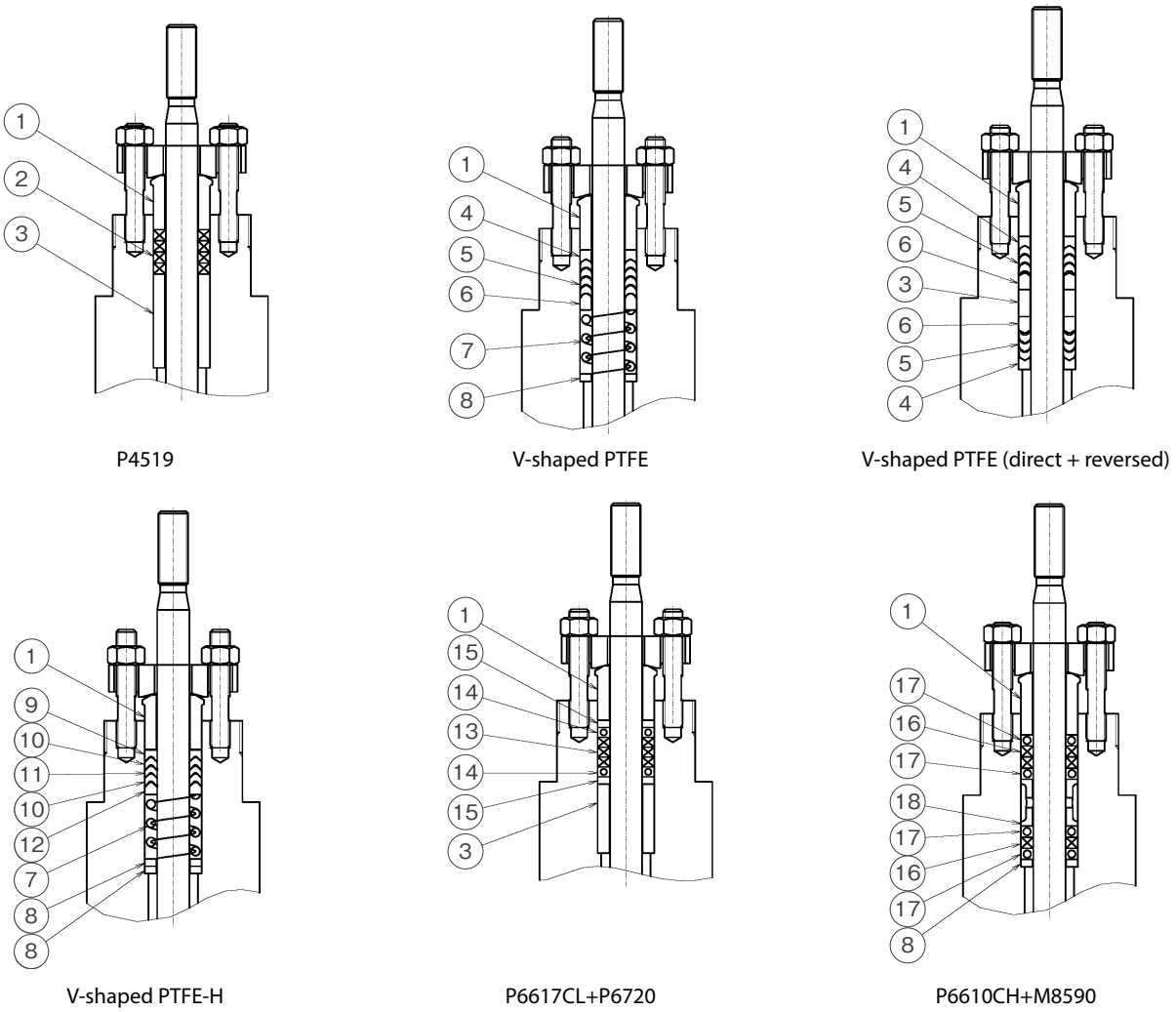


Figure 2. Gland structure (general gland packing)

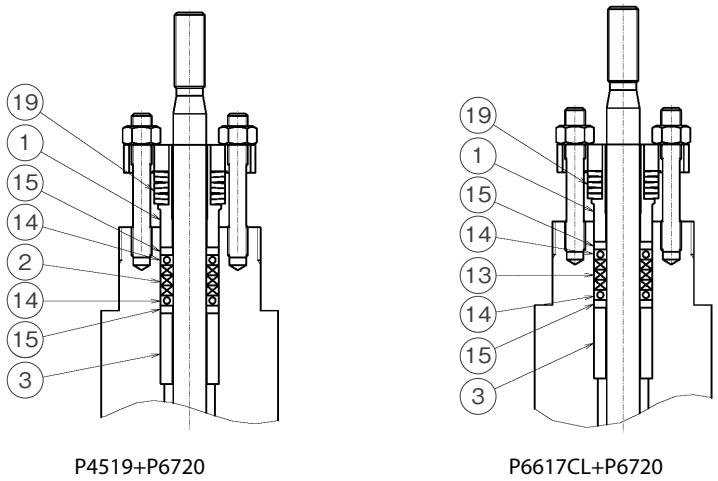


Figure 3. Gland structure (low-emission gland packing)

No	Name
1	Packing follower
2	PTFE yarn packing
3	Packing spacer
4	V-PTFE packing holder
5	V-PTFE packing
6	V-PTFE packing retainer
7	Gland spring
8	Packing ring
9	V-PTFE adapter packing (top)
10	V-PTFE main packing for high pressure
11	V-PTFE adapter packing for high pressure
12	V-PTFE adapter packing (bottom)
13	Graphite main packing (P6617CL)
14	Graphite adapter packing (P6720)
15	Carbon ring
16	Graphite main packing (P6610CH)
17	Graphite adapter packing (M8590)
18	Lantern ring
19	Belleville spring

Gasket

Single-seated valves

Model AS111 (for normal temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Valve size (inches)		Oil-free treatment
		1 or smaller	1½ or larger	
Serrated (SUS316L/PTFE)	-	✓	-	Not available
Serrated (SUS316L/PTFE)	Spiral (SUS316L/graphite)	-	✓	
Spiral (SUS316L/graphite)	-	✓	-	
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	-	✓	
Serrated (SUS316L/PTFE)	Flat (SUS316L/PTFE)	✓	-	Available
Serrated (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	-	✓	
Spiral (SUS316L/PTFE)	Flat (SUS316L/PTFE)	✓	-	
Spiral (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	-	✓	

Model AS211 (for high temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Valve size (inches)		Oil-free treatment
		1 or smaller	1½ or larger	
Serrated (SUS316L)	-	✓	-	Not available
Serrated (SUS316L)	Spiral (SUS316L/graphite)	-	✓	
Spiral (SUS316L/graphite)	-	✓	-	
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	-	✓	

Model AS311 (for low temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Valve size (inches)		Oil-free treatment
		1 or smaller	1½ or larger	
Serrated (SUS316L/PTFE)	Flat (SUS316L/PTFE)	✓	-	Available
Serrated (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	-	✓	
Spiral (SUS316L/PTFE)	Flat (SUS316L/PTFE)	✓	-	
Spiral (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	-	✓	
Serrated (SUS316L/PTFE)	-	✓	-	Not available, Specifying water-free treatment
Serrated (SUS316L/PTFE)	Spiral (SUS316L/graphite)	-	✓	
Spiral (SUS316L/graphite)	-	✓	-	
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	-	✓	

Cage valves

Model AC111 (for normal temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Oil-free treatment
Serrated (SUS316L/PTFE)	Spiral (SUS316L/graphite)	Not available
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	
Serrated (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	Available
Spiral (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	

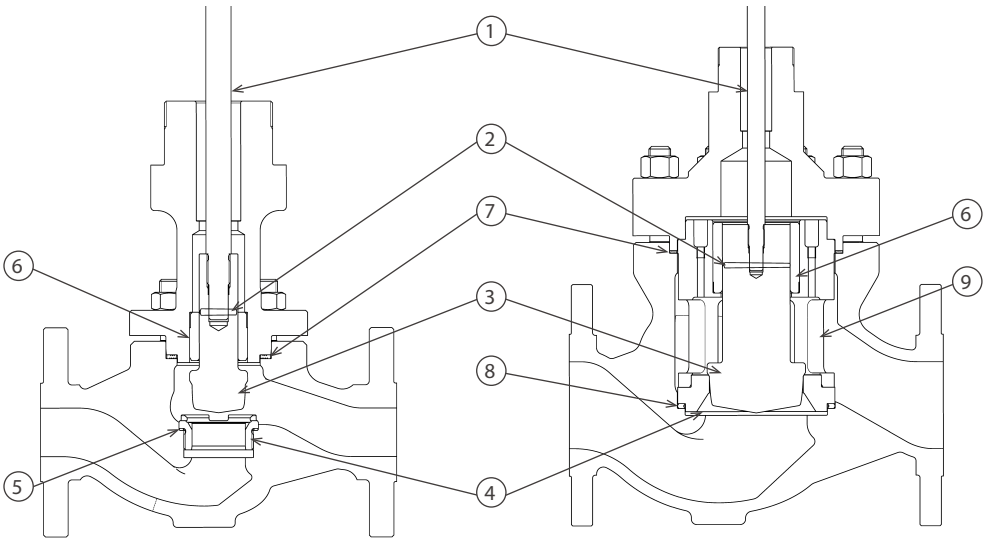
Model AC211 (for high temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Oil-free treatment
Serrated (SUS316L)	Spiral (SUS316L/graphite)	Not available
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	

Model AC311 (for low temperature use)

Body and bonnet connection gasket (material/coating)	Seat ring (hoop material / filler material)	Oil-free treatment
Serrated (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	Available
Spiral (SUS316L/PTFE)	Spiral (SUS316L/PTFE)	
Spiral (SUS316L/graphite)	Spiral (SUS316L/graphite)	Not available, Specifying water-free treatment

Structure

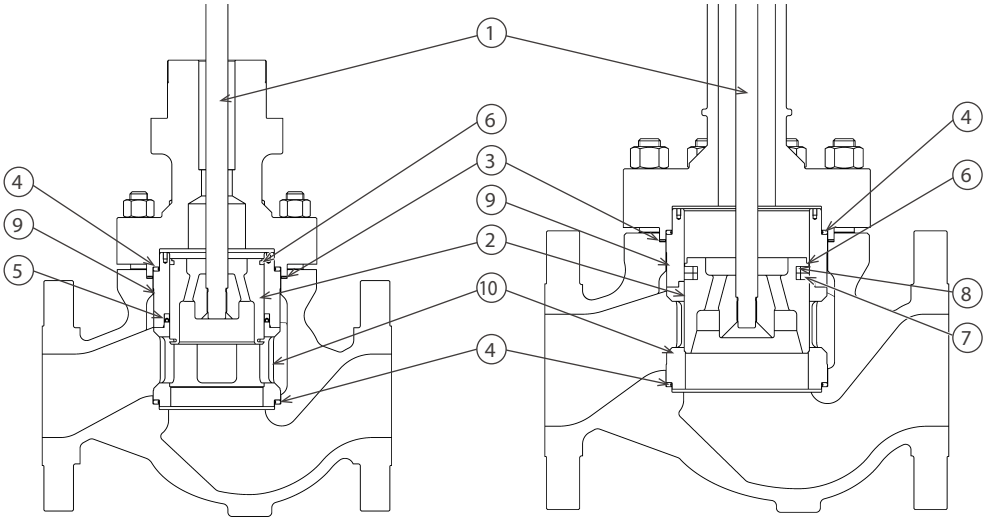


Model AS_11 (valve size: ½–1 inch) Model AS_11 (valve size: 1½–4 inch)

1	Stem
2	Tapered pin
3	Plug
4	Seat ring*
5	Seat gasket (for oil-free models)
6	Guide bushing
7	Bonnet gasket
8	Seat gasket
9	Seat holder

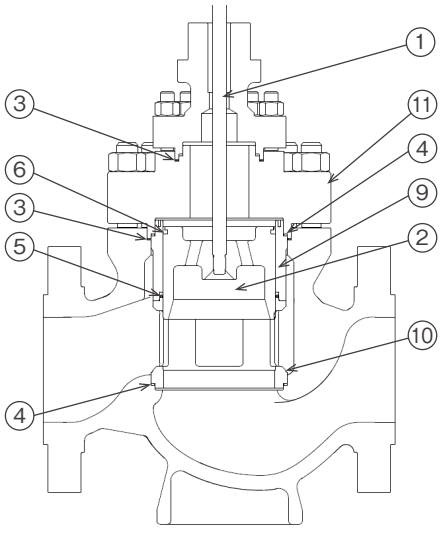
** Screw-in seat ring for 1-inch or smaller valves. Press-in seat ring for 1½-inch or larger valves.*

Figure 4. Structure of top-guided single-seated control valve



Model AC111/Model AC311 Model AC211

1	Stem
2	Plug
3	Bonnet gasket
4	Seat gasket
5	Seal ring
6	Scraper ring
7	Carbon ring
8	Expander ring
9	Upper cage
10	Lower cage
11	Adapter



Model AC_11 (valve size: 6 & 8 inches, bonnet structure: separated)

Figure 5. Structure of pressure-balanced cage valve

Table 4. Cv / flow characteristics / rangeability (single-seated valves)

Model AS111/AS211/AS311

- Seat leakage: Class IV (0.01 % or less of rated Cv)
- Seat leakage: Class V

Valve size		Cv or port size (inches)		Rated travel (mm)	Rated Cv by flow characteristic		Rangeability
(inches)	(mm)				LN	EQ	
1/2	15	Cv=5.1		20	5.1	5.1	50:1
		Cv=3.3			3.3	3.3	50:1
		Cv=2			2	2	50:1
		Cv=1.2			1.2	1.2	50:1
		Cv=0.78			0.78	0.78	30:1
		Cv=0.58			0.58	0.58	30:1
		Cv=0.35			0.35	0.35	20:1
		Cv=0.22			0.22		20:1
		Cv=0.1			0.1		15:1
3/4	20	Cv=9		20	9	9	100:1
		Cv=7.2			7.2	7.2	50:1
		Cv=3.5			3.5	3.5	50:1
		Cv=2.2			2.2	2.2	50:1
		Cv=1.2			1.2	1.2	50:1
		Cv=0.78			0.78	0.78	30:1
		Cv=0.58			0.58	0.58	30:1
		Cv=0.35			0.35	0.35	20:1
		Cv=0.22			0.22		20:1
		Cv=0.1			0.1		15:1
1	25	Cv=20		20	20	20	100:1
		Cv=13			13	13	100:1
		Cv=8.2			8.2	8.2	50:1
		Cv=4			4	4	50:1
		Cv=2.2			2.2	2.2	50:1
		Cv=1.2			1.2	1.2	50:1
		Cv=0.78			0.78	0.78	30:1
		Cv=0.58			0.58	0.58	30:1
		Cv=0.35			0.35	0.35	20:1
		Cv=0.22			0.22		20:1
		Cv=0.1			0.1		15:1
1-1/2	32	Full port	1-1/2	20	42	42	100:1
		1 step reduced port	1-1/4		24	24	100:1
		2 step reduced port	1		14.5	14.5	100:1
2	50	Full port	2	20	71	67	100:1
		1 step reduced port	1-1/2		48	48	100:1
		2 step reduced port	1-1/4		26	26	100:1
		3 step reduced port	1		14.5	14.5	100:1
2-1/2	65	Full port	2-1/2	40	99	99	100:1
		1 step reduced port	2		65	65	100:1
		2 step reduced port	1-1/2		41	41	100:1
3	80	Full port	3	40	142	142	100:1
		1 step reduced port	2-1/2		122	122	100:1
		2 step reduced port	2		70	70	100:1
		3 step reduced port	1-1/2		41	41	100:1
4	100	Full port	4	40	245	232	100:1
		1 step reduced port	3		180	180	100:1
		2 step reduced port	2-1/2		138	138	100:1

Table 5. Cv / flow characteristics / rangeability (cage valves)

Model AC111 (for normal temperature use) / model AC311 (for low temperature use)

• Seat leakage: Class IV

Valve size		Port size (inches)		Rated travel (mm)	Rated Cv by flow characteristic		Rangeability
(inches)	(mm)				LN	EQ	
1-1/2	32	Full port	1-1/2	20	44	37	100:1
		1 step reduced port	1-1/4		22.5	22.5	50:1
		2 step reduced port	1		14	14	30:1
2	50	Full port	2	20	71	60	100:1
		1 step reduced port	1-1/2		63	46	100:1
		2 step reduced port	1-1/4		31	27.5	50:1
		3 step reduced port	1		17	16	30:1
2-1/2	65	Full port	2-1/2	40	111	99	100:1
		1 step reduced port	2		72	67	60:1
		2 step reduced port	1-1/2		50	40	40:1
3	80	Full port	3	40	146	134	100:1
		1 step reduced port	2-1/2		138	120	100:1
		2 step reduced port	2		90	76	60:1
		3 step reduced port	1-1/2		60	44	40:1
4	100	Full port	4	40	232	207	100:1
		1 step reduced port	3		146	146	60:1
		2 step reduced port	2-1/2		120	120	40:1
6	150	Full port	6	75	516	464	100:1
		1 step reduced port	5		335	270	50:1
		2 step reduced port	4		260	215	40:1
8	200	Full port	8	75	863	735	100:1
		1 step reduced port	6		516	490	50:1
		2 step reduced port	5		330	280	35:1

Model AC111 (for normal temperature use)

• Seat leakage: Class V

Valve size		Port size (inches)		Rated travel (mm)	Rated Cv by flow characteristic		Rangeability
(inches)	(mm)				LN	EQ	
1-1/2	32	Full port	1-1/2	20	42	37	75:1
		1 step reduced port	1-1/4		22.5	22.5	50:1
		2 step reduced port	1		14	14	30:1
2	50	Full port	2	20	67	60	75:1
		1 step reduced port	1-1/2		63	46	75:1
		2 step reduced port	1-1/4		31	27.5	50:1
		3 step reduced port	1		17	16	30:1
2-1/2	65	Full port	2-1/2	40	105	99	75:1
		1 step reduced port	2		72	67	60:1
		2 step reduced port	1-1/2		50	40	40:1
3	80	Full port	3	40	143	134	75:1
		1 step reduced port	2-1/2		138	120	75:1
		2 step reduced port	2		90	76	60:1
		3 step reduced port	1-1/2		60	44	40:1
4	100	Full port	4	40	220	207	75:1
		1 step reduced port	3		146	146	60:1
		2 step reduced port	2-1/2		120	120	40:1
6	150	Not specified					
8	200	Not specified					

Model AC211 (for high temperature use)

• Seat leakage

Valve size		Port size (inches)		Rated travel (mm)	Rated Cv by flow characteristic		Rangeability	% of class or rated CV value
(inches)	(mm)				LN	EQ		
1-1/2	32	Full port	1-1/2	20	44	37	100:1	0.03 %
		1 step reduced port	1-1/4		22.5	22.5	50:1	0.05 %
		2 step reduced port	1		14	14	30:1	0.08 %
2	50	Full port	2	20	71	60	100:1	0.03 %
		1 step reduced port	1-1/2		63	46	100:1	0.03 %
		2 step reduced port	1-1/4		31	27.5	50:1	0.03 %
		3 step reduced port	1		17		30:1	0.05 %
		3 step reduced port	1			16	30:1	0.08 %
2-1/2	65	Full port	2-1/2	40	111	99	100:1	Class IV
		1 step reduced port	2		72	67	60:1	0.03 %
		2 step reduced port	1-1/2		50	40	40:1	0.03 %
3	80	Full port	3	40	146	134	100:1	Class IV
		1 step reduced port	2-1/2		138	120	100:1	Class IV
		2 step reduced port	2		90	76	60:1	0.03 %
		3 step reduced port	1-1/2		60	44	40:1	0.03 %
4	100	Full port	4	40	232	207	100:1	Class IV
		1 step reduced port	3		146	146	60:1	
		2 step reduced port	2-1/2		120	120	40:1	
6	150	Full port	6	75	516	464	100:1	
		1 step reduced port	5		335	270	50:1	
		2 step reduced port	4		260	215	40:1	
8	200	Full port	8	75	863	735	100:1	
		1 step reduced port	6		516	490	50:1	
		2 step reduced port	5		330	280	35:1	

Table 6. Combinations of body and bonnet materials (single-seated valves)

Body material	Bonnet material	Bonnet structure	Manufacturing method
ASTM A216 WCB	ASTM A216 WCB	Integrated	Casting
JIS SCPH2	JIS SCPH2		
ASTM A351 CF8	ASTM A351 CF8		
JIS SCS13A	JIS SCS13A		
ASTM A351 CF8M	ASTM A351 CF8M		
JIS SCS14A	JIS SCS14A		

Table 7. Combinations of body and trim materials (single-seated valves)

Model AS111 (for normal temperature use)

Body material	Trim						Gland parts	Oil-free treatment
		Valve plug	Seat ring	Guide bushing	Seat holder	Stem		
ASTM A216 WCB JIS SCPH2	ASTM A479 316	ASTM A479 316	ASTM A351CF8M*3	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	Not available
	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat					Available*1
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					Available*1
ASTM A351 CF8 JIS SCS13A	ASTM A479 316	ASTM A479 316	ASTM A351CF8M*3	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	Not available
	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat					Available*1
	IS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					Available*2
ASTM A351 CF8M JIS SCS14A	ASTM A479 316	ASTM A479 316	ASTM A351CF8M*3	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	Not available
	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat					Available*1
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					Available*2

**1. For models with oil-free treatment: ASTM A479 316+overall CoCr-A guide bushing*
**2. For models with oil-free treatment: ASTM A479 316+CoCr-A valve plug and ASTM A479 317+overall CoCr-A guide bushing*
**3. For Rated Cv ≤1.2, JIS G4303 SUS316*

Model AS211 (for high temperature use)

Body material	Trim						Gland parts	Oil-free treatment
		Valve plug	Seat ring	Guide bushing	Seat holder	Stem		
ASTM A216 WCB JIS SCPH2	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat	ASTM A479 316 + CoCr-A face	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	Not available
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					
ASTM A351 CF8 JIS SCS13A	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat	ASTM A479 316 + CoCr-A face	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					
ASTM A351 CF8M JIS SCS14A	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat	ASTM A479 316 + CoCr-A face	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					

Model AS311 (for low temperature use)

Body material	Trim						Gland parts	Oil-free treatment
		Valve plug	Seat ring	Guide bushing	Seat holder	Stem		
ASTM A351 CF8 JIS SCS13A	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat	ASTM A479 316 + CoCr-A face	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	Available
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					
ASTM A351 CF8M JIS SCS14A	ASTM A479 316 + CoCr-A seat	ASTM A479 316 + CoCr-A seat	ASTM A351CF8M + CoCr-A seat	ASTM A479 316 + CoCr-A face	ASTM A351CF8M	ASTM A479 316	ASTM A479 316	
	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A face	JIS G4303 SUS316 + CoCr-A seat					

Table 8. Combinations of body and bonnet materials (cage valves)

Basic model No.	Pressure rating	Valve size (inches)						
		1-1/2	2	2-1/2	3	4	6	8
Model AC111 (for normal temperature use)	Class 150 Class 300							
	Class 600			See , "Table 8-1."			See , "Table 8-1." and, "Table 8-3."*2	
Model AS211 (for high temperature use)	Class 150 Class 300							
Model AS311 (for low temperature use)	Class 600	*1			See , "Table 8-2."		See , "Table 8-2." and, "Table 8-3."*2	

**1. For the PA2/3 actuators, see Table 8-1. For the PA4/5 actuators, see Table 8-2.*
**2. Separated bonnet*

Table 8-1

Body material	Bonnet material (casting)
ASTM A216 WCB	ASTM A216 WCB
JIS SCPH2	JIS SCPH2
ASTM A351 CF8	ASTM A351 CF8
JIS SCS13A	JIS SCS13A
ASTM A351 CF8M	ASTM A351 CF8M
JIS SCS14A	JIS SCS14A

Table 8-2

Body material	Bonnet material (casting)
ASTM A216 WCB	ASTM A105
JIS SCPH2	ASTM A105
ASTM A351 CF8	ASTM A182 F304
JIS SCS13A	ASTM A182 F304
ASTM A351 CF8M	ASTM A182 F316
JIS SCS14A	ASTM A182 F316

Table 8-3

Bonnet adapter material (forged)
ASTM A105
ASTM A105
ASTM A182 F304
ASTM A182 F304
ASTM A182 F316
ASTM A182 F316

Table 9. Combinations of body and trim materials (cage valves)

Model AC111 (for normal temperature use)

Body material	Trim					Seal ring	Gland parts	Oil-free treatment
		Valve plug	Upper cage	Lower cage	Stem			
ASTM A216 WCB JIS SCPH2	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A479 316	MoS2-inserted PTFE, ASTM B574 (Hastelloy C-276 equivalent) with spring	ASTM A479 316	Not available
	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M	ASTM A351 CF8M+CoCr-A seat				Available
	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1				Available
ASTM A351 CF8 JIS SCS13A	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M				Not available
	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M	ASTM A351 CF8M+CoCr-A seat				Available
ASTM A351 CF8M JIS SCS14A	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M	ASTM A351 CF8M				Not available
	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M	ASTM A351 CF8M+CoCr-A seat				Available

Model AC211 (for high temperature use)

Body material	Trim					Seal ring	Gland parts	Oil-free treatment
		Valve plug	Upper cage	Lower cage	Stem			
ASTM A216 WCB JIS SCPH2	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A479 316	Carbon impregnated with antimony	ASTM A479 316	Not available
	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1	ASTM A747 CB7Cu-1				
ASTM A351 CF8 JIS SCS13A	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat				
ASTM A351 CF8M JIS SCS14A	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat				

Model AC311 (for low temperature use)

Body material	Trim					Seal ring	Gland parts	Oil-free treatment
		Valve plug	Upper cage	Lower cage	Stem			
ASTM A351 CF8 JIS SCS13A	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M	ASTM A351 CF8M+CoCr-A seat	ASTM A479 316	MoS2-inserted PTFE, ASTM B574 (Hastelloy C-276 equivalent) with spring	ASTM A479 316	Available
ASTM A351 CF8M JIS SCS14A	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M+CoCr-A seat	ASTM A351 CF8M	ASTM A351 CF8M+CoCr-A seat				

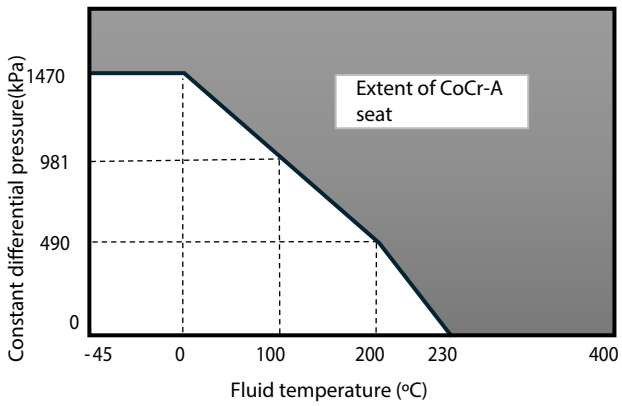


Figure 6. Temperature and constant differential pressure ranges requiring CoCr-A seat

Note 1. CoCr-A seat is one of the hardening treatment methods.

Note 2. For cavitation/flashing service, oil-free service, and in a case where retention of valve shutoff performance is required, CoCr-A is recommended regardless of the temperature and differential pressure.

Table 10. Inherent characteristics (single-seated valves)

The inherent values, F_L and X_T, are based on actual measured data. The F_L* and X_T* are based on standardized flow characteristic data.

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
1/2	15	class IV, V	16	Cv=5.1	LN	C_V	0.374	1.02	1.60	2.18	2.77	3.32	3.72	4.37	4.87	5.10
						F_L*	0.960	0.940	0.927	0.918	0.912	0.909	0.907	0.904	0.901	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.158	0.346	0.571	0.867	1.28	1.83	2.66	3.79	4.72	5.10
						F_L*	0.968	0.961	0.953	0.944	0.933	0.923	0.913	0.906	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			12	Cv=3.3	LN	C_V	0.186	0.541	0.934	1.34	1.72	2.10	2.45	2.77	3.05	3.30
						F_L*	0.963	0.945	0.930	0.920	0.913	0.909	0.906	0.904	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.077	0.147	0.215	0.345	0.483	0.727	1.06	1.63	2.35	3.30
						F_L*	0.970	0.965	0.961	0.954	0.947	0.937	0.926	0.914	0.907	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			8	Cv=2	LN	C_V	0.125	0.352	0.558	0.771	0.974	1.18	1.39	1.60	1.81	2.00
						F_L*	0.962	0.943	0.930	0.921	0.915	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.067	0.103	0.149	0.224	0.301	0.422	0.642	0.941	1.40	2.00
						F_L*	0.967	0.964	0.959	0.953	0.947	0.938	0.926	0.916	0.907	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=1.2	LN	C_V	0.079	0.232	0.367	0.505	0.625	0.742	0.853	0.960	1.08	1.20
						F_L*	0.961	0.941	0.928	0.919	0.913	0.910	0.907	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.030	0.058	0.085	0.119	0.164	0.223	0.353	0.529	0.805	1.20
						F_L*	0.969	0.964	0.960	0.955	0.949	0.942	0.929	0.917	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.78	LN	C_V	0.060	0.140	0.220	0.300	0.380	0.460	0.540	0.620	0.690	0.780
						F_L*	0.959	0.943	0.930	0.921	0.915	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.043	0.062	0.081	0.101	0.125	0.211	0.316	0.498	0.780
						F_L*	0.968	0.963	0.959	0.954	0.950	0.945	0.931	0.920	0.909	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.58	LN	C_V	0.049	0.109	0.168	0.233	0.287	0.346	0.403	0.462	0.516	0.580
						F_L*	0.958	0.941	0.929	0.920	0.914	0.910	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.028	0.051	0.073	0.095	0.119	0.148	0.196	0.290	0.403	0.580
						F_L*	0.964	0.957	0.951	0.945	0.939	0.933	0.925	0.914	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.35	LN	C_V	0.033	0.071	0.104	0.139	0.176	0.214	0.251	0.287	0.320	0.350
						F_L*	0.956	0.940	0.929	0.920	0.914	0.910	0.907	0.905	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.047	0.067	0.086	0.105	0.129	0.160	0.205	0.260	0.350
						F_L*	0.961	0.949	0.941	0.934	0.928	0.922	0.916	0.911	0.906	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.22	LN	C_V	0.021	0.045	0.066	0.087	0.108	0.131	0.151	0.172	0.192	0.220
						F_L*	0.956	0.939	0.928	0.920	0.915	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.1	LN	C_V	0.010	0.022	0.032	0.042	0.051	0.061	0.069	0.078	0.085	0.100
						F_L*	0.955	0.937	0.926	0.919	0.914	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
3/4	20	class IV, V	20.5	Cv=9	LN	C_V	0.661	1.78	2.85	3.87	4.79	5.83	6.88	7.69	8.46	9.00
						F_L*	0.960	0.940	0.927	0.918	0.913	0.909	0.906	0.904	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.282	0.570	0.927	1.38	2.05	2.98	4.36	6.60	8.14	9.00
						F_L*	0.968	0.962	0.954	0.946	0.936	0.925	0.915	0.907	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			16	Cv=7.2	LN	C_V	0.374	1.02	1.71	2.38	3.06	3.74	4.35	5.40	6.41	7.20
						F_L*	0.964	0.948	0.935	0.925	0.918	0.913	0.910	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.158	0.346	0.571	0.867	1.32	1.96	2.95	4.51	6.17	7.20
						F_L*	0.970	0.965	0.959	0.951	0.942	0.931	0.919	0.909	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			12	Cv=3.5	LN	C_V	0.186	0.541	0.864	1.28	1.67	2.06	2.44	2.84	3.18	3.50
						F_L*	0.964	0.946	0.934	0.922	0.915	0.911	0.907	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.077	0.147	0.215	0.345	0.454	0.644	1.01	1.59	2.38	3.50
						F_L*	0.970	0.966	0.962	0.955	0.950	0.942	0.930	0.917	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			8	Cv=2.2	LN	C_V	0.125	0.352	0.596	0.819	1.05	1.27	1.49	1.72	1.97	2.20
						F_L*	0.963	0.945	0.931	0.922	0.915	0.911	0.908	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.067	0.103	0.149	0.224	0.314	0.473	0.686	1.02	1.53	2.20
						F_L*	0.968	0.965	0.961	0.955	0.948	0.938	0.927	0.916	0.907	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=1.2	LN	C_V	0.076	0.225	0.366	0.499	0.626	0.740	0.857	0.964	1.09	1.20
						F_L*	0.962	0.941	0.928	0.919	0.913	0.910	0.907	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.027	0.056	0.083	0.117	0.157	0.222	0.351	0.552	0.805	1.20
						F_L*	0.970	0.965	0.960	0.955	0.950	0.942	0.929	0.916	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.78	LN	C_V	0.062	0.140	0.221	0.299	0.380	0.459	0.537	0.618	0.687	0.780
						F_L*	0.959	0.943	0.930	0.921	0.915	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.043	0.062	0.081	0.101	0.125	0.211	0.316	0.498	0.780
						F_L*	0.968	0.963	0.959	0.954	0.950	0.945	0.931	0.920	0.909	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.58	LN	C_V	0.049	0.109	0.168	0.233	0.287	0.346	0.403	0.462	0.516	0.580
						F_L*	0.958	0.941	0.929	0.920	0.914	0.910	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.028	0.051	0.073	0.095	0.119	0.148	0.196	0.290	0.403	0.580
						F_L*	0.964	0.957	0.951	0.945	0.939	0.933	0.925	0.914	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.35	LN	C_V	0.033	0.070	0.104	0.139	0.176	0.214	0.251	0.287	0.320	0.350
						F_L*	0.956	0.940	0.929	0.920	0.914	0.910	0.907	0.905	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.047	0.067	0.086	0.105	0.129	0.160	0.205	0.260	0.350
						F_L*	0.961	0.949	0.941	0.934	0.928	0.922	0.916	0.911	0.906	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.22	LN	C_V	0.021	0.045	0.066	0.087	0.108	0.131	0.151	0.172	0.192	0.220
						F_L*	0.956	0.939	0.928	0.920	0.915	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.1	LN	C_V	0.010	0.022	0.032	0.042	0.051	0.061	0.069	0.078	0.085	0.100
						F_L*	0.955	0.937	0.926	0.919	0.914	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
1	25	class IV, V	27.5	Cv=20	LN	C_V	1.07	3.23	5.67	8.05	10.5	12.8	15.0	17.0	18.7	20.0
						F_L	0.966	0.985	0.985	0.985	0.985	0.950	0.951	0.951	0.941	0.942
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.244	0.438	0.842	1.36	2.38	4.91	10.1	14.3	17.9	20.0
						F_L	0.968	0.985	0.985	0.964	0.972	0.975	0.878	0.919	0.958	0.957
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			20.5	Cv=13	LN	C_V	0.661	2.03	3.15	4.33	5.58	7.11	8.70	10.2	11.6	13.0
						F_L*	0.964	0.946	0.934	0.925	0.918	0.912	0.908	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.282	0.570	0.927	1.38	2.24	3.30	5.12	8.71	11.0	13.0
						F_L*	0.970	0.965	0.960	0.954	0.944	0.933	0.920	0.908	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			16	Cv=8.2	LN	C_V	0.374	1.02	1.61	2.33	3.06	3.77	4.52	5.66	7.08	8.20
						F_L*	0.965	0.951	0.940	0.930	0.922	0.916	0.912	0.908	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.158	0.346	0.571	0.867	1.35	1.97	3.01	4.69	6.68	8.20
						F_L*	0.970	0.966	0.960	0.954	0.945	0.935	0.922	0.911	0.905	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
1	25	class IV, V	12	Cv=4	LN	C_V	0.186	0.541	0.948	1.40	1.84	2.28	2.73	3.16	3.60	4.00
						F_L*	0.965	0.949	0.935	0.924	0.916	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.077	0.147	0.215	0.345	0.484	0.765	1.11	1.72	2.61	4.00
						F_L*	0.970	0.967	0.963	0.957	0.951	0.941	0.931	0.918	0.909	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			8	Cv=2.2	LN	C_V	0.125	0.352	0.570	0.791	1.02	1.25	1.48	1.71	1.96	2.20
						F_L*	0.963	0.945	0.933	0.923	0.916	0.911	0.908	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.067	0.103	0.149	0.224	0.302	0.443	0.677	1.01	1.51	2.20
						F_L*	0.968	0.965	0.961	0.955	0.949	0.940	0.928	0.916	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=1.2	LN	C_V	0.096	0.244	0.380	0.514	0.635	0.750	0.857	0.970	1.08	1.20
						F_L*	0.958	0.939	0.927	0.918	0.913	0.909	0.907	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.026	0.057	0.083	0.117	0.160	0.221	0.353	0.554	0.798	1.20
						F_L*	0.970	0.965	0.960	0.955	0.949	0.942	0.929	0.916	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.78	LN	C_V	0.060	0.140	0.220	0.300	0.380	0.460	0.540	0.620	0.690	0.780
						F_L*	0.959	0.943	0.930	0.921	0.915	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.043	0.062	0.081	0.101	0.125	0.211	0.316	0.498	0.780
						F_L*	0.968	0.963	0.959	0.954	0.950	0.945	0.931	0.920	0.909	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.58	LN	C_V	0.049	0.109	0.168	0.233	0.287	0.346	0.403	0.462	0.516	0.580
						F_L*	0.958	0.941	0.929	0.920	0.914	0.910	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.028	0.051	0.073	0.095	0.119	0.148	0.196	0.290	0.403	0.580
						F_L*	0.964	0.957	0.951	0.945	0.939	0.933	0.925	0.914	0.908	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			6	Cv=0.35	LN	C_V	0.033	0.070	0.104	0.139	0.176	0.214	0.251	0.287	0.320	0.350
						F_L*	0.956	0.940	0.929	0.920	0.914	0.910	0.907	0.905	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.023	0.047	0.067	0.086	0.105	0.129	0.160	0.205	0.260	0.350
						F_L*	0.961	0.949	0.941	0.934	0.928	0.922	0.916	0.911	0.906	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.22	LN	C_V	0.021	0.045	0.066	0.087	0.108	0.131	0.151	0.172	0.192	0.220
						F_L*	0.956	0.939	0.928	0.920	0.915	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			4.5	Cv=0.1	LN	C_V	0.010	0.022	0.032	0.042	0.051	0.061	0.069	0.078	0.085	0.100
						F_L*	0.955	0.937	0.926	0.919	0.914	0.910	0.908	0.906	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
1-1/2	32	class IV, V	41.8	Full port	LN	C_V	3.34	8.01	14.2	20.6	25.3	31.0	34.7	37.9	40.3	42.0
						F_L	0.814	0.874	0.849	0.882	0.946	0.942	0.946	0.948	0.949	0.939
						X_T	0.432	0.601	0.558	0.607	0.641	0.696	0.719	0.720	0.717	0.696
					EQ	C_V	0.486	0.986	1.60	2.83	10.0	18.2	27.3	33.9	38.6	42.0
						F_L	0.909	0.968	0.985	0.985	0.743	0.848	0.877	0.942	0.952	0.949
						X_T	0.720	0.568	0.597	0.634	0.401	0.497	0.612	0.694	0.708	0.716
			27.5	1 step reduced port	LN	C_V	1.42	3.78	6.21	8.67	11.3	14.0	16.7	19.4	21.9	24.0
						F_L*	0.962	0.946	0.933	0.923	0.916	0.911	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.319	0.503	0.923	1.50	2.52	4.91	11.6	17.4	21.6	24.0
						F_L*	0.972	0.970	0.966	0.962	0.954	0.939	0.915	0.907	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			20.5	2 step reduced port	LN	C_V	0.635	1.83	3.08	4.21	5.37	6.79	8.81	10.7	12.8	14.5
						F_L*	0.965	0.951	0.938	0.929	0.922	0.916	0.910	0.907	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.242	0.526	0.911	1.35	2.16	3.23	4.95	9.23	12.5	14.5
						F_L*	0.971	0.967	0.962	0.956	0.947	0.937	0.925	0.909	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
2	50	class IV, V	55	Full port	LN	C_V	3.850	12.7	20.2	30.4	39.6	49.0	56.5	62.7	67.5	71.0
						F_L	0.821	0.887	0.889	0.873	0.905	0.921	0.924	0.925	0.930	0.942
						X_T	0.535	0.618	0.585	0.530	0.609	0.659	0.706	0.734	0.784	0.802
					EQ	C_V	0.946	1.73	2.92	6.66	18.3	31.8	44.3	55.8	63.6	67.0
						F_L	0.984	0.985	0.985	0.899	0.985	0.942	0.933	0.932	0.945	0.931
						X_T	0.720	0.573	0.600	0.527	0.595	0.659	0.686	0.732	0.801	0.819
			41.8	1 step reduced port	LN	C_V	3.14	7.55	13.3	20.0	25.7	31.3	36.6	41.2	44.9	48.0
						F_L*	0.961	0.946	0.931	0.919	0.913	0.909	0.906	0.904	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.533	1.02	1.63	3.06	8.57	17.3	27.3	36.9	43.5	48.0
						F_L*	0.972	0.970	0.967	0.961	0.943	0.923	0.911	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
2	50	class IV, V	27.5	2 step reduced port	LN	C_V	1.28	3.63	6.24	8.65	11.4	14.4	17.5	20.7	23.7	26.0
						F_L*	0.964	0.948	0.935	0.925	0.918	0.912	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.325	0.532	0.935	1.53	2.59	5.15	12.4	18.6	23.0	26.0
						F_L*	0.972	0.970	0.967	0.962	0.955	0.940	0.915	0.907	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			20.5	3 step reduced port	LN	C_V	0.568	1.75	2.92	4.04	5.19	6.66	8.51	10.5	12.5	14.5
						F_L*	0.966	0.951	0.940	0.930	0.923	0.916	0.911	0.907	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.275	0.527	0.886	1.28	2.02	2.95	4.69	9.14	12.5	14.5
						F_L*	0.970	0.967	0.962	0.957	0.948	0.939	0.926	0.909	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
2-1/2	65	class IV, V	69.3	Full port	LN	C_V	7.01	19.9	32.5	44.8	57.1	70.3	81.5	90.4	95.9	99.0
						F_L	0.985	0.985	0.943	0.976	0.948	0.951	0.930	0.922	0.912	0.910
						X_T	0.595	0.660	0.640	0.669	0.683	0.745	0.790	0.815	0.827	0.841
					EQ	C_V	2.56	5.17	8.97	14.2	21.1	44.6	69.2	85.4	95.1	99.0
						F_L	0.985	0.985	0.985	0.985	0.945	0.832	0.885	0.942	0.926	0.930
						X_T	0.648	0.611	0.603	0.631	0.633	0.490	0.718	0.793	0.831	0.842
			55	1 step reduced port	LN	C_V	3.42	10.7	17.4	24.6	31.4	38.1	44.9	51.7	58.4	65.0
						F_L*	0.964	0.945	0.932	0.922	0.915	0.911	0.908	0.905	0.903	0.900
						X_T	0.643	0.651	0.649	0.652	0.650	0.669	0.677	0.695	0.715	0.745
					EQ	C_V	0.745	1.39	2.28	3.89	6.03	9.95	16.4	28.0	47.8	65.0
						F_L*	0.972	0.970	0.967	0.962	0.956	0.946	0.933	0.918	0.907	0.900
						X_T	0.720	0.604	0.635	0.606	0.606	0.612	0.651	0.648	0.608	0.746
			41.8	2 step reduced port	LN	C_V	2.53	7.15	11.6	16.1	20.5	24.7	28.8	33.3	37.3	41.0
						F_L*	0.962	0.943	0.930	0.921	0.914	0.910	0.907	0.905	0.903	0.900
						X_T	0.601	0.608	0.636	0.651	0.637	0.639	0.646	0.648	0.627	0.637
					EQ	C_V	0.481	0.932	1.49	2.39	3.30	5.84	9.22	15.1	25.6	41.0
						F_L*	0.972	0.970	0.967	0.963	0.958	0.948	0.937	0.922	0.909	0.900
						X_T	0.720	0.720	0.613	0.618	0.582	0.588	0.631	0.598	0.622	0.557
3	80	class IV, V	82.5	Full port	LN	C_V	9.49	26.9	44.3	63.1	83.0	104	122	133	140	142
						F_L	0.958	0.973	0.965	0.959	0.951	0.927	0.911	0.902	0.896	0.869
						X_T	0.720	0.698	0.642	0.627	0.615	0.624	0.684	0.749	0.816	0.818
					EQ	C_V	2.21	4.95	8.34	13.7	27.9	67.7	98.4	120	136	142
						F_L	0.971	0.975	0.975	0.969	0.971	0.801	0.874	0.886	0.871	0.865
						X_T	0.720	0.649	0.627	0.620	0.604	0.523	0.613	0.747	0.821	0.840
			69.3	1 step reduced port	LN	C_V	6.45	19.2	31.4	43.8	56.9	71.6	87.0	101	113	122
						F_L*	0.964	0.946	0.933	0.923	0.916	0.911	0.907	0.905	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	2.54	5.14	8.72	13.6	20.6	44.4	69.7	92.1	109	122
						F_L*	0.970	0.966	0.960	0.953	0.944	0.923	0.911	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			55	2 step reduced port	LN	C_V	3.76	10.8	18.1	25.3	32.2	39.7	46.7	54.4	62.6	70.0
						F_L*	0.963	0.946	0.933	0.923	0.916	0.911	0.908	0.906	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.721	1.40	2.18	3.99	6.53	10.5	17.2	30.6	50.9	70.0
						F_L*	0.972	0.970	0.968	0.963	0.956	0.947	0.934	0.918	0.907	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			42	3 step reduced port	LN	C_V	2.48	7.01	11.6	16.1	20.4	24.7	28.7	33.1	37.0	41.0
						F_L*	0.962	0.944	0.930	0.921	0.914	0.910	0.907	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	0.470	0.940	1.45	2.30	3.31	5.80	9.24	15.0	25.5	41.0
						F_L*	0.972	0.970	0.967	0.963	0.958	0.948	0.937	0.922	0.909	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
4	100	class IV, V	110	Full port	LN	C_V	16.9	42.7	80.5	126	166	201	223	235	241	245
						F_L*	0.961	0.943	0.926	0.914	0.908	0.905	0.903	0.901	0.900	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	5.05	12.8	25.6	41.8	77.7	123	160	196	218	232
						F_L*	0.970	0.963	0.953	0.942	0.925	0.913	0.908	0.904	0.902	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			82.5	1 step reduced port	LN	C_V	8.26	24.9	41.5	59.1	77.9	99.4	122	142	164	180
						F_L*	0.965	0.949	0.936	0.926	0.918	0.912	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	2.13	4.88	8.34	13.9	27.4	67.8	99.2	129	157	180
						F_L*	0.972	0.969	0.965	0.959	0.947	0.922	0.912	0.907	0.904	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
			69.3	2 step reduced port	LN	C_V	7.43	19.7	32.2	44.6	58.1	73.5	91.2	109	125	138
						F_L*	0.963	0.948	0.936	0.926	0.919	0.913	0.908	0.905	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720
					EQ	C_V	2.47	4.84	8.66	13.7	20.5	45.5	74.8	98.7	122	138
						F_L*	0.971	0.967	0.962	0.955	0.947	0.926	0.912	0.907	0.903	0.900
						X_T*	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720	0.720

Table 11. Inherent characteristics (cage valves)

The inherent values, F_L and X_T, are based on actual measured data. The F_L* and X_T* are based on standardized flow characteristic data.

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
1-1/2	32	class IV	50	Full port	LN	C_V	1.59	10.2	17.4	26.5	32.6	37.5	39.7	41.6	43.1	44.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.548	0.496	0.705	0.715	0.729	0.687	0.643	0.629	0.609	0.582
					EQ	C_V	0.294	1.21	2.53	4.27	7.80	13.5	20.6	28.6	34.2	37.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.700	0.807	0.742	0.719	0.652	0.619	0.664	0.652	0.663	0.636
			50	1 step reduced port	LN	C_V	0.605	2.62	5.00	8.49	11.9	14.6	16.9	19.1	21.3	22.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.334	1.31	2.53	3.82	5.72	8.08	11.3	14.7	18.7	22.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	2 step reduced port	LN	C_V	0.494	1.67	3.38	5.32	7.02	8.53	10.2	11.7	12.9	14.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.264	1.11	2.36	3.81	5.11	6.67	8.32	10.3	12.1	14.0
						F_L	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
		class V	50	Full port	LN	C_V	1.42	7.95	16.5	25.2	30.7	35.3	38.3	39.9	40.9	42.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.659	1.62	2.95	4.74	8.28	14.0	22.3	29.7	34.6	37.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	1 step reduced port	LN	C_V	0.605	2.62	5.00	8.49	11.9	14.6	16.9	19.1	21.3	22.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.334	1.31	2.53	3.82	5.72	8.08	11.3	14.7	18.7	22.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	2 step reduced port	LN	C_V	0.494	1.67	3.38	5.32	7.02	8.53	10.2	11.7	12.9	14.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.264	1.11	2.36	3.81	5.11	6.67	8.32	10.3	12.1	14.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
2	50	class IV	60	Full port	LN	C_V	2.24	9.25	16.7	25.8	37.0	48.0	58.6	65.9	70.3	71.0
						F_L	0.887	0.811	0.929	0.924	0.907	0.885	0.830	0.801	0.773	0.762
						X_T	0.454	0.619	0.700	0.729	0.733	0.767	0.653	0.594	0.580	0.584
					EQ	C_V	0.724	1.74	3.08	6.37	13.7	23.3	34.2	45.3	55.6	60.0
						F_L	0.962	0.897	0.938	0.932	0.956	0.919	0.909	0.883	0.820	0.823
						X_T	0.700	0.722	0.770	0.736	0.764	0.734	0.720	0.739	0.678	0.690
			50	1 step reduced port	LN	C_V	2.69	9.90	17.8	28.2	36.1	48.4	54.8	58.4	61.8	63.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.427	1.41	2.76	4.60	8.60	14.1	22.8	31.8	39.9	46.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	2 step reduced port	LN	C_V	0.735	2.44	5.21	8.86	12.4	15.9	19.4	23.1	27.1	31.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.313	1.34	2.64	3.98	5.76	8.28	11.6	16.2	21.6	27.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	3 step reduced port	LN	C_V	0.562	1.74	3.47	5.46	7.28	9.22	11.1	13.0	15.0	17.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.266	1.19	2.38	3.82	5.14	6.82	8.67	10.7	13.3	16.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
		class V	60	Full port	LN	C_V	2.90	10.3	18.7	29.0	37.7	45.7	55.7	62.0	66.5	67.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.812	1.84	3.53	7.26	14.4	25.0	36.2	46.1	53.3	60.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	1 step reduced port	LN	C_V	1.50	8.06	17.0	27.9	36.8	46.2	52.4	57.3	60.7	63.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.611	1.45	2.69	4.33	7.59	13.1	21.7	31.7	39.9	46.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
2	50	class V	50	2 step reduced port	LN	C_V	0.735	2.44	5.21	8.86	12.4	15.9	19.4	23.1	27.1	31.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.313	1.34	2.64	3.98	5.76	8.28	11.6	16.2	21.6	27.5
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			50	3 step reduced port	LN	C_V	0.562	1.74	3.47	5.46	7.28	9.22	11.1	13.0	15.0	17.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.266	1.19	2.38	3.82	5.14	6.82	8.67	10.7	13.3	16.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
2-1/2	65	class IV	72	Full port	LN	C_V	3.69	19.5	40.6	60.0	77.4	90.1	100	107	110	111
						F_L	0.890	0.927	0.939	0.881	0.890	0.892	0.872	0.829	0.851	0.856
						X_T	0.641	0.726	0.737	0.734	0.728	0.696	0.679	0.649	0.642	0.649
					EQ	C_V	1.05	3.57	6.46	12.0	21.0	38.4	60.9	82.7	94.3	99.0
						F_L	0.960	0.925	0.945	0.933	0.922	0.875	0.906	0.892	0.869	0.855
						X_T	0.700	0.753	0.732	0.675	0.640	0.612	0.655	0.678	0.678	0.707
			72	1 step reduced port	LN	C_V	2.28	10.5	20.9	30.5	39.9	48.2	55.1	61.4	67.1	72.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.822	0.734	0.749	0.732	0.733	0.757	0.796	0.805	0.783	0.766
					EQ	C_V	0.869	3.13	5.99	8.35	12.4	18.0	25.8	33.9	52.6	67.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.700	0.791	0.735	0.769	0.733	0.714	0.698	0.637	0.642	0.730
			72	2 step reduced port	LN	C_V	1.01	5.28	12.3	18.8	25.0	31.2	36.8	42.0	46.1	50.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.997	0.736	0.736	0.731	0.737	0.743	0.718	0.729	0.750	0.777
					EQ	C_V	0.996	3.41	6.24	8.75	11.9	15.4	19.6	25.1	32.6	40.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T	0.700	0.806	0.727	0.731	0.722	0.703	0.699	0.691	0.645	0.661
		class V	72	Full port	LN	C_V	3.30	17.8	37.0	54.7	72.2	85.5	96.5	103	104	105
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.52	3.90	6.67	12.0	21.1	37.9	61.5	82.8	94.9	99.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	1 step reduced port	LN	C_V	2.28	10.5	20.9	30.5	39.9	48.2	55.1	61.4	67.1	72.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.869	3.13	5.99	8.35	12.4	18.0	25.8	33.9	52.6	67.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	2 step reduced port	LN	C_V	1.01	5.28	12.3	18.8	25.0	31.2	36.8	42.0	46.1	50.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.996	3.41	6.24	8.75	11.9	15.4	19.6	25.1	32.6	40.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
3	80	class IV	84	Full port	LN	C_V	4.70	22.1	47.4	70.1	91.5	109	123	134	143	146
						F_L	0.882	0.948	0.948	0.921	0.887	0.874	0.855	0.838	0.819	0.816
						X_T	0.671	0.730	0.737	0.782	0.807	0.872	0.700	0.700	0.700	0.700
					EQ	C_V	1.22	3.71	6.88	15.2	31.9	56.0	86.4	113	128	134
						F_L	0.939	0.948	0.977	0.856	0.834	0.895	0.895	0.861	0.832	0.837
						X_T	0.722	0.759	0.717	0.585	0.574	0.692	0.747	0.795	0.700	0.700
			72	1 step reduced port	LN	C_V	3.34	17.4	38.1	60.4	79.7	97.3	111	123	133	138
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.01	3.39	6.18	11.4	20.2	37.5	61.5	90.5	112	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	2 step reduced port	LN	C_V	1.54	9.25	20.6	32.0	44.6	55.6	67.8	76.7	84.5	90
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.899	3.29	5.68	8.07	11.8	17.4	24.7	36.3	55.0	76
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	3 step reduced port	LN	C_V	1.02	5.41	12.5	19.5	26.7	33.7	40.9	48.2	54.5	60.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.844	3.12	5.91	8.45	11.4	15.1	19.4	25.5	34.4	44.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
3	80	class V	84	Full port	LN	C_V	5.46	23.6	47.9	71.7	93.1	114	130	135	140	143
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.72	4.18	7.40	15.6	32.0	57.8	91.7	116	129	134
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	1 step reduced port	LN	C_V	3.29	17.4	37.1	55.5	74.8	96.9	115	128	137	138
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.51	3.88	6.62	12.0	21.4	38.3	65.0	94.8	118	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	2 step reduced port	LN	C_V	1.54	9.25	20.6	32.0	44.6	55.6	67.8	76.7	84.5	90.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.899	3.29	5.68	8.07	11.8	17.4	24.7	36.3	55.0	76.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			72	3 step reduced port	LN	C_V	1.02	5.41	12.5	19.5	26.7	33.7	40.9	48.2	54.5	60.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	0.844	3.12	5.91	8.45	11.4	15.1	19.4	25.5	34.4	44.0
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
4	100	class IV	112	Full port	LN	C_V	6.03	34.9	73.8	114	160	190	214	225	230	232
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.73	4.90	13.6	31.1	61.7	103	143	176	196	207
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			112	1 step reduced port	LN	C_V	3.67	17.5	36.8	56.8	75.4	93.1	109	126	140	146
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.04	3.43	6.28	11.2	20.5	32.5	50.7	80.7	113	146
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			112	2 step reduced port	LN	C_V	2.63	12.7	27.7	43.4	58.3	73.1	86.7	98.8	110	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.32	3.94	6.66	9.64	16.0	25.9	40.2	63.8	89.6	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
		class V	112	Full port	LN	C_V	5.99	35.3	74.7	114	152	182	200	210	215	220
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.70	4.52	13.3	31.5	64.7	107	144	176	192	207
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			112	1 step reduced port	LN	C_V	3.67	17.5	36.8	56.8	75.4	93.1	109	126	140	146
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.04	3.43	6.28	11.2	20.5	32.5	50.7	80.7	113	146
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			112	2 step reduced port	LN	C_V	2.63	12.7	27.7	43.4	58.3	73.1	86.7	98.8	110	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	1.32	3.94	6.66	9.64	16.0	25.9	40.2	63.8	89.6	120
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
6	150	class IV	160	Full port	LN	C_V	25.0	109	199	280	350	413	463	494	515	516
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	4.53	12.1	19.9	44.2	98.1	195	294	388	442	464
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			160	1 step reduced port	LN	C_V	10.3	46.3	88.2	131	172	212	250	283	311	335
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	3.43	10.3	17.7	25.0	32.4	49.0	76.2	115	179	270
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700

Valve size		Seat leakage	Port size (mm)	Cv	Flow charact.	Inherent value	Travel (%)									
(inches)	(mm)						10	20	30	40	50	60	70	80	90	100
6	150	class IV	160	2 step reduced port	LN	C_V	7.84	33.5	65.3	96.8	128	160	189	215	239	260
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	3.36	9.96	17.2	24.1	30.8	44.0	65.8	96.4	150	215
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
8	200	class IV	205	Full port	LN	C_V	26.8	178	330	467	593	693	770	817	845	863
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	4.84	12.4	40.1	95.4	214	364	499	601	679	735
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			205	1 step reduced port	LN	C_V	15.4	70.5	134	201	263	323	379	432	478	516
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	3.54	10.1	20.4	40.7	72.6	115	167	243	363	490
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
			205	2 step reduced port	LN	C_V	8.86	41.1	79.1	118	159	197	235	270	303	330
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700
					EQ	C_V	3.36	10.3	17.5	23.4	34.6	53.0	83.8	124	193	280
						F_L*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
						X_T*	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700	0.700

Dimensions and weight

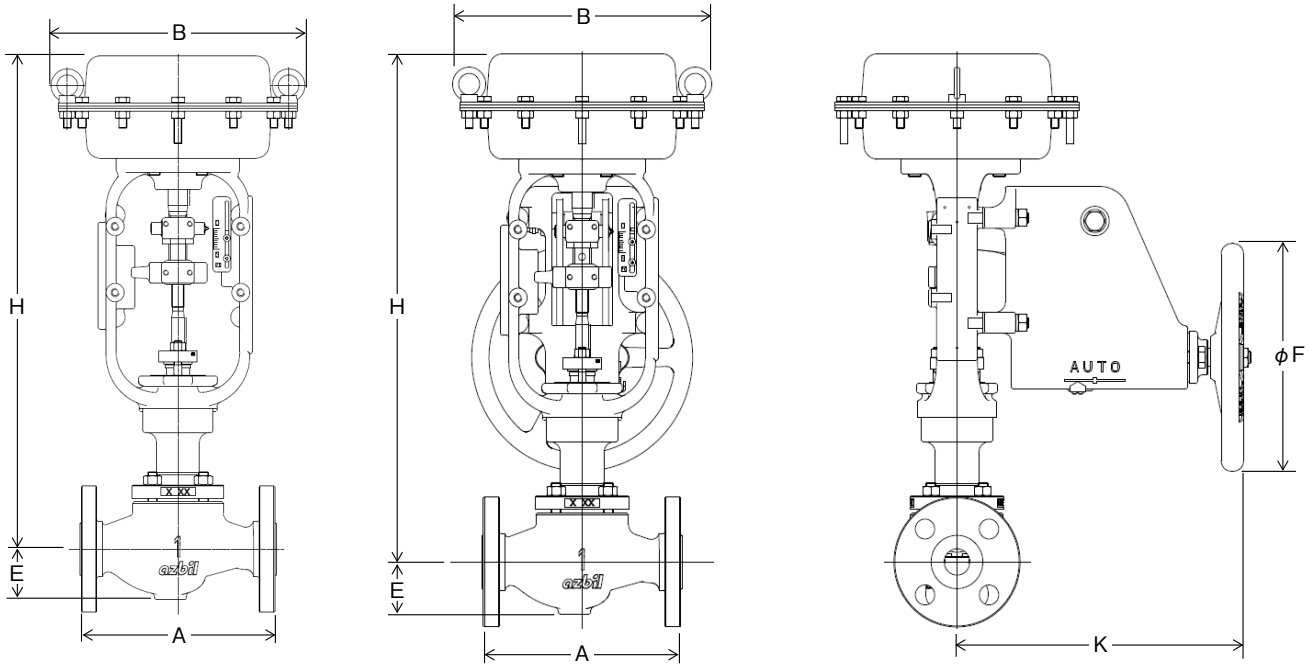


Figure 7. Face-to-face length and dimensions

Table 12. Face-to-face length

Unit: mm

Valve size (inches)	A		
	Class 150	Class 300	Class 600
1/2	184	190	203
3/4	184	194	206
1	184	197	210
1-1/2	222	235	251
2	254	267	286
2-1/2	276	292	311
3	298	317	337
4	352	368	394
6	451	473	508
8	543	568	610

Table 13. Dimensions

Unit: mm

Valve size (inches)	Actuator model	H				B	E			With a side handwheel	
		Model AS111/AC111 (for normal temp. use)		Model AS211/AC211 (for high temp. use) Model AS311/AC311 (for low temp. use)			class 150	class 300	class 600	K	φF
		Class 150/300	Class 600	Class 150/300	Class 600						
1/2	PA2	501		626		255	31	32	32	288	217
	PA3	542		667		321				288	217
3/4	PA2	501		626		255	32	33	33	288	217
	PA3	542		667		321				288	217
1	PA2	486		611		255	49	50	50	288	217
	PA3	527		652		321				288	217
1-1/2	PA2	511		696		255	69	70	71	288	217
	PA3	552		737		321				288	217
	PA4	729		894		411				476	575
	PA5	835		1000		502				476	575
2	PA2	511		696		255	77	78	78	288	217
	PA3	552		737		321				288	217
	PA4	729		894		411				476	575
	PA5	835		1000		502				476	575
2-1/2	PA3	622		797		321	88	90	92	288	217
	PA4	789		954		411				476	575
	PA5	895		1060		502				476	575
3	PA3	622		797		321	109	110	113	288	217
	PA4	789		954		411				476	575
	PA5	895		1060		502				476	575
4	PA3	642		812		321	127	130	134	288	217
	PA4	799		974		411				476	575
	PA5	905		1080		502				476	575
6	PA5	980	1085	1230	1250	502	175	195	223	476	575
8	PA5	1035	1150	1300	1325	502	200	210	255	476	575

Table 14. Weight

Without a side handwheel

Unit: kg

Valve size (inches)	Actuator model	Class 150		Class 300		Class 600	
		Model AS111/ AC111 (for normal temp. use)	Model AS211/AC211 (for high temp. use) Model AS311/AC311 (for low temp. use)	Model AS111/ AC111 (for normal temp. use)	Model AS211/AC211 (for high temp. use) Model AS311/AC311 (for low temp. use)	Model AS111/ AC111 (for normal temp. use)	Model AS211/AC211 (for high temp. use) Model AS311/AC311 (for low temp. use)
1/2	PA2	17	19	18	19	19	20
	PA3	27	29	28	29	29	30
3/4	PA2	17	18	18	20	20	21
	PA3	27	28	28	30	30	31
1	PA2	18	19	19	20	21	22
	PA3	28	29	29	30	31	32
1-1/2	PA2	30	33	33	36	36	39
	PA3	40	43	43	46	46	49
	PA4	72	74	75	77	78	81
	PA5	106	108	109	111	112	115
2	PA2	34	36	36	38	40	42
	PA3	44	46	46	48	50	52
	PA4	75	77	77	80	83	84
	PA5	109	111	111	114	117	118
2-1/2	PA3	58	61	62	65	71	75
	PA4	90	92	95	98	103	106
	PA5	124	126	129	132	137	140
3	PA3	62	64	64	70	75	82
	PA4	93	97	99	102	110	113
	PA5	127	131	133	136	144	147
4	PA3	84	89	100	102	121	124
	PA4	115	118	131	133	153	156
	PA5	149	152	165	167	187	190
6	PA5	219	235	246	263	340	343
8	PA5	320	336	345	376	523	529

With a side handwheel

Actuator model	Add the following weight to the weight shown in Table 14.
PA2	+10 kg
PA3	
PA4	+44 kg
PA5	

Mounting orientation

If not specified, products for mounting orientation No.1 will be delivered. Please check the operability and space available after installation, and then select the orientation.

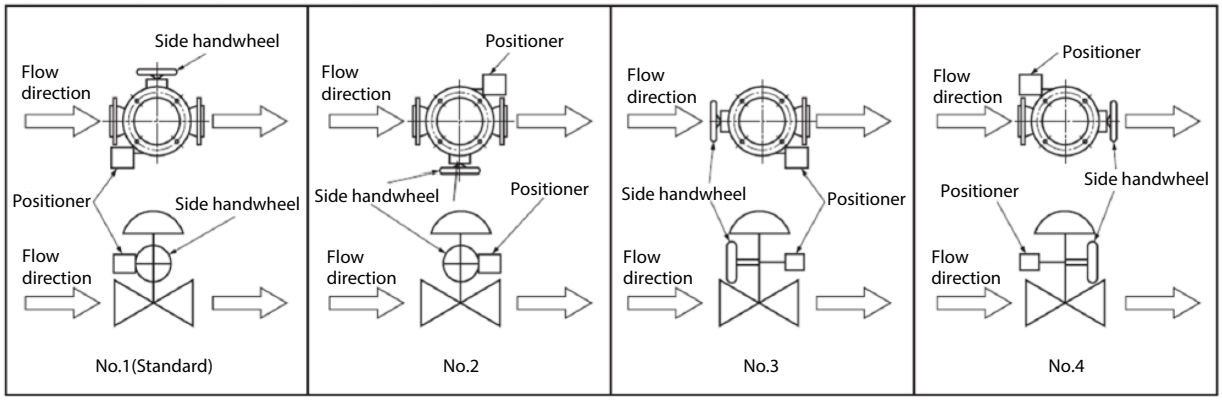


Figure 8. Mounting orientation

Precautions for Use

This manual uses the following symbols to promote the safe use of the product.

⚠ WARNING	Warnings are indicated when mishandling the product might result in the death or serious injury of the user.
⚠ CAUTION	Cautions are indicated when mishandling this product could result in minor injury.

Symbols

⃠	The indicated action is prohibited.
❗	The indicated instructions must be observed.

Precautions for Safe Operation

⚠ WARNING	
❗	Before starting to work, check that the pressure in the pipes has dropped to atmospheric pressure. If fluid spews out, injury may result.

⚠ CAUTION	
⃠	Do not stand on the device or use it as a step. There is a risk of falling.
⃠	Do not touch the device unnecessarily while it is operating. Depending on the operating conditions, the surface might be extremely hot or cold.
❗	Since this product is heavy, when handling it, wear safety shoes and watch your step.
❗	During work, wear protective goggles to prevent injury from flying objects and harm from chemicals.
❗	During work, wear protective gloves to prevent injury from burrs on bolt heads or edges and harm from chemicals.
⃠	While this device is operating, do not touch movable parts such as the stem connector. Your hand, etc., may be caught in the mechanism and be injured.
❗	When assembling or disassembling the diaphragm, which is part of the actuator, wear protective gloves to prevent prolonged contact with your skin. “Prolonged contact” refers to total daily skin contact of 10 minutes continuously or 30 minutes intermittently.

Installation precautions

⚠ WARNING	
❗	If the rated pressure or standards for connection are ignored when this device is used, damage to the product or leakage may cause a serious accident.
⃠	When connecting the valve to the piping, do not put your hand or foot under the valve or between flanges. You may lose your fingers or your foot may be injured.
❗	Before reinstalling the valve after maintenance or modification, wash out any residual fluid in the pipes or replace it with a safe fluid. Otherwise, the residual fluid may cause an injury.

⚠ CAUTION	
❗	Make sure that there is a straight pipe section at least 10 times the pipe diameter on the upstream side and 6 imes the pipe diameter on the downstream side (D: nominal diameter). If the straight pipe sections are not long enough, insufficient valve capacity or unusual noise or vibration could result.
❗	Install the valve in the correct direction, leaving clearance around the valve as much as possible for easy maintenance (piping, wiring, adjustment, etc.).
❗	Provide appropriate support for the valve itself and for connected pipes to prevent an excessive load from the weight and operation of the valve. (Care is needed especially for large valves and valves for low-temperature fluid.)
❗	If the valve is installed along a passageway used by outsiders, install a fence or cover as a protective measure.
⃠	Do not install the valve where it may be submerged by rainwater, covered with snow, or subject to freezing. Otherwise the valve might be damaged
❗	If the valve is exposed to radiant heat, provide a shielding plate or the like. Failure to do so may result in damage to the actuator or auxiliary equipment.
❗	If the valve is exposed to salt or a corrosive atmosphere, take measures against corrosion. Otherwise the valve might be damaged.
❗	Check that there is no damage to the valve (including the actuator and auxiliary equipment).
❗	Check that there is no damage to the flanges or welded piping. If fluid leaks, it may cause injury.
❗	If pipe flanges connected to the valve are being welded, the valve surface may also heat up. Do not touch the valve unnecessarily.
❗	Chamfer the edges of the pipe flanges. Sharp edges can cause an injury.
❗	Check that the pipes on both sides of the valve are firmly supported. Insufficient support may cause leakage from pipe connections, potentially causing injury.
❗	After installation, check that the pipes are still properly aligned. Misalignment may cause fluid leakage from pipe connections, potentially causing injury.
❗	If the eyebolts (eyenuts) attached to the actuator are used to lift the valve, make sure that the weight does not exceed the limit specified in the user's manual. An excessive load may damage the actuator or cause air leakage.
⃠	Do not hang the product using a sling or other means in locations other than those specified in this user’s manual. Threads of long bolts, etc., may become deformed, making disassembly impossible or damaging the product.
❗	Use bolts and nuts that conform to the standards for the pipe flange. If fluid leaks, it may cause injury.
❗	Use new flange gaskets that are appropriate for the properties of the fluid, the operating temperature, and the pressure. Damaged gaskets may cause fluid leakage, potentially causing injury.
⃠	Open the valve fully before flushing the inside of the piping, and do not change the valve travel while the pipes are being flushed. Otherwise, the valve may be damaged by welding spatter or other foreign matter.
❗	When keeping the valve warm or cold, also keep the stud bolts and nuts that connect the valve and the bonnet warm or cold. Thermal deformation may cause fluid leakage, potentially causing injury.

Precautions for air supply piping and electrical work

⚠CAUTION
For the air supply, use pipes with an appropriate internal diameter so that the pressure does not drop while the valve is operating. Failure to do so may result in poor valve performance.
Wiring should be carried out only by qualified technicians and should comply with local electrotechnical standards. Otherwise, there is a danger of electric shock.
Cabling should be carried out in accordance with facility conditions. Use an adapter (and packing) whose size is appropriate for the outer diameter of the cable.
If sealing tape is applied to air supply pipe threads, leave the two threads nearest the tip bare. Clogging caused by pieces of tape may result in poor valve performance.
If liquid packing (thread lock sealant) is used for air supply piping work, do not allow it to enter inside the pipes. If it does, poor valve performance may result.
Avoid doing wiring work on a rainy day or in high humidity. Moisture inside the connectors or the terminal box may cause a short-circuit or rust.

PrecautioPrecautions for assembly and disassembly

⚠WARNING
Before starting work, clean the inside of the valve, replace any residual gas, etc. Otherwise, the residual fluid may cause an injury.
Do not disassemble the pneumatic actuator while supply air pressure is being applied. The compressed air may cause an injury.
Because damaged or corroded bolts and nuts may damage the valve and cause injury, replace them with new ones.
For an actuator that incorporates compressed coil springs, follow the disassembly procedure when removing bolts, nuts, etc. Otherwise, the springs may jump out, causing an injury.

⚠CAUTION
Observe the tightening torques indicated in the user's manual when tightening bolts and nuts.
When removing the valve from the piping, if the eyebolts (eyenuts) attached to the actuator are used to hoist the valve, make sure that the weight does not exceed the limit specified in the user's manual. Otherwise, the valve may fall.
Before removing or attaching the trim (internal valve), check whether a dedicated tool is necessary. If it is needed, be sure to use it. Otherwise, parts may be damaged.
Assemble the valve using the parts, bolts, nuts, etc., in the order stated in the assembly procedure. Otherwise, malfunction may result.
When reassembling the valve, use new packing and gaskets. The reuse of old parts may cause fluid leakage.

Precautions for maintenance

⚠WARNING
If fluid leakage from the valve is found, stay away from the valve until safety can be confirmed. Depending on the properties of the fluid, a serious accident or injury may result.

⚠CAUTION
Check the gland daily, and tighten the packing if leakage is found.
Check valve operation daily, including a visual check for hunting.
During valve operation, look and listen for unusual noise or vibration.

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