

The Best in Sanitary Flow Control Equipment

771 Throttling Valve

Application

The 771 air-operated throttling valve is ideal for high volume, sanitary liquid processing applications where precision control of flow rate or pressure is required. Its heavy-duty construction and precision-molded bonnet gaskets ensure positive alignment under severe operating conditions. The 771 valve has a sanitary and flexible design allowing it to be used in a wide range of metering, blending, weighing and filling system applications.

Working principle

The valve is remote-controlled by means of compressed air. It has few and simple moveable parts which results in a very reliable valve.

Standard Design

771 throttling valves are designed to deliver years of reliable performance. They feature a broad selection of stainless steel, tapered valve stems and special actuators that ensure an outstanding degree of precise product control. Rugged and long-lasting plastic stem bushings eliminate metal-to-metal galling. The stems are threaded to the actuator shaft, eliminating the coupling between the stem and the actuator, thereby ensuring proper alignment. The valve stem design requires only a single o-ring seal. Bushings at each end of the actuator cylinder support stem also ensure perfect alignment. 32Ra finish is standard on the ID.

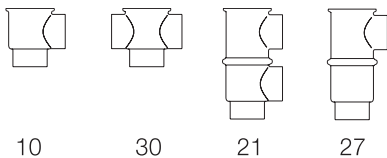
Actuator Function

- Pneumatic downward movement, spring return (NO).
- Pneumatic upward movement, spring return (NC).
- Pneumatic positioner controlled (NO).
- Pneumatic positioner controlled (NC).

Other valves in the same basic design:

- 371 Throttling valve

Valve body combinations



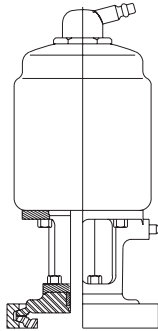
771 Throttling valve, 10 body, with positioner

Actuator

Actuator Function

Diaphragm Type

Diaphragm Type Actuators are recommended for applications when positioners are not typically required. Their low friction characteristics result in a smooth modulating action.



-Type 15 (air-to-close — spring-to-open)

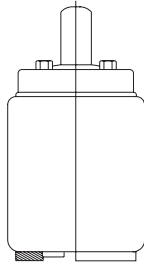
Diaphragm Type Actuator for use on 771-10 and 771-30 Shut-Off Type Valves. Maximum air pressure is 20 to 40 psi (1.5 to 2.75 bar) depending on valve size.

-Type 25 (air-to-open — spring-to-close)

Diaphragm Type Actuator that can be used on the 771-27 Reverse Acting Type Valves only. Since it is easy to overpower this type of actuator, it is only recommended for applications where product pressures are low.

Piston Type

Piston actuators are recommended for higher pressure applications and line sizes above 2 inches as they can be used throughout a wide range of product pressures.



-Type 10 (air-to-close — spring-to-open)

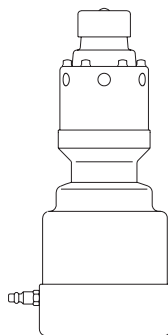
Piston Actuator can be used on all valve body types. Minimum air supply required is 70 psi (4.14 bar). Maximum air supply required is 100 psi (6 bar).

-Type 20 (air-to-open — spring-to-close)

Piston Actuator can be used on all valve body types. Minimum air supply required is 70 psi (4.14 bar). Maximum air supply required is 100 psi (6 bar).

Positioners

Integral valve positioners are also available. They operate with a pneumatic signal span, typically 3 - 15 psi. This signal drives the valve by using the full force of the air supply (up to 90 psi). The positioner works with the signal from the controller and a supply air line. This allows the valve to act as if it has a built in air booster. In addition, the positioner will hold the stem in a static position regardless of product flow or pressure. Positioners may be attached to either piston or diaphragm type actuators.



- 14D (normally-open/air-to-close with positioner) diaphragm style
- 14P (normally-open/air-to-close with positioner) piston style
- 24D (normally-closed/air-to-open-with positioner) diaphragm style (type 771-27 only)
- 24P (normally-closed/air-to-open with positioner) piston style

Actuator Air Supply Specifications

See chart below for minimum air pressure requirements. Maximum air pressure is 100 psi (normal). Air volume required is identified by the length of the stroke.

Valve Size	Stroke (inch)	Volume (cu. in.)
1-inch	0.75	11.1
1½-3-inch	0.75	11.1
4-inch short stroke HP	2.00	50.0
Type 15 diaphragm	1.00	18.0

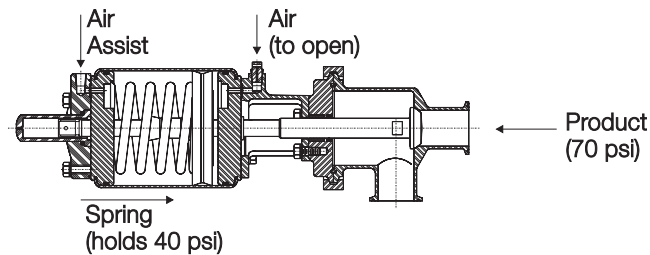
Lubricated air is not required. Filtered air and a pressure regulator valve are required.

Additional Holding Pressure

Additional air supply must be relieved when product pressure is not present. Failure to do so will result in pressure damage to the seat. When using additional air loading, it should exceed the minimum required by no more that 3 to 5 psig.

Example: A customer has an application for a 3" valve that is required to hold 70 psi product pressure with an elastomer (Buna). The valve without an air assist will hold 40 psi. An additional holding force to overcome 30 psi (70 psi-40 psi) is needed. Since the ratio is 5:10 (air-to-product pressure ratio) a 15 psi air assist is needed.

Note! Since it takes 60 psi to fully stroke the valve without air assist, it will take 75 psi to open the example. (60 psi+15 psi)



Valve Size	Air to Product Pressure Ratio	Max. Recommended Air Assist	Max. Product Holding Pressure
1-inch	1:10	10	200
1½-inch	1:10	5	200
2-inch	2:10	10	150
2½-inch	3:10	20	100
3-inch	5:10	35	100
4-inch HP	4:10	25	100

Actuators

Actuator Air Supply Specifications:

- Air pressure range for sizes 1-3" is 35 to 50 psi (normal)
- Air volume required, sizes 1-3": 16 cu. inches

Type 10

Type 10 Piston (Normally-open) used on 371-10, 371-30 and 371- automatically opens the valve.

Type 10 (Normally-Open)

Size (Tube OD)	Product Line Pressure Valve will hold against	
	70 psi - air supply to actuator	90 psi - air supply to actuator
1-inch	105 psi	105 psi
1½-inch	120 psi	150 psi
2-inch	80 psi	150 psi
2½-inch	35 psi	80 psi
3-inch	20 psi	60 psi

Note! Actuator can accommodate air supply pressure in excess of 50 psi to close against higher line pressures. Consult Alfa Laval for recommendations

Type 20

Type 20 Piston (Air-to-open, spring-to-close) used on 771-10, 771-30 and 771-21 when a normally-closed valve is required for fail-safe operation. In the event of air failure the spring automatically closes the valve.

Holding pressure for Type 20 (air-to-open, spring-to-close) is as follows:

Size (Tube OD)	Product Line Pressure Valve will hold against
1-inch	105 psi
1½-inch	140 psi
2-inch	80 psi
2½-inch	50 psi
3-inch	40 psi

Type 15/25

Type 15 Diaphragm (air-to-close, spring-to-open) used on 771-10, 771-30 and 771-21 valves. Type 25 Diaphragm (air-toopen, spring-to-close) used on 771-27 Reverse Acting Valve only.

Shut-Off line pressure for Type 15 (air-to-open, spring-to-close) is as follows:

Size	Air Supply Pressure						Product Line Pressure Valve will hold against
	20 psi	30 psi	40 psi	50 psi	60 psi	80 psi	
1-inch	70 psi	100 psi	-	-	-	-	
1½-inch	40 psi	60 psi	110 psi	-	-	-	
2-inch	20 psi	40 psi	78 psi	100 psi	-	-	
2½-inch	0 psi	25 psi	40 psi	55 psi	70 psi	100 psi	
3-inch	0 psi	0 psi	31 psi	45 psi	57 psi	82 psi	

Air Loading for Air/Air Actuator

The following shows the additional air supply pressure required to hold each additional 10 psi of product line pressure. (Type 20)

1½"-1.0 psi	2½" - 3.0 psi
2" - 2.0 psi	3" - 4.5 psi

Size (Tube OD)	Product Line Pressure Valve will hold against
1½-inch	25 psi
2-inch	18 psi
2½-inch	10 psi
3-inch	9 psi



Valve Sizing

Flow Coefficients (Cv)

The following formula and flow coefficient values enable you to select the correct throttling valve for your application.

Formula for water and other products with a specific gravity equal to 1.0:

$$Cv = \frac{GPM}{\sqrt{\Delta P}}$$

Formula for products with a specific gravity other than to 1.0:

$$Cv = \frac{GPM}{\sqrt{\Delta P / SG}}$$

Where:

GPM = Product flow rate in gallons per minute

SG = Specific gravity of product

P = Pressure drop across valve in psi
(inlet pressure minus outlet pressure)

Example of Cv Calculation:

Determine the proper size valve for 175 GPM of water.

Inlet pressure of 11 psi

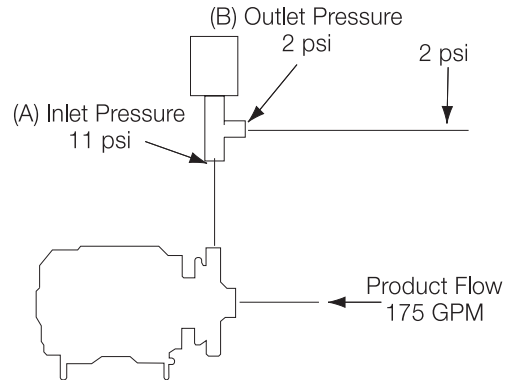
Outlet pressure of 2 psi

Solution: Inlet pressure (A) minus outlet pressure (B):

DP = 11 psi - 2 psi = 9 psi

DP = 11 psi - 2 psi = 9 psi

$$Cv = \frac{175}{\sqrt{9}} = \frac{175}{3} = 58.3$$



How to Use Data to Select Valve Size

After the Cv factor for a specific application has been calculated, locate the factor on Chart A on the following page. If the Cv factor resulting from your calculations is not shown in the charts, use the next closest factor. There are instances where a Cv factor may be listed in several columns. In situations of this type, select the size valve where the factor is closest to the optimum operating point (Optimum operating point is when valve is 50% open). If a valve is already in place and requires a lower Cv than the standard parabolic stem (Chart A), use Chart B to size for an appropriate special taper stem.

Using the above example, refer to the charts on the following page, and you'll find that the Cv factor (58) is listed in the short stroke columns for 2" (50.8 mm), 2½" (63.5mm), and 3" (76.2 mm). The correct valve size to use is 2" (50.8 mm) because the factor of 58.3 is closest to the optimum operating point of 50%.

Valve Sizing

Chart A: 771 Series Shut-Off Valves (Cv) Factor (Standard) Parabolic Taper

% of Valve Stroke	1" (25.4 mm)	1½" (38.1 mm)	2" (50.8 mm)	2½" (63.5 mm)	3" (76.2 mm)	4" (101.6 mm)	% of Valve Stroke
10	4.0	5.6	11.5	17.4	22.0	45.0	10
20	5.3	10.0	26.0	33.0	43.0	99.0	20
30	6.9	14.3	36.4	48.0	64.5	138.0	30
40	8.3	18.4	46.0	63.0	85.4	167.0	40
50*	9.8	22.0	55.0	77.0	105.0	198.0	50*
60	11.3	25.8	64.0	90.5	125.0	228.0	60
70	12.6	29.2	72.0	104.0	145.0	258.0	70
80	14.3	32.5	80.0	115.0	164.0	287.0	80
90	16.0	34.9	88.5	126.0	178.0	316.0	90
100	20.0	36.0	96.0	136.0	184.0	344.0	100

* Optimum operating point.

Chart B: 771 Series Valves (Cv) Factor Special Taper Stems**

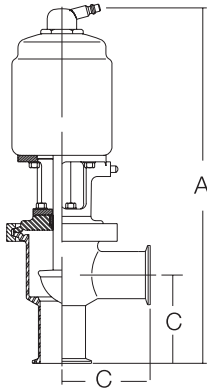
% of Valve Stroke	1" (25.4 mm)			1½" (38.1 mm)				2" (50.8 mm)			2½" (63.5 mm)				3" (76.2 mm)				% of Valve Stroke
	½°	2°	6°	1°	2°	6°	9°	2°	6°	15°	2°	6°	9°	15°	3°	6°	9°	15°	
	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	Taper	
10	1.5	1.7	2.5	1.0	2.0	2.9	6.6	3.2	6.7	11.8	4.2	5.2	6.5	11.6	6.5	6.7	10.0	11.6	10
20	1.7	2.0	3.4	1.4	2.5	4.8	11.1	4.5	11.0	17.2	6.0	8.7	12.2	18.5	8.9	12.4	15.4	18.2	20
30	1.9	2.2	4.1	1.8	3.0	6.3	8.0	6.4	14.2	22.6	7.4	11.6	16.9	25.1	10.6	15.8	20.2	24.0	30
40	2.1	2.5	4.7	2.2	3.5	7.7	10.0	7.6	17.0	27.2	8.6	14.4	21.9	31.0	12.2	18.7	24.2	30.0	40
50*	2.3	2.8	5.3	2.6	4.0	9.2	11.5	9.0	20.0	32.7	9.7	17.0	26.2	37.0	13.8	21.8	28.6	36.8	50*
60	2.5	3.1	5.8	3.0	4.5	10.5	13.0	10.3	22.7	38.1	10.6	19.6	31.8	42.4	15.6	25.0	34.0	44.0	60
70	2.6	3.4	6.2	3.5	4.9	11.5	14.2	11.8	24.8	43.7	11.5	21.8	36.4	46.8	17.0	27.9	38.0	50.0	70
80	2.7	3.7	6.6	4.0	5.4	12.6	16.0	12.5	27.8	49.0	12.4	24.0	41.4	50.0	18.6	30.6	41.8	56.0	80
90	2.9	4.1	7.0	4.5	5.7	14.0	18.0	13.2	31.2	53.8	13.2	26.0	45.2	53.8	20.2	33.7	45.6	63.0	90
100	3.2	4.7	7.3	5.5	6.6	15.7	20.0	14.2	35.2	60.0	14.0	28.2	49.5	56.4	21.6	36.2	49.2	69.0	100

* Optimum operating point.

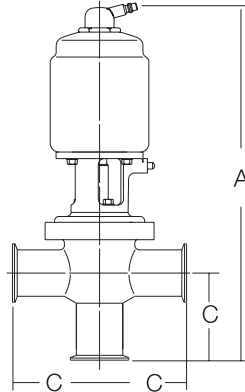
** Other taper stems available upon request.



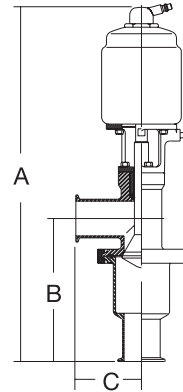
Dimensions



771-10 Shut-off Valve



771-30 Shut-Off Valve



771-27 Reverse-Acting Valve

Diaphragm Actuated Throttling Valve

Valve Size (Tube OD)	A				B		C	
	Shut-Off Valve		Reverse-Acting Valves		Reverse-Acting Valves		All Valves	
	inch	mm	inch	mm	inch	mm	inch	mm
1-inch	14.13	358.80	NA	NA	NA	NA	2.50	63.50
1½-inch	15.06	382.60	18.63	473.10	7.38	187.30	2.75	70.00
2-inch	15.56	395.30	19.13	485.80	7.63	193.70	3.50	89.00
2½-inch	15.50	393.70	19.75	501.60	8.00	203.20	3.50	89.00
3-inch	15.50	393.70	20.75	527.00	8.75	222.20	3.75	95.20

Positioner Actuated Throttling Valve

Valve Size (Tube OD)	A				B		C	
	Shut-Off Valve		Reverse-Acting Valves		Reverse-Acting Valves		All Valves	
	Diaphragm		Piston		Diaphragm			
inch	mm	inch	mm	inch	mm	inch	mm	
1-inch	20.13	511.2	20.88	530.20	NA	NA	2.50	63.50
1½-inch	20.13	511.20	23.13	587.40	23.63	600.10	2.75	70.00
2-inch	20.63	523.90	23.63	600.10	25.38	644.50	3.50	89.00
2½-inch	20.63	523.90	23.63	600.10	25.63	651.00	3.50	89.00
3-inch	21.13	536.60	24.13	614.80	25.63	651.00	3.75	95.00
4-inch	NA	NA	30.00	762.00	NA	NA	4.00	101.60

Valve Size (Tube OD)	A				B		C	
	Shut-Off Valve		Reverse-Acting Valves		Reverse-Acting Valves		All Valves	
	inch	mm	inch	mm	inch	mm	inch	mm
1-inch	14.88	377.80	NA	NA	NA	NA	2.50	3.50
1½-inch	17.13	435.00	20.72	536.20	7.38	187.20	2.75	70.00
2-inch	17.63	447.70	21.16	538.20	7.63	193.70	3.50	89.00
2½-inch	17.56	446.10	21.85	54.80	8.00	203.20	3.50	89.00
3-inch	18.06	458.80	22.85	580.20	8.75	222.20	3.75	95.20
4-inch	25.00	635.00	31.00	787.40	NA	NA	4.00	101.60

Technical data

Maximum product pressure	depends on valve specifications and size (contact Alfa Laval)
Temperature range	200° F to 284° F (EPDM)
Air pressure	60-80 PSI

Materials

Product wetted steel parts	stainless steel AISI 316L
Finish	32 microinch Ra standard
Other steel parts	stainless steel AISI 304
Plug stem	stainless steel AISI 316L
Product wetted seals	Buna
Process connections	Tri-Clamp® or weld

Options

Equipment

- Process connections, weld, bevel seat
- Positioner 3-15 psi
- High pressure actuator for 2½" and 3" size
- 20 Ra or 15 Ra ID surface finish
- Special taper stem plugs

Material Grades

- O-rings and seals of EPDM or SFY (Flouroelastomer)

Ordering

Please state the following when ordering:

- Size.
- Connections
- Valve body combination
- Actuator type and function, NC, NO or A/A Piston or Diaphragm
- With or without Positioner
- Options.