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The Best in Sanitary Flow Control Equipment

371 Throttling Valve

PD 66363 US1 2001-07

Application

This air-operated throttling valve features the positive action of a short-stroke actuator and is used in applications where level or pressure control is desired. The 371 valve is ideal for high volume, sanitary liquid processing applications. The 371 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

The 371 consists of an open yoke, visible valve stem coupler, actuator, plug and valve bodies. All components are assembled by means of clamp rings and a stem clip-system. They feature a broad selection of stainless steel tapered valve stems and special actuators that ensure an outstanding degree of precise product control. The valve stem seal design requires only a single o-ring. To ensure full drainage, the valve porting is flush to the bottom surface of the valve body and the highly polished surface areas help eliminate crevices and "blind" areas that can hide or trap bacteria.

Actuator function

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

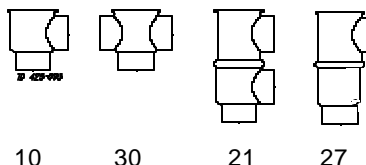
Other valves in the same basic design

- 771 Throttling valve



Fig. 1. 371 Throttling valve with 10 body

Valve body combinations

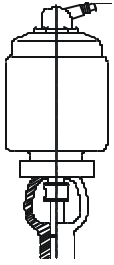


Actuator

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 371-10 and 371-30

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)

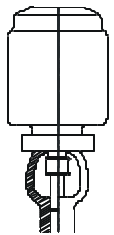
Diaphragm Type Actuator that can be used on the 371-27 Reverse

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 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 40 psi (2.75 bar). Maximum air supply required is 80 psi (5.5 bar).

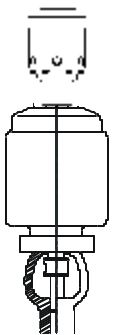
-Type 20 (air-to-open — spring-to-open)

Piston Actuator can be used on all valve body types.

Minimum air supply required is 40 psi (2.75 bar). Maximum air supply required is 80 psi (5.5 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 50 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.



-14 (normally-open/air-to-close with positioner)
diaphragm style

-14P (normally-open/air-to-close with positioner)
piston style

-24 (normally-closed/air-to-open with positioner)
piston style

Actuator Air Supply Specifications

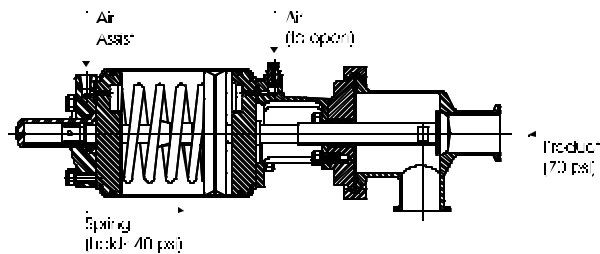
Lubricated air is not required. Filtered air and a pressure regulator valve are required.

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 40 psi to fully stroke the valve without air assist, it will take 55 psi to open the example. (40 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

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 371-21 valves. In the event of air failure the spring automatically opens the valve.

Size (Tube OD)	Product Line Pressure Valve will hold against	
	35 psi air supply to actuator	50 psi air supply to actuator
1-inch	250 psi	250 psi
1½-inch	250 psi	135 psi
2-inch	140 psi	65 psi
2½-inch	78 psi	33 psi
3-inch	57 psi	27 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 371-10, 371-30 and 371-21 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	60 psi
1½-inch	120 psi
2-inch	72 psi
2½-inch	38 psi
3-inch	31 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 220)

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

Type 15/25

Type 15 Diaphragm (air-to-close, spring-to-open) used on 371-10, 371-30 and 371-21 valves. Type 25 Diaphragm (air-to-open, spring-to-close) used on 371-27 valve only. Recommended because of low friction characteristics and smooth action on modulating applications. Available with valve positioner No. 214 or 224 as integral part of actuator assembly. Repeatability of positioner -0.3% of total actuator stroke.

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	

Holding pressure for Type 25

(air-to-open, spring-to-close) is as follows:

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 is:

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

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

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

Where:

GPM = Product flow rate in gallons per minute
SG = Specific gravity of product
 ΔP = 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.

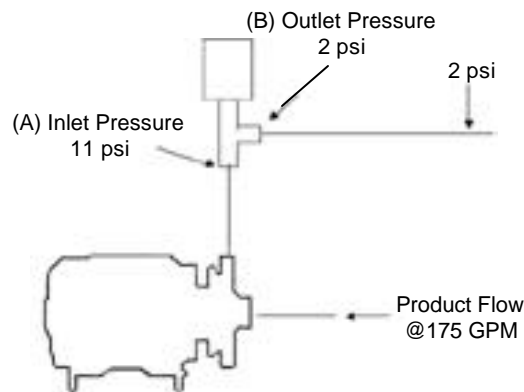
Inlet pressure of 11 psi

Outlet pressure of 2 psi

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

$$DP = 11 \text{ psi} - 2 \text{ psi} = 9 \text{ psi}$$

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



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: 371 Series Shut-Off Valves (Cv) Factor (Standard) Parabolic Taper

% of Valve Stroke	371-10 & 371-30					371-21 & 371-27					% of Valve Stroke
	1" (25mm)	1½" (38mm)	2" (51mm)	2½" (63.5mm)	3" (76mm)	1" (25mm)	1½" (38mm)	2" (51mm)	2½" (63.5mm)	3" (76mm)	
10	4.0	4.0	4.0	6.0	11.5	3.05	6.6	14.0	21.6	23.3	10
20	5.3	5.0	15.5	26.0	35.0	5.0	11.3	23.8	36.0	40.7	20
30	6.9	8.4	30.0	45.0	56.0	6.6	15.5	32.5	49.0	55.5	30
40	8.3	11.8	41.0	60.0	76.0	8.1	19.4	40.0	58.8	69.0	40
50*	9.8	16.5	51.5	78.0	99.0	9.6	23.0	47.8	70.0	82.0	50*
60	11.3	21.5	62.0	9.8	120.0	10.8	26.5	54.7	80.0	96.0	60
70	12.6	26.5	72.0	113.0	140.0	12.0	30.0	61.0	89.5	110.0	70
80	14.3	31.5	82.0	129.0	161.0	13.2	33.2	67.0	98.0	123.0	80
90	16.0	37.5	92.0	145.0	180.0	14.3	36.8	73.5	109.0	134.0	90
100	20.0	43.0	102.0	155.0	197.0	15.4	40.0	79.0	118.0	145.0	100

* Optimum operating point.

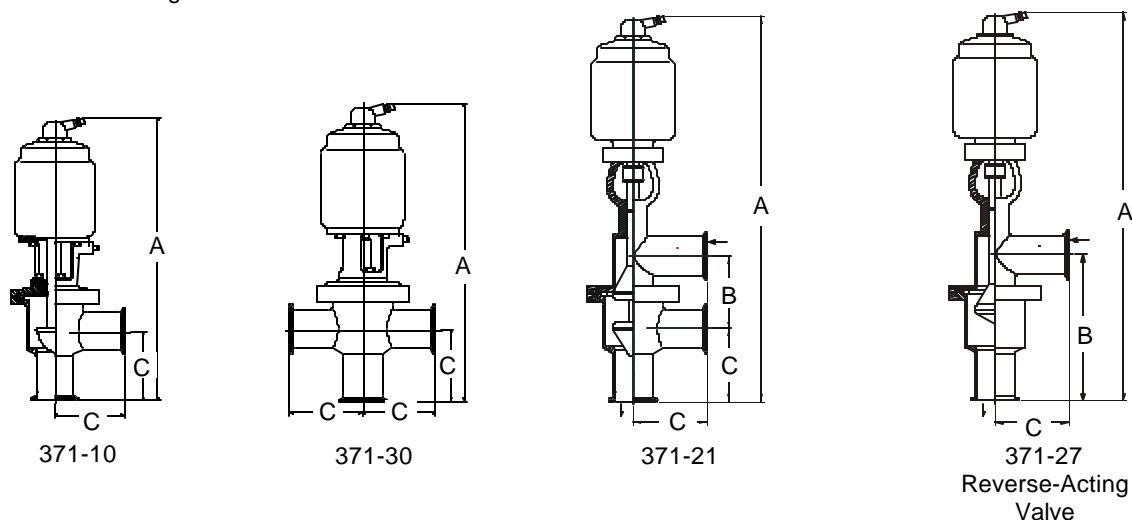
Chart B: 371 Series Valves (Cv) Factor Special Taper Stems**

% of Valve Stroke	1" (25.4mm)			1½" (38.1mm)				2" (50.8mm)			2½" (63.5mm)				3" (76.2mm)				% of Valve Stroke
	½° Taper	2° Taper	6° Taper	1° Taper	2° Taper	6° Taper	9° Taper	2° Taper	6° Taper	15° Taper	2° Taper	6° Taper	9° Taper	15° Taper	2° Taper	6° Taper	9° Taper	15° Taper	
10	1.5	1.7	2.5	1.0	2.0	2.9	6.6.0	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.

Dimensional Diagrams



Diaphragm Actuated Throttling Valve

Valve Size	A				B				C	
	Shut-Off Valve		Divert & Reverse Acting		Divert Valve		Reverse Acting		All	
	in	mm	in	mm	in	mm	in	mm	in	mm
1-inch	14.00	356.00	--	--	--	--	--	--	--	63.50
1½-inch	13.88	352.50	17.91	455.00	3.25	82.50	6.00	152.50	2.75	70.00
2-inch	14.88	378.00	19.41	493.00	3.75	95.00	7.25	184.00	3.50	89.00
2½-inch	15.13	384.00	20.16	512.00	4.25	108.00	7.75	197.00	3.50	89.00
3-inch	15.63	397.00	21.16	537.50	4.75	121.00	8.50	216.00	3.75	95.00

Positioner Actuated Throttling Valve

Valve Size	A				B				C	
	Shut-Off Valve		Divert & Reverse Acting		Divert Valve		Reverse Acting		All	
	in	mm	in	mm	in	mm	in	mm	in	mm
1-inch	21.00	533.00	--	--	--	--	--	--	--	63.50
1½-inch	20.90	531.00	24.19	632.00	3.25	82.50	6.00	152.50	2.75	70.00
2-inch	21.90	556.00	26.41	617.00	3.75	95.00	7.25	184.00	3.50	89.00
2½-inch	22.15	563.00	27.16	688.00	4.25	108.00	7.75	197.00	3.50	89.00
3-inch	22.65	575.00	28.16	714.00	4.75	121.00	8.50	216.00	3.75	95.00

Piston Actuated Throttling Valve

Valve Size	A				B				C	
	Shut-Off Valve		Divert & Reverse Acting		Divert Valve		Reverse Acting		All	
	in	mm	in	mm	in	mm	in	mm	in	mm
1-inch	13.96	355.00	--	--	--	--	--	--	--	63.50
1½-inch	13.89	352.00	17.91	455.00	3.25	82.50	6.00	152.50	2.75	70.00
2-inch	14.87	378.00	19.41	493.00	3.75	95.00	7.25	184.00	3.50	89.00
2½-inch	15.12	384.00	20.16	512.00	4.25	108.00	7.75	197.00	3.50	89.00
3-inch	15.62	397.00	21.16	537.00	4.75	121.00	8.50	216.00	3.75	95.00

Technical data

Maximum product pressure	depending on valve specifications and size (contact Alfa Laval)
Temperature range	200° F to 285° F (EPDM)
Air pressure	35-50 PSI
Air pressure range for sizes 1-3"	35-50 PSI (normal)
Air volume required for sizes 1-3"	16 cu. inches

Materials

Product wetted steel parts	stainless steel AISI 316L.
Finish	32 Ra Standard ID (Scotch Brite OD)
Other steel parts	stainless steel AISI 304.
Plug stem	316L Tapered Plug
Product wetted seals	Buna
Other seals	Buna
Product connections	Tri-Clamp®

Options

Equipment

- Product connections: weld, bevel seat
- 20 Ra ID surface finish
- Positioner (Type-3-15 psi Air Control Signal)
- Special taper stem plug

Material Grades

- Seals and gaskets of EPDM or SFY (fluoroelastomer)

Ordering

Please state the following when ordering:

- Size
- Product connections
- Valve body combination
- Actuator function, NC, NO , Positioner, Type 15 (NO)
- Options

Air Actuator Supply Specifications

Air pressure range determined by control instrument.

Lubricated air is not required. Filtered air is required.

Actuator	Effective Operating Area:	Air Volume Required: (per cycle)
Type 10 & Type 20	14.5 sq. in. (94 sq. cm.)	Short Stroke- 16 cu. in. (255cc)
Type 15 & Type 25	9 sq. in. (58 sq. cm.)	18 cu. in. (295cc)

