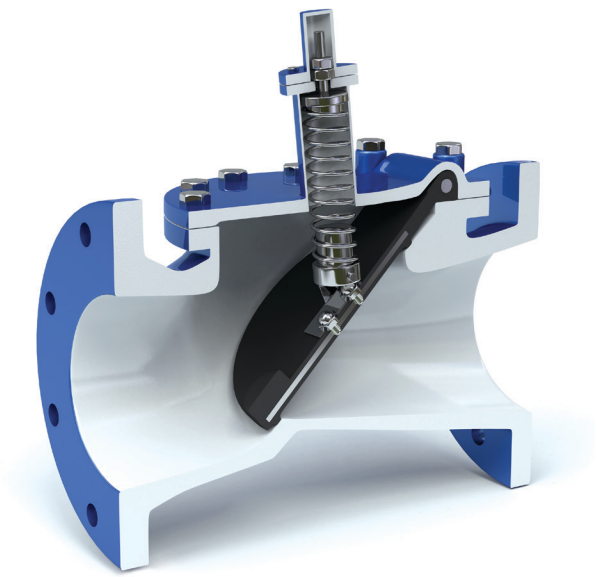
DeZURIK

BULLETIN 100
DECEMBER 2023

APCO CRF100,100SA &100SR RUBBER FLAPPER SWING CHECK VALVES

Design & Construction

APCO CRF 100, 100SA and 100SR Rubber Flapper Swing Check Valves are uniquely simple in design but durable for use on a variety of applications. Available in sizes 2-48" (50-1200mm), they are available in Ductile Iron or Cast Iron bodies with ASME 125/150 flanges and maximum pressure ratings up to 175 psi (1210 kPa). For additional abrasion resistance, full-flow area bodies can be lined with elastomers.



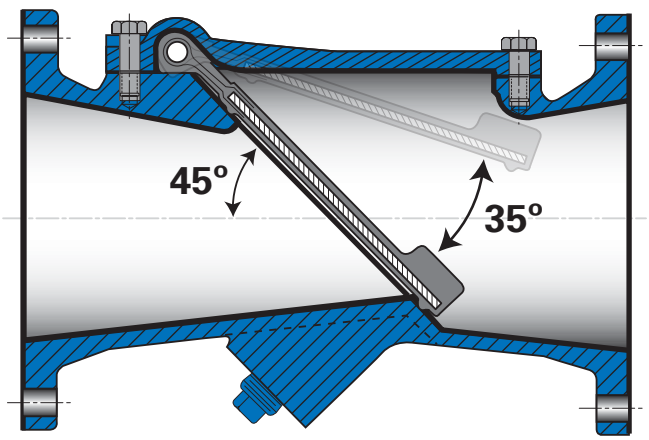
Since the APCO CRF Rubber Flapper Check Valve was introduced in 1965, it has been operating successfully in thousands of installations. The unique features of the Rubber Flapper Check Valve makes it ideally suited for applications such as raw sewage, water systems, industrial wastes, chemical lines, erosive services, ash service, acid lines, tailings systems, light slurries, corrosive services, leaching lines, scrubbers, and brine & salt water systems.

Unique 45° Angle Provides Non-Slam Properties

APCO CRF Rubber Flapper Swing Check Valves feature a unique, simple design with one moving part. The flapper does not swing from a hinge pin; it simply flexes open. The valve body seat is on an angle of 45° to the centerline of the pipe, permitting horizontal or vertical flow up installation. The unique 45° angle on the body seat gives the valve non-slamming properties. The flapper travels 35° from open to close, usually before column reversal can occur.

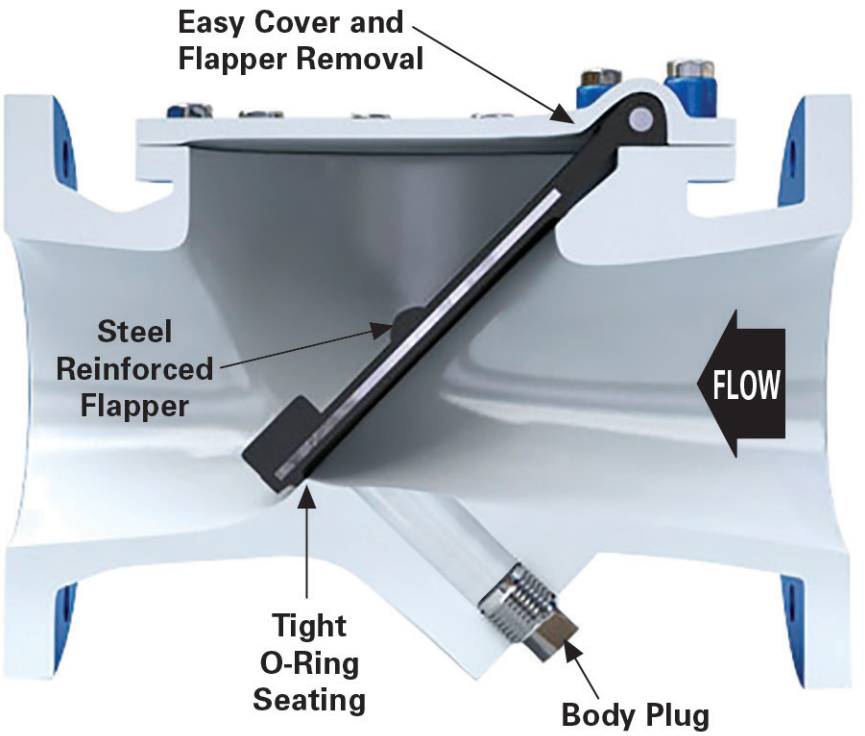
Full Flow Area

With the flapper fully open, there is a straight unobstructed flow passage, so all foreign matter is flushed away by the flowing medium. This eliminates clogging associated with other valve styles. Due to this unobstructed flow passage, the pressure drop is considerably lower through the APCO Rubber Flapper Check than through conventional swing check valves.



Precision Molded, Steel Reinforced Rubber Flapper Provides Bubble Tight Seating

The Acrylonitrile-Butadiene (NBR) flapper provides excellent abrasion-resistant qualities. The flapper can also be compression molded with Terpolymer of Ethylene Propylene & A Diene (EPDM) or other synthetic rubbers on application. A steel disc for strength and a steel bar are molded inside the flapper.



Cycle Tested Flapper Prevents Jamming or Sticking

A high strength fabric is integrally molded over the disc and bar to form a flexible joint. When the valve is assembled, the flapper is firmly clamped between body and cover. This feature eliminates problems of moving parts, shafts, pins, bearings, bushings or packing (as required in conventional check valves). The flapper design prevents jamming or sticking in the open position.

Rubber Flapper Provides Bubble-Tight Sealing

The o-ring seal molded into the disc face assures positive sealing, even at lower pressures.

No Regular Maintenance Required

With only three major parts: Body, Flapper and Cover, the CRF Rubber Flapper Check Valve requires relatively no maintenance. If maintenance should be required, the flapper can be replaced in a matter of minutes.

4.3" Size Designed Specifically for Raw Sewage

The 4.3" size Rubber Flapper Swing Check Valve is specifically designed for raw sewage with a flow area through the seat almost twice (23.76", 604mm) that of standard pipe (12.73", 323mm) permitting the valve to pass a 3" (76mm) diameter solid as required by many states and municipalities for 4" (100mm) check valves used on sewage lift stations.

Choice of Body Materials

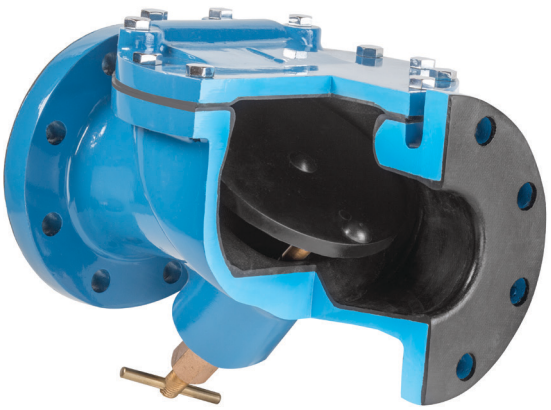
Unlined bodies are normally made of Ductile Iron for 2-24" (50-600mm) sizes and Cast Iron for 30-48" (750-1200) sizes. Ductile Iron and Cast Iron valves can be lined with elastomers for additional abrasion resistance.

Buried Service Valves

When used in buried service applications, the CFR Rubber Flapper Swing Check Valve can be ordered with 316 stainless steel cover bolts for corrosion resistance.

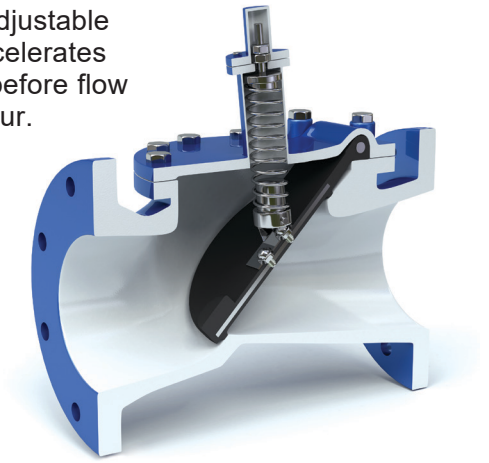
Rubber Lined Bodies For Extra Abrasion Resistance

The CRF Rubber Flapper Swing Check Valve is specially designed for rubber lining. The valve contains no sharp corners or crevices, and the smooth body and cover contours readily accept the 1/8" rubber lining or coating. The result after lining is a totally encapsulated valve without any exposed metal surfaces. Bodies can be lined with Natural Rubber (NR), Terpolymer of Ethylene Propylene & A Diene (EPDM) or Acrylonitrile-Butadiene (NBR).



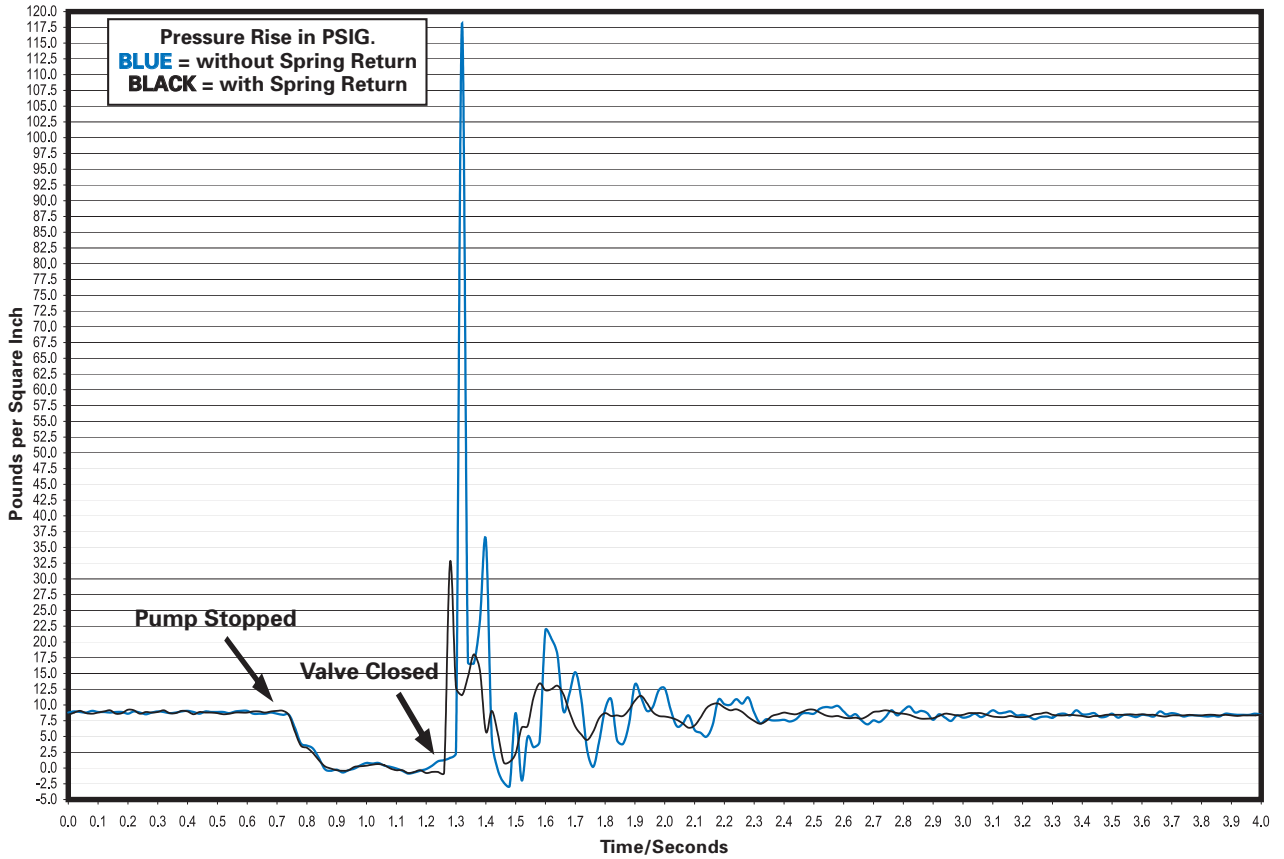
Spring Return Rubber Flapper Swing Check Valve (100SR)

In difficult high head applications where rapid flow reversal can occur, standard swing check valves will often slam. The CRF-100SR Spring Return model was designed to eliminate or minimize slam in these applications, even in tough vertical flow-up installations.



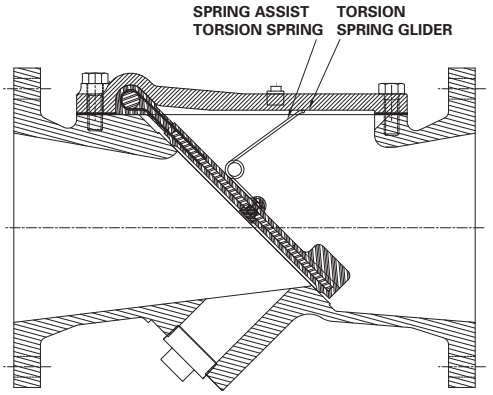
The externally adjustable spring return accelerates flapper closure before flow reversal can occur. The stainless steel helical compression spring can be externally adjusted without removing the cover from the valve or removing the valve from service. Adjustments are made by an external sealed screw which provides infinite adjustment to the internal spring compression.

The graph below compares closing characteristics of the rubber flapper swing check valve with and without the spring return closure. The installation is “flow up” and the power failure simulation for the tests was identical. The pressure rise (black line) with the spring return closure was only 33 psi (228 kPa). This represents a 85 psi (586 kPa) reduction in the pressure surge. Also, subsequent wave patterns were more subdued and rounded. On-site closure noise (valve slam) and pipe displacement disappeared with the 100SR Spring Return.



Spring Assist Rubber Flapper Swing Check Valve (100SA)

The CRF Rubber Flapper Check Valve with Spring Assist Closure includes a Stainless Steel double torsion spring mounted to the flapper that accelerates valve closure before reverse flow can occur, minimizing potential valve slam. The double torsion spring is rigidly secured to the flapper.

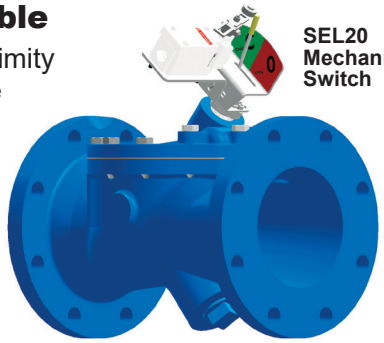


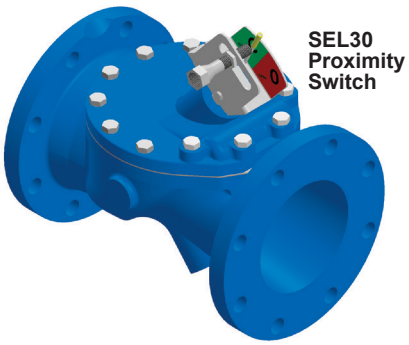
Hold Open Device For Backflushing

The Hold Open Device, available on 3-30" (80-750mm) valve sizes, can be ordered on the valve to make back-flushing the system, priming pumps or draining the system safe and convenient. The APCO Backflow Device meets OSHA's easily activated requirements without risk of injury to operating personnel during a backflow procedure. This Hold Open Device is positive and will not slip during full backflow. The Backflow Device can be operated without removing the check valve or taking the pump out of service. Hold Open Devices on size 3" and 4" (80 and 100mm) are constructed of Bronze ASTM B-584.

Proximity Switches & Limit Switches Available

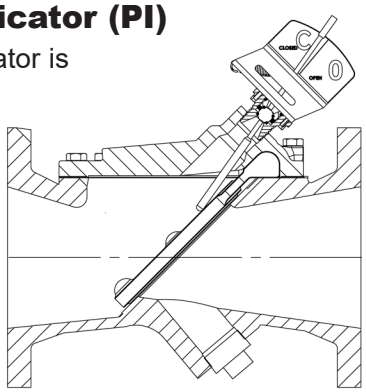
An inductive type proximity switch (SEL30) can be mounted on the position indicator. The switch transmits an electrical signal indicating when the flapper is fully closed. Mechanical Limit switches (SEL20) are also available. Both type of switches must be ordered with Position Indicator (PI)



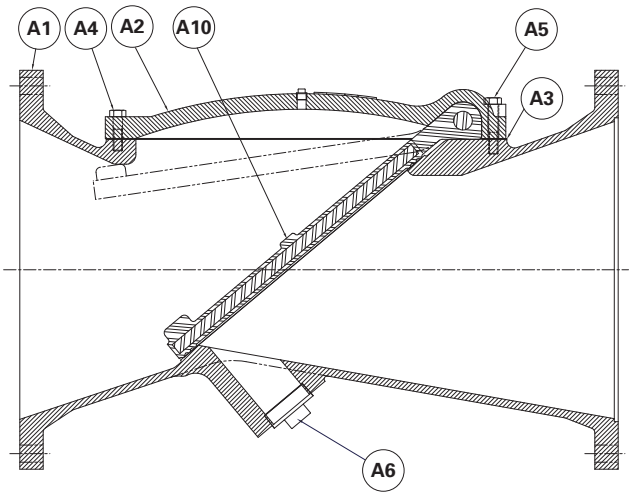


Disc Position Indicator (PI)

The Disc Position Indicator is mounted to the cover and clearly identifies the position of the flapper upon visual inspection. The Disc Position Indicator is available on body styles 100, 100SR and 100SA.



Materials of Construction



Item	Description	Material
A1	Body	Cast Iron, ASTM A126, Grade B
		Ductile Iron, ASTM A536, Grade 65-45-12
A2	Cover	Same as body material
A3	Gasket*	Non-asbestos with butadiene rubber binder
A4	Cover Bolt	316 Stainless Steel, or Steel A449, Grade 5
A5	Cover Bolt	316 Stainless Steel, or Steel A449, Grade 5
A6	Body Pipe Plug	Iron, Malleable, ASTM A48, Class 40
A10	Rubber Flapper	Reinforced NBR, Acrylonitrile-Butadiene, Carbon Steel ASTM A36
		Reinforced EPDM, Terpolymer of Ethylene Propylene & A Diene, Carbon Steel ASTM A36

*Cover gasket is not used on lined valves

Valve Selection

Pressure Ratings

Body Style	Maximum Differential Cold Working Pressure
100, 100SA & 100SR	175 psi (1210 kPa)

Note: Specify operating pressure when ordering

Temperature Ratings

Material	Temperature Range*
NBR, Acrylonitrile-Butadiene	-70 to 250° F (-57 to 121° C)
EPDM, Terpolymer of Ethylene Propylene & A Diene	-20 to 300° F (-29 to 150° C)
NR, Natural Rubber	-40 to 180° F (-40 to 82° C)

*Maximum operating temperature is a function of the materials used in the valve.

All valves are rated to a maximum temperature of at least 180° F (82° C).

Contact application engineering if the valve is required to operate above 180° F (82° C).

Applicable Standards

APCO CRF Rubber Flapper Swing Check Valves are designed and/or tested to meet the following standards:	
MIL V 18436 F	Conforms to material requirements of Group A, Type III, Trim 1, Bronze Swing Check Valves
ASME B16.1	Cast iron pipe flanges and flanged fittings. Conforms to related flange drilling dimensions.
AWWA C508	Valves tested as a complete assembly per AWWA C508

Valve Weights

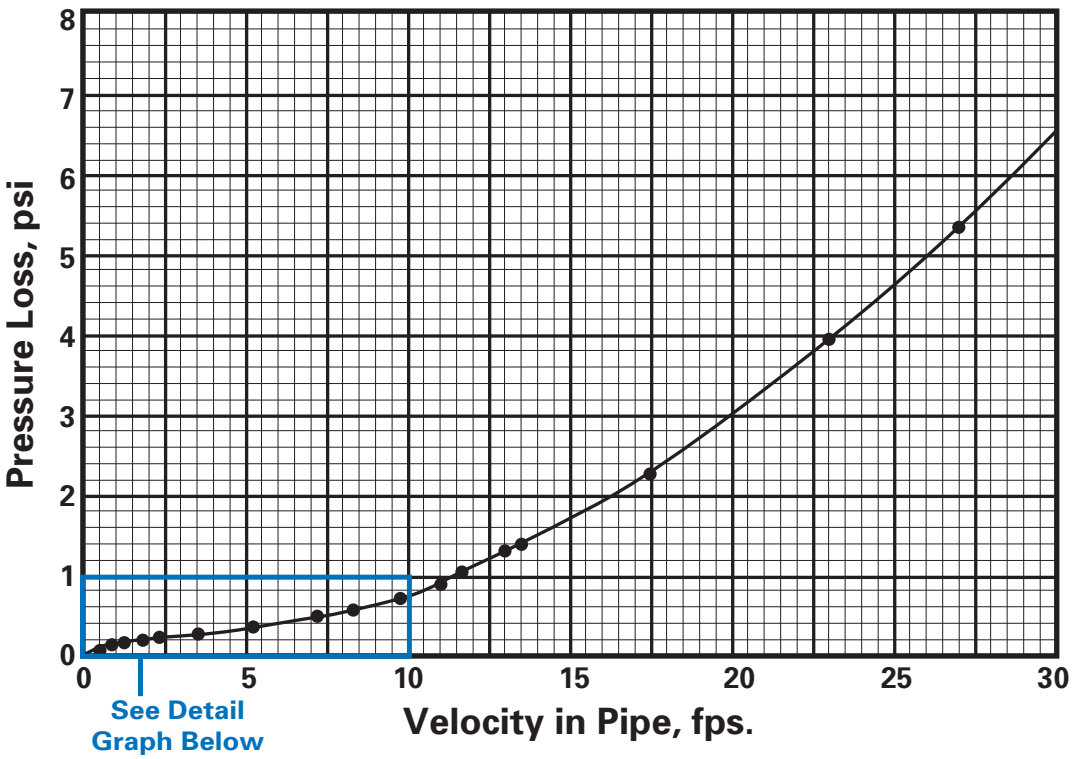
Valve Size	Ductile Iron Body
2" / 50mm	19 / 8
3" / 80mm	21 / 10
4" / 100mm	38 / 17
4.3" / 110mm	70 / 32
6" / 150mm	100 / 45
8" / 200mm	185 / 84
10" / 250mm	335 / 152
12" / 300mm	475 / 215
14" / 350mm	640 / 290
16" / 400mm	950 / 431
18" / 450mm	1250 / 567
20" / 500mm	1550 / 703
24" / 600mm	2000 / 907
30-48" / 750-1200mm	Contact DeZURIK

Pounds
Kilograms

Valve Selection

12" Rubber Flapper Swing Check Valve

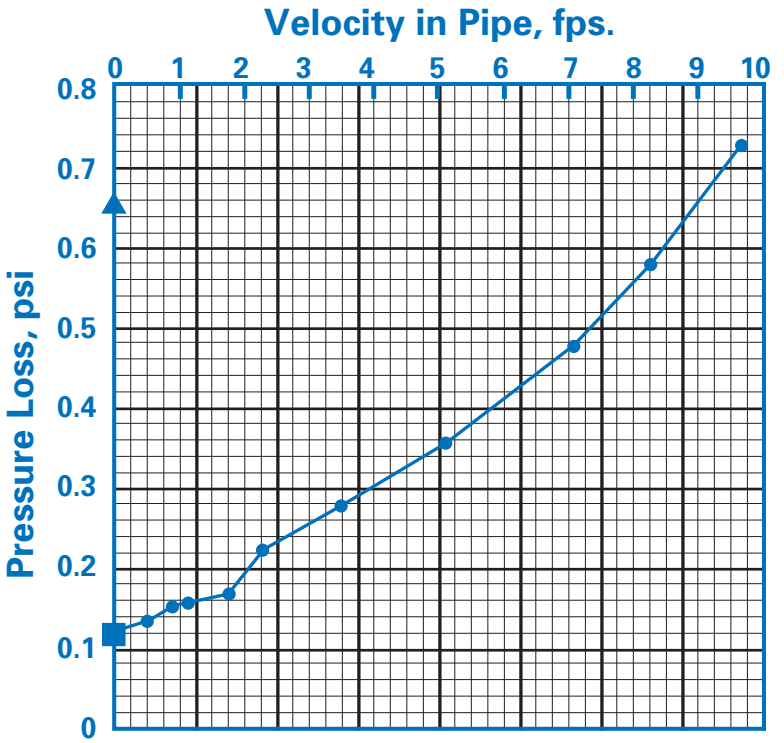
Tests indicate losses are slightly higher for smaller sizes and lower for larger sizes than shown here



●●■▲ Actual Test Points

■ Pressure head to unseat flapper with downstream pipe full (discharge side). Flapper submerged and bouyant

▲ Pressure head to unseat flapper, downstream pipe empty



Ordering

To order, simply complete the valve order code from information shown.
An ordering example is shown for your reference.

Valve Style
Give valve style code as follows:

CRF	=	Rubber Flapper Swing Check Valves

Valve Size
Give valve size code as follows:

2	=	2"	(50mm)	16	=	16"	(400mm)
3	=	3"	(80mm)	18	=	18"	(450mm)
4	=	4"	(100mm)	20	=	20"	(500mm)
4.3	=	4"	(100mm)	24	=	24"	(600mm)
6	=	6"	(150mm)	30	=	30"	(750mm)
8	=	8"	(200mm)	36	=	36"	(900mm)
10	=	10"	(250mm)	42	=	42"	(1100mm)
12	=	12"	(300mm)	48	=	48"	(1200mm)
14	=	14"	(350mm)				

Body Style
Give body style code as follows:

100	=	Rubber Flapper (2-48")
100SA	=	Rubber Flapper with Spring Assist (4.3-30")
100SR	=	Rubber Flapper with Spring Return (3-30")

End Connection
Give end connection code as follows:

F1	=	Flanged ASME 125/150

Body Material
Give body material code as follows:

Unlined - Body 100, 100SA or 100SR

CI	=	Cast Iron (standard for 30-48")
DI	=	Ductile Iron (standard for 2-24")

Lined - Body Styles 100 & 100SA (2-24")

DINR	=	Ductile Iron, Natural Rubber (NR) Lined
DIEP	=	Ductile Iron, Terpolymer of Ethylene Propylene & A Diene (EPDM) Lined
DINB	=	Ductile Iron, Acrylonitrile Butadiene (NBR) Lined

Flapper Material
Give flapper material code as follows:

NBR	=	Acrylonitrile-Butadiene, -70 to 250° F (-57 to 121° C)
EPDM	=	Terpolymer of Ethylene Propylene & A Diene -20 to 300° F (-29 to 150° C)

Options
Give options code as follows:

DTR	=	DeZURIK Standard Certified Production Hydrostatic Shell & Seat Test Report
PI	=	Disc Position Indicator (4.3-30"). Body Styles 100, 100SA or 100SR Unlined Valves
SB16	=	316 Stainless Steel Bolting

Accessories
Give accessory code as follows:

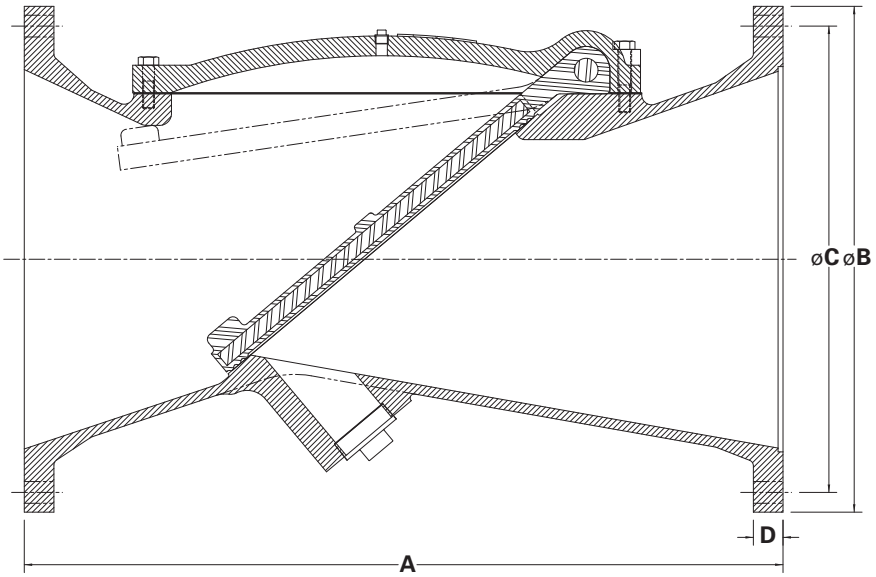
HOD	=	Hold Open Device (Back flush) (3-30")
SEL20	=	Limit Switch with Disc Position Indicator AB 802T-ATP (4.3-30") Unlined Valves: must be ordered with PI
SEL30	=	(1) Proximity Switch - SPDT GO 73-13566-B2. (4.3-30")Unlined Valves only; must be ordered with PI

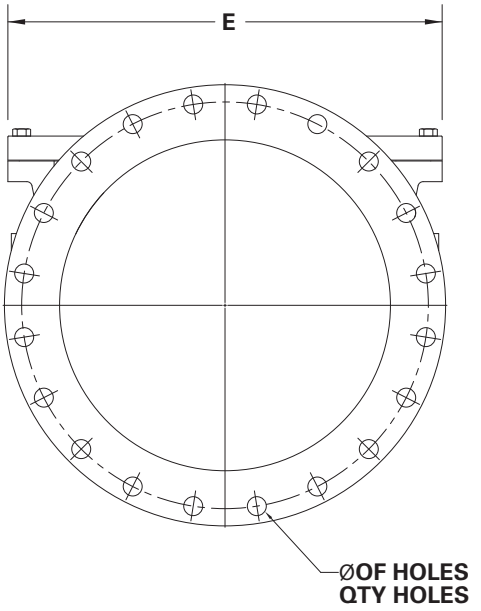
Ordering Example

CRF,10,100SA,F1,DICR,CR,SB16*BMB

Dimensions

Body Style 100



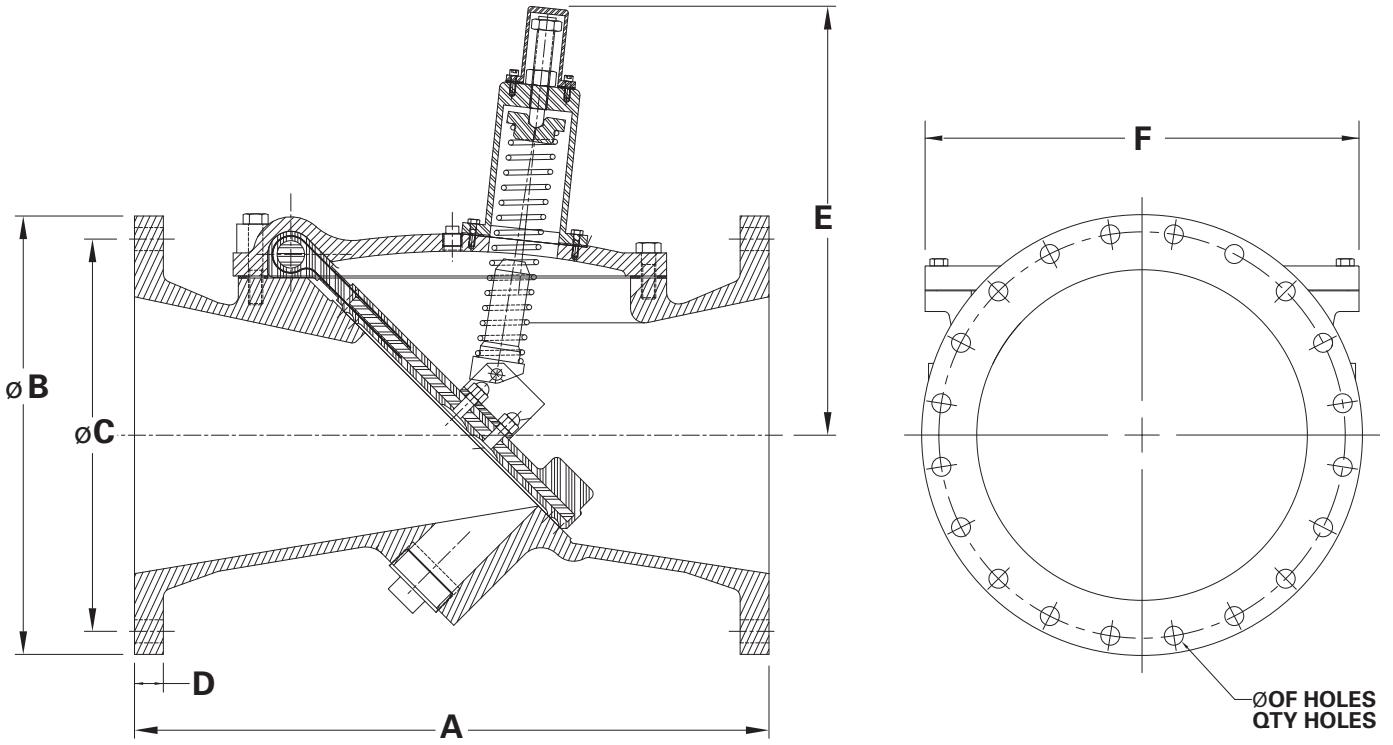


Valve Size	A	B	C	D	No. of Flange Bolts	Bolt Hole Size	E
2" 50mm	8.00 203	6.00 152	4.75 121	0.63 16	4	0.75 19	5.26 134
3" 80mm	9.50 241	7.50 191	6.00 152	0.75 19	4	0.75 19	7.00 178
4" 100mm	11.50 292	9.00 229	7.50 191	0.94 24	8	0.75 19	7.38 187
4.3" 100mm	13.75 349	9.00 229	7.50 191	0.94 24	8	0.75 19	10.25 260
6" 150mm	15.00 381	11.00 279	9.50 241	1.00 25	8	0.88 22	10.25 260
8" 200mm	19.50 495	13.50 343	11.75 298	1.13 29	8	0.88 22	15.25 387
10" 250mm	24.50 622	16.00 406	14.25 362	1.19 30	12	1.00 25	19.26 489
12" 300mm	27.50 699	19.00 483	17.00 432	1.25 32	12	1.00 25	19.26 489
14" 350mm	31.00 787	21.00 533	18.75 476	1.38 35	12	1.13 29	23.63 600
16" 400mm	32.00 813	23.50 597	21.25 540	1.44 37	16	1.13 29	24.00 610
18" 450mm	36.00 914	25.00 635	22.75 578	1.56 40	16	1.25 32	27.75 705
20" 500mm	40.00 1016	27.50 699	25.00 635	1.69 43	20	1.25 32	27.75 705
24" 600mm	48.00 1219	32.00 813	29.50 749	1.88 48	20	1.38 35	31.50 800
30" 750mm	70.50 1791	38.75 984	36.00 914	2.13 54	28	1.38 35	49.00 1245
36" 900mm	75.00 1905	46.00 1168	42.75 1086	2.38 60	32	1.63 41	55.00 1397
42-48" 1100-1200mm	Contact Factory						

Inches
Millimeters

Dimensions

Body Style 100SR, Spring Return



Valve Size	A	B	C	D	E	No. of Flange Bolts	Bolt Hole Size	F
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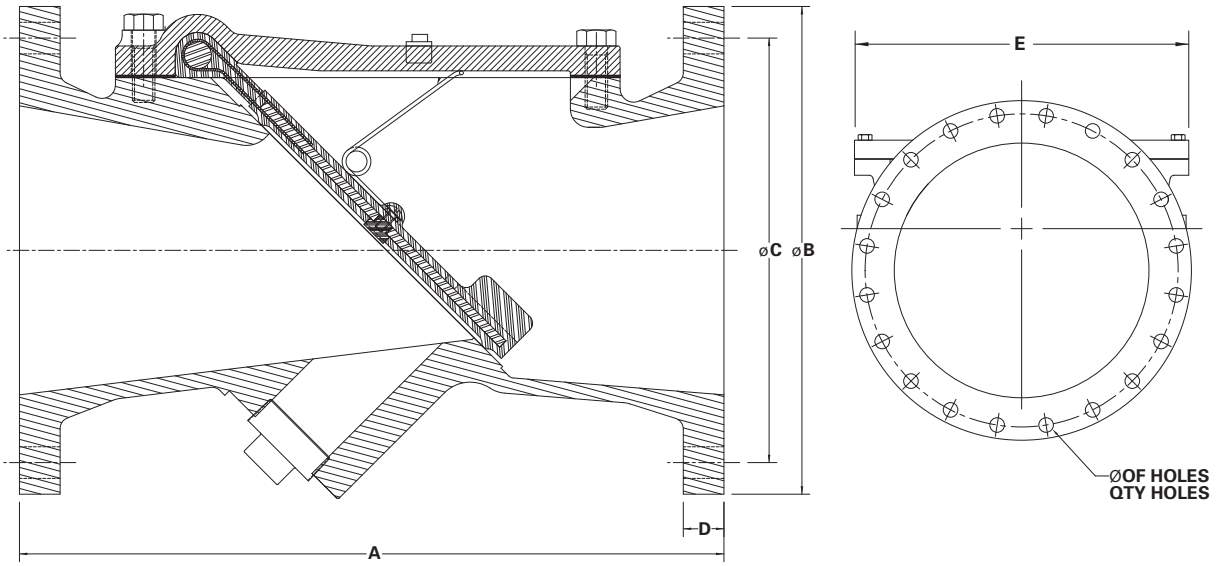
18" 450mm	36.00 914	25.00 635	22.75 578	1.56 40	26.25 667	16	1.13 29	27.75 705
20" 500mm	40.00 1016	27.50 699	25.00 635	1.69 43	26.25 667	20	1.13 29	27.75 705
24" 600mm	48.00 1219	32.00 813	29.50 749	1.88 48	25.75 654	20	1.38 35	31.50 800

Inches
Millimeters

Dimensions

Body Style 100SA, Spring Assist



Inches
Millimeters

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4.3" 100mm	13.75 349	9.00 229	7.50 191	0.94 24	8	0.75 19	10.25 260
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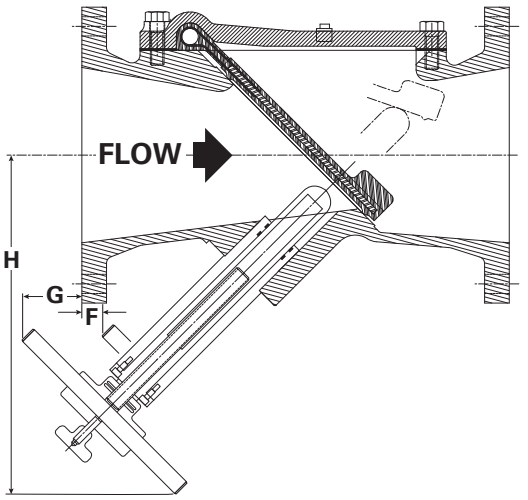
18" 450mm	36.00 914	25.00 635	22.75 578	1.56 40	16	1.25 32	27.75 705
20" 500mm	40.00 1016	27.50 699	25.00 635	1.69 43	20	1.25 32	27.75 705
24" 600mm	48.00 1219	32.00 813	29.50 749	1.88 48	20	1.38 35	31.50 800

Dimensions

Hold Open Device



Valve Size	F	G	H
3" 80mm	1.00 25	—	8.00 203
4" 100mm	2.75 70	—	8.50 216
4.3" 100mm	—	2.25 57	12.25 311
6" 150mm	—	1.63 41	12.50 318
8" 200mm	—	1.75 44	15.50 394
10" 250mm	—	1.75 44	22.00 559
12" 300mm	—	2.00 51	20.50 521
14" 350mm	0.75 19	—	22.00 559
16" 400mm	1.25 32	—	22.00 559
18" 450mm	—	2.00 51	28.00 711
20" 500mm	—	1.75 44	28.00 711
24" 600mm		1.75 44	30.00 762
30" 750mm	Contact DeZURIK		

Inches
Millimeters

Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:
Web Site: DeZURIK.com E-Mail: info@DeZURIK.com

DeZURIK

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