



 **WARNING**

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### General Description

Series AVF (Hydraulic) adjustable velocity fuses are designed to provide automatic hydraulic line rupture shut-off, as well as the ability to isolate a problem circuit on parallel circuit applications. Use of the fuses limits oil spillage and potential component damage. The fuses feature an adjustable flow for easy set-up and operation. A set screw in the body is provided to “lock in” the selected flow.

## C

### Features

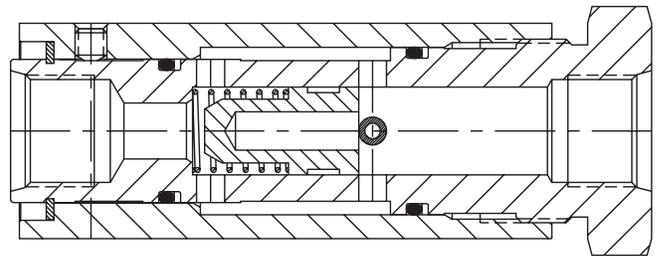
- Provides automatic line rupture shut-off.
- Isolates problem circuit on parallel circuit applications.
- Limits oil spillage and potential component damage.
- Adjustable closing flow — simple readjustment.

### Specifications

<b>Service Application</b>	Hydraulic
<b>Maximum Operating Pressure</b>	340 Bar (5000 PSI)
<b>Material</b>	Body, Sleeve, Steel Poppet, Roll Pin Spring Stainless Steel O-ring Fluorocarbon Back-up Ring PTFE Finish Zinc Plated
<b>Operating Temperature</b>	-27°C to +177°C (-20°F to +350°F)
<b>Mounting</b>	Any



### Construction View



### Performance Data

Valve Size	Closing Flow Adjustment Range	
	Minimum	Maximum
1/4"	1.9 LPM (1/2 GPM)	15 LPM (4 GPM)
3/8"	3.8 LPM (1 GPM)	30 LPM (8 GPM)
1/2"	5.7 LPM (1-1/2 GPM)	45 LPM (12 GPM)
3/4"	7.6 LPM (2 GPM)	68 LPM (18 GPM)
1"	11 LPM (3 GPM)	102 LPM (27 GPM)
1-1/2"	23 LPM (6 GPM)	227 LPM (60 GPM)

Pressure drop at maximum rated flow is less than 100 PSID on all sizes.

### Ordering Information

Nominal Size	Port Type	
	NPT P/N	SAE P/N
1/4"	AVF-1/4-S28	AVF-106-S28
3/8"	AVF-3/8-S28	AVF-108-S28
1/2"	AVF-1/2-S28	AVF-110-S28
3/4"	AVF-3/4-S28	AVF-112-S28
1"	AVF-1-S28	AVF-116-S28
1-1/2"	AVF-1 1/2-S28	AVF-124-S28

**Operation**

Series AVF adjustable velocity fuse is a normally open, in-line valve. Under normal conditions, a spring holds the fuse poppet off its seat.

Flow Path

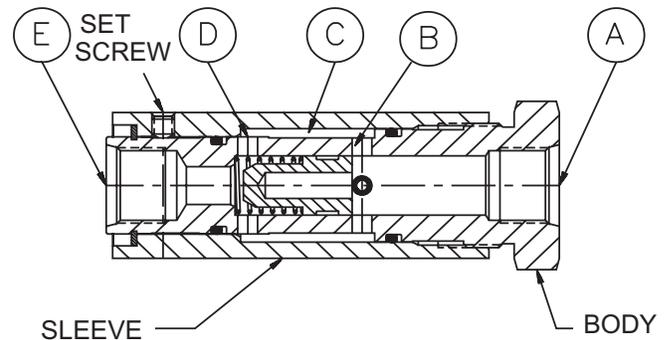
Flow enters the fuse at the flanged inlet port (A). Before reaching the poppet, a series of radial holes (B) in the body directs flow from the body core into an annular cavity (C) between the body and the adjusting sleeve. Flow is directed axially between the body and sleeve until it reaches another series of radial holes (D) at the poppet seat. Flow is then directed back into the body core through the seat and out the fuse outlet port (E).

Making Adjustments

External adjustments of the sleeve reduce the “free” area of the radial holes (D). This reduction in area creates an increase in flow velocity, resulting in a higher pressure drop. When the pressure drop exceeds the spring force holding the poppet open, the inlet pressure will force the poppet against its seat, effectively closing the fuse.

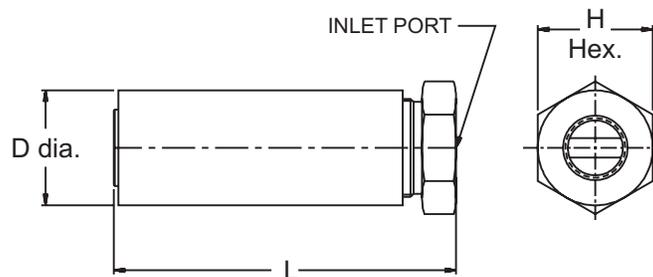
Line Rupture Shut-Off

The sleeve can be adjusted such that, at normal flows, the fuse will remain open but increased flow rates (such as caused by downstream line rupture) will result in a rapid closing of the fuse. The fuse will remain closed until the inlet pressure is eliminated or the downstream pressure is equalized with the inlet.



**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)



Nominal Size	L mm - (in)	D mm - (in)	H mm - (in)	Weight kg - (lbs.)
1/4"	90 (3.56)	29 (1.13)	29 (1.13)	0.36 (0.8)
3/8"	108 (4.25)	33 (1.31)	33 (1.31)	0.54 (1.2)
1/2"	128 (5.02)	43 (1.69)	43 (1.69)	1.1 (2.4)
3/4"	143 (5.62)	51 (2.0)	51 (2.0)	1.7 (3.8)
1"	168 (6.62)	61 (2.38)	61 (2.38)	2.8 (6.1)
1-1/2"	221 (8.69)	76 (3.0)	76 (3.0)	5.3 (11.6)

**Conventional Fuse**

- Closing flow must be calculated
- Calculation error results in unusable valve
- System changes make valve unusable
- “Matched” fuses are very expensive
- Special order to meet requirements

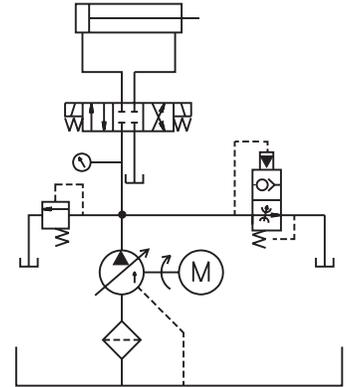
**AVF Series Adjustable Velocity Fuse**

- No calculations required
- Correct size always supplied
- Simple re-adjustment
- Minor adjustment only
- Stocked by pipe size

**C**

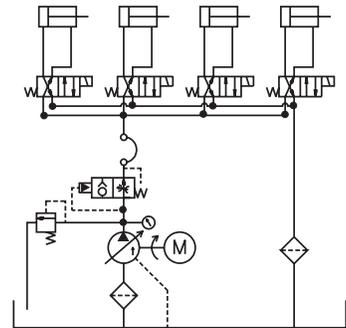
**Pump/System Air Bleed**

When starting a pump under load, the blocked port resists flow, and more torque is required from the prime mover. This condition may cause an electric motor to draw higher “pull-up current,” or may cause a combustion engine powered pump to stall. The velocity fuse is normally open and when tied into the tank, it will provide an open, load free path to tank when the pump first starts. As the pump nears operating speed, the resulting flow will cause the fuse to close, directing all flow into the primary circuit.



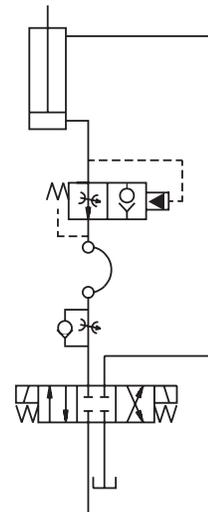
**Main Pressure Line from Pump to Manifold**

A line rupture in a central power unit would allow fluid to be pumped out through the broken line. The loss of oil can be expensive to clean up, dispose of, and replace; plus it must be done in accordance with EPA regulations. Ruptured lines may cause physical damage or the release of oil into a flammable area. A velocity fuse closes down flow when failure of a line occurs and eliminates these problems.



**Cylinder/Actuator Shut-Off**

A line rupture that occurs when a cylinder is supporting a load allows the load to fall unrestricted. A velocity fuse installed at the cylinder port will shut off flow and prevent the load from falling in the event of a hose or tubing failure.



### General Description

Series AVF (Pneumatic) adjustable velocity fuses are designed to provide automatic air line shut-off if a line should rupture or break. The use of fuses limits the possibility of personal injury or damage to equipment from whipping hoses. The fuses are field adjustable for easy setup and operation. A set screw in the body allows the selected setting to be locked.

### Features

- Provides automatic line rupture shut-off.
- Limits runaway conditions.
- Eliminates hose whip.
- Air or water compatible.

### Benefits

- Eliminates “line whip.” No injury or damage possible.
- Limits runaway conditions. Load will stay in place after break.
- Precise sizing not required. Each valve has an adjustable flow range.
- Simple readjustments. Turn barrel to reset.
- Setting may be locked.
- Four sizes available.
- Resets quickly after line repair. Pressurize downstream line.

### Specifications

<b>Service Application</b>	Pneumatic
<b>Maximum Operating Pressure</b>	136 Bar (2000 PSI)
<b>Material</b>	Body, Sleeve, Brass Poppet, Roll Pin Stainless Steel Spring O-ring Nitrile Back-up Ring PTFE
<b>Operating Temperature</b>	-27°C to +177°C (-20°F to +350°F)
<b>Mounting</b>	Any
<b>Sizes</b>	1/4", 3/8", 1/2" and 3/4" NPT

### Ordering Information

Series AVF Air Service	
Valve Size	Part Number
1/4" NPT	AVF-1/4-B2
3/8" NPT	AVF-3/8-B2
1/2" NPT	AVF-1/2-B2
3/4" NPT	AVF-3/4-B2

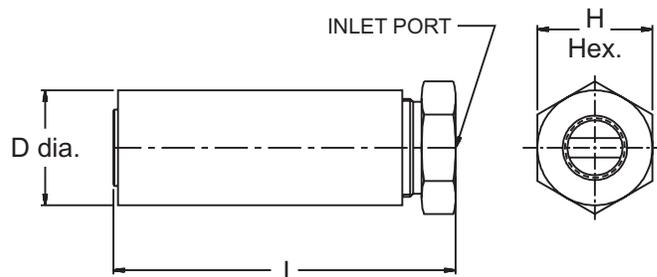


### Performance Data

Valve Size	Series AVF Air Service Closing Flow Adjustment Range	
	Minimum	Maximum
1/4" NPT	5 SCFM	30 SCFM
3/8" NPT	5 SCFM	45 SCFM
1/2" NPT	10 SCFM	60 SCFM
3/4" NPT	10 SCFM	60 SCFM

### Dimensions

Inch equivalents for millimeter dimensions are shown in (\*\*)



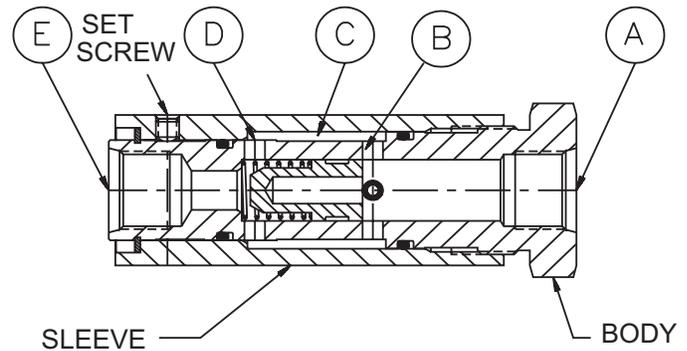
Nom. Size	L mm (Inches)	D mm (Inches)	H mm (Inches)	Weight kg (lbs.)
1/4"	90 (3.56)	29 (1.13)	29 (1.13)	0.36 (0.80)
3/8"	108 (4.25)	33 (1.31)	33 (1.31)	0.54 (1.20)
1/2"	128 (5.02)	43 (1.69)	43 (1.69)	1.10 (2.40)
3/4"	143 (5.62)	51 (2.00)	51 (2.00)	1.70 (3.80)

## Operation

Series AVF adjustable velocity fuse is a normally open, in-line valve. Under normal conditions, a spring holds the fuse poppet off its seat.

### Flow Path

Flow enters the fuse at the flanged inlet port (A). Before reaching the poppet, a series of radial holes (B) in the body directs flow from the body core into an annular cavity (C) between the body and the adjusting sleeve. Flow is directed axially between the body and sleeve until it reaches another series of radial holes (D) at the poppet seat. Flow is then directed back into the body core through the seat and out the fuse outlet port (E).



### Making Adjustments

External adjustments of the sleeve reduce the “free” area of the radial holes (D). This reduction in area creates an increase in flow velocity, resulting in a higher pressure drop. When the pressure drop exceeds the spring force holding the poppet open, the inlet pressure will force the poppet against its seat, effectively closing the fuse.

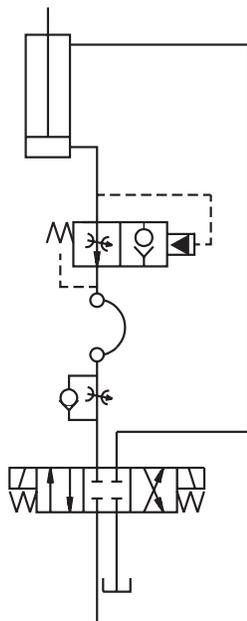
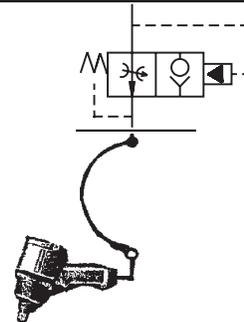
### Line Rupture Shut-Off

The sleeve can be adjusted such that, at normal flows, the fuse will remain open but increased flow rates (such as caused by downstream line rupture) will result in a rapid closing of the fuse. The fuse will remain closed until the inlet pressure is eliminated or the downstream pressure is equalized with the inlet.

## Applications

### Air Line Drop

A broken air hose may cause a violent whipping action that could cause injury to employees or damage to equipment. A velocity fuse will provide an automatic shut-off of air in case of a broken hose and eliminate this problem.



### Cylinder / Actuator Shut-Off

A line rupture that occurs when a cylinder is supporting a load allows the load to fall unrestricted. A velocity fuse installed at the cylinder port will shut off flow and prevent the load from falling in the event of a hose or tube failure.

**General Description**

Series LT and LTF check valves will operate satisfactorily when installed in any position. These valves may be used as line check valves, permitting full flow of hydraulic oil in one direction only or they may be used as restrictors.

An assortment of restrictors are available. When installed, the valve becomes a line throttle valve permitting free flow of hydraulic oil in one direction and a restricted flow in the opposite direction.

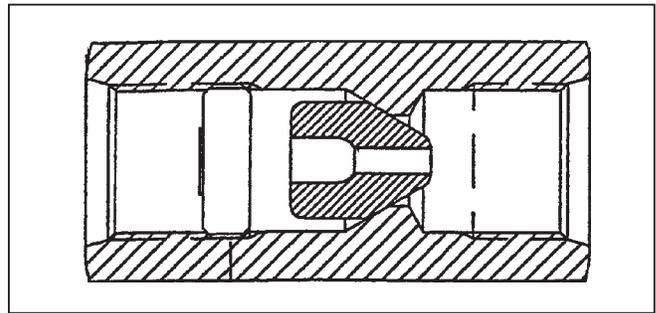
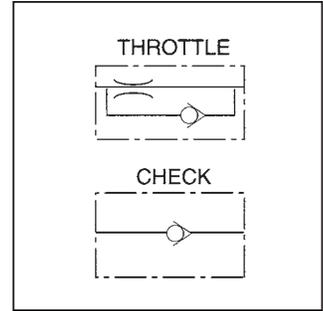
An array of color-coded poppets allows easy and quick identification.

**Features**

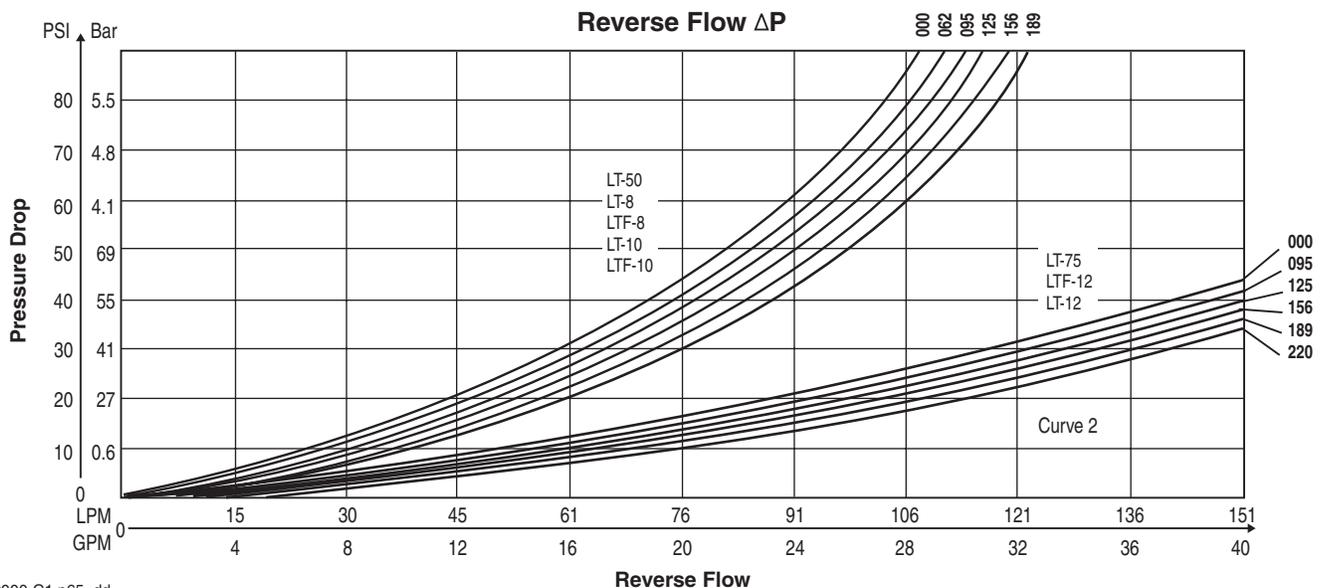
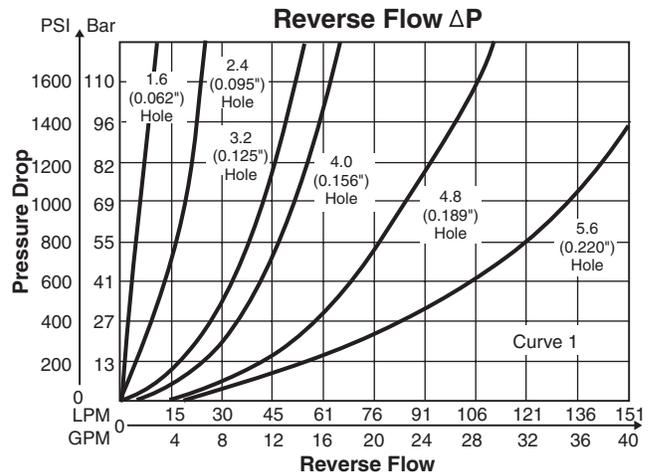
- Accurate control of double-acting cylinder by having both sides of the piston pressurized.
- For improving control of the lowering stroke of a cylinder.
- For preventing cavitation of a cylinder or motor having an inertia load.
- For metering oil flow to a hydraulic motor for proper motor speed.
- For improving control of the extend stroke of a hydraulic cylinder.
- Unidirectional.

**Specifications**

<b>Maximum Operating Pressure</b>	207 Bar (3000 PSI)	
<b>Materials</b>	Body:	Steel/Zinc-plated
	Poppet:	Nylon
	Retainer:	416 Stainless Steel
<b>Operating Temperature</b>	-30°C to +100°C (-22°F to +212°F)	



**Performance Curves**



3000-C1.p65, dd

**Ordering Information**



Series

Code	Series
LT	Male-Female Ports
LTF	Female-Female Ports



Port Size

Code	Size
8	3/4" – 16 UNF-2
10	7/8" – 14 UNF-2
12	1 1/16" – 12 UNF-2
50	1/2" – 14 NPT (LT Only)
75	3/4" – 14 NPT (LT Only)



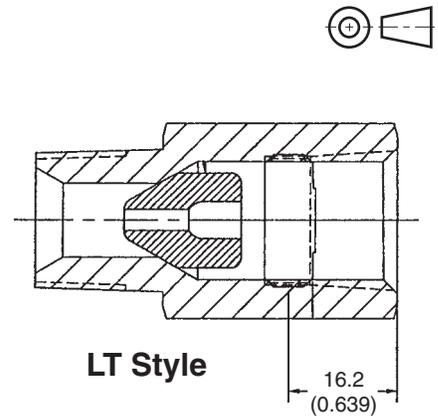
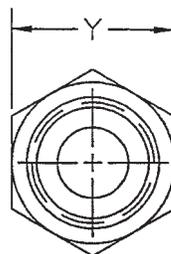
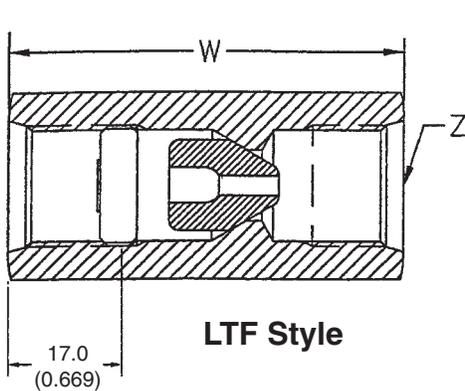
Throttle and Check Poppets

Poppet Order Symbol	Diameter of Hole in Poppet		Poppet Color
<b>For Part Numbers LT-8, LT-10, LT-50, LTF-8, LTF-10</b>			
4	1.19	(.947)	Brown
6	1.57	(.062)	Purple
8	1.98	(.078)	Pink
9	2.41	(.095)	Red
11	2.77	(.109)	Beige
12	3.18	(.125)	Yellow
15	3.96	(.156)	Lt. Green
18	4.80	(.189)	Black
25	6.40	(.252)	Dk. Green
0	Check (No Hole)		Beige
<b>For Part Numbers LT-12, LT-75, LTF-12</b>			
180	4.80	(.189)	Black
210	5.59	(.220)	Orange
250	6.40	(.252)	Lt. Blue
00	Check (No Hole)		White



**Dimensions**

Inch equivalents for millimeter dimensions are shown in (\*\*)



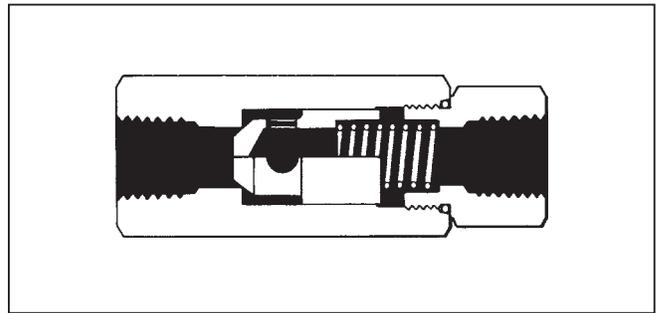
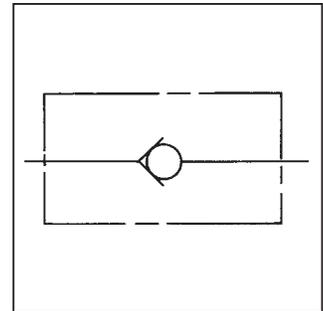
Model Number	W Length	Y Hex Size	Z Thread (Both Ends)
LT-50	54.1 (2.13)	25.4 (1.00)	1/2" – 14 NPT
LT-8	54.1 (2.13)	25.4 (1.00)	SAE 8 (3/4" – 16 UNF)
LT-10	58.7 (2.31)	28.7 (1.13)	SAE 10 (7/8" – 14 UNF)
LT-12	77.7 (3.06)	35.1 (1.38)	SAE 12 (1 1/16" – 12 UN)
LT-75	73.2 (2.88)	35.1 (1.38)	3/4" – 14 NPT
LTF-8	62.0 (2.44)	25.4 (1.00)	SAE 8 (3/4" – 16 UNF)
LTF-10	68.3 (2.69)	28.7 (1.13)	SAE 10 (7/8" – 14 UNF)
LTF-12	82.6 (3.25)	35.1 (1.38)	SAE 12 (1 1/16" – 12 UN)

**General Description**

Series CLS inline check valves are designed to provide free flow in one direction and a positive check in the opposite direction. They are available with a variety of port types and sizes and may be mounted in any position.

**Specifications**

<b>Maximum Operating Pressure</b>	207 Bar (3000 PSI)
<b>Flow Rating</b>	Consult pressure drop data
<b>Fluid Recommended</b>	Premium grade hydraulic fluid with viscosity of 10cSt (60 SUS) to 216 cSt (1000 SUS) at operating temperature.
<b>Operating Temperature</b>	Under normal conditions of continuous operation, fluid temperature should not exceed -82°C (180° F). In no instance should the temperature exceed 93°C (200°F).
<b>Material</b>	All steel
<b>Mounting</b>	Not restricted

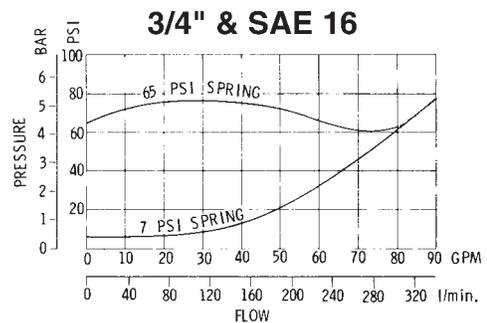
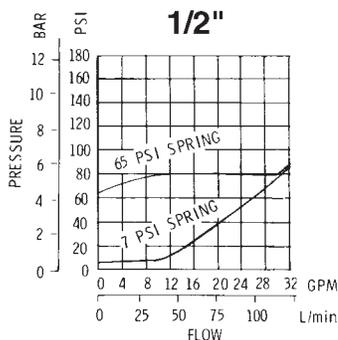
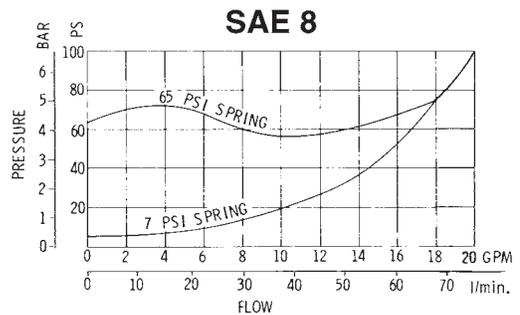
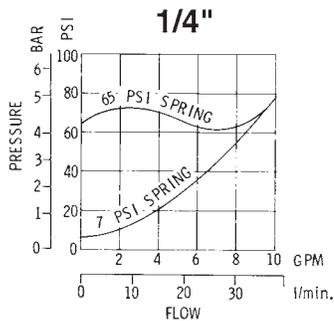


**C**

**Features**

- Up to 3000 PSI (207 Bar)
- 1/4", 1/2", 3/4" NPTF
- #8, #12, #16 SAE

**Performance Curves**



**Ordering Information**

**CLS**

Check Valve

Port Size

Code	Size
25	1/4" NPTF
50	1/2" NPT
75	3/4" NPT
08	SAE 8
12	SAE 12
16	SAE 16

**NOTE:** NPT ports not available on Male type valves.

Port Type

Code	Type
1	NPT
2	SAE

Spring Rate

Code	Size
7	7 PSI
45	45 PSI
65	65 PSI

Type

Code	Type
M	Male
F	Female

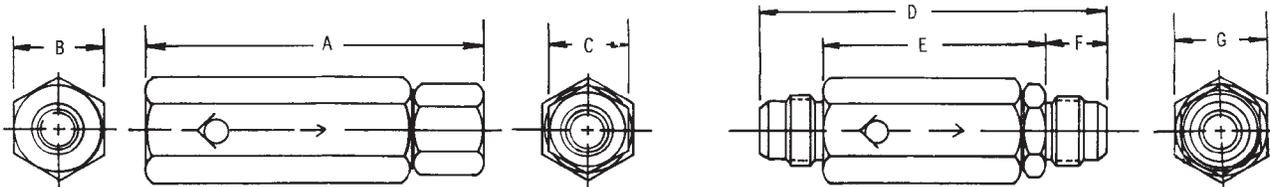
**C**

**Weight (approx.)**

1/4"	0.50 lbs. [0,23 kg]
1/2"	1.00 lbs. [0,45 kg]
3/4"	2.88 lbs. [1,30 kg]
SAE 8	1.00 lbs. [0,45 kg]
SAE 12	2.80 lbs. [1,27 kg]
SAE 16	3.00 lbs. [1,36 kg]

**Dimensions**

Millimeter equivalents for inch dimensions are shown in (\*\*)



VALVE SIZE NPT & FEMALE SAE	A	B	C
1/4"	3.30 ( 83.8)	0.88 (22.3)	0.75 (19.1)
SAE 8	3.66 ( 92.9)	1.00 (25.4)	0.88 (22.3)
1/2" & SAE 10	4.50 (114.3)	1.38 (35.0)	1.25 (31.7)
3/4" & SAE 12	5.22 (132.6)	1.75 (44.4)	1.50 (38.1)

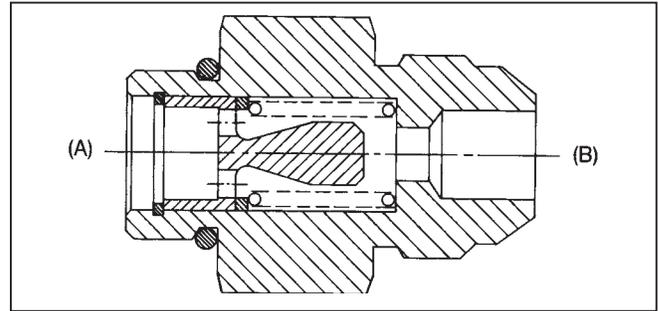
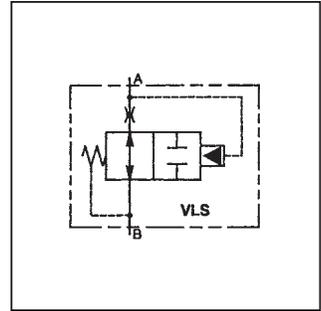
VALVE SIZE MALE TUBE	D	E	F	G
SAE 12	5.30 (134.6)	3.58 ( 90.9)	0.86 (21.8)	1.75 (44.4)
SAE 16	5.36 (136.1)	3.54 ( 89.9)	0.91 (23.1)	1.75 (44.4)



**General Description**

Series VLS velocity check valves protect your hydraulic system in the event of line rupture. These valves return to the open position once the pressure is equalized.

Series VLS valve is a flow sensing, hydraulic check. Flow will pass through the check until the designated closing flow is reached. Then the check will close, stopping further flow.



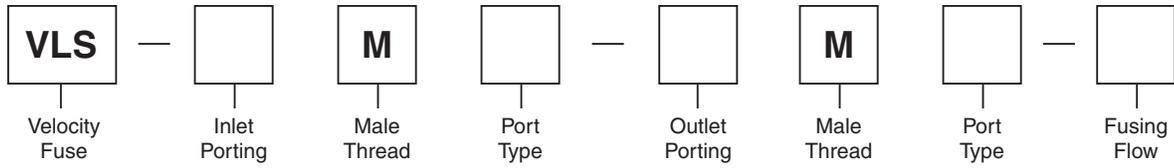
**Features**

- Up to 207 Bar (3,000 PSI),  
 0.01 to 23.8 LPM (0.5 to 90 GPM)

**Specifications**

<b>Maximum Operating Pressure</b>	207 Bar (3000 PSI)	<b>Operating Temperature</b>	Under normal conditions of continuous operation, fluid temperature should not exceed -82°C (180° F). In no instance should the temperature exceed 93°C (200°F).
<b>Normal Closing Flow</b>	To be based on a nominal 3.5 Bar (50 PSI) with 150 SUS oil		
<b>Leakage After Closing</b>	10 DPM maximum	<b>Torque Required for Installation</b>	See chart
<b>Reverse Flow</b>	Not to exceed 150% of specified closing flow	<b>Material</b>	All steel
<b>Fluid Recommended</b>	Premium grade hydraulic fluid with viscosity of 10cSt (60 SUS) to 216 cSt (1000 SUS) at operating temperature.	<b>Seals</b>	Nitrile standard. For other seal compounds, consult factory
		<b>Mounting</b>	Not restricted

**C**



Code	Size
50	1/2" NPTF
06	SAE -6
08	SAE -8
10	SAE -10
12	SAE -12

Code	Type
1	NPTF
2	SAE

Code	Size
50	1/2" NPTF
06	SAE -6
08	SAE -8
10	SAE -10
12	SAE -12

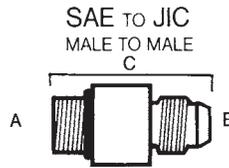
Code	Type
1	NPTF
2	SAE
3	JIC
4	ORS

Code	Flow*
0.8	3.0 LPM (0.8 GPM)
1.5	5.7 LPM (1.5 GPM)
2.0	7.6 LPM (2.0 GPM)
3.0	11.4 LPM (3.0 GPM)
6.0	22.7 LPM (6.0 GPM)
7.0	26.5 LPM (7.0 GPM)
10	37.9 LPM (10 GPM)
22	83.3 LPM (22 GPM)

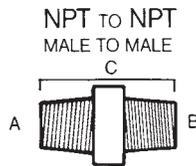
VLS Flow Chart	
Max Flow	Models
26.5 LPM (7 GPM)	06M2-06M3
37.9 LPM (10 GPM)	08M2-08M3 10M2-08M4
45.4 LPM (12 GPM)	10M2-10M3
56.8 LPM (15 GPM)	50M1-50M1
90.8 LPM (24 GPM)	12M2-12M3

**C**

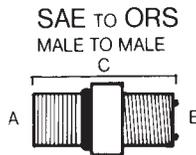
Inch equivalents for millimeter dimensions are shown in (\*\*)



A (In.)	B (In.)	C		Hex		Part Number	Recommended Installation Torque* (In Lb. Ft.)	
		(In.)	(mm)	(In.)	(mm)		In Aluminum	In Steel
3/8	3/8	1.30	(33.0)	11/16	(17.5)	VLS-06M2-06M3-**	85-100	13-16
1/2	1/2	2.25	(57.2)	7/8	(22.2)	VLS-08M2-08M3-**	15-20	25-33
5/8	5/8	2.06	(52.3)	1	(25.4)	VLS-10M2-10M3-**	25-30	42-50
3/4	3/4	1.97	(50.0)	1 1/4	(31.8)	VLS-12M2-12M3-**	35-40	55-65



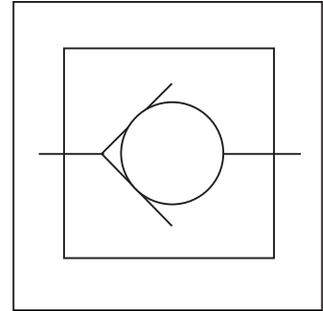
A (In.)	B (In.)	C		Hex		Part Number	Recommended Installation Torque* (In Lb. Ft.)	
		(In.)	(mm)	(In.)	(mm)		In Aluminum	In Steel
1/2	1/2	1.90	(48.4)	7/8	(22.2)	VLS-50M1-50M1-**	55-60	85-90



A (In.)	B (In.)	C		Hex		Part Number	Recommended Installation Torque* (In Lb. Ft.)	
		(In.)	(mm)	(In.)	(mm)		In Aluminum	In Steel
3/8	3/8	1.25	(31.8)	3/4	(19.1)	VLS-06M2-06M4-**	85-100	13-16
5/8	1/2	2.10	(53.3)	1	(25.4)	VLS-10M2-08M4-**	25-30	42-50

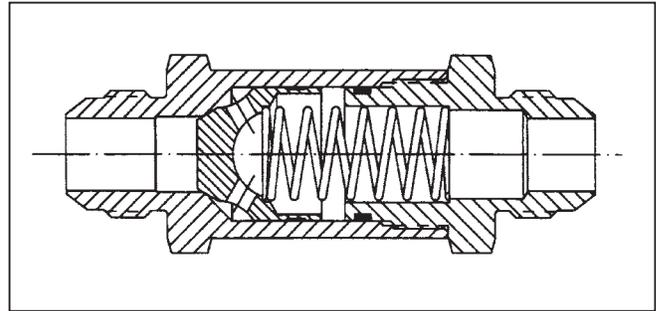
**General Description**

Series 440 and 450 high pressure check valves permit free flow in one direction, and shut off in the reverse direction with an extremely low internal leakage. These valves are ruggedly built for systems with high shock and high velocity, and will close smoothly.



**Features**

- High-pressure check valves.
- Poppet 440F stainless steel.
- For high-shock service.
- AN and MS valves are qualified to military specifications MIL-V-5524 and MIL-V-19069.



**Specifications**

<b>Service App.</b>	Hydraulic	<b>Mounting</b>	In-line
<b>Maximum Operating Pressure</b>	Working: Aluminum alloy 207 Bar (3000 PSI) Steel and Stainless Steel 345 Bar (5000 PSI)  Proof: Aluminum alloy 345 Bar (4500 PSI) Steel and Stainless Steel 517.5 Bar (7500 PSI)	<b>Ports</b>	NPT: Pipe threads FLD: Flared tube connection SAE 30° MS33656 FLS: Flareless tube connection MS33514 IST: Internal straight threads per MS33649
<b>Nominal Cracking Pressure</b>	0.4 Bar (6 PSI), ± 0.14 Bar (2 PSI), or 4.5 Bar (65 PSI), ± 0.4 Bar (6 PSI)  Below 0.4 Bar (6 PSI), ±33% 0.4 - 1.4 Bar (6 - 20 PSI), ± 0.14 Bar (2 PSI)  Above 1.4 Bar (20 PSI) ±10% Other settings available to order	<b>Material</b>	Body & Cap: Aluminum alloy, steel or 303 Stainless steel Poppet: Hardened 440F Stainless Steel Tube: Steel and aluminum valves: aluminum alloy Stainless steel valves: 316 Stainless steel  Spring: 302 Stainless Steel Finish: Aluminum alloy, anodized; steel, cadmium plated; stainless steel  O-ring: Synthetic rubber. Aluminum and stainless steel valves, sizes 4 - 16, when furnished to MS28765, MS28771, MS28890 and MS28892 only, O-rings are Code 27 (MIL-P-25732)  Back-up rings: PTFE
<b>Operating Temperature</b>	-40°C to +121°C (-40°F to +250°F) Higher on special order		
<b>Internal Leakage</b>	1 drop in 2 minutes		
<b>Sizes</b>	NPT: 1/8", 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2" FLD, FLS: 4", 6", 8", 10", 12", 16", 20", 24", 32"		

Valve Tube	Size Pipe	Weights, Maximum (Approx.)		CV Factors	
		Aluminum Alloy	Steel & Stainless Steel	440 Series	450 Series
4	1/8	0.03 kg (0.06 lbs.)	0.06 kg (0.13 lbs.)	.06	0.84
6	1/4	0.06 kg (0.13 lbs.)	0.12 kg (0.25 lbs.)	1.6	1.6
8	3/8	0.12 kg (0.25 lbs.)	0.23 kg (0.5 lbs.)	2.6	2.7
10	1/2	0.17 kg (0.38 lbs.)	0.28 kg (0.63 lbs.)	4.1	4.2
12	3/4	0.23 kg (0.5 lbs.)	0.57 kg (1.25 lbs.)	6.5	6.5
16	1	0.40 kg (.88 lbs.)	0.85 kg (1.88 lbs.)	11	10
20	1 1/4	1.13 kg (2.5 lbs.)	2.3 kg (5.0 lbs)	18	18
24	1 1/2	1.13 kg (2.5 lbs.)	2.3 kg (5.0 lbs)	24	23

3000-C1.p65, dd

**Ordering Information**

453	
Catalog Number	
448	Inlet FLS / Outlet FLS
453	Inlet NPT / Outlet NPT
458	Inlet FLD / Outlet FLD
459	Inlet NPT / Outlet NPT

-1/4	
Size and Type Ports	
4 IST or FLD or FLS	
6 IST or FLD or FLS	1/4 NPT
8 IST or FLD or FLS	3/8 NPT
10 IST or FLD or FLS	1/2 NPT
12 IST or FLD or FLS	3/4 NPT
16 IST or FLD or FLS	1 NPT
20 IST or FLD or FLS	1-1/4 NPT
24 IST or FLD or FLS	1-1/2 NPT

S
Materials
D Aluminum Alloy
<b>S Steel</b>
SS Stainless Steel

2
O-Ring Code
2 Nitrile
27 MIL-P-25732
Others Available See O-Ring Code & Media Chart Reference Section

6
Cracking Pressure
6 PSI ± 2
Others Available Consult Factory

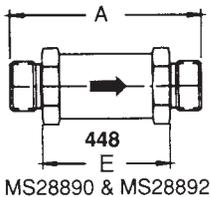
**Phase Out**

Valves meet or exceed AN or MS military specifications as shown.  
 Part numbers marked \* should be used for new production, and for replacement of parts marked †.  
**PARTS MARKED † SHOULD NOT BE USED IN PLACE OF THOSE MARKED \*.**

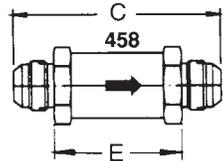
MS or AN Number	Materials	Pressure P.S.I.	Military Spec.
†AN6207	Alum. Alloy	1500	MIL-V-5524
†AN6249	Alum. Alloy	3000	MIL-V-5524
*MS28771	Alum. Alloy, Stain. Steel	3000	MIL-V-19069
†MS28890	Alum. Alloy	3000	MIL-V-5524
*MS28892	Alum. Alloy, Stain. Steel	3000	MIL-V-19069

**NOTE:** AN and MS part numbers require the addition of a dash number for size identification, example MS28892-12.

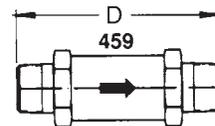
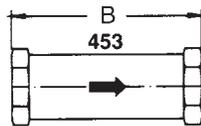
\*\* Add dash number for size and SS for Stainless Steel or AL for Aluminum.



MS28890 & MS28892



AN6207, AN6249, MS28771

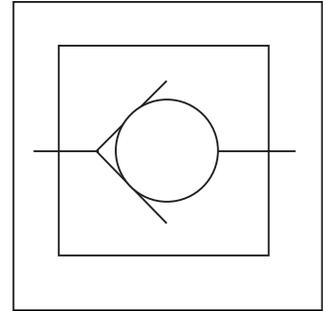


Valve Size		All Dimensions in Inches					
Tube	Pipe	A	B	C	D	E	Flats F
4		2 7/16	2 11/32	2 41/64	2 7/16	1 17/32	11/16
6	1/4	2 11/16	2 11/16	2 55/64	3 1/32	1 3/4	13/16
8	3/8	3 11/32	3 3/8	3 17/32	3 17/32	2 7/32	1 1/16
10	1/2	3 21/32	3 23/32	3 59/64	3 15/16	2 13/32	1 1/8
12	3/4	4 1/8	4 5/64	4 31/64	4 3/8	2 3/4	1 7/16
16	1	4 11/16	4 7/8	5 1/8	5 13/32	3 5/16	1 11/16
20	1 1/4	5 7/16	6	5 15/16	6 3/16	4 1/16	2 1/4
24	1 1/2	5 5/8	6 3/16	6 13/32	6 17/32	4 1/4	2 1/2
32	2	6 3/16	7	7 15/32	7 1/8	4 13/16	3



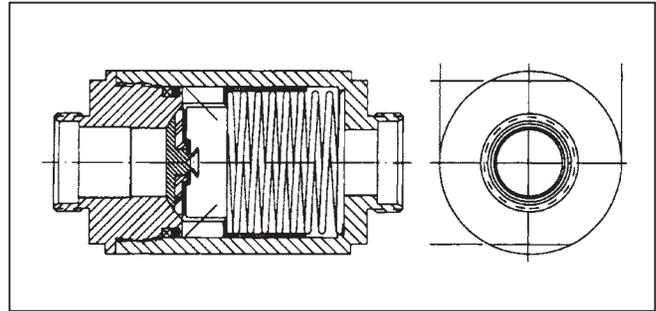
**General Description**

Series 480 free flow check valves permit free flow in one direction, and shut off in the reverse direction. Series 480 check valves can handle high velocity and will provide low pressure drop and zero leakage.



**C Features**

- Resilient molded seal is permanently locked to poppet which ensures zero leakage in high velocity applications.

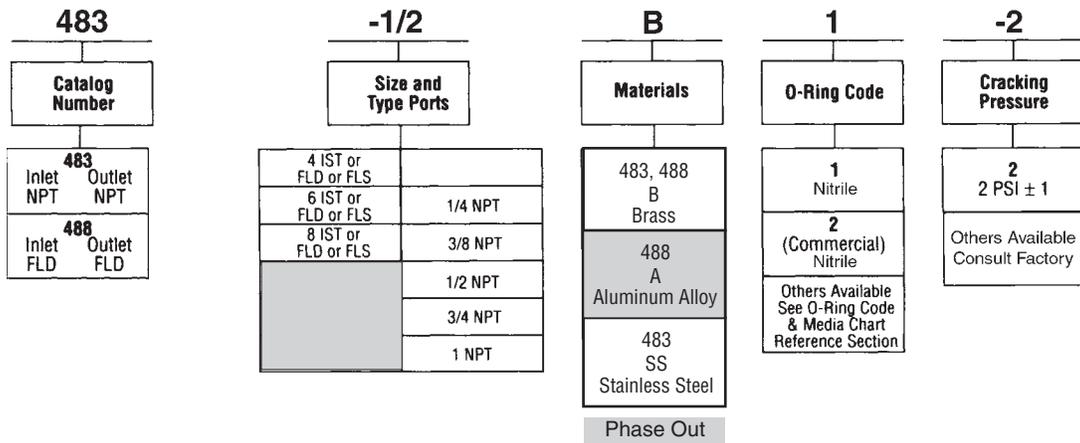


**Specifications**

<b>Service App.</b>	Pneumatic or Hydraulic	<b>Mounting</b>	In-line
<b>Maximum Operating Pressure</b>	Working: 207 Bar (3000 PSI) Proof: 345 Bar (4500 PSI) Burst: 517.5 Bar (7500 PSI)	<b>Ports</b>	NPT: Pipe threads FLD: Flared tube connection SAE 30° MS33656 (AND10056) FLS: Flareless tube connection MS33514 IST: Internal straight threads (tube connection) O-ring seals.
<b>Nominal Cracking Pressure</b>	0.14 Bar (2 PSI), ± 0.07 Bar (1 PSI) Other settings available to order	<b>Material</b>	Body & Cap: Brass, Aluminum alloy, or 303 Stainless steel Poppet Body: 305 Stainless steel Poppet Nose: 305 Stainless steel Spring: AMS5688 Stainless Steel O-ring: Synthetic rubber. Molded Seal: Synthetic rubber Back-up ring: PTFE
<b>Operating Temperature</b>	-54°C to +93°C (-65°F to +200°F) Higher temperature limits available		
<b>Internal Leakage</b>	Zero		
<b>Sizes</b>	IPT, EPT: 1/4", 3/8", 1/2", 3/4", 1" ISD, FLD, FLS: 4", 6", 8",		

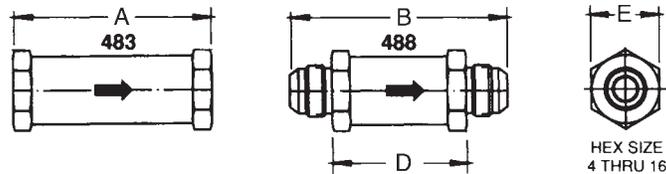
Valve Size		Weights ( Lbs. Approx.)			CV Factors
Tube	Pipe	Brass	Aluminum Alloy	Stainless Steel	Coefficient of Flow
4		.12	.06	.12	.75
6	1/4	.37	.12	.37	1.5
8	3/8	.62	.25	.62	4
	1/2	1.25	.5	1.25	6
	3/4	1.62	.75	1.62	7.5
	1	2.5	1.0	2.5	13

**Ordering Information**



**Dimensions**

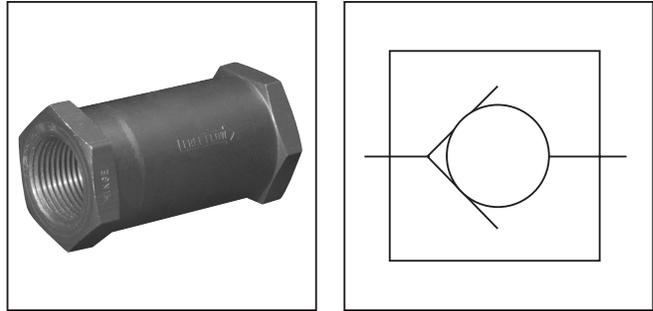
Inch equivalents for millimeter dimensions are shown in (\*\*)



Valve Size		All Dimensions in Inches			
Tube	Pipe	A	B	D	Flats C
4		1 11/16	2 5/8	1 17/32	3/4
6	1/4	2 1/4	2 31/32	1 55/64	1
8	3/8	2 7/16	3 13/32	2 3/32	1 1/4
	1/2	2 15/16	3 31/32	2 29/64	1 1/2
	3/4	3 3/8	4 7/16	2 45/64	1 3/4
	1	3 25/32	4 15/16	3 7/64	2

**General Description**

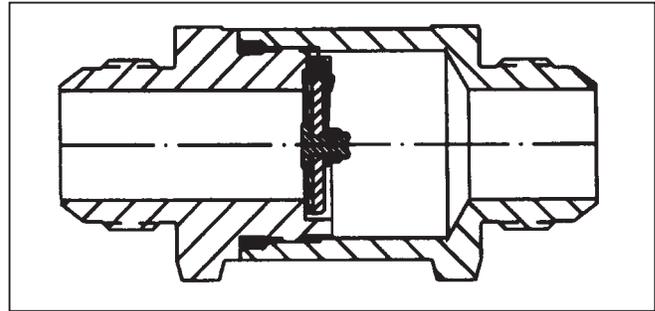
Series 580 and 593 swing check valves permit free flow in one direction, and shut off in the reverse direction with an extremely low internal leakage. Series 580 and 593 check valves will provide low pressure drop.



**Features**

**C**

- Zero leakage (less than 1 drop per minute).
- Full flow with low opening pressure.
- Improved hinge controls.
- Mounts in any position.
- MS valves meet the following specifications: MS28882A or B, MS28884A or B (see chart).



**Specifications**

<b>Service App.</b>	Hydraulic or Pneumatic	<b>Ports</b>	NPT: Pipe threads FLD: Flared tube connection SAE 37° MS33656 (AND10056) IST: Internal straight threads
<b>Maximum Operating Pressure</b>	Working: Sizes 4 to 16 - 24.2 Bar (350 PSI) Sizes 20 to 32 - 20.7 Bar (300 PSI) Cracking: 8", 0.02 Bar (0.29 PSI) water max.	<b>Material</b>	Body & Cap: Aluminum alloy, anodized Internal Parts: Aluminum alloy, anodized, and Stainless steel Molded Seal: Synthetic rubber O-ring: Synthetic rubber
<b>Operating Temperature</b>	Code 1 -55°C to +71°C (-67°F to +160°F)		
<b>Internal Leakage</b>	Zero		
<b>Sizes</b>	NPT: 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2" IST, FLD: 4", 6", 8", 10", 12", 16"		
<b>Mounting</b>	In-line, mounts in any position		

Valve Size		Weight	CV Factor		
Tube	Pipe		583 Series	588 Series	593 Series
4		2 Oz.	2.5	1.5	1.5
6	1/4	2 Oz.	4.6	3.8	3.8
8	3/8	3 Oz.	7.3	7.1	7.1
10	1/2	3 Oz.	12.0	11.8	11.8
12	3/4	6 Oz.	17.7	17.1	17.1
16	1	8 Oz.	36	35.3	35.3
	1-1/4	14 Oz.	52	58.8	58.8
	1-1/2	1.3 Lbs.	84	82.3	82.3

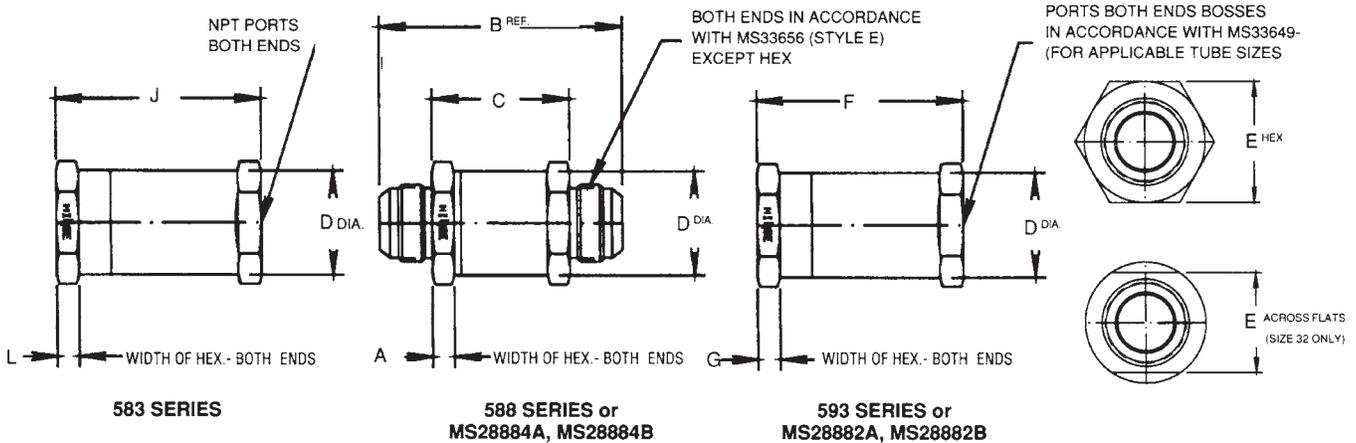
**Ordering Information**

<b>583</b>	<b>-1/8</b>	<b>D</b>	<b>1</b>	<table border="1"> <thead> <tr> <th colspan="2">Type Port</th> <th rowspan="2">MS Number Ref. Only</th> </tr> <tr> <th>Inlet</th> <th>Outlet</th> </tr> </thead> <tbody> <tr> <td rowspan="5">FLD</td> <td rowspan="5">FLD</td> <td>MS28884A - 4D1</td> </tr> <tr> <td>MS28884A - 6D1</td> </tr> <tr> <td>MS28884A - 8D1</td> </tr> <tr> <td>MS28884A - 10D1</td> </tr> <tr> <td>MS28884A - 12D1</td> </tr> <tr> <td rowspan="5">IST</td> <td rowspan="5">IST</td> <td>MS28882A - 4D1</td> </tr> <tr> <td>MS28882A - 6D1</td> </tr> <tr> <td>MS28882A - 8D1</td> </tr> <tr> <td>MS28882A - 10D1</td> </tr> <tr> <td>MS28882A - 12D1</td> </tr> </tbody> </table>	Type Port		MS Number Ref. Only	Inlet	Outlet	FLD	FLD	MS28884A - 4D1	MS28884A - 6D1	MS28884A - 8D1	MS28884A - 10D1	MS28884A - 12D1	IST	IST	MS28882A - 4D1	MS28882A - 6D1	MS28882A - 8D1	MS28882A - 10D1	MS28882A - 12D1														
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**Dimensions**

Shown in inches



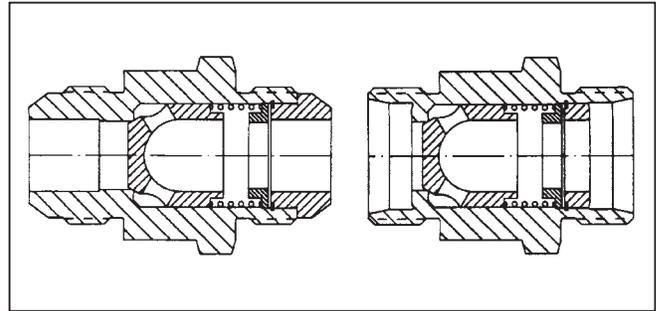
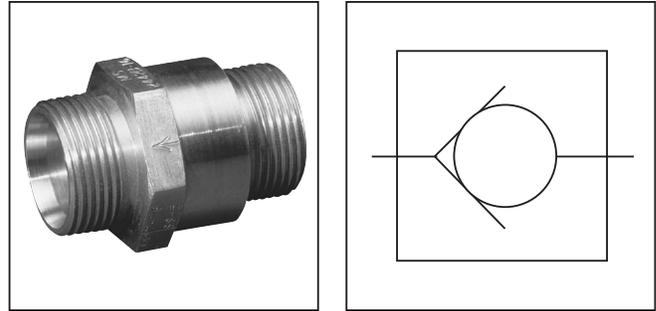
Valve Size	A	B	C	D	E	F	G	H	J	K	L
Tube Pipe	Min.		±.031			±.031	Min.	Max.	±.031	Min.	Min.
4	.125	2.663	1.563	1.032	1.066/1.057	2.031	.250	3/4	1.906	.250	1/4
6		2.675									
8		2.988									
10	.250	3.298	1.674	1.157	1.190/1.181	2.344	.375	1	2.031	.375	—
—	—	—	—	1.220	1.253/1.244	—	—		2.625		5/16
12	.250	3.791	2.063	1.470	1.503/1.494	3.500	.375		3.000		1/4
16		4.197	2.375	1.782	1.820/1.796	3.594		3.532			
—	.312	4.604	2.688	2.470	2.508/2.484	4.062	.500	4.140	.375	3/8	
1-1/4		.375	5.229	3.063	2.720	2.758/2.734		4.625			4.140

**General Description**

Series J416 and J417 mini-check valves permit free flow in one direction and near zero leakage in the reverse direction. Series J416 and J417 check valves are used in applications with restricted weight and space constraints.

**Specifications**

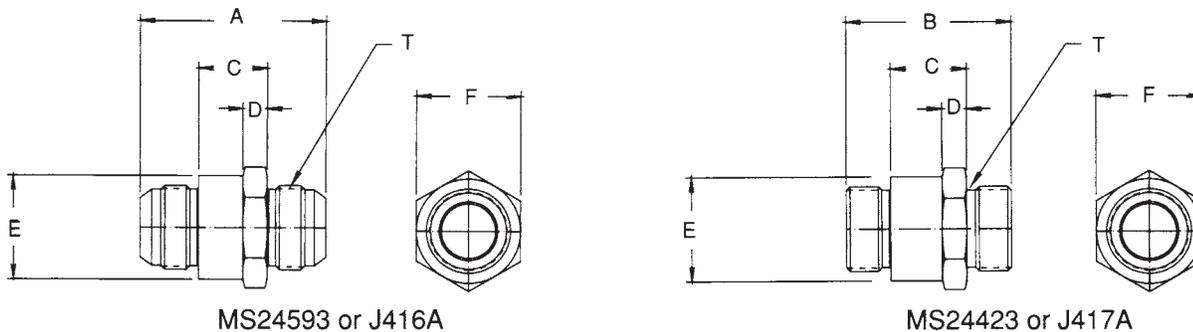
<b>Service App.</b>	Any liquid compatible with 316SS, and hardened 440 FSS
<b>Maximum Operating Pressure</b>	Working: 345 Bar (5000 PSI) maximum Proof: 517.5 Bar (7500 PSI) Burst: 828 Bar (12,000 PSI) Cracking: 0.3 Bar (5 PSI), ± 0.2 Bar (3 PSI)
<b>Operating Temperature</b>	-40°C to +82°C (-40°F to +180°F)
<b>Internal Leakage</b>	Zero above 0.3 Bar (5 PSI) 1 DPM maximum below 0.3 Bar (5 PSI)
<b>Sizes</b>	4", 6", 8", 12"
<b>Ports</b>	FLD: Flared tube connection SAE 37° MS33656 FLS: Flareless tube connection MS33514
<b>Material</b>	Body & Nose: 316 Stainless steel Poppet: 440C Stainless steel Spring: AMS5688 Stainless steel



**Ordering Information**

<b>J416A</b>		<b>-4</b>		<b>SS</b>		<b>-5</b>		<b>MS Part Number</b>	
Catalog Number		Size & Type Ports		Materials		Cracking Pressure		Flared	Flareless
J416A Inlet FLD Outlet FLD	J417A Inlet FLS Outlet FLS	4 FLD or FLS 6 FLD or FLS 8 FLD or FLS 12 FLD or FLS		SS Stainless Steel		5 5 PSI ± 3		MS24593-4 MS24593-6 MS24593-8 MS24593-10 MS24593-12 MS24593-16	MS24423-4 MS24423-6 MS24423-8 MS24423-10 MS24423-12 MS24423-16

**Dimensions — Shown in inches**



Valve Size		T	A	B	F	C	D	E	Flow	Weight	Cv
Pipe	Tube	Thread	Ref.	Ref.	Hex						
1/4	4	.4375-20UNJF-3A	1.538	1.344	.688	.438	.219	.678	1.2	.07	.38
3/8	6	.5625-18UNJF-3A	1.581	1.407	.813	.469	.250	.803	3.5	.105	.99
1/2	8	.7500-18UNJF-3A	1.814	1.624	1.000	.500	.281	.990	6.0	.195	1.98
3/4	12	1.0625-12UNJ-3A	2.290	1.938	1.375	.562	.343	1.365	16.0	.450	4.45



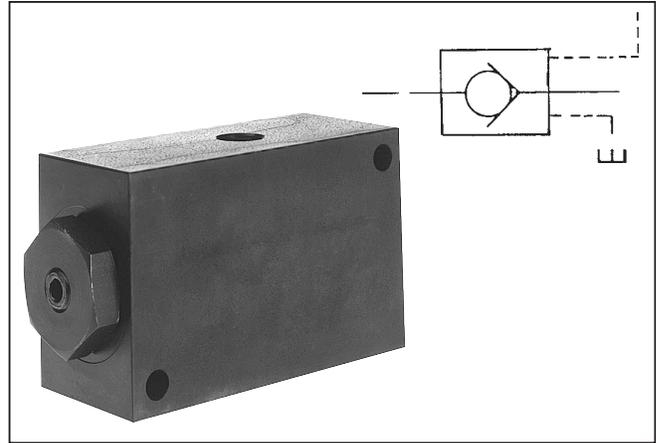
**General Description**

Series CP check valves permit free flow in one direction; flow in the opposite direction is blocked until pilot pressure unseats the poppet and permits flow in the opposite direction.

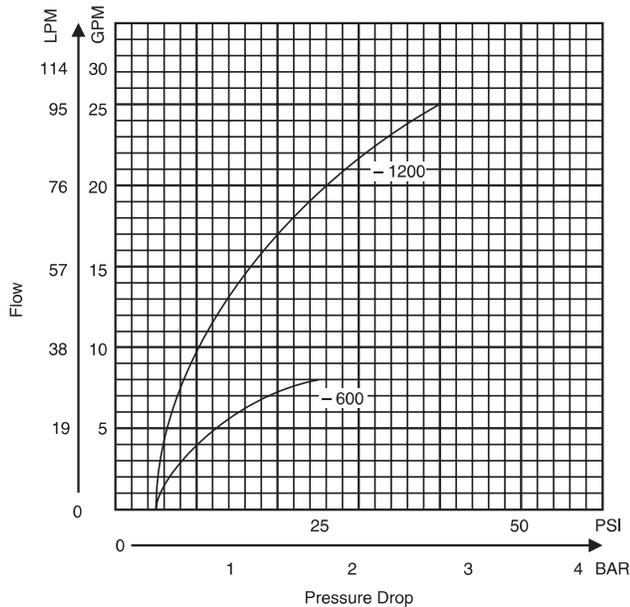
Choice of pilots operated by either air or oil.

For fast response without decompression, select the single-stage poppet having a 5 to 1 ratio of pilot piston area to check valve area.

To eliminate hydraulic shock and surge on opening, select the decompression type 2-stage poppet which has a 40 to 1 ratio of pilot piston area to decompression poppet area. This valve is ideal for controlling 207 Bar (3000 PSI) line pressures by means of 5.5 Bar (80 PSI) pilot pressure.



**Performance Curves**



Flow vs. Pressure Drop

**Specifications**

<b>Maximum Operating Pressure</b>	Poppet Type B: 7 Bar (100 PSI) Poppet Type N: 60 Bar (800 PSI) Poppet Type M: 210 Bar (3000 PSI)
<b>Maximum Pilot Pressure</b>	Air: BACP, BACPS 6 Bar (80 PSI) Oil: CP1200, CPS1200 70 Bar (1000 PSI) CP600, CPS600 210 Bar (3000 PSI)
<b>Cracking Pressure</b>	0.4 Bar (5 PSI) Free flow direction
<b>Material</b>	Type B: Nitrile Type N: Nylon Type M: Solid Metal

**Flow Data**

Valve Model	Flow, Max. GPM (L/M)	Pilot Piston Area To Decompression Poppet Area	Pilot Piston Area To Check Valve Area	Port Size
CP*600S5 BACP*600S5	8 (30)	—	5:1	3/8 NPTF
CP*600S40 BACP*600S40	8 (30)	40:1	5:1	3/8 NPTF
CP*1200S5 BACP*1200S5	25 (95)	—	5:1	3/4 NPTF
CP*1200S40 BACP*1200S40	25 (95)	40:1	5:1	3/4 NPTF

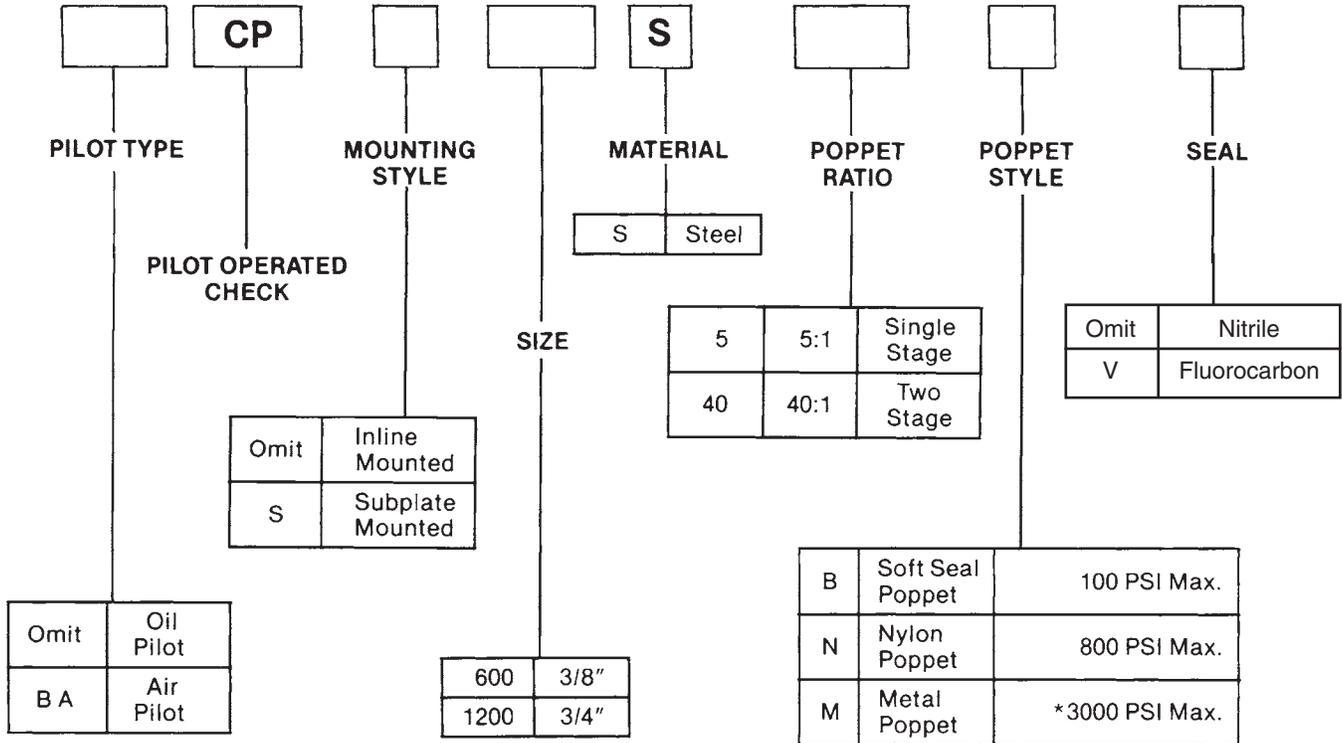
Note: Models CP/CPS are oil-operated pilot  
 Models BACP/BACPS are air-operated pilots

\*Insert "S" in model code for subplate mounted valve.

3000-C1.p65, dd

Example: "BACP600S40N" means air pilot-operated 3/8" in-line check valve, steel, two-stage 40-to-1 pilot ratio, nylon poppet for 800 PSI maximum line pressure, with nitrile seals.

**C**



\*3000 PSI is the system pressure rating. The pilot pressure rating is 80 PSI for Air Pilot, 1000 PSI for Oil Pilot 1200 size and 3000 PSI for Oil Pilot 600 size.

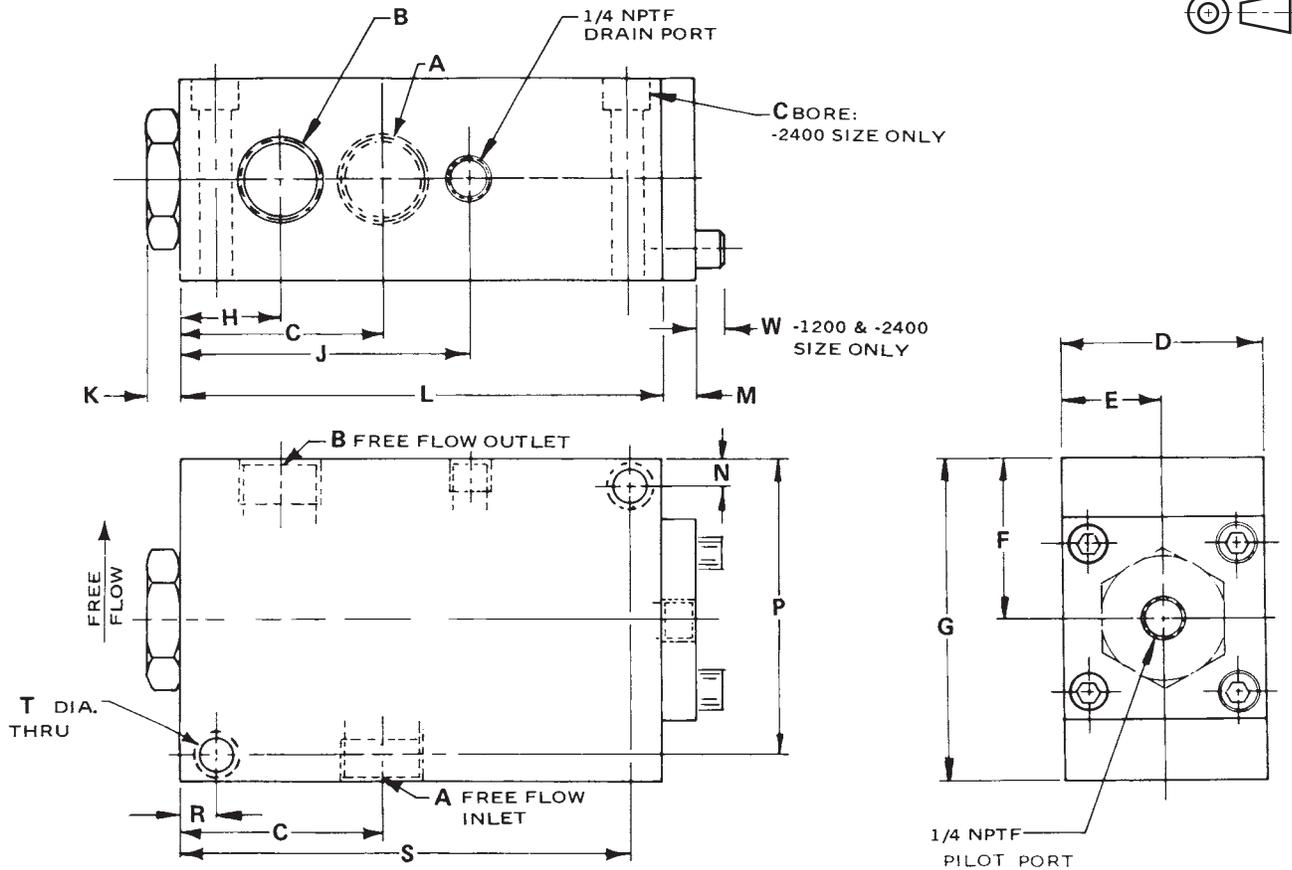
**Bolt Kits**

Valve	Bolt Kit	Bolt Specification* SAE Grade 8 or Better	Bolt Torque
CPS600S BACPS600S	BK10	5/16-18 x 2-1/2"	20-25 FT.-LB.
CPS1200S BACPS1200S	BK14	3/8-16 x 3"	45-50 FT.-LB.

Millimeter equivalents for inch dimensions are shown in (\*\*)

**Models CP and BACP**

In-line pilot operated check valves, optional air or oil operated pilots



Valve Size	A&B Thread	C	D	E	F	G	H	J	K
CP600S BACP600S	3/8—18 NPTF	2.10 (53.3)	2.00 (50.8)	1.00 (25.4)	1.50 (38.1)	3.00 (76.2)	1.00 (25.4)	3.00 (76.2)	.41 (10.4)
CP1200S BACP1200S	3/4—14 NPTF	2.50 (63.5)	2.50 (63.5)	1.25 (31.8)	2.00 (50.8)	4.00 (101.6)	1.25 (31.8)	3.61 (91.2)	.42 (10.7)

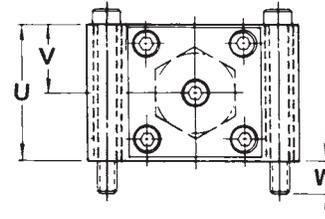
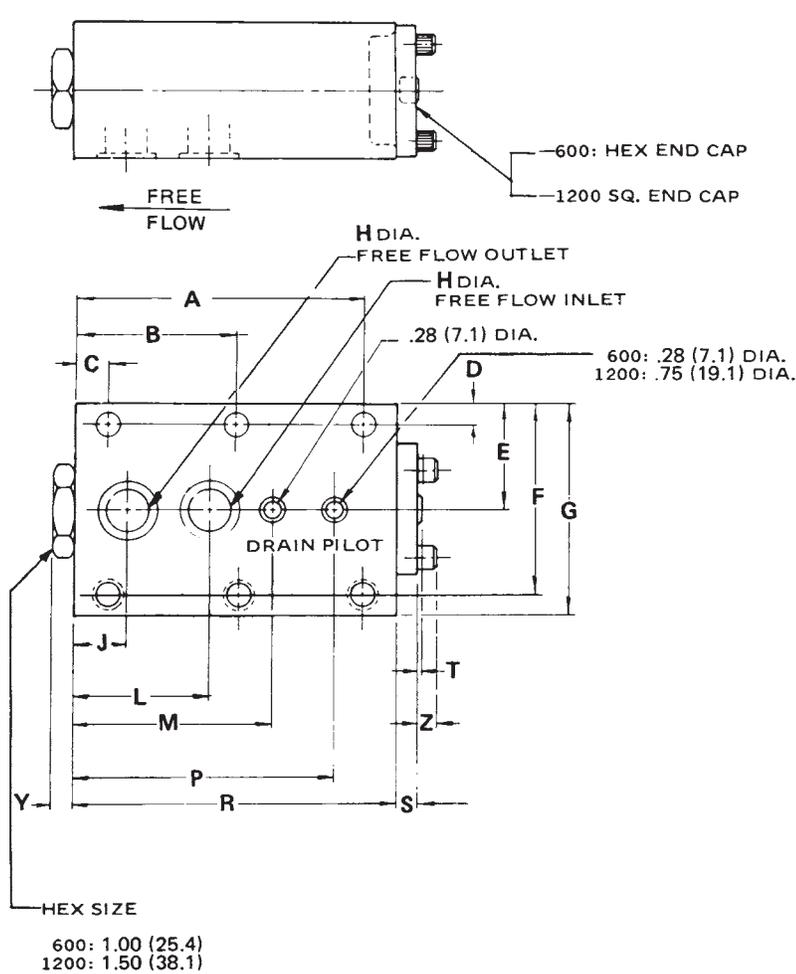
Valve Size	A&B Thread	L	M	N	P	R	S	T	W
CP600S BACP600S	3/8—18 NPTF	4.75 (120.7)	.42 (10.7)	.37 (9.4)	2.62 (66.5)	.37 (9.4)	4.37 (111)	.36 (9.1)	—
CP1200S BACP1200S	3/4—14 NPTF	6.00 (152.4)	.45 (11.43)	.44 (11.2)	3.56 (90.4)	.44 (11.2)	5.56 (141.2)	.42 (10.7)	.31 (7.9)

Millimeter equivalents for inch dimensions are shown in (\*\*)

**Models CP and BACP**

Manifold mounted pilot operated check valves, optional air or oil operated pilots

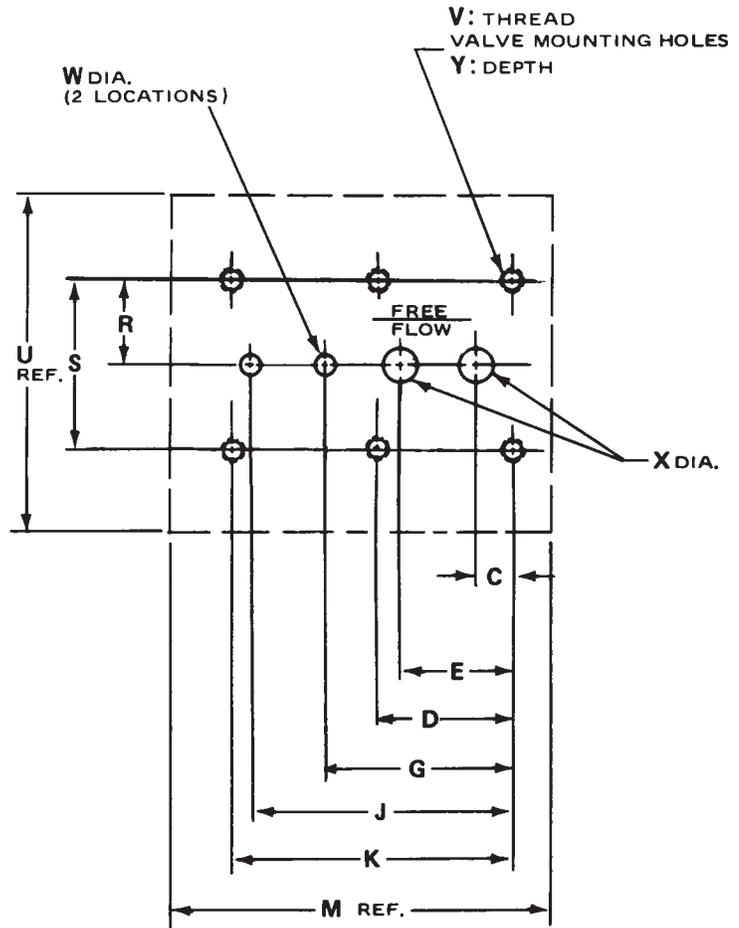
**C**



	Valve Model	
	CPS600S BACPS600S	CPS1200S BACPS1200S
<b>A</b>	4.25 (108.0)	5.37 (136.4)
<b>B</b>	2.37 (60.2)	3.00 (76.2)
<b>C</b>	.50 (12.7)	.62 (15.7)
<b>D</b>	.34 (8.6)	.40 (10.2)
<b>E</b>	1.50 (38.1)	2.00 (50.8)
<b>F</b>	2.65 (67.3)	3.59 (91.2)
<b>G</b>	3.00 (76.2)	4.00 (101.6)
<b>H</b>	.44 (11.2)	.75 (19.1)
<b>J</b>	.84 (21.3)	1.00 (25.4)
<b>L</b>	2.10 (53.3)	2.50 (63.5)
<b>M</b>	3.00 (76.2)	3.69 (93.7)
<b>P</b>	4.00 (101.6)	5.00 (127.0)
<b>R</b>	4.75 (120.7)	6.00 (152.4)
<b>S</b>	.42 (10.7)	.45 (11.4)
<b>T</b>	.04 (1.0)	.04 (1.0)
<b>U</b>	2.00 (50.8)	2.50 (63.5)
<b>V</b>	1.00 (25.4)	1.25 (31.8)
<b>W</b>	.50 (12.7)	.50 (12.7)
<b>Y</b>	.31 (7.9)	.40 (10.2)
<b>Z</b>	—	.31 (7.9)
<b>Weight Lb. (Kg)</b>	7.7 (4)	16 (7)

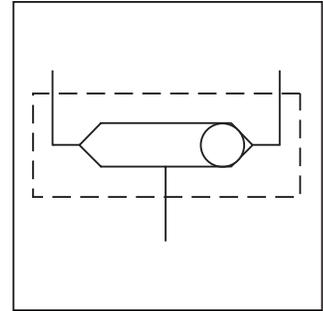
Millimeter equivalents for inch dimensions are shown in (\*\*)

	Valve Model	
	600	1200
C	.344 (8.7)	.375 (9.5)
D	1.875 (47.6)	2.375 (60.3)
E	1.600 (40.6)	1.880 (47.8)
G	2.500 (63.5)	3.067 (77.9)
H	—	—
J	3.500 (88.9)	4.192 (106.5)
K	3.750 (95.3)	4.750 (120.7)
M	4.750 (120.7)	6.000 (152.4)
R	1.156 (29.4)	1.594 (40.5)
S	2.312 (58.7)	3.187 (81.0)
U	4.500 (114.3)	5.440 (138.2)
V	5/16-18	3/8-16
W	.281 (7.1)	.281 (7.1)
X	.469 (11.9)	.750 (19.1)
Y	.620 (15.7)	.620 (15.7)



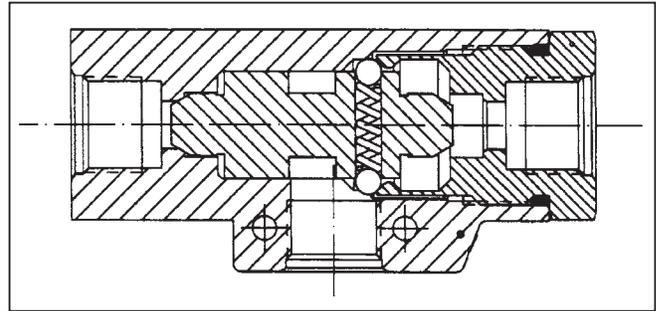
**General Description**

Series 419 shuttle valves allow for the selection of a hydraulic circuit when there is more than one control source in the hydraulic circuit. An increased pressure in one source causes the valve to actuate, providing flow to and from that source. The shuttle will remain in its position for flow in either direction until a differential pressure of approximately 40 psi ( $\pm 10$ ) is reached in the alternate circuit.



**Features**

- Conforms to military specifications:
  - (1) MS28767 (Type II systems)
  - (2) AN6277 (Type I systems)
  - (3) MIL-V-5530A.
- Shuttle detented to prevent blocking of outlet port.

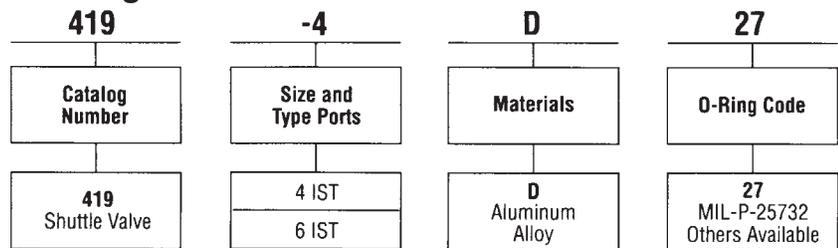


**Specifications**

<b>Service App.</b>	Hydraulic
<b>Maximum Operating Pressure</b>	Working: 345 Bar (5000 PSI) Proof: 310.5 Bar (4500 PSI) Burst: 517.5 Bar (7500 PSI) Shuttles at 2.8 Bar (40 PSI), $\pm 10$ differential pressure
<b>Operating Temperature</b>	-54°C to +135°C (-65°F to +275°F) for Type II systems
<b>Sizes</b>	IST: 4", 6"
<b>Ports</b>	IST: Internal straight threads (tube connection) AND10050 O-ring seal
<b>Mounting</b>	Two 3/16" diameter holes through

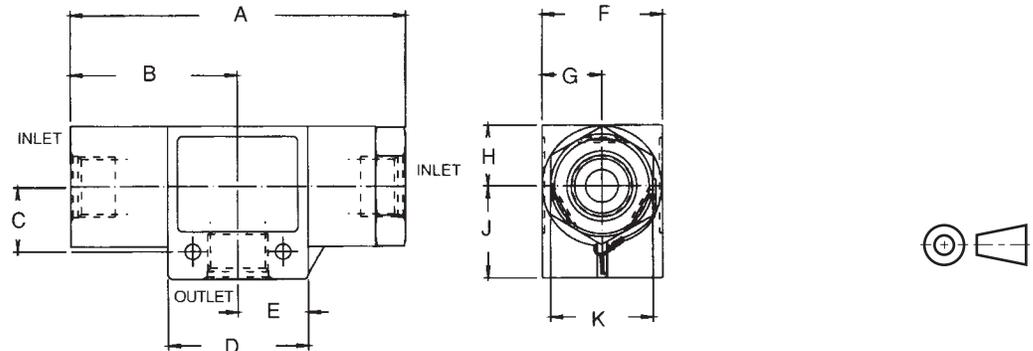
<b>Interflow</b>	Between source ports during shuttle movement: 3cc (0.18 cu. in.) max.
<b>Internal Leakage</b>	1 DPM Max. from closed port
<b>Material</b>	Body: Forged aluminum alloy, anodized Cap: Aluminum alloy, anodized Shuttle: 303 Stainless steel Spring: AMS5688 Stainless steel Balls: 440 Stainless steel O-ring: Synthetic rubber Lockwire: Stainless steel Back-up Ring: PTFE

**Ordering Information**



MS Equivalent			
Size	Type Ports	Part Number	Military Number
4	IST	419 - 4D27	MS 28767-4
6	IST	419 - 6D27	MS 28767-6

**Dimensions**  
 Shown in inches



Valve Size	A $\pm .031$	B	C	D	E	F $+0, -1/32$	G Min.	H	J	K Hex.	Flow GPM	Weight Ozs.	CV Factor
4	3.750	1-7/8	3/4	.875	7/16	1	.492	1/2	1	15/16	1.2	7	.32
6	3.875	1-15/16	3/4	1.125	9/16	1-1/4	.617	5/8	1	1-1/8	3.5	9-1/2	1.0

3000-C1.p65, dd



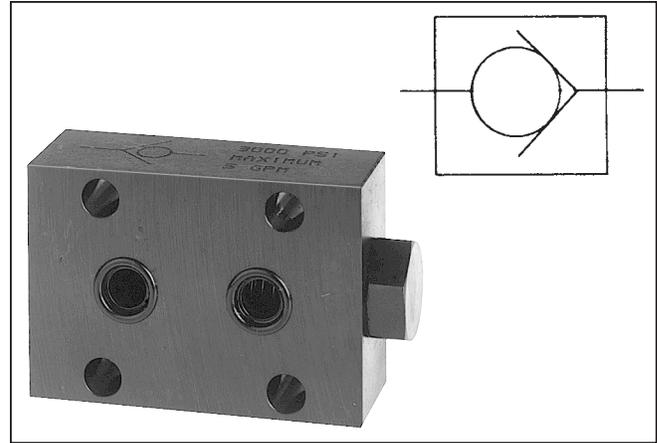
**General Description**

Series CS check valves permit free flow in one direction, and total shut-off automatically in the reverse direction.

Poppet checks, not ball checks, are standard on all Series CS check valves. Poppets eliminate chatter and minimize wear.

**Features**

- Stainless steel poppets standard.
- Triangular retainers guide the poppets and hold the spring firmly in place even under high velocity and shock.



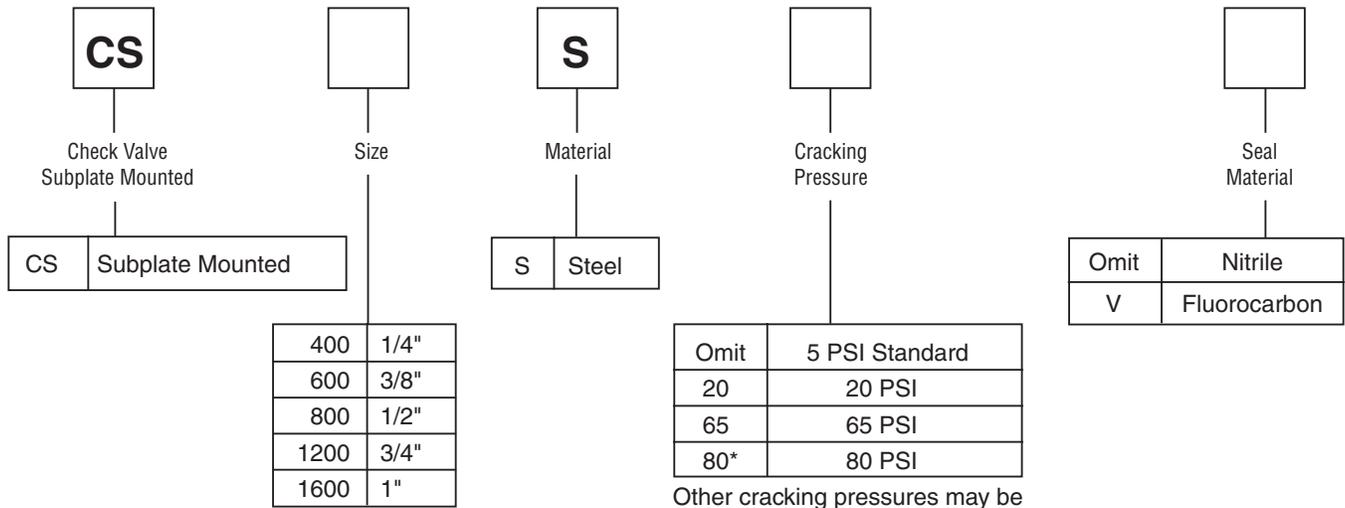
**Specifications**

<b>Maximum Operating Pressure</b>	210 Bar (3000 PSI)
<b>Nominal Cracking Pressure</b>	0.3 Bar (5 PSI) Other cracking pressures may be available on request.
<b>Standard Options</b>	1.3 Bar (20 PSI) 4.5 Bar (65 PSI)
<b>Poppet Style</b>	Solid metal poppet, Stainless steel

**Quick Reference Data Chart**

Model Number	Port Size	Rate LPM (GPM)	Free Flow Cv GPM	Orifice area, in <sup>2</sup>	ΔP at Max. Flow Bar (PSI)
CS400	1/4	23 (5)	1.56	0.068	0.6 (9)
CS600	3/8	30 (8)	2.27	0.099	0.8 (11)
CS800	1/2	45 (15)	5.11	0.224	0.6 (8)
CS1200	3/4	100 (25)	7.95	0.348	0.9 (13)
CS1600	1	150 (40)	10.35	0.453	0.9 (13)

**Ordering Information**



Other cracking pressures may be available on request.

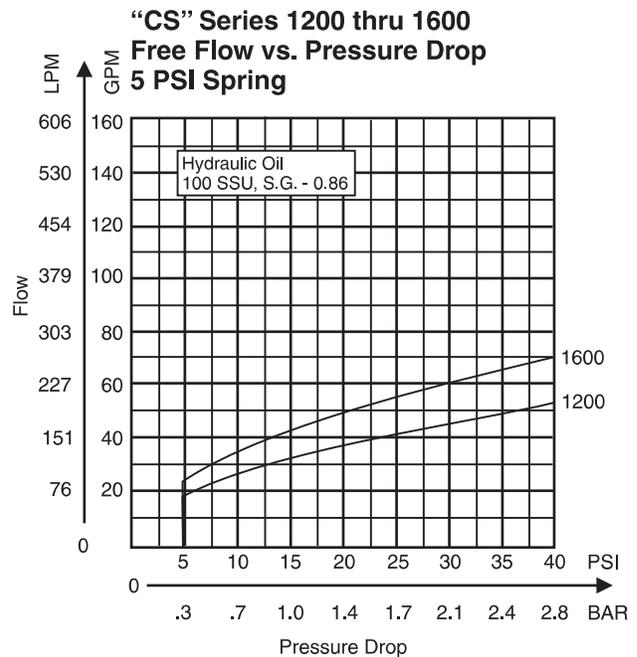
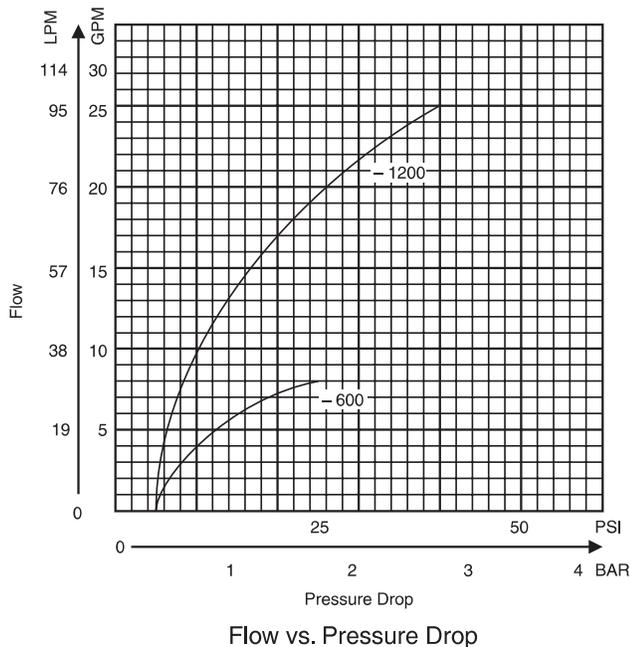
\*80 PSI cracking pressure available on 1200 size and smaller.

**Bolt Kits** To order bolt kits, specify bolt kit number

Valve	Bolt Kit	Bolt Specification*	Bolt Torque
CS400S	BK01	1/4-20 x 1-1/4"	13 Ft.-Lbs.
CS600S	BK02	1/4-20 x 1-1/2"	13 Ft.-Lbs.
CS800S	BK04	1/4-20 x 1-3/4"	13 Ft.-Lbs.
CS1200S	BK08	5/16-18 x 2-1/4"	27 Ft.-Lbs.
CS1600S	BK10	5/16-18 x 2-1/2"	27 Ft.-Lbs.

\*Use SAE Grade 8 or Better.

**Performance Curves**

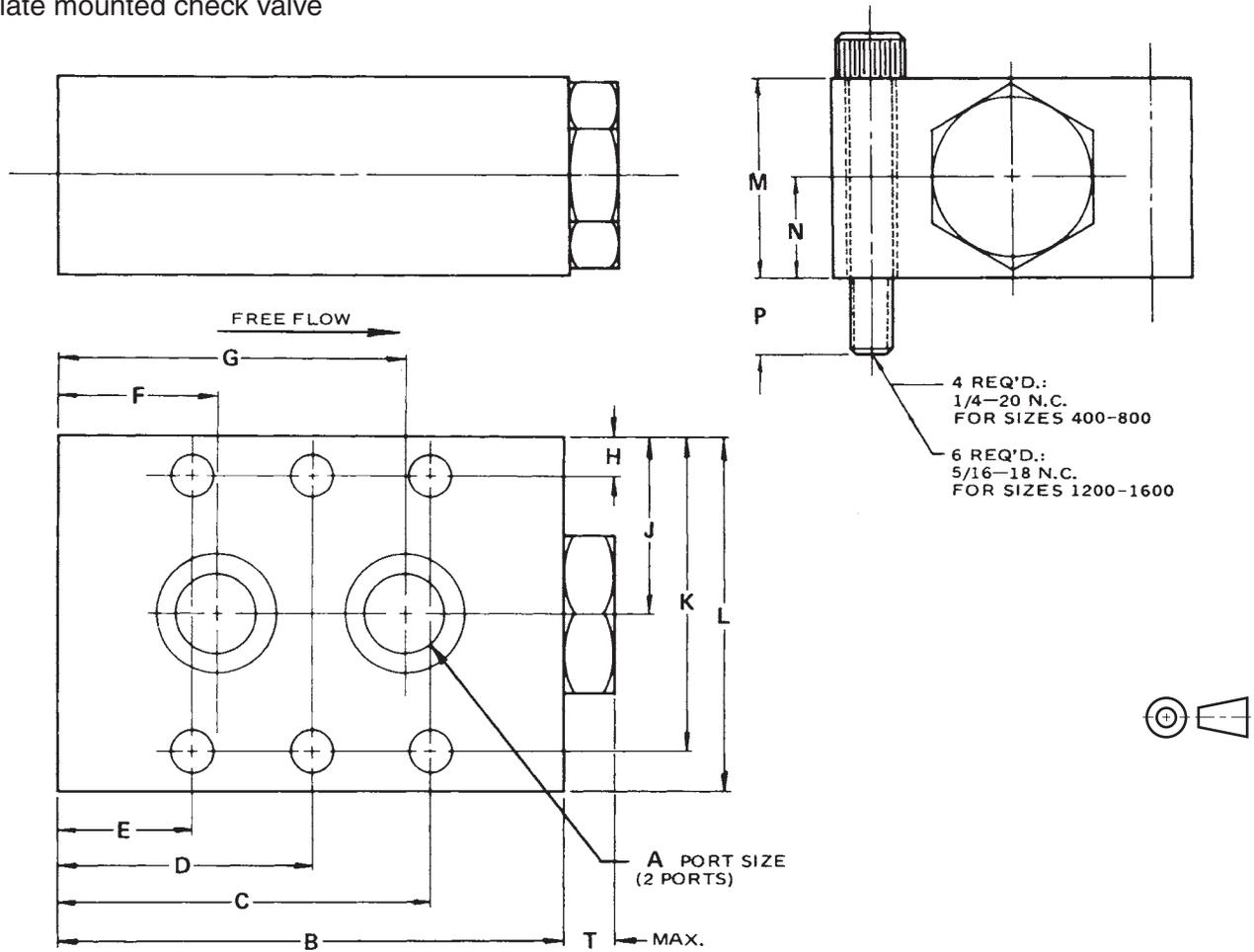


3000-C1.p65, dd

Millimeter equivalents for inch dimensions are shown in (\*\*)

**Models CS400S through CS1600S**

Subplate mounted check valve



**C**

Valve Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	T	Weight LB. (Kg)
CS400S	.28 (7.1)	2.50 (63.5)	1.93 (49.0)	—	.56 (14.2)	.75 (19.1)	1.75 (44.5)	.21 (5.3)	.87 (22.1)	1.53 (38.9)	1.75 (44.5)	.87 (22.1)	.43 (10.9)	.39 (9.9)	.31 (7.9)	1.1 (0.5)
CS600S	.40 (10.2)	2.75 (69.9)	2.03 (51.6)	—	.71 (18.0)	.87 (22.1)	1.87 (47.5)	.25 (6.4)	1.00 (25.4)	1.75 (44.5)	2.00 (50.8)	1.00 (25.4)	.50 (12.7)	.51 (13.0)	.32 (8.1)	1.6 (0.7)
CS800S	.47 (11.9)	3.18 (80.7)	2.34 (59.4)	—	.84 (21.3)	1.00 (25.4)	2.19 (55.6)	.25 (6.4)	1.12 (28.4)	2.00 (50.8)	2.25 (57.2)	1.25 (31.8)	.62 (15.7)	.52 (13.2)	.32 (8.1)	2.3 (1.0)
CS1200S	.68 (17.3)	4.09 (103.9)	3.54 (89.9)	2.04 (51.8)	.54 (13.7)	.99 (25.1)	3.12 (79.2)	.31 (7.9)	1.37 (34.8)	2.43 (61.7)	2.75 (69.9)	1.75 (44.5)	.87 (22.1)	.57 (14.5)	.42 (10.7)	5.1 (2.3)
CS1600S	.87 (22.1)	5.00 (127.0)	4.37 (111.0)	2.50 (63.5)	.62 (15.7)	1.37 (34.8)	3.62 (91.9)	.31 (7.9)	1.50 (38.1)	2.68 (68.1)	3.00 (76.2)	2.00 (50.8)	1.00 (25.4)	.57 (14.5)	.42 (10.7)	7.6 (3.5)

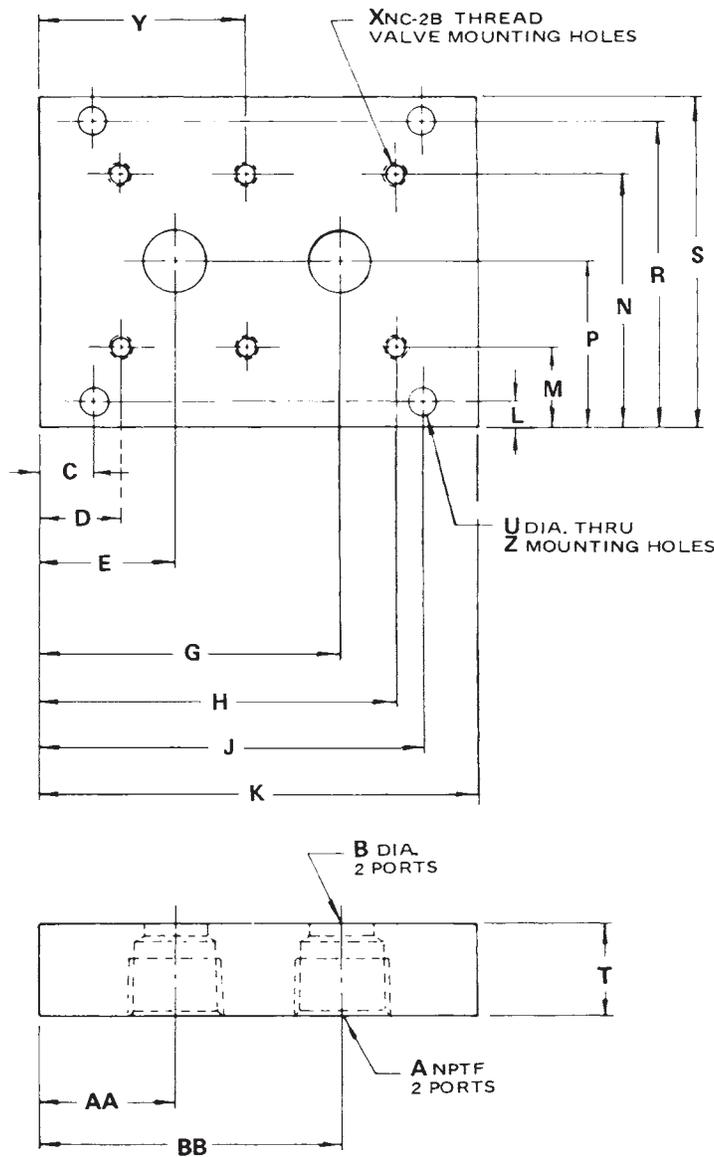
Millimeter equivalents for inch dimensions are shown in (\*\*)

**Subplate**

Reference Data Only

(Subplates are not available)

**C**



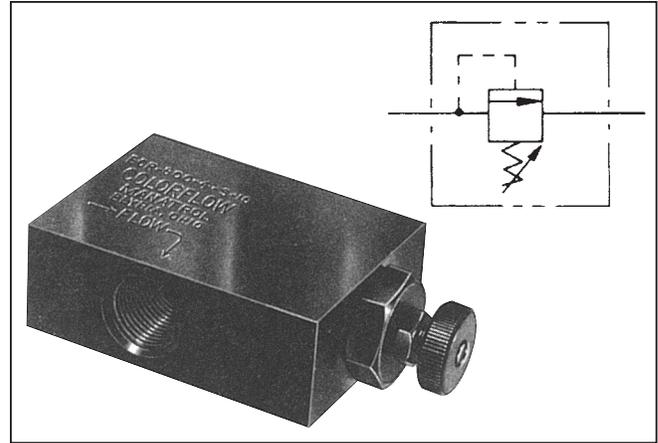
Valve Numbers					
	CS 400	CS 600	CS 800	CS 1200	CS 1600
A	1/4"	3/8"	1/2"	3/4"	1"
B	.281 (7.1)	.406 (10.3)	.469 (11.9)	.656 (16.7)	.875 (22.2)
C	.375 (9.5)	.375 (9.5)	.500 (12.7)	.344 (8.7)	1.500 (38.1)
D	.562 (14.3)	.843 (21.4)	.875 (22.2)	.750 (19.1)	1.125 (28.6)
E	.750 (19.1)	1.000 (25.4)	1.031 (26.2)	1.188 (30.2)	1.875 (47.6)
G	1.750 (44.5)	2.000 (50.8)	2.219 (56.4)	3.328 (84.5)	4.125 (104.8)
H	1.938 (49.2)	2.156 (54.8)	2.375 (60.3)	3.750 (95.3)	4.875 (123.8)
J	2.125 (54.0)	2.625 (66.7)	2.750 (69.9)	4.156 (105.6)	4.500 (114.3)
K	2.50 (63.5)	3.00 (76.2)	3.25 (82.6)	4.50 (114.3)	6.00 (152.4)
L	.344 (8.7)	.250 (6.4)	.438 (11.1)	.344 (8.7)	.343 (8.7)
M	.844 (21.4)	.750 (19.1)	1.125 (28.6)	1.062 (27.0)	1.062 (27.0)
N	2.156 (54.8)	2.250 (57.2)	2.875 (73.0)	3.188 (81.0)	3.438 (87.3)
P	1.500 (38.1)	1.500 (38.1)	2.000 (80.8)	2.125 (54.0)	2.250 (57.2)
R	2.656 (67.5)	2.750 (69.9)	3.562 (90.5)	3.906 (99.2)	4.156 (105.6)
S	3.00 (76.2)	3.00 (76.2)	4.00 (101.6)	4.25 (108.0)	4.50 (114.3)
T	1.125 (28.6)	1.125 (28.6)	1.125 (28.6)	1.125 (28.6)	1.250 (31.8)
U	.281 (7.1)	.281 (7.1)	.359 (9.1)	.422 (10.7)	.422 (10.7)
X	1/4-20	1/4-20	1/4-20	5/16-18	5/16-18
Y	—	—	—	2.250 (57.2)	3.000 (76.2)
Z	4 Holes	4 Holes	4 Holes	6 Holes	6 Holes
AA	.750 (19.1)	1.000 (25.4)	1.031 (26.2)	1.188 (30.2)	1.875 (47.6)
BB	1.750 (44.5)	2.000 (50.8)	2.219 (56.4)	3.328 (84.5)	4.125 (104.8)

### General Description

Series ECR adjustable check valves have an adjustable knob that allows the cracking pressure to be selected and locked at that rate by a jam nut. These valves allow flow in one direction and prevent flow in the opposite direction.

### Features

- Can be utilized as a check valve with adjustable cracking pressure or as a low pressure direct spring relief valve.
- Valve may be ordered with one out of four adjustment ranges.



### Specifications

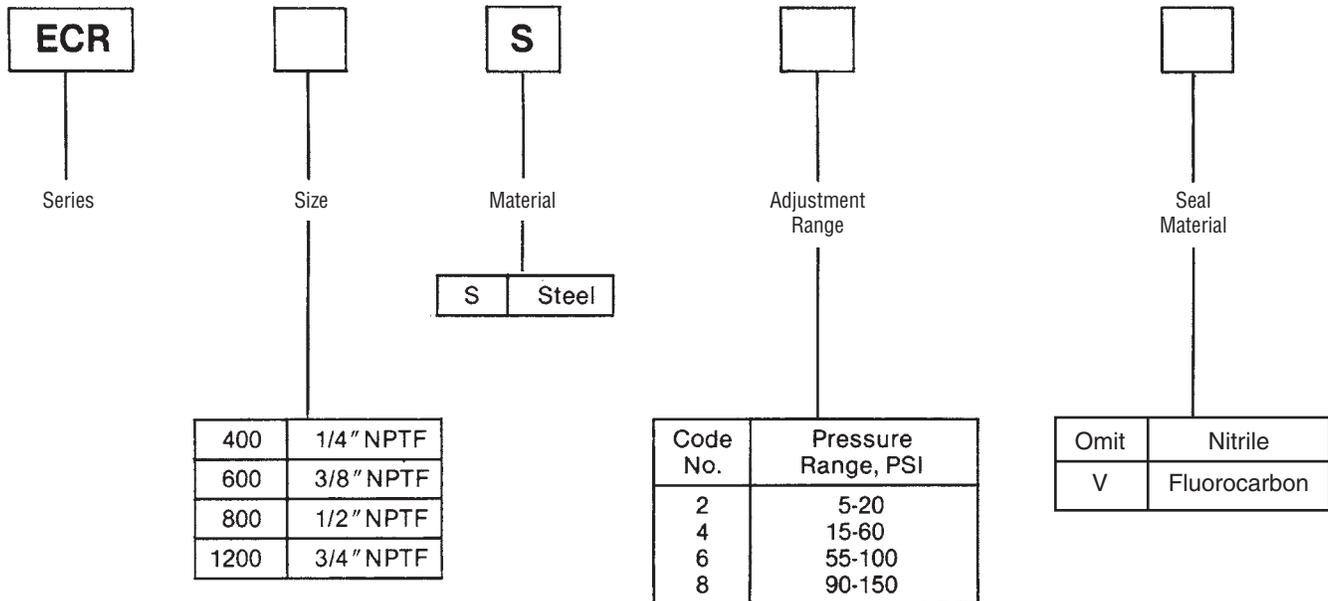
<b>Maximum Operating Pressure</b>	210 Bar (3000 PSI)
<b>Normal Cracking Pressure</b>	0.3 - 1.4 Bar (5 - 20 PSI) 1.0 - 4.1 Bar (15 - 60 PSI) 3.8 - 6.9 Bar (55 - 100 PSI) 6.2 - 10.4 Bar (90 - 150 PSI)
<b>Mounting</b>	In-line in any position
<b>Material</b>	Steel

### Flow Rates

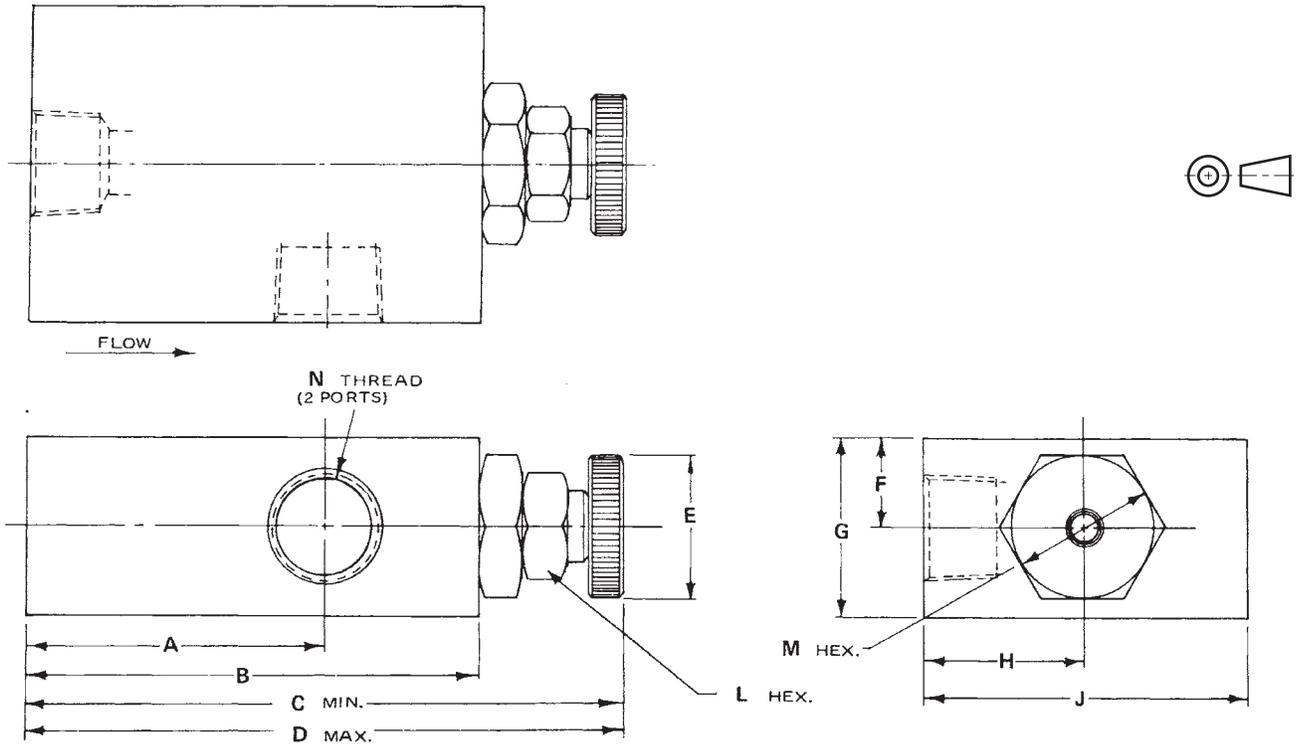
Model Number	Port Size, In. NPTF	Flow, Max. GPM (L/M)
ECR400S	1/4"	6 (23)
ECR600S	3/8"	8 (30)
ECR800S	1/2"	12 (45)
ECR1200S	3/4"	27 (100)

### Ordering Information

Example: "ECR600S4" means Model ECR, Size 600 (3/8" ports), steel, cracking range 4 (15-60 PSI), Standard seals.



Millimeter equivalents for inch dimensions are shown in (\*\*)



VALVE MODEL	A	B	C	D	E	F	G	H	J	L	M	N THREAD	WEIGHT LB. (Kg)
ECR400S	1.00 (25.4)	2.50 (63.5)	3.24 (82.3)	3.56 (90.4)	.75 (19.1)	.43 (10.9)	.87 (22.1)	.87 (22.1)	1.75 (44.5)	.50 (12.7)	.68 (17.3)	1/4 — 18 NPTF	1.1 (0.5)
ECR600S	1.78 (45.2)	2.75 (69.9)	3.63 (92.2)	3.96 (100.6)	.75 (19.1)	.50 (12.7)	1.00 (25.4)	1.00 (25.4)	2.00 (50.8)	.75 (19.1)	.87 (22.1)	3/8 — 18 NPTF	1.5 (0.7)
ECR800S	2.15 (54.6)	3.18 (80.8)	4.07 (103.3)	4.44 (112.8)	1.00 (25.4)	.62 (15.7)	1.25 (31.8)	1.12 (28.4)	2.25 (57.2)	.75 (19.1)	1.00 (25.4)	1/2 — 14 NPTF	2.4 (1)
ECR1200S	2.68 (68.1)	4.09 (103.9)	5.20 (132.1)	5.64 (143.3)	1.25 (31.8)	.87 (22.1)	1.75 (44.5)	1.37 (34.8)	2.75 (69.9)	.93 (23.6)	1.25 (31.8)	3/4 — 14 NPTF	5.2 (2.5)

**General Description**

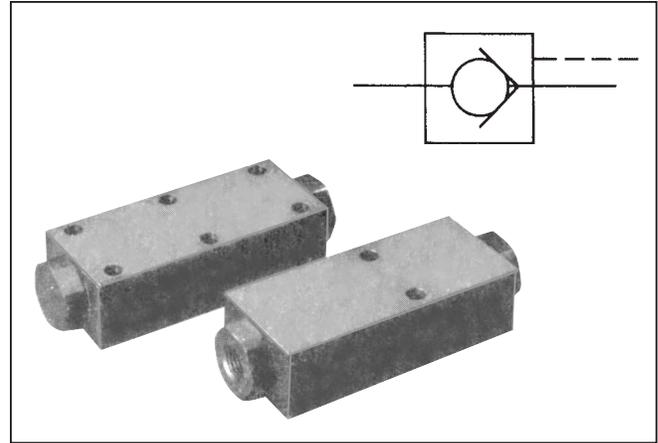
Series ICP pilot-operated check valves allow free flow in one direction, and prevent any flow in the opposite direction until the pilot is actuated, allowing the valve to open and permit flow in the reverse direction.

**Features**

- One of two poppet ratios may be selected.
- The -19 poppet is 2-stage, which helps eliminate shock. It permits the use of lower pilot pressures.

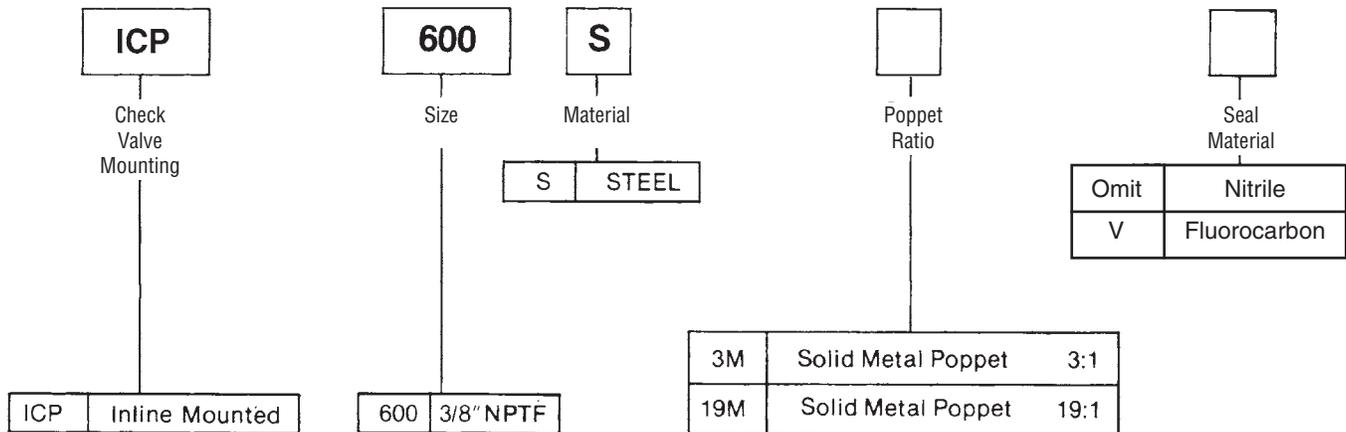
**Specifications**

<b>Maximum Operating Pressure</b>	210 Bar (3000 PSI)
<b>Nominal Flow</b>	30 LPM (8 GPM)
<b>Maximum Flow</b>	45 LPM (12 GPM)
<b>Poppet Styles</b>	Single stage: 3:1 area ratio Two stage, decompression: 19:1 area ratio
<b>Mounting</b>	In-line, in any position
<b>Material</b>	Steel

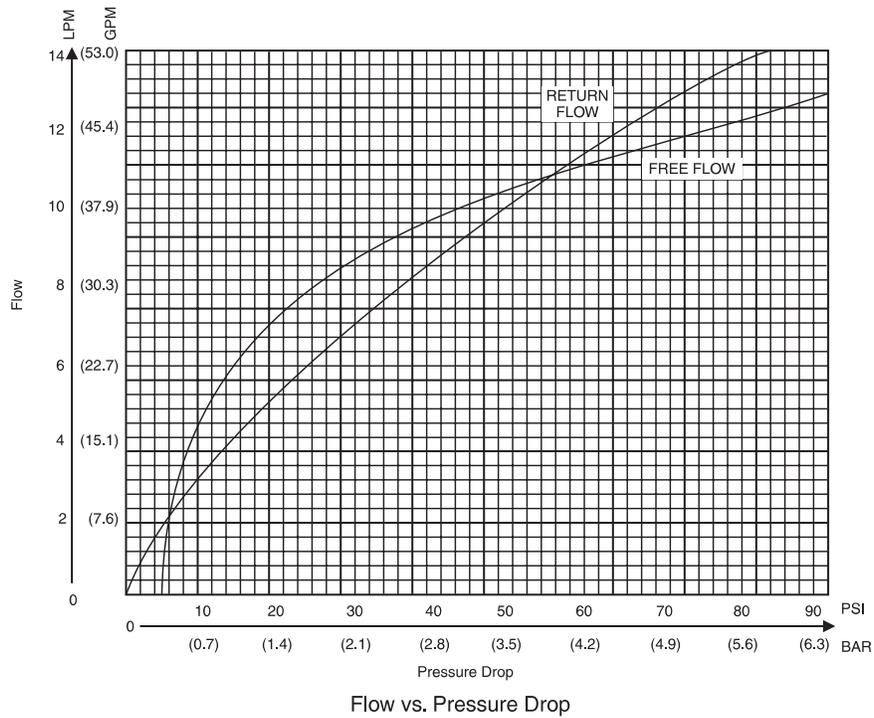


**Ordering Information**

Example: "ICP6003M—" means Model ICP, 3/8" NPTF 3:1 pilot piston area ratio, standard nitrile seal.

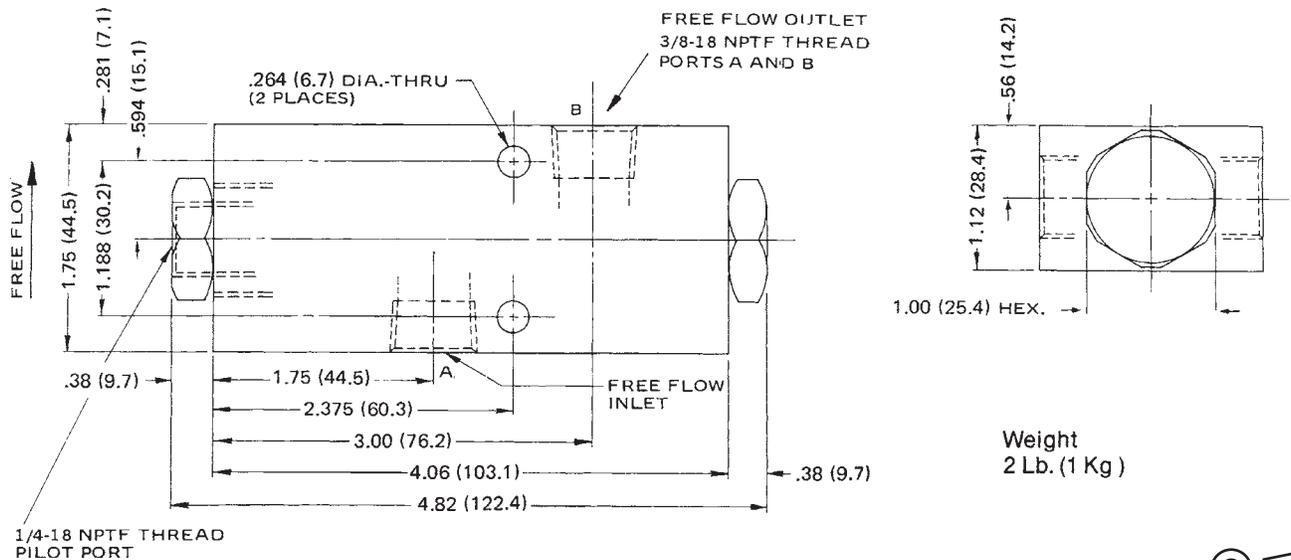


**Performance Curves**



**Dimensions**

Millimeter equivalents for inch dimensions are shown in (\*\*)



Valve Model	Port Size	Flow (Max) GPM (L/M)	Δ P @ Max Free Flow PSI (Bar)	Δ P @ Max Reverse Flow PSI (Bar)	Area Ratio	
					Pilot Piston Area To Decompression Poppet Area	Pilot Piston Area To Check Valve Area
ICP 600S3*	3/8 NPTF	12 (45.4)	78 (5.5)	60 (4.2)	—	3:1
ICP 600S19*	3/8 NPTF	12 (45.4)	78 (5.5)	60 (4.2)	19:1	3:1

3000-C1.p65, dd