

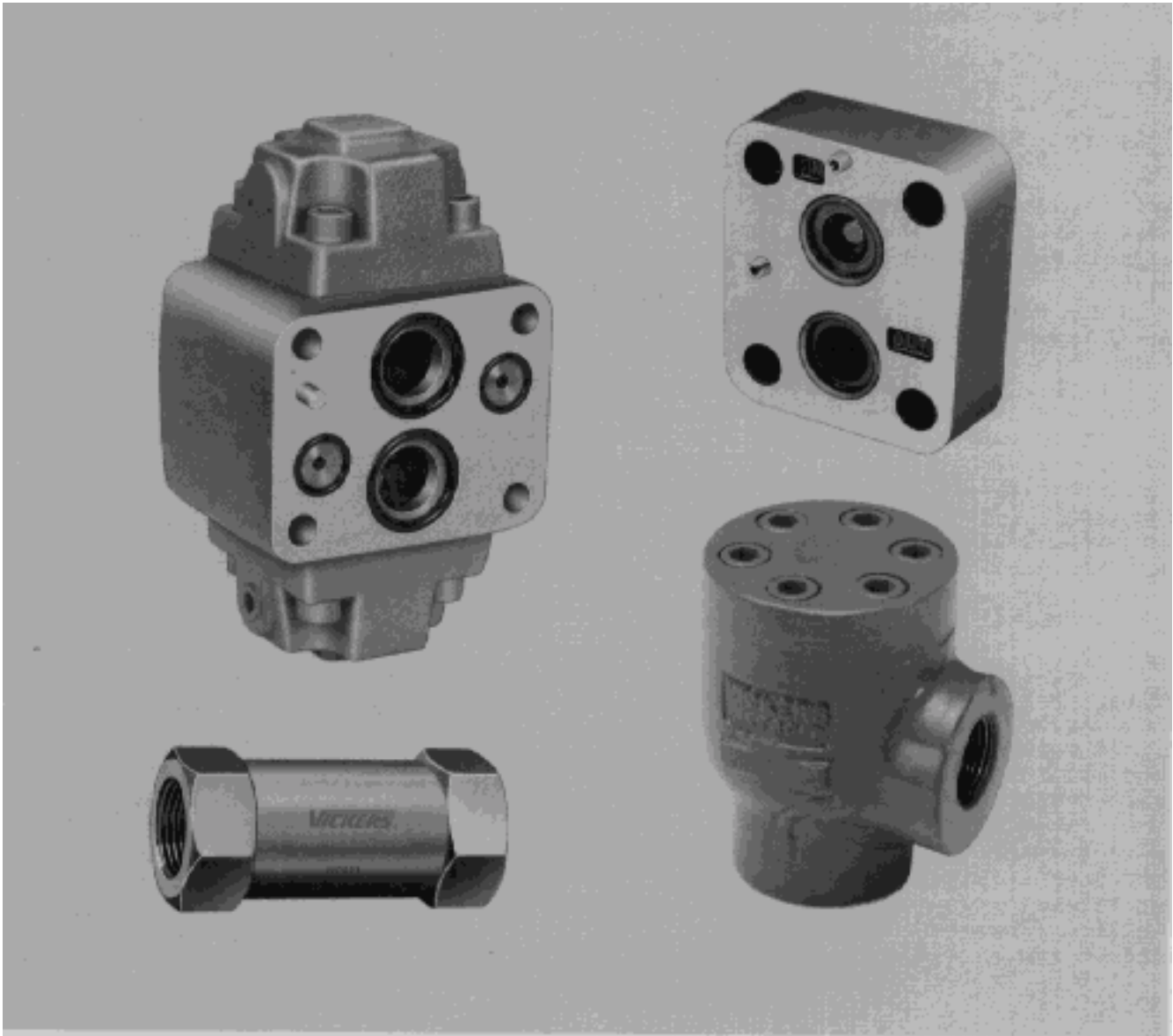
Vickers®

# Check Valves



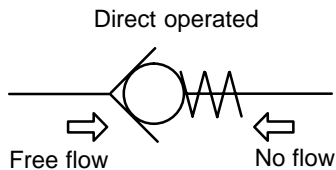
## Check Valves

Inline, right angle, manifold mounted, and pilot operated designs



# Introduction

Vickers inline, right-angle, and manifold mounted check valves are *direct operated* and used in hydraulic circuits to allow the free flow of fluid in one direction only. The graphical symbol for these valves is a spring-loaded ball and a seat, as shown below.

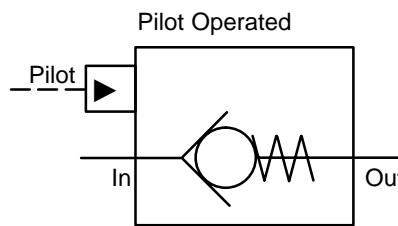


A light spring holds the valve poppet in its normally closed position. The valve starts to pass fluid at a pressure equivalent to the spring cracking pressure level. Various spring (cracking) pressures are available to suit application requirements.

All except inline models can be used for high velocity flows resulting in shock conditions. Inline models are designed for low shock service. *Inline check valves* can be used as a safety bypass for flow surges through filters and heat exchangers. With a higher spring rating, they can also be used as a means of generating pilot pressure.

*Right angle check valves* are designed for higher flows with less pressure drop. The valves' seat and poppet are of hardened and ground steel for improved cycle life. An orifice plug can be placed in the poppet to permit a restricted flow through the valve in its normally closed position; as such, these valves are typically used in controlling the rate of decompression in a large press before shifting the main valve.

*Pilot operated valves*, like direct operated valves, permit free flow in one direction and prevent flow in the reverse direction. However, pilot operated valves permit reverse flow when a pilot pressure signal is applied to the valve's pilot port. The graphical symbol for these valves is shown below. Pilot operated valves have very low internal leakage and are typically used to lock a cylinder in place until the main directional valve shifts.



Note: Vickers also has a range of SAE flange mounted check valves, and ISO 4401-03 and -05 stackable check valves. Flange mounted models are described in publication 627. Size -03 and -05 stackable models are described in publications GB-C-2027 and GB-C-2022, respectively.

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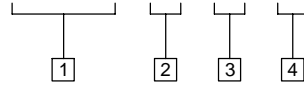
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- Hydraulic Fluids
- Seals
- Mounting Position
- Port Connections
- Fluid Cleanliness
- Ordering
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# Inline Check Valves

## Model Code

**D\*8P1 - \*\* - \*\* - 1\***



### 1 Model Series

DS8P1 – SAE straight threaded ports  
DT8P1 – NPTF pipe threaded ports

### 2 Nominal Size (in inches)

02 – 1/4 (not available in DS8P1 series)  
03 – 3/8  
06 – 3/4  
10 – 1-1/4

### 4 Design Number

10 – For “02” and “03” size  
11 – For “06” and “10” size  
Subject to change. Installation dimensions remain unchanged for designs 10 through 19.

### 3 Cracking Pressure

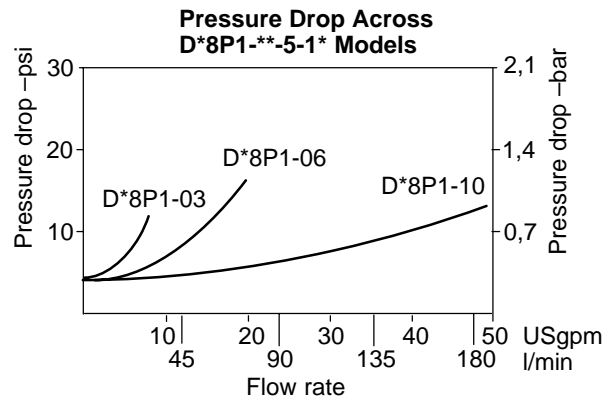
5 – 0,35 bar (5 psi)  
30 – 2,0 bar (30 psi)  
65 – 4,5 bar (65 psi)

## Ratings and Specifications

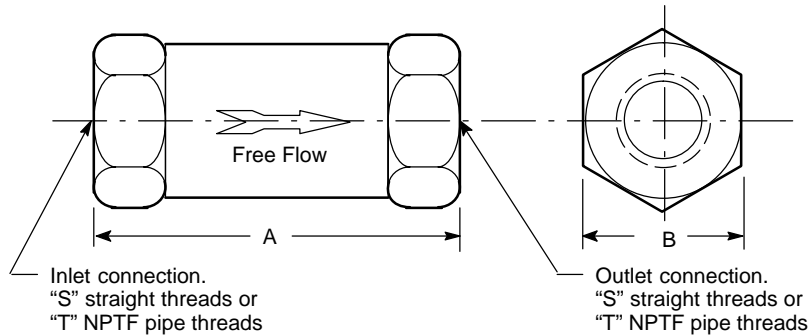
Model Series	Maximum Operating Pressure – bar (psi)	Flow Capacity l/min (USgpm)†	Approximate Weight – kg (lb)
DT8P1-02	210 (3000)	12 (3.2)	0,10 (.50)
D*8P1-03	210 (3000)	30 (8.0)	0,34 (.75)
D*8P1-06	210 (3000)	75 (20)	0,68 (1.5)
D*8P1-10	210 (3000)	200 (50)	2,70 (6.0)

† Using hydraulic oil with viscosity rating of 32 cSt (150 SUS) at 38°C (100°F).

## Pressure Drop



## Installation Dimensions Millimeters (Inches)



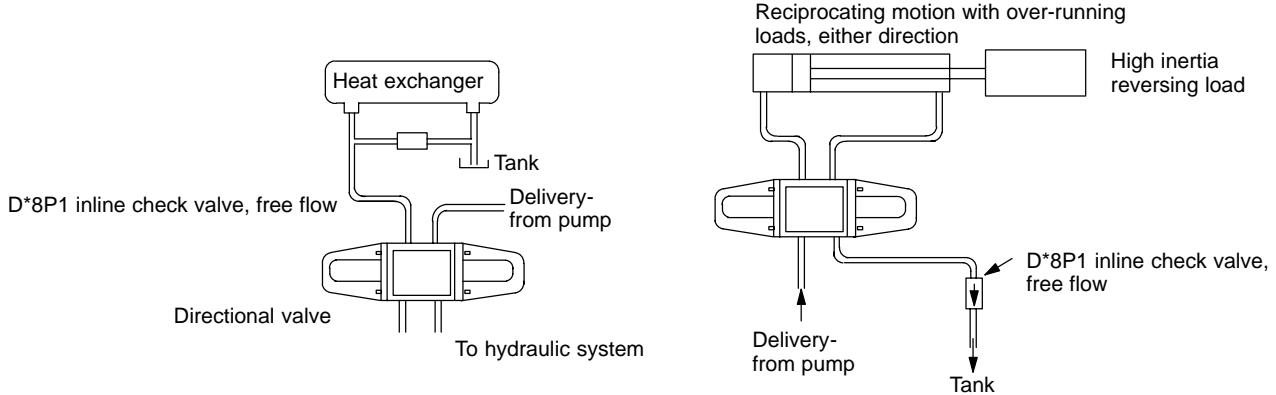
### CAUTION:

Do not use this valve to check a high velocity reverse flow resulting in shock conditions. (See typical applications below.) Where such conditions exist, Vickers C2-8\*\* or C5G-8\*\* type check valve should be used.

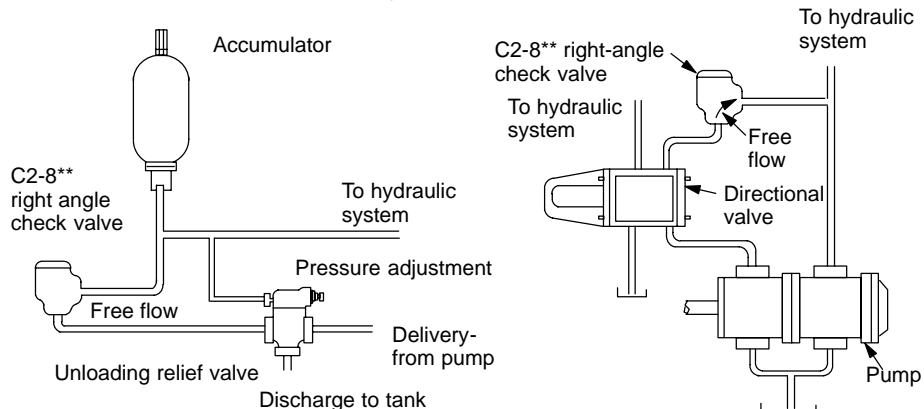
Model Series	A	B	"S" Straight Thread	"T" NPTF Pipe Thd.
DT8P1-02	57,2 (2.25)	22,4 (0.88)	—	1/4
D*8P1-03	76,2 (3.00)	25,4 (1.00)	.7500-16 UNF-2B	3/8
DT8P1-06	98,6 (3.88)	38,1 (1.50)	1.0625-12 UNF-2B	3/4
DS8P1-06	104,0 (4.09)	38,1 (1.50)	1.0625-12 UNF-2B	3/4
D*8P1-10	134,4 (5.25)	63,5 (2.50)	1.6250-12 UNF-2B	1-1/4

## Typical Applications

### D\*8P1 Inline Check Valve *Can Be Used*



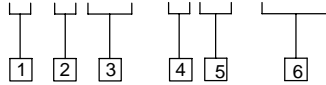
### C2-8\*\* or C5G-8\*\* Type Check Valve *Should Be Used*



# Right Angle Check Valves

## Model Code

**C 2 (S) - 8 \*\* - (\*\*\*)**



### 1 Check Valve

### 2 Design Number

Subject to change.

### 3 Port Threads

Blank – NPT threads  
S – Straight threads

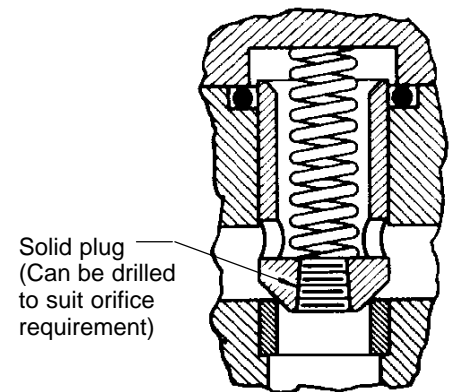
### 4 Right Angle Type Valve

### 5 Port Size

00 – 1/4" NPT  
05 – 3/8" NPT or  
.7500-16 UNF-2B (.500 tubing)  
15 – 3/4" NPT or  
1.0625-12 UNF-2B (.750 tubing)  
20 – 1" NPT  
25 – 1-1/4" NPT or 1.6250-12 UNF-2B  
(1.250 tubing)  
30 – 1-1/2" NPT  
35 – 2" NPT

### 6 Cracking Pressure

Blank – 0,3 bar (5 psi), standard  
S2 – 2,4 bar (35 psi)  
S3 – 3,4 bar (50 psi)  
S8 – 5,2 bar (75 psi)  
S12 – 0,3 bar (5 psi) and plug in  
poppet. (See view below.)  
S17 – 8.6 bar (125 psi)  
S19 – 1,4 bar (20 psi)



Construction of  
"S12" Cracking  
Pressures Model

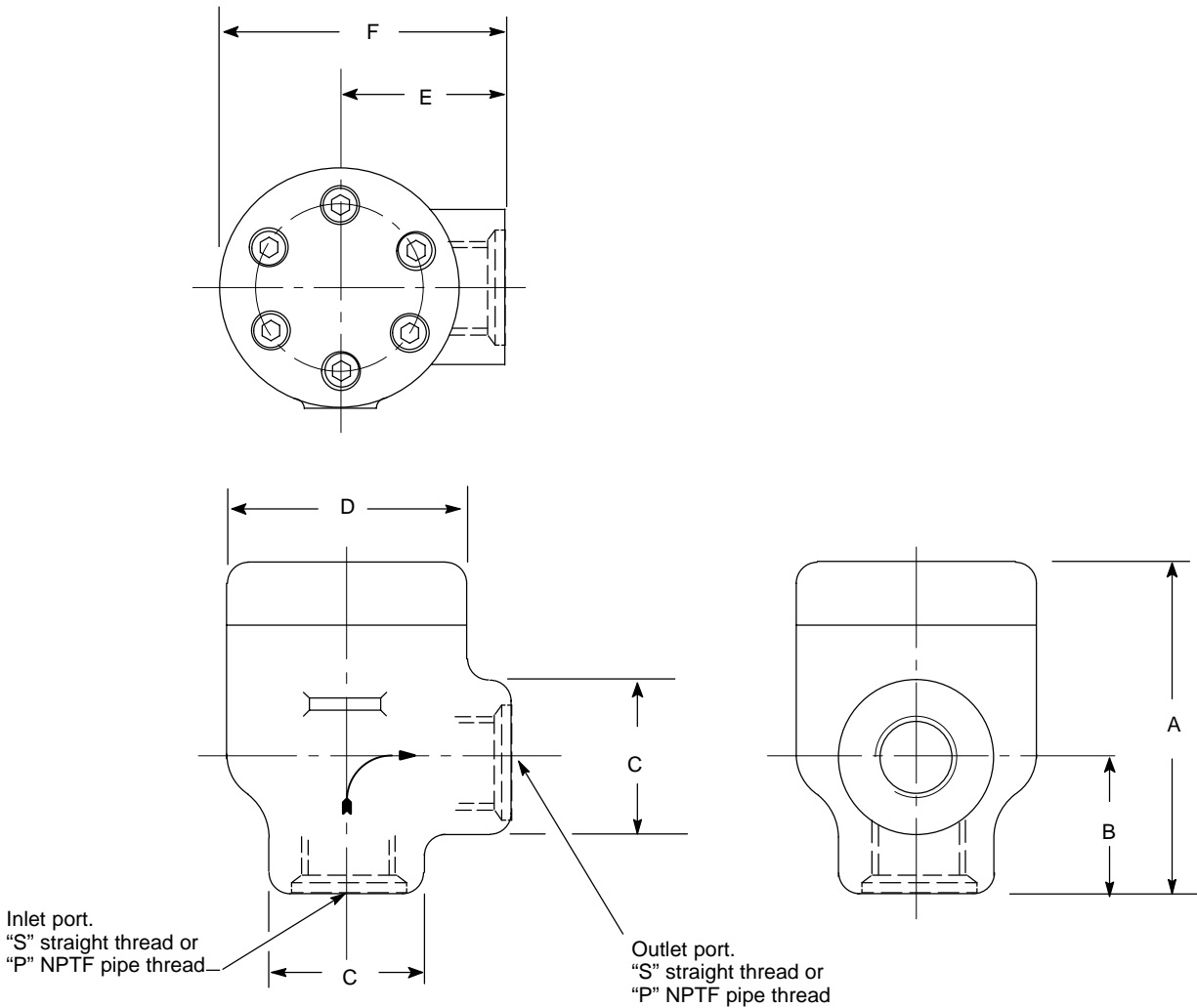
## Ratings and Specifications

Model Series	Maximum Operating Pressure bar (psi)	Nominal Flow Capacity l/min (USgpm)	Approximate Pressure Drop at Rated Flow bar (psi) †	Approx. Weight kg (lb)
C2-800	210 (3000)	11 (3)	1,2 (18)	1,4 (3)
C2(S)-805	210 (3000)	25 (6)	1,4 (20)	1,4 (3)
C2(S)-815	210 (3000)	60 (16)	1,4 (20)	2,3 (5)
C2-820	210 (3000)	100 (28)	1,0 (14)	3,6 (8)
C2(S)-825	210 (3000)	170 (45)	1,0 (14)	4,8 (10.5)
C2-830	210 (3000)	250 (65)	1,6 (23)	4,8 (10.5)
C2-835	210 (3000)	400 (100)	1,4 (20)	12,2 (27)

† Using SAE 10W Oil at 49°C (120°F)

## Installation Dimensions

Millimeters (Inches)



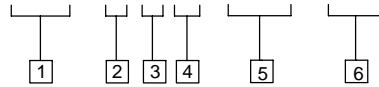
Model Series	"S" Straight Thread	"P" Pipe Thread	A	B	C	D	E	F
C2-800	—	1/4" NPT	74,7 (2.94)	26,1 (1.03)	31,8 (1.25)	53,8 (2.12)	31,8 (1.25)	58,7 (2.31)
C2(S)-805	.7500-16 UNF-2B	3/8" NPT	74,7(2.94)	26,1 (1.03)	31,8 (1.25)	53,8 (2.12)	31,8 (1.25)	58,7 (2.31)
C2(S)-815	1.0625-12 UNF-2B	3/4" NPT	98,6 (3.88)	44,4 (1.75)	50,8 (2.00)	69,8 (2.75)	46,0 (1.81)	81,0 (3,19)
C2-820	—	1" NPT	115,8 (4.56)	46,7 (1.84)	57,1 (2.25)	82,6 (3.25)	57,1 (2.25)	98,6 (3.88)
C2(S)-825	1.6250-12 UNF-2B	1-1/4" NPT	138,2 (5.44)	66,5 (2.62)	76,2 (3.00)	82,6 (3.25)	66,5 (2.62)	107,9 (4.25)
C2-830	—	1-1/2" NPT	138,2 (5.44)	66,5 (2.62)	76,2 (3.00)	82,6 (3.25)	66,5 (2.62)	107,9 (4.25)
C2-835	—	2" NPT	187,4 (7.38)	73,1 (2.88)	88,9 (3.50)	114,3 (4.50)	91,9 (3.62)	149,3 (5.88)

† Using SAE 10W Oil at 49°C (120°F)

# Manifold Mounted Check Valves

## Model Code

**(F3) - C 5 G - 8 \*\* - (\*\*)**



### 1 Special Seals

See "Seals" section on page 15.  
Omit for standard seals.

### 2 Check Valve

### 3 Design Number

Subject to change.

### 4 Subplate or Manifold Mounted

### 5 Nominal Size

805 – 3/8" pipe or 1/2" tube  
815 – 3/4" pipe or 3/4" tube  
825 – 1-1/4" pipe or 1-1/4" tube

### 6 Cracking Pressure

Blank – 0,3 bar (5 psi), standard  
S3 – 3,4 bar (50 psi)  
S8 – 5,2 bar (75 psi)

## Ratings and Specifications

Model Series	Maximum Operating Pressure bar (psi)	Nominal Flow Capacity l/min (USgpm)	Approximate Weight kg (lb)
C5G-805	210 (3000)	40 (10)	1,2 (2.7)
C5G-815	210 (3000)	75 (20)	2,9 (6.5)
C5G-825	210 (3000)	400 (100)	6,1 (13.5)

## Pressure Drop

### Pressure Drop for Free Flow Across Check Valve

Model Series	Flow Rate l/min (USgpm)	$\Delta P$ bar (psi)
C5G-805	18,9 (5)	0,9 (13)
	37,8 (10)	1,2 (17)
	56,8 (15)	1,5 (22)
	75,7 (20)	1,9 (27)
C5G-815	37,8 (10)	0,5 (7)
	75,7 (20)	1,0 (15)
	113,6 (30)	1,7 (25)
	151,4 (40)	2,4 (35)
C5G-825	94,6 (25)	0,6 (8)
	189,3 (50)	0,8 (12)
	283,9 (75)	1,1 (16)
	378,5 (100)	1,5 (22)
	473,2 (125)	2,1 (30)

1. Figures in the chart at left give approximate pressure drops ( $\Delta P$ ) when passing 21 cSt (100 SUS) fluid having .865 specific gravity.

2. For any other viscosity, pressure drop ( $\Delta P_1$ ) will be:

Viscosities – cSt (SUS)	14 (75)	32 (150)	43 (200)	54 (250)	65 (300)	76 (350)	86 (400)
% of $\Delta P$ (Approximate)	93	111	119	126	132	137	141

3. For any other specific gravity ( $G_1$ ), pressure drop ( $\Delta P_1$ ) will be approximately:  
 $\Delta P_1 = \Delta P (G_1/G)$ . (Obtain specific gravity figure from fluid producer; figure will be higher for fire-resistant fluids than for oil.)



## Installation Dimensions – C5G-805 Series

Millimeters (Inches)

### Mounting Bolt Kits

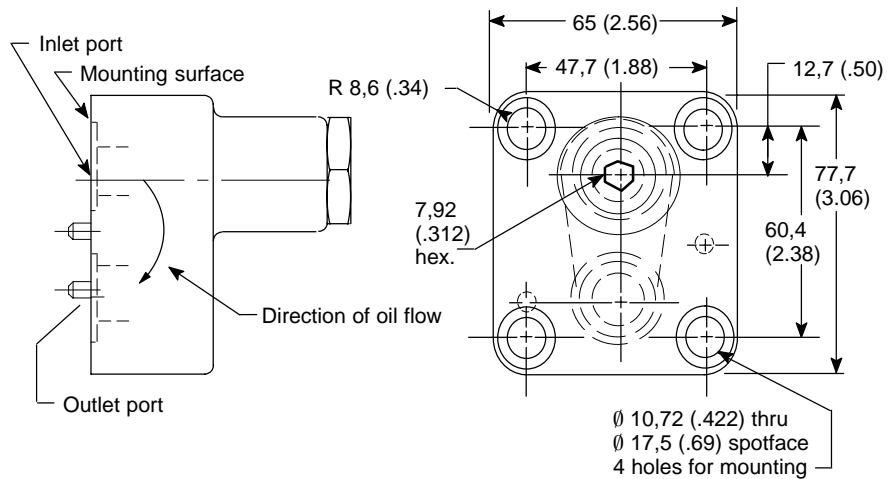
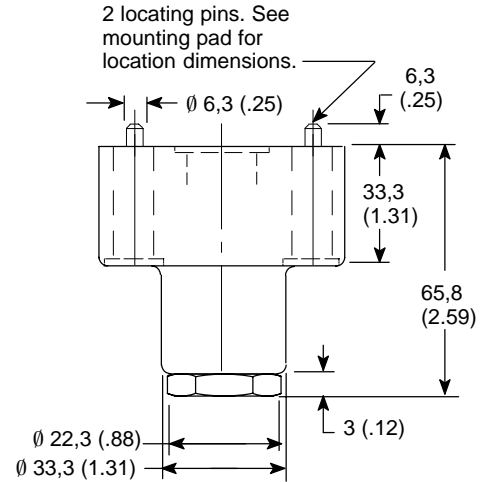
Mounting bolts must be ordered separately.

Example:

One (1) C5G-805 Check Valve  
One (1) BKCG-805-619 Bolt Kit

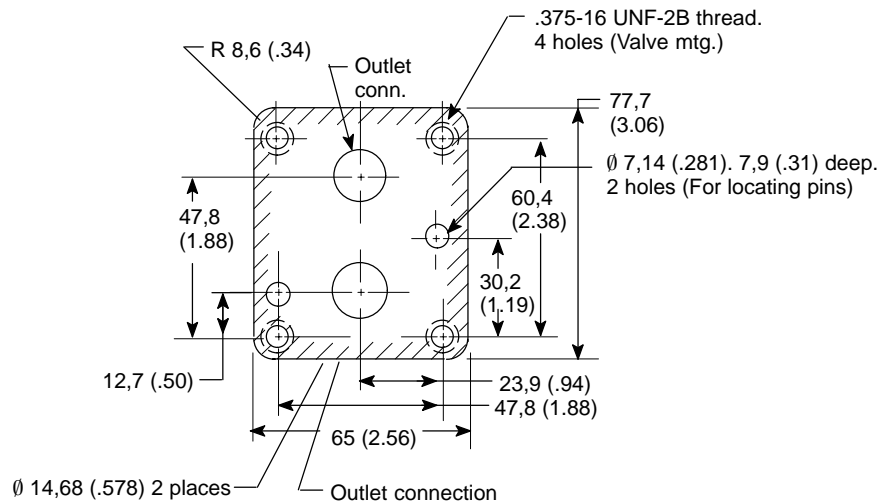
Bolt thread size is .375-16, and bolt length is 1.75 (both in inches). Maximum bolt torque is 35 Nm (26 lbf. ft.).

Mounting bolts, when provided by customer, must be SAE grade 7, or better.



### Mounting Pad

A machined pad, as indicated by shaded area, must be provided for mounting. Pad must be flat within 0,013 mm (.0005 in.) and smooth within 1,6 micron (63 microinch).



## Installation Dimensions – C5G-815 and C5G-825 Series

Millimeters (Inches)

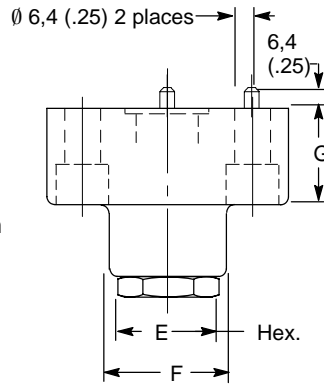
### Mounting Bolt Kits

Mounting bolts must be ordered separately.

Valve Series	Bolt Kit	Bolt Thd. × Length
C5G-815	BKCG815-612	.625-11 × 1.75 inch
C5G-825	BKCG10-616	.750-10 × 3.50 inch

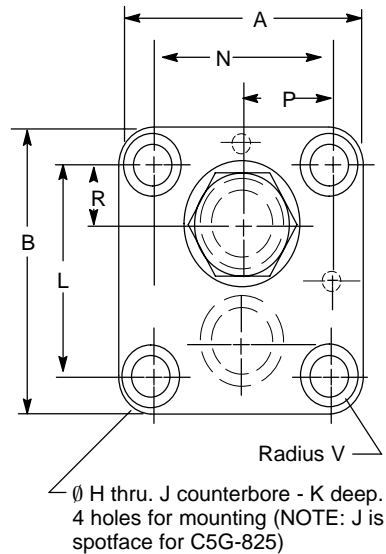
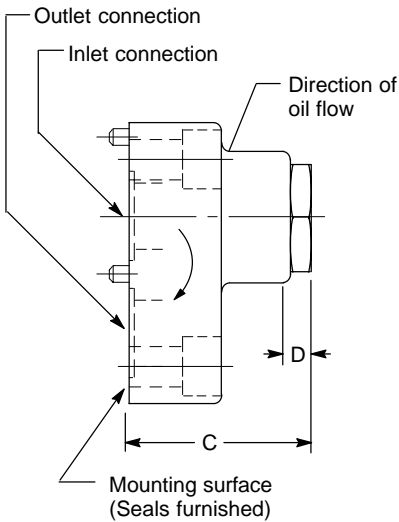
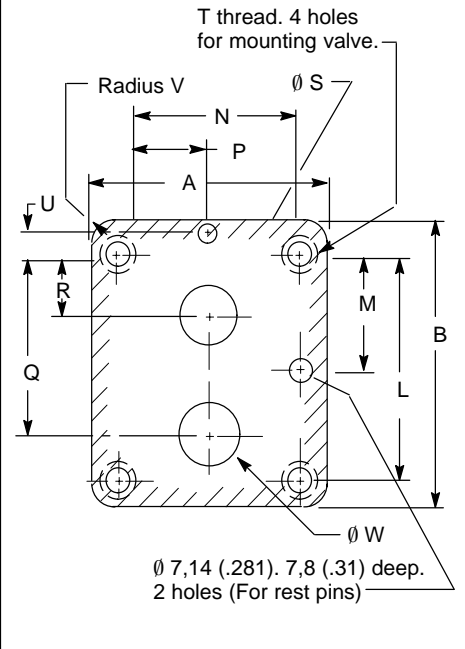
Maximum bolt torques are 47 Nm (35 lbf. ft.) and 95 Nm (70 lbf ft.) for .625-11 and .750-10 bolts, respectively.

Mounting bolts, when provided by customer, must be SAE grade 7, or better.



### Mounting Pad

A machined pad, as indicated by shaded area, must be provided for mounting. Pad must be flat within 0,013 mm (.0005 in.) and smooth within 1,6 micron (63 microinch).



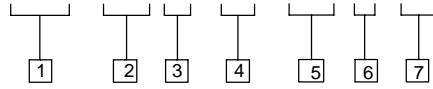
Model Series	A	B	C	D	E	F	G	H	J	K
C5G-815	96,8 (3.81)	112,8 (4.44)	76,2 (3.00)	11,2 (.44)	41,1 (1.62)	50,8 (2.00)	38,1 (1.50)	16,66 (.656)	25,4 (1.000)	15,7 (.62)
C5G-825	127 (5.00)	127 (5.00)	110,2 (4.34)	10,4 (.41)	47,7 (1.88)	66,5 (2.62)	57,9 (2.28)	19,84 (.781)	30 (1.18)	–

Model Series	L	M	N	P	Q	R	S	T	U	V	W
C5G-815	81 (3.19)	40,4 (1.59)	65 (2.56)	32,5 (1.28)	68,3 (2.69)	22,3 (.88)	23,01 (.906)	.625-11 UNC-2B	8,6 (.34)	15,7 (.62)	23,01 (.906)
C5G-825	91,9 (3.62)	46 (1.81)	91,9 (3.62)	46 (1.81)	71,4 (2.81)	20,6 (.81)	34,92 (1.375)	.750-10 UNC-2B	9,6 (.38)	17,5 (.69)	28,6 (1.125)

# Pilot Operated Check Valves

## Model Code

(F3) - 4C \* - \*\* - (D) \* - 2\*



### 1 Special Seals

See "Seals" section on page 15.  
Omit for standard seals.

### 2 Check Valve

### 3 Mounting Type

G – Manifold or subplate  
S – SAE straight thread  
T – NPTF thread

### 4 Nominal Valve Size

03 – 3/8" pipe or 1/2" tubing  
06 – 3/4" pipe or 3/4" tubing  
10 – 1-1/4" pipe or 1-1/4" tubing

### 5 Decompression Poppet

D – With decompression.  
Omit if not required.  
(See "Pilot Area and Cylinder Ratios" section below.)

### 6 Cracking Pressure

A – 2 bar (30 psi)  
C – 5 bar (75 psi)  
F – 10 bar (150 psi)

### 7 Design Number

20 – For 4CG models  
21 – For 4CS and 4CT models  
Subject to change. Installation dimensions remain unchanged for designs 20 through 29.

## Pilot Area and Cylinder Ratios

The ratio between a check valve's pilot pressure area and poppet area must be greater than the ratio between a hydraulic cylinder's piston and annulus areas. If it is not, the valve will not open to permit reverse flow. For example, if the cylinder has a piston-to-annulus area ratio of 2:1, the valve must have a greater (3:1) ratio.

With large check valves or large differential-area cylinders, the valve's ratio may be difficult to achieve. For these cases, a decompression-type check valve, which can have an opening ratio of 30:1 or greater, can be used.

A decompression poppet (within the main poppet) is much smaller than the check valve's pilot piston and is seated

in a "through" hole in the pilot-piston end of the main poppet. The decompression poppet opens first, reducing the pressure behind the main poppet that is holding the main poppet closed. When this pressure is low enough, the pilot piston pushes the main poppet into the "open" position to allow full reverse flow.

## Ratings and Specifications

Model Series	Maximum Operating Pressure bar (psi)	Nominal Flow Rating l/min (USgpm)	Area Ratio		Pressure Drop bar (psi) †		"C" in Formula Below
			Pilot Piston Area to Decompression Poppet Area	Pilot Piston Area to Check Valve Area	●	●●	
4C*-03-A	210 (3000)	50 (12)	30:1	3.11:1	1,7 (25)	3,8 (55)	14
4C*-03-C	210 (3000)	50 (12)	30:1	3.11:1	1,7 (25)	6,2 (90)	21
4C*-03-F	210 (3000)	50 (12)	30:1	3.11:1	1,7 (25)	13,1 (190)	58
4C*-06-A	210 (3000)	100 (30)	48.2:1	3.12:1	2,7 (40)	4,5 (65)	09
4C*-06-C	210 (3000)	100 (30)	48.2:1	3.12:1	2,7 (40)	9,0 (130)	22
4C*-06-F	210 (3000)	100 (30)	48.2:1	3.12:1	2,7 (40)	15,8 (230)	43
4C*-10-A	210 (3000)	300 (75)	77:1	2.6:1	3,4 (50)	3,4 (50)	12
4C*-10-C	210 (3000)	300 (75)	77:1	2.6:1	3,4 (50)	8,3 (120)	29
4C*-10-F	210 (3000)	300 (75)	77:1	2.6:1	3,4 (50)	13,8 (200)	58

† Approximate pressure drop at rated flow. ● Valve held open by pilot pressure. ●● Free flow across poppet.

### Formula

Pilot pressure to crack decompression poppet or check valve:

$$\text{Pilot Pressure} = \frac{\text{"P" Out} - \text{"P" In}}{\text{Area Ratio}} + \text{"P" In} + C$$

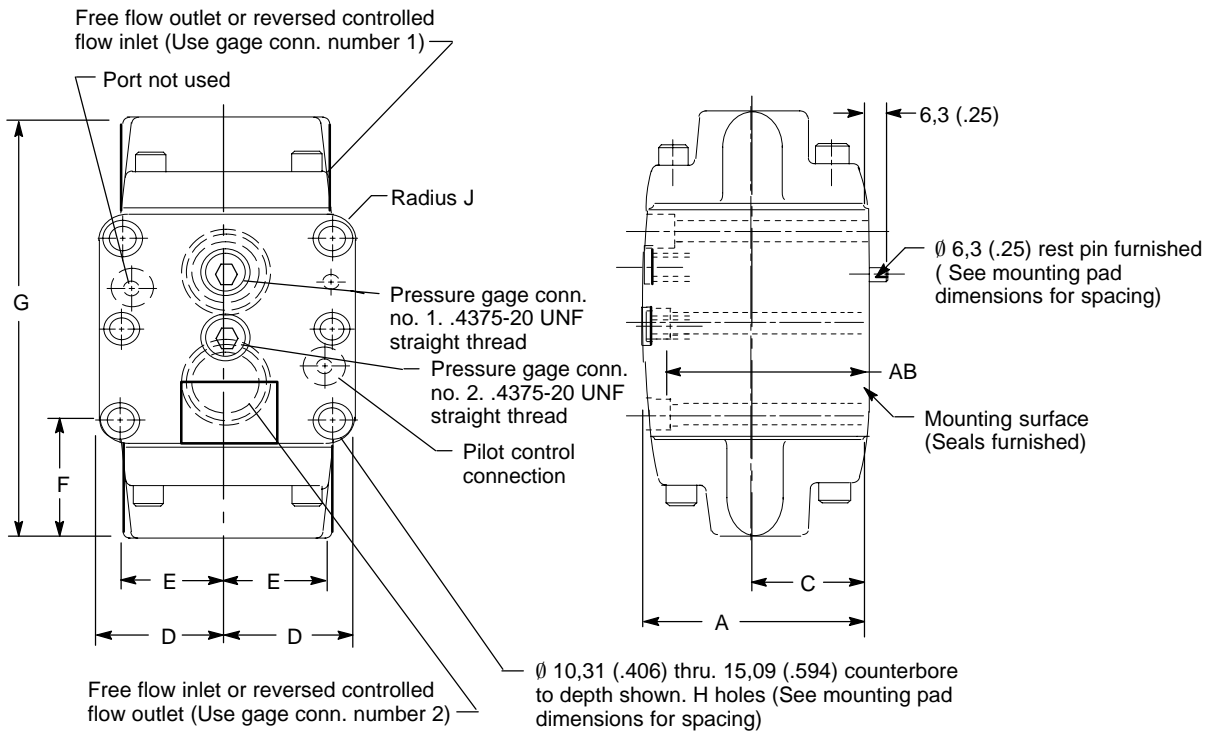
Where: "P" Out = Pressure at free flow outlet  
"P" In = Pressure at free flow inlet  
C = Figure from chart above

### Directional Valve Compatibility

Directional valves with their cylinder ports open to tank in the center position (Vickers spool types 0, 6, 9, and 33) are recommended for use with 4C\* series check valves.

## Installation Dimensions – 4CG Series

Millimeters (inches)



Model Series	A	C	D	E	F	G	H	J	AB	Approx. Weight kg (lb)
4CG-03	68,1 (2.68)	36,6 (1.44)	43,7 (1.72)	28,4 (1.12)	39,6 (1.56)	122,2 (4.81)	4	10,4 (.41)	55,9 (2.20)	3,6 (8)
4CG-06	78,5 (3.09)	41,4 (1.63)	50,8 (2.00)	35 (1.38)	55,6 (2.19)	171,7 (6.76)	4	11,2 (.44)	68,6 (2.70)	6,8 (15)
4CG-10	100,1 (3.94)	50,8 (2.00)	58,7 (2.31)	47,7 (1.88)	54,9 (2.16)	193,5 (7.62)	6	10,4 (.41)	90,2 (3.55)	11,8 (26)

# Installation Dimensions Subplates and Bolt Kits for 4CG Valves

Millimeters (inches)

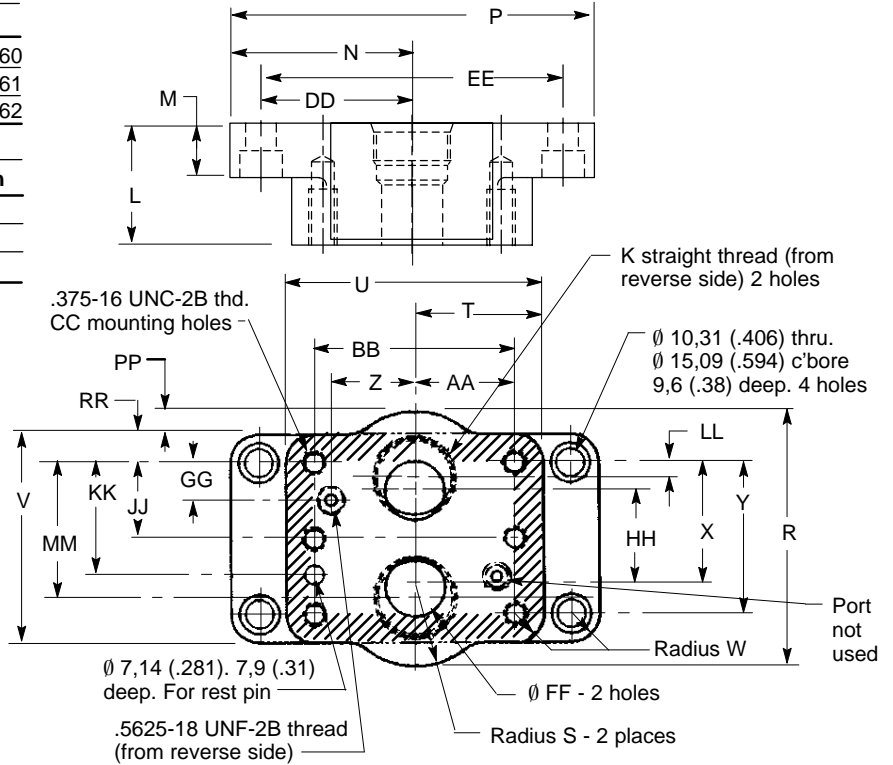
Valve Series	Subplate	Bolt Kit
4CG-03	RXGM-03S-20	BKRX-03-660
4CG-06	RXGM-06SX-20	BKRX-06-661
4CG-10	RXGM-10S-30	BKRX-10-662

Bolt Kit	Bolt Thread Size × Length
BKRX-03-660	.375-16 × 2.75 inch
BKRX-06-661	.375-16 × 3.25 inch
BKRX-10-662	.375-16 × 4.00 inch

Valves, subplates, and mounting bolts must be ordered separately.

When subplate is not used, machined pad must be provided for mounting. Pad must be flat within 0,013 mm (.0005 in.) and smooth within 1,6 micron (63 microinch).

Mounting bolts, when provided by customer, must be SAE grade 7, or better.



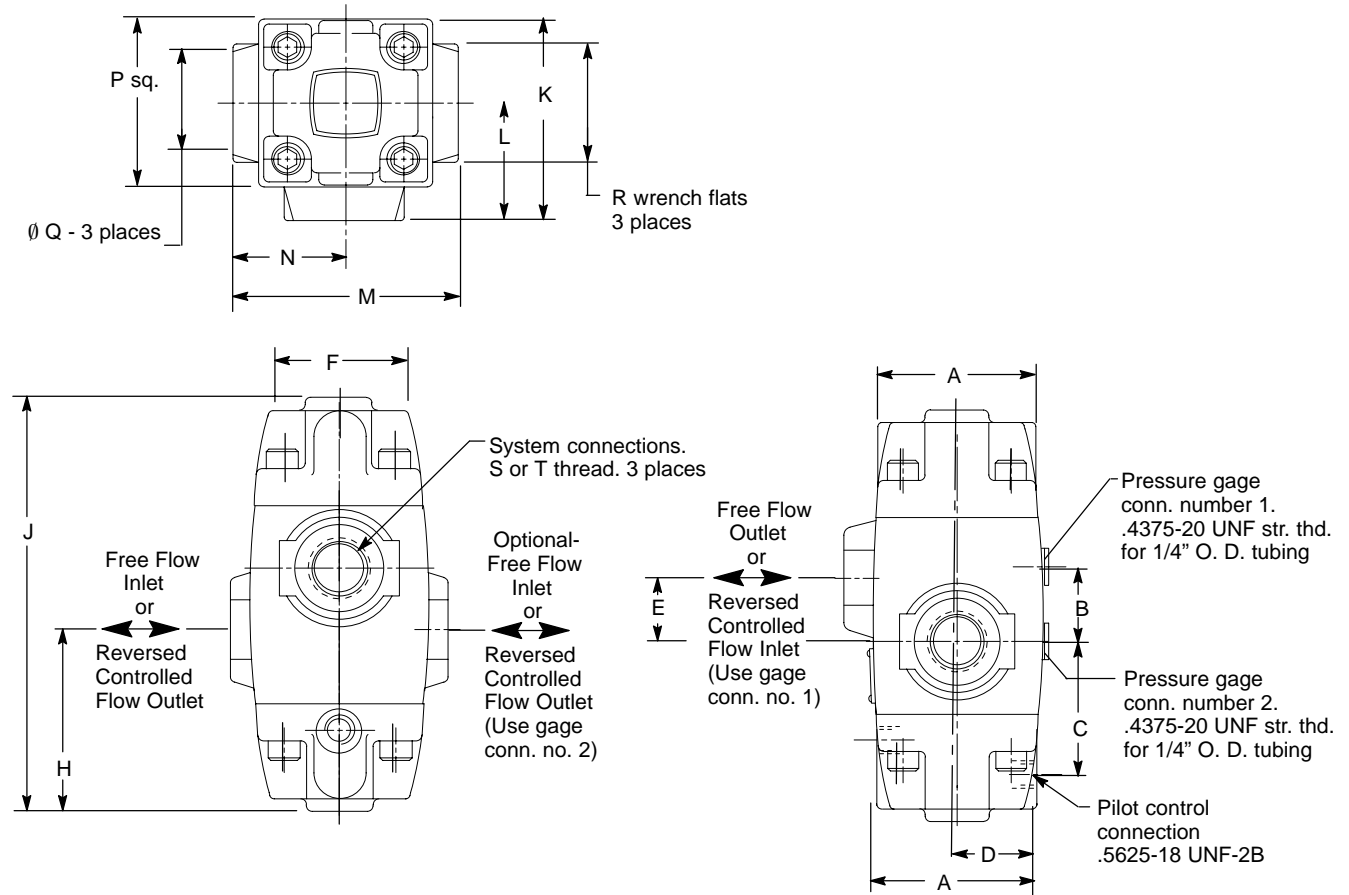
\*\* RXGM-03 and -06 use 4 valve mounting bolts. RXGM-10 uses 6 bolts.

Subplate Model	K	Tube O. D.	L	M	N	P	R	S	T	U	V	W	X	Y	Z
RXGM-03S--20	.7500-16 UNF-2B	1/2"	25,4 (1.00)	19 (.75)	63,5 (2.50)	127 (5.00)	76,2 (3.00)	23,9 (.94)	43,7 (1.72)	87,4 (3.44)	63,5 (2.50)	10,4 (.41)	35,8 (1.41)	42,9 (1.69)	25,4 (1.00)
RXGM-06SX-20	1.3125-12 UN-2B	1"	31,7 (1.25)	19 (.75)	73,1 (2.88)	146 (5.75)	117,3 (4.62)	39,6 (1.56)	50,8 (2.00)	101,6 (4.00)	82,5 (3.25)	11,2 (.44)	49,3 (1.94)	60,4 (2.38)	33,3 (1.31)
RXGM-10S-30	1.6250-12 UN-2B	1-1/4"	47,7 (1.88)	22,3 (.88)	79,2 (3.12)	158,7 (6.25)	146 (5.75)	47,7 (1.88)	58,7 (2.31)	117,3 (4.62)	104,6 (4.12)	10,4 (.41)	67,6 (2.66)	84,1 (3.31)	44,4 (1.75)

Subplate Model	AA	BB	CC	DD	EE	FF	GG	HH	JJ **	KK	LL	MM	PP	RR	Approx. Weight kg (lb)	NFPA Interface
RXGM-03S-20	33,3 (1.31)	66,5 (2.62)	4	53,1 (2.09)	106,4 (4.19)	14,2 (.56)	21,3 (.84)	28,4 (1.12)	-	31,7 (1.25)	4,8 (.19)	38,1 (1.50)	6,3 (.25)	10,4 (.41)	1,5 (3.25)	P03
RXGM-06SX-20	39,6 (1.56)	79,2 (3.12)	4	62 (2.44)	123,9 (4.88)	23,1 (.91)	20,6 (.81)	38,1 (1.50)	-	44,4 (1.75)	6,3 (.25)	53,8 (2.12)	17,5 (.69)	11,2 (.44)	2,9 (6.50)	P06
RXGM-10S-30	48,5 (1.91)	96,8 (3.81)	6	69,1 (2.72)	138,2 (5.44)	28,4 (1.12)	24,6 (.97)	50,8 (2.00)	42,2 (1.66)	62,7 (2.47)	7,9 (.31)	76,2 (3.00)	20,6 (.81)	10,4 (.41)	5 (11)	P10

## Installation Dimensions – 4CS and 4CT Series

Millimeters (Inches)



Model Series	A	B	C	D	E	H	J	K	L
4C*-03	57,1 (2.25)	24,1 (.95)	45,2 (1.78)	28,4 (1.12)	23,1 (.91)	53,1 (2.09)	122,2 (4.81)	69,8 2.75	39,6 1.56
4C*-06	70,1 (2.76)	31,7 (1.25)	57,1 (2.25)	35 (1.38)	26,9 (1.06)	74,7 (2.94)	171,4 (6.75)	88,6 (3.49)	50,8 (2.00)
4C*-10	95,2 (3.75)	29,2 (1.15)	77,8 (3.10)	47,7 (1.88)	28,9 (1.14)	84,1 (3.31)	193,8 (7.63)	117,8 4.64	68,3 2.69

Model Series	M	N	P	Q	R	S Straight Thread	T NPTF Thread	Approx. Weight kg (lb)
4C*-03	70,9 (2.79)	35 (1.38)	59,4 (2.34)	35 (1.38)	35 (1.38)	.7500-16 UNF-2B	3/8	2,7 (6)
4C*-06	95,2 (3.75)	47,7 (1.88)	75,7 (2.98)	47,7 (1.88)	50,8 (2.00)	1.0625-12 UN-2B	3/4	5,7 (12.5)
4C*-10	107,9 (4.25)	53,8 (2.12)	99,1 (3.90)	82,5 (3.25)	86,4 (3.40)	1.6250-12 UN-2B	1-1/4	12 (26.5)

# Application Data, Ordering, and Service

## Hydraulic fluids

Valves can be used with anti-wear hydraulic oil, or automotive type crankcase oil (designations SC, SD, SE, SF, or SG) per SAE J183 JUN89. Fire-resistant fluids can also be used, but may require the use of special seals as explained in the following "Seals" section.

A fluid viscosity ranging between 32 cSt (150 SUS) and 48,5 cSt (225 SUS) at 38°C (100°F) is recommended.

## Seals

Inline check valves have no elastomer seals, so they can be used with petroleum or fire-resistant fluids. Nitrile (Buna N) seals are standard in other Vickers check valves, except certain pilot operated models described below. These seals are suitable for use with petroleum and water-glycol fluids, and water-in-oil emulsions.

Synthetic fire-resistant fluids require the use of Viton™ seals, which are identified in model codes by an "F3" prefix. These seals are standard in pilot operated 4CS and 4CT models, so the prefix need not be added. (Viton is a registered trademark of E.I. DuPont Co.)

## Mounting position

The mounting position of valves is not limited because of their spring closure construction.

## Port connections

Straight-threaded or flanged O-ring connections are less likely to leak, compared to taper-threaded (NPT) connections, and are recommended.

## Fluid cleanliness

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials and additives for protection against wear of components, elevated viscosity and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561; "Vickers Guide to Systemic Contamination Control," available from your local Vickers distributor or by contacting Vickers, Incorporated. Recommendations on filtration and the selection of products to control fluid condition are included in 561.

Recommended cleanliness levels, using petroleum oil under common conditions, are based on the highest fluid pressure levels in the system and are coded in the chart below. Fluids other than petroleum, severe service cycles or temperature extremes are cause for adjustment of these cleanliness codes. See Vickers publication 561 for exact details.

Vickers products, as any components, will operate with apparent satisfaction in fluids with higher cleanliness codes than those described. Other manufacturers will often recommend levels above those specified. Experience has shown, however, that life of any hydraulic components is shortened in fluids with higher cleanliness codes than those listed below. These codes have been proven to provide a long trouble-free service life for the products shown, regardless of the manufacturer.

## Ordering

Order each valve by complete model number to ensure size and cracking pressure are as required. If needed, a mounting subplate, and/or bolt kit, must be ordered separately:

Example:

One (1) 4CG-06-A-21 Valve  
One (1) RXGM-06SX-20 Subplate  
One (1) BKRX-06-661 Bolt Kit

## Service information

Refer to following parts drawings for service information:

Model Series	Drawing
C2-8**	I-0632-S
C2S-8**	I-3612-S
C5G-805	I-3582-S
C5G-815/825	I-3578-S
DS8P1	I-0953-S
DT8P1	I-0953-S
4CG-03	I-3579-S
4CG-06	I-3580-S
4CG-10	I-3581-S
4CS/4CT-03	I-3681-S
4CS/4CT-06	I-3682-S
4CS/4CT-10	I-3683-S

## Cleanliness codes for petroleum oil usage

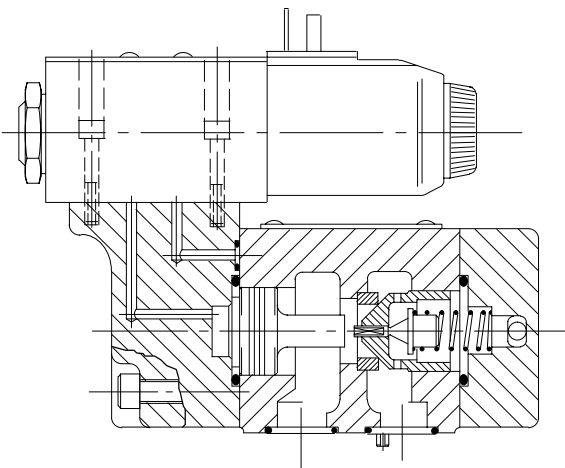
Product	System Pressure Level		
	< 2000 psi	2000-3000 psi	3000+ psi
Vane pumps, fixed	20/18/15	19/17/14	18/16/13
Vane pumps, variable	18/16/14	17/15/13	
Piston pumps, fixed	19/17/15	18/16/14	17/15/13
Piston pumps, variable	18/16/14	17/15/13	16/14/12
Directional valves	20/18/15	20/18/15	19/17/14
Check valves	20/18/15	20/18/15	20/18/15
Proportional valves	17/15/12	17/15/12	15/13/11
Servo valves	16/14/11	16/14/11	15/13/10
Pressure / Flow controls	19/17/14	19/17/14	19/17/14
Cylinders	20/18/15	20/18/15	20/18/15
Vane motors	20/18/15	19/17/14	18/16/13
Axial piston motors	19/17/14	18/16/13	17/15/12
Radial piston motors	20/18/14	19/17/13	18/16/13

# Pilot Operated Check Valves

PCGV-6/8, 10 Series; PCG5V-6/8, 20 Series

## Typical Section

Typical PCG5V model with internally drained pilot piston



## Basic Characteristics

Max. operating pressure . . . . . 350 bar  
(5000 psi)

Max. flow rates:

PCG(5)V-6 . . . . 150 L/min (40 USgpm)

PCG(5)V-8 . . . . 300 L/min (80 USgpm)

Mounting surfaces to ISO 5781:

PCG(5)V-6 . . . . . AG-06-2-A

PCG(5)V-8 . . . . . AH-08-2-A

## General Description

These pilot operated check valves operate as a direct check valve but can also be opened by pilot pressure, on the control piston, to permit free reverse flow. The amount of pilot pressure required to open the valve is stated as a ratio of the pressure above the check to the pilot pressure.

Two basic types of valve are available relative to the piloting method. The PCGV model is the traditional type requiring an external remote pilot valve to control the admission and release of pressure to the pilot piston. The other, the PCG5V model, has a fitted solenoid-operated pilot valve that obviates a separate mounting and can include manual override(s) for local emergency control. The PCG5V type can take its hydraulic pilot supply from the load pressure in the adjacent cylinder under control or from a remote source. Where cylinder pressure is to be used and where even the minimal

internal leakage through the closed pilot valve would cause an unacceptable amount of cylinder "creep", a Vickers poppet-type pilot valve can be substituted. This pilot would be a model DG3VP-3-103A (see catalog 642); ask your Vickers representative for advice.

All PCG(5)V valves are available with or without an integral decompression feature.

## Features and Benefits

- Less power wastage from low pressure drops.
- Smooth steady lowering of heavy weights in conjunction with flow control valves aided by use of externally drained models.
- Zero-leakage design to prevent actuator "creep" from check valve leakage.
- Smooth release of stored energy by using models with decompression poppets.
- Extra-fast response from solenoid piloted models using actuator-supplied pilot pressure instead of remote external source.
- International standard mountings permit fitment on many existing installations.
- Reduced installed cost and space results from higher power/weight ratios.

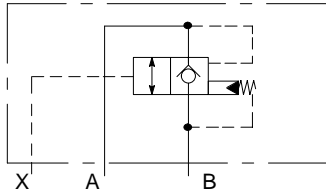
Operation of both types of valve is portrayed in the "Functional Symbols" section, whilst the following sectional illustration shows the construction of the solenoid controlled type. The remote piloted type operates and can be used in the same ways as the previous 4CG models described in the Vickers "Industrial Hydraulics Manual". The solenoid pilot directional control valve option is basically the same as the single solenoid directional valve shown in the same manual.



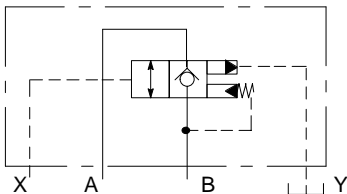
## Functional Symbols

Examples:

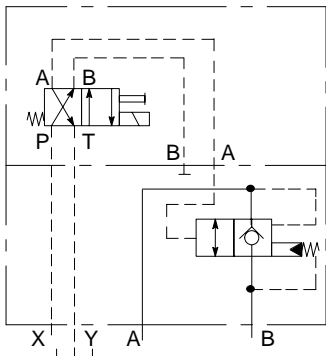
Pilot operated check valve with internally drained pilot piston, PCGV-\*\*(D)-10 model



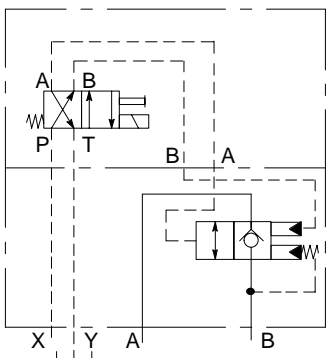
Pilot operated check valve with externally drained pilot piston, PCGV-\*\*(D)-1-10 model



Solenoid controlled pilot operated check valve with internally drained pilot piston, PCG5V-\*\*(D), 11 and 20 series



Solenoid controlled pilot operated check valve with externally drained pilot piston, PCG5V-\*\*(D)-1, 11 and 20 series

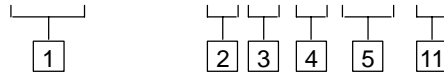


## Model Code

Features in brackets ( ) may be omitted if not required. All other features must be specified.

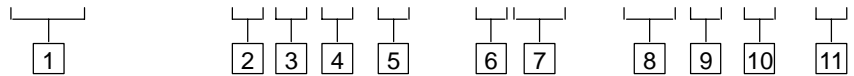
### Basic Models (Without Integral Solenoid Pilot Valve)

**(F3-)PCGV- \* - \* (D)(-1)-1\***



### Models With Integral Solenoid Pilot Valve

**(F3-)PCG5V- \* - \* (D)(-1)-E- \* -(V)M- \*\*\* (L)- \* 5-2\***



#### 1 Fluid compatibility

Blank = Antiwear hydraulic oil (class L-HM), invert emulsion (class L-HFB) or water glycol (class L-HFC)

F3 = As above or phosphate ester (class L-HFD)

#### 2 Mounting surface ISO 5781

6 = Code AG-06-2-A

8 = Code AH-08-2-A

#### 3 Cracking pressure

A = 2 bar (29 psi)

C = 5 bar (73 psi)

F = 10 bar (145 psi)

#### 4 Decompression feature

Omit if not required

#### 5 External drain option

1 = Externally drained pilot piston  
Omit for internally drained pilot piston

#### 6 Manual override options

Override option in solenoid end only.

Blank = Plain manual override

H = Water-resistant override, DC solenoid only

Z = No override

#### 7 Solenoid identity method

V = Solenoid "A" at port A end of pilot valve; solenoid "B" at B end of pilot valve (German practice).

Omit for solenoid identity to USA ANSI B93.9 standard, i.e. energize solenoid "A" for P to A; solenoid "B" for P to B.

#### 8 Solenoid connection type ▲

U = ISO 4400 (DIN 43650) on coil ◆

FW = 1/2" NPT thread conduit box

FTW = 1/2" NPT thread conduit box and terminal strip

FJ = M20 thread conduit box

FTJ = M20 thread conduit box and terminal strip

▲ Other connection types as shown in catalog 2015 (DG4V-3/3S) may be made available depending on quantities.

◆ Female connector to be supplied by user.

#### 9 Indicator lights

Option for solenoid connection types F(T)W and F(T)J

L = Lights fitted

Omit if lights not required

For U type coil, use plug with integral light, see 7 pages on.

#### 10 Coil rating

A = 110V AC

B■ = 110V AC 50 Hz/120V AC 60 Hz

C = 220V AC 50 Hz

D■ = 220V AC 50 Hz/240V AC 60 Hz

G = 12V DC

H = 24V DC

■ For 60 Hz or dual frequency.

#### 11 Design number

10 series for PCGV models

20 series for PCG5V models

Subject to change. Installation

dimensions unaltered for design

numbers 10-19 and 20-29 respectively.

## Operating Data

Typical with petroleum oil at 21 cSt (102 SUS) and at 50°C (122°F).

Maximum pressures: Ports A, B and X Port Y ▲: PCGV, 10 series PCG5V, 20 series ▲ Normally drained directly to the reservoir. For fast closure of valves under low load pressure conditions use the external drain option ("1" at model code [5]). For PCGV models apply pressure to port Y to retract the pilot piston.	350 bar (5000 psi)  350 bar (5000 psi) 100 bar (1500 psi) <i>PCG5V, 20 series valves are designed to satisfy the needs of most applications. Consult your Vickers representative about an alternative model if:</i> a) Valves are required to remain pressurized for long periods without frequent switching, and/or b) Back pressure on port Y is required to rise above 100 bar (1500 psi)
Maximum flow rates: PCG(5)V-6 PCG(5)V-8	150 L/min (40 USgpm) 300 L/min (80 USgpm)
Cracking pressures	See "Model Code" [3]
Pilot piston area ratios Without decompression feature: All models With decompression feature ("D" at model code [4]): PCG(5)V-6 models PCG(5)V-8 models	3,5:1  33,8:1 52,6:1
Pilot pressure	See page 5
Pressure drops	See next page

### Electrical Data for PCG5V Models

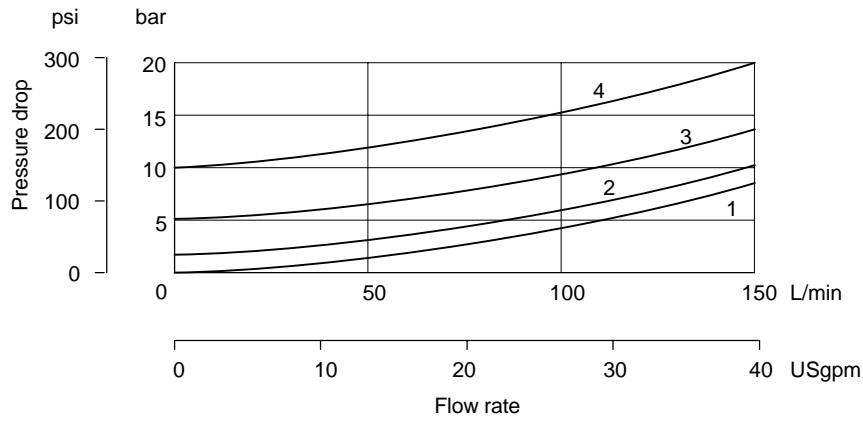
Coil voltages	See "Model Code" [10]
Permissible voltage fluctuation: Maximum Minimum	See "Temperature Limits", page 5 90% of rated voltage, see "Model Code" [10]
Relative duty factor	Continuous, ED = 100%
Types of protection: ISO 4400 coils with plug fitted correctly Conduit box Coil winding Lead wires (coils type F**) Coil encapsulation	IEC144, class IP65 IEC144, class IP65 Class H Class H Class F
Power consumption for coils listed in "Model Code" [10]:	Initial ♦      Holding VA (rms)      VA (rms)
AC coils: Types A, C at 50 Hz Types B, D at 50 Hz Types B, D at 60 Hz	225              39 265              49 260              48
DC coils: G H	30W              – 30W              –
	♦ 1st half cycle; solenoid armature fully retracted.

**Performance Characteristics**

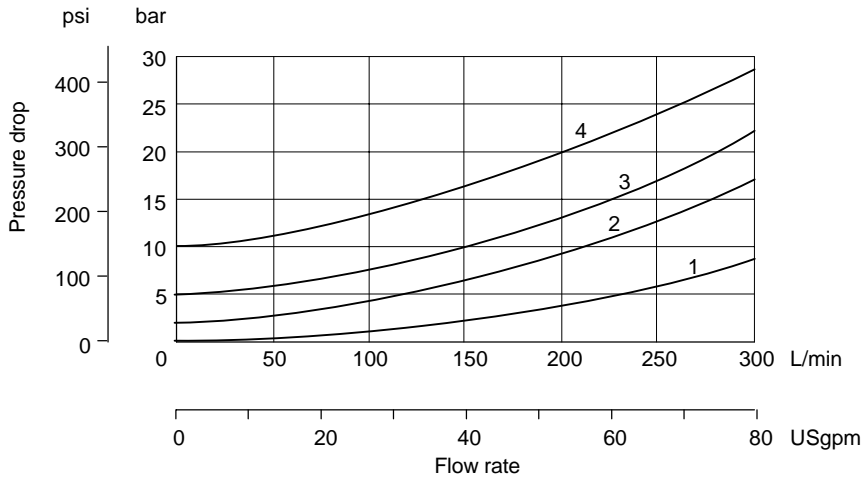
Typical with petroleum oil at  
21 cSt (102 SUS) and at 50°C (122°F)  
unless stated otherwise.

**Pressure Drops**

PCG(5)V-6 models



PCG(5)V-8 models



Port B to A, piloted open . . . . . Curve 1  
 Port A to B, no pilot pressure:  
 PCG(5)V-\*A models . . . . . Curve 2  
 PCG(5)V-\*C models . . . . . Curve 3  
 PCG(5)V-\*F models . . . . . Curve 4

### Pilot Pressure

The pilot pressure required to open the check valve or decompression poppet is stated as a ratio of the pressure on the check (port B) to the pilot pressure. To determine the required pilot pressure the following formulae should be used. These are valid for pressures calculated in either bar or psi, using the appropriate "C" factor.

For internally drained pilot piston models, no symbol at model code **5**:

$$\text{Pilot pressure } P_X = \frac{P_B - P_A}{\text{Area ratio}} + P_A + C$$

For externally drained pilot piston models, "1" at model code **5**:

$$\text{Pilot pressure } P_X = \frac{P_B}{\text{Area ratio}} + 0,85 P_Y + C$$

Where:

$P_X$  = Pressure at pilot port X  
 $P_B$  = Pressure at free flow outlet port B  
 $P_A$  = Pressure at free flow inlet port A  
 $P_Y$  = Back pressure at drain port Y  
 $C$  = Varies according to cracking pressure, see table.

Model type	"C" factor bar	psi
PCG(5)V-6A	0,6	9
PCG(5)V-6C	1,5	22
PCG(5)V-6F	4,0	58
PCG(5)V-8A	0,6	9
PCG(5)V-8C	1,5	22
PCG(5)V-8F	3,0	44

### Hydraulic Fluids

All valves can be used with:  
 Antiwear hydraulic oils (class L-HM)  
 Invert emulsions (class L-HFB)  
 Water glycol (class L-HFC)  
 Phosphate ester (class L-HFD), adding "F3-" prefix at model code **1**.

The extreme viscosity range is from 500 to 13 cSt (2270 to 70 SUS) but the recommended range is 54 to 13 cSt (245 to 70 SUS).

For further information about fluids see catalog 920.

### Temperature Limits

Minimum ambient: -20°C (-4°F)

Maximum ambient:  
 For PCGV valves: 70°C (158°F)

For PCG5V valves with coils listed in model code **10** and at 110% of rated voltage:

Coil type and frequency	Max. ambient temperature
Dual frequency coils	
at 50 Hz	65°C (149°F)
at 60 Hz	65°C (149°F)
Single frequency coils	
at 50 Hz	65°C (149°F)
DC coils	70°C (158°F)

Fluid temperatures (all models)

	Petroleum oil	Water-containing
Min.	-20°C (-4°F)	+10°C (+50°F)
Max.*	+70°C (+158°F)	+54°C (+129°F)

\* To obtain optimum service life from both fluid and hydraulic system, 65°C (150°F) normally is the maximum temperature except for water-containing fluids.

For synthetic fluids consult fluid manufacturer or Vickers representative where limits are outside those of petroleum oil.

Whatever the actual temperature range, ensure that viscosities stay within the limits specified in the "Hydraulic Fluids" section.

### Contamination Control Requirements

Recommendations on contamination control methods and the selection of products to control fluid condition are included in Vickers publication 9132 or 561, "Vickers Guide to Systemic Contamination Control". The book also includes information on the Vickers concept of "ProActive Maintenance". The following recommendations are based on ISO cleanliness levels at 2 µm, 5 µm and 15 µm. For products in this catalog the recommended levels are:

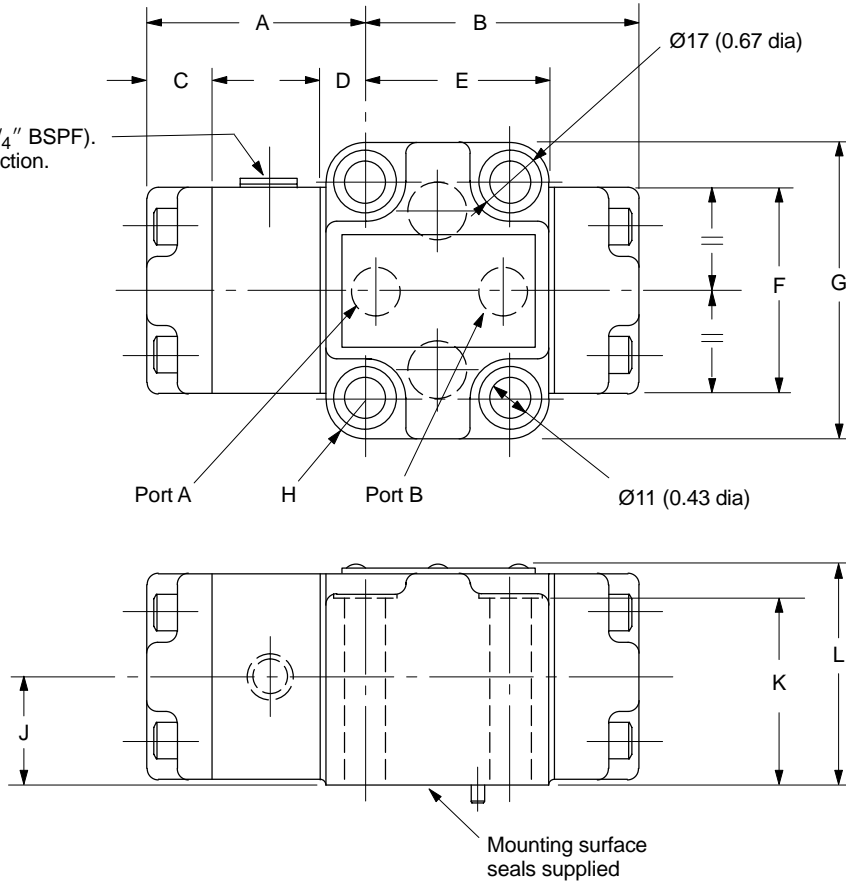
Up to 210 bar (3050 psi) . . . . . 20/18/15  
 Above 210 bar (3050 psi) . . . . . 20/18/15

# Installation Dimensions in mm (inches)

## PCGV Model



PCGV-\*\*(D)-1 models only:  
Alternative drain port G<sup>1/4</sup> (1/4" BSPF).  
Remove plug to make connection.



For port functions see "Mounting Surfaces", page 8

Model	A	B	C	D	E	F	G	H
PCGV-6*(D)-10	38 (1.5)	82 (3.2)	24 (1.0)	12 (0.47)	55 (2.2)	62 (2.5)	89 (3.5)	10 (0.4)
PCGV-6*(D)-1-10	66 (2.6)	82 (3.2)	24 (1.0)	12 (0.47)	55 (2.2)	62 (2.5)	89 (3.5)	10 (0.4)
PCGV-8*(D)-10	38 (1.5)	98 (3.9)	23 (0.9)	13 (0.5)	74 (2.9)	78 (3.1)	103 (4.1)	11 (0.45)
PCGV-8*(D)-1-10	66 (2.6)	98 (3.9)	23 (0.9)	13 (0.5)	74 (2.9)	78 (3.1)	103 (4.1)	11 (0.45)
PCGV5V-6*(D)---20	—	82 (3.2)	—	12 (0.47)	55 (2.2)	62 (2.5)	89 (3.5)	10 (0.4)
PCGV5V-6*(D)-1---20	—	82 (3.2)	—	12 (0.47)	55 (2.2)	62 (2.5)	89 (3.5)	10 (0.4)
PCGV5V-8*(D)---20	—	98 (3.9)	—	13 (0.5)	74 (2.9)	78 (3.1)	103 (4.1)	11 (0.45)
PCGV5V-8*(D)-1---20	—	98 (3.9)	—	13 (0.5)	74 (2.9)	78 (3.1)	103 (4.1)	11 (0.45)

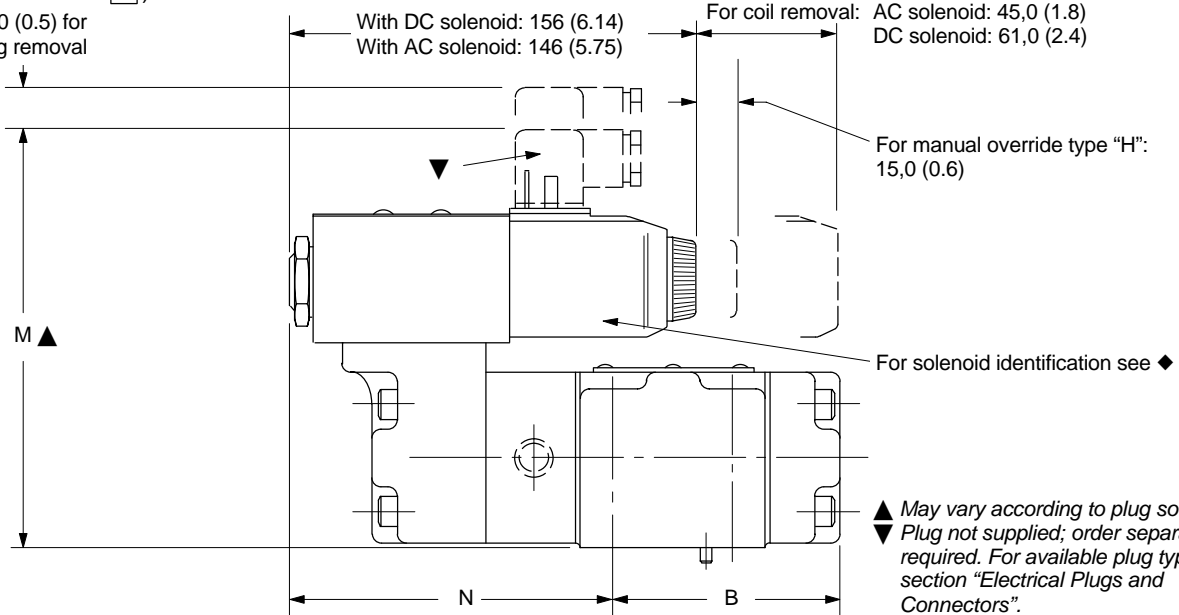
Model	J	K	L	M	N
PCGV-6*(D)-10	—	56 (2.2)	68 (2.7)	—	—
PCGV-6*(D)-1-10	33 (1.3)	56 (2.2)	68 (2.7)	—	—
PCGV-8*(D)-10	—	60 (2.4)	72 (2.8)	—	—
PCGV-8*(D)-1-10	35 (1.4)	60 (2.4)	72 (2.8)	—	—
PCGV5V-6*(D)---20	—	56 (2.2)	68 (2.7)	165 (6.5)	86 (3.4)
PCGV5V-6*(D)-1---20	—	56 (2.2)	68 (2.7)	165 (6.5)	114 (4.5)
PCGV5V-8*(D)---20	—	60 (2.4)	72 (2.8)	168 (6.6)	86 (3.4)
PCGV5V-8*(D)-1---20	—	60 (2.4)	72 (2.8)	168 (6.6)	114 (4.5)

**PCG5V Models**

**With Type “U” Coil Connection**

(“U” at model code [8])

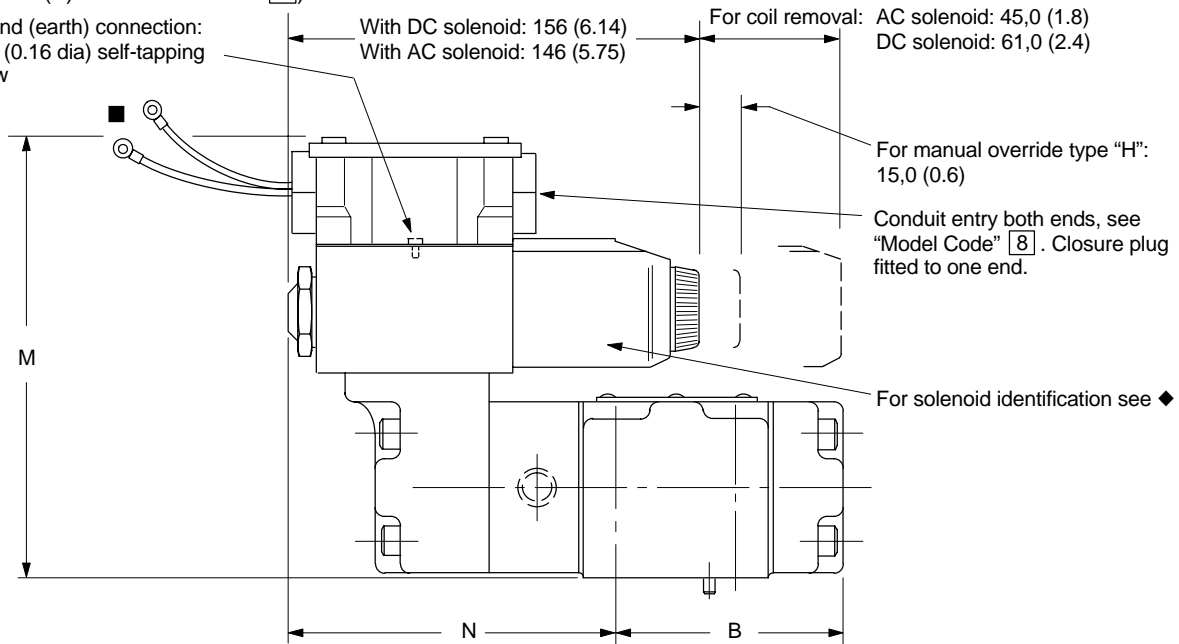
13,0 (0.5) for  
plug removal



**With Type “F\*\*” Coil Connection**

(“F(T)J” or “F(T)W” at model code [8])

Ground (earth) connection:  
Ø0,4 (0.16 dia) self-tapping  
screw



◆ The solenoid identification is printed on the nameplate of the pilot valve. Identification options are described under “Model Code” [7].

For ANSI/NFPA method (no symbol at model code [7]) solenoid identity is: “Sol. A”.

For German method (“V” in model code [7]) solenoid identity is: “Sol. B”.

■ Ref. model code [8]:

Codes “FJ” and “FW”: 2 lead wires for each solenoid, approx. 150,00 (6.0) long. M3 terminals provided for customer connection.

Codes “FTJ” and “FTW”: lead wires connected into terminal strip suitable for M3 terminals on customer connection.

**Mounting Surfaces, Based on**

**ISO 5781, Codes:**

**AG-06-2-A**

**AH-08-2-A**

When a subplate is not used a raised machined pad must be provided for mounting. The pad must be flat within 0,01mm/100 mm (0.001"/10") and smooth within 0,8 µm (32 µin).

Dimensional tolerances are ± 0,2 mm (0.008") except where indicated.

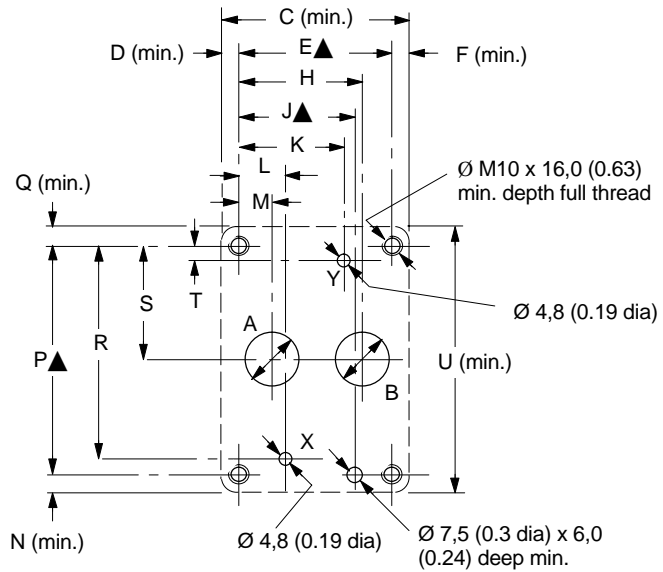
**Port functions**

A = Free flow inlet and controlled reverse flow outlet

B = Free flow outlet and controlled reverse flow inlet

X = Pilot control port

Y = External drain port

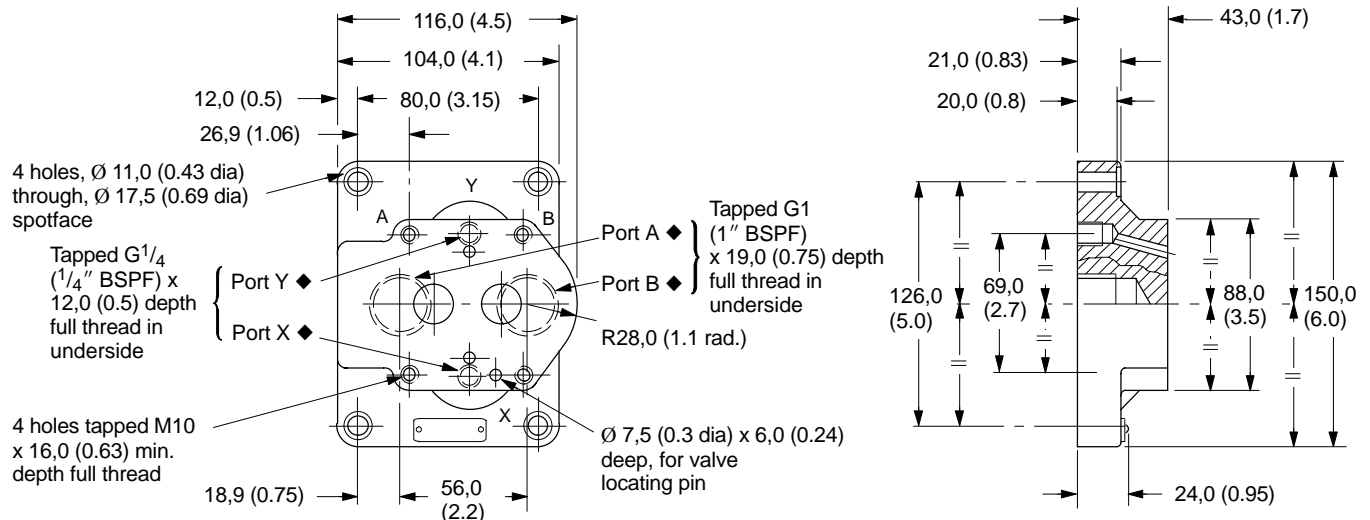


Size	A dia.	B dia.	C	D	E	F	H	J	K
06	14,7 (0.58)	14,7 (0.58)	61,0 (2.4)	9,0 (0.4)	42,9 (1.69)	9,0 (0.4)	35,7 (1.4)	31,8 (1.25)	21,4 (0.84)
08	23,4 (0.92)	23,4 (0.92)	78,0 (3.1)	8,8 (0.35)	60,3 (2.37)	8,8 (0.35)	49,2 (1.94)	44,5 (1.75)	39,7 (1.56)

Size	L	M	N	P	Q	R	S	T	U
06	21,4 (0.84)	7,1 (0.28)	10,0 (0.4)	66,7 (2.62)	10,0 (0.4)	58,7 (2.3)	33,3 (1.3)	7,9 (0.31)	87,0 (3.4)
08	20,6 (0.81)	11,1 (0.44)	10,8 (0.43)	79,4 (3.125)	10,8 (0.43)	73,0 (2.87)	39,7 (1.56)	6,4 (0.25)	101,0 (4.0)

▲ Tolerance on bolt and pin locations ± 0,1 mm (0.004")

**XCGVM-6-10R Subplate**



◆ See "Mounting Surfaces" section above for port usage

## Installation Data

### Mounting Attitude

Unrestricted.

### Subplates

For PCG(5)V-6 valves see type XCVGM-6-10R, on previous page.  
For PCG(5)V-8 valves consult your Vickers representative.

### Mounting Bolts/Torques

For PCG(5)V-6 valves:  
bolt kit BKPCGV-6.  
For PCG(5)V-8 valves:  
bolt kit BKPCGV-8.  
Bolts should be torqued to 59-73 Nm (44-53 lbf ft), with threads lubricated.

## Mass (approx.)

	PCG(5)V-6 kg (lb)	PCG(5)V-8 kg (lb)
PCGV with internal drain	3,2 (7)	4,9 (10.8)
PCGV with external drain	4,0 (8.8)	5,9 (13)
PCG5V with internal drain ▲		
AC voltage models	5,7 (12.6)	7,3 (16.1)
DC voltage models	5,9 (13)	7,5 (16.5)
PCG5V with external drain ▲		
AC voltage models	6,5 (14.3)	8,3 (18.3)
DC voltage models	6,7 (14.8)	8,5 (18.7)

▲ *Pilot piston drain.*

XCVGM-6-10R subplate: 3,0 kg (6.6 lb)

For valves with type "U" coils (see model code).

The cable entry on these plugs can be repositioned at 90° intervals by reassembly of the contact holder relative

to the plug housing. The cable entry is Pg 11 for cable Ø 6-10 mm (0.24-0.40" dia).

Order plugs separately by part number.

## Electrical Plugs and Connectors

### Plugs for ISO 4400 (DIN 43650) Type Coil Connection

Voltage	Part number	
	Gray (Sol. A)	Black (Sol. B)
Without indicator light		
–	710776	710775
With indicator light		
12-24V	977467	977466
100-125V	977469	977468
200-240V	977471	977470

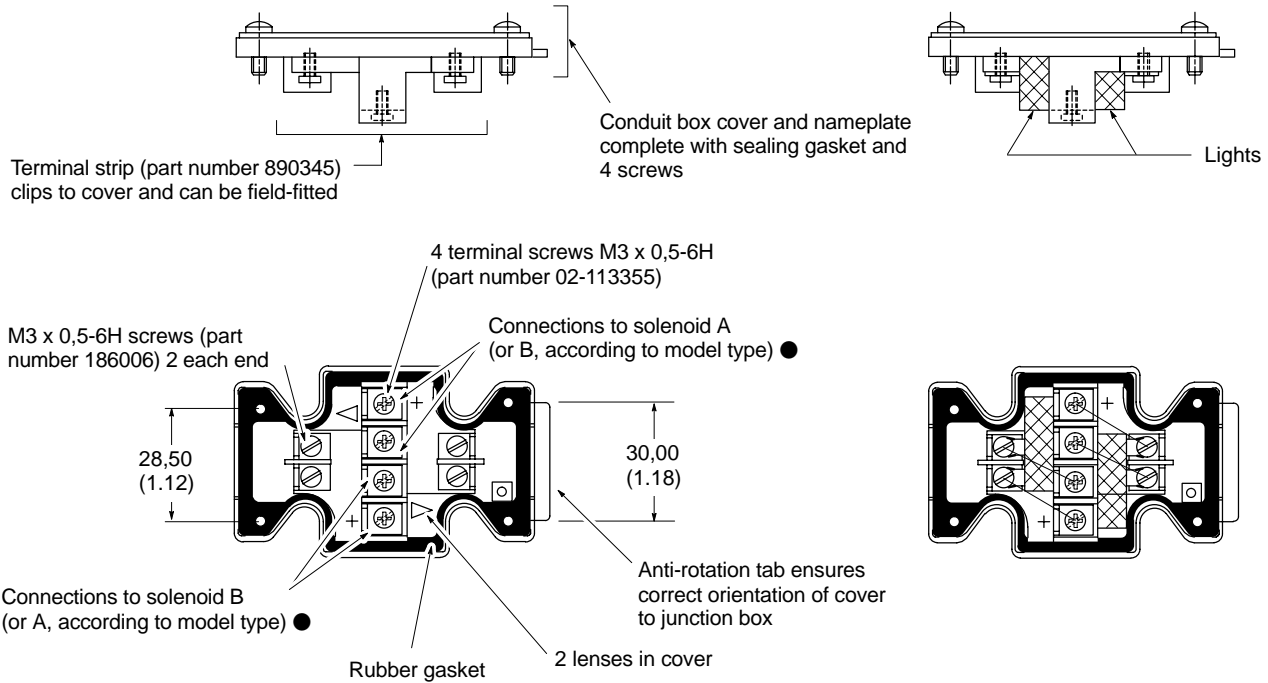


## Terminal Strip and Lights

For valves with type "F\*\*" coils, see model code location **8**

For "FTJ" or "FTW" at model code **8**

For "FTJL" or "FTWL" at model code **8** + **9**



● 1. For DC coils the +ve lead(s) must be connected to the terminal(s) marked +. When using 3-wire incoming leads to double solenoid valves (i.e. common neutral) the inner pair of terminals must be linked.

2. For correct light indication of energized solenoid ensure that solenoid leads are correctly connected: light terminals are common with each outer pair of solenoid terminals according to the side with + mark.

## Ordering Procedure

Valves, subplates and bolt kits should be ordered by full model code designation.