Vickers®

Flow Control Valves - Pressure Compensated

FCG-H02	315 Bar, 50 LPM
FCG-H03	315 Bar, 160 LPM

Powering Business Worldwide

Table of Contents

General Description

Features:

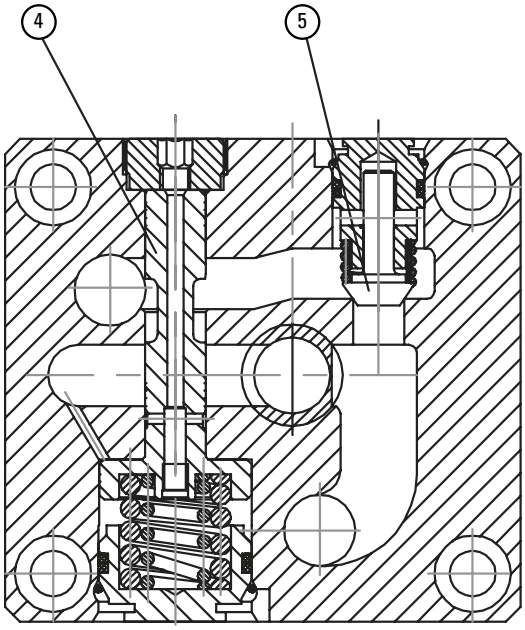
- Porting pattern to DIN 24 340, form G,ISO 6263, CETOP-RP 121H and NFPA 3.5.1 MR1
- Pressure compensator stroke limiter, optional
- Mechanical operation
- Start-up jump reduction
- Flow control in both directions using a rectifier sandwich plate

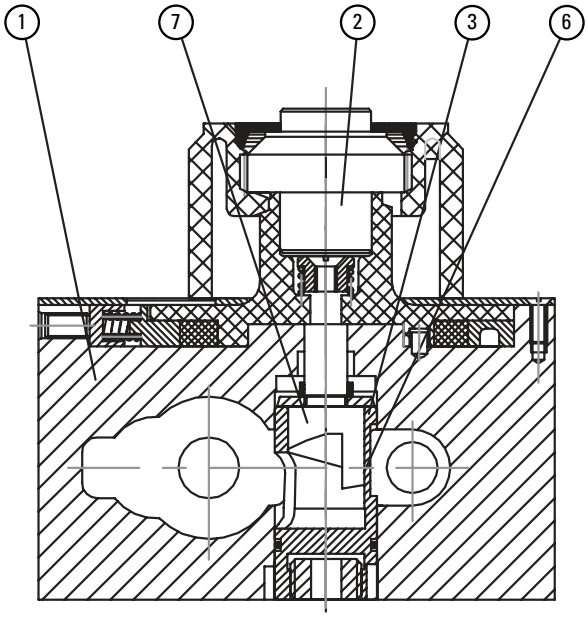
General

Eaton's Vickers ® FCG flow control valves are used to maintain a flow constant largely independent of pressure and temperature.

The valves basically consist of the housing (1), orifice bushing(3), pressure compensator (4) with optional stroke limiter,check valve(5), adjustment element (2).

The flow from channel A to channel B is throttle at the orifice (6). In order to maintain the flow across the orifice constant, a pressure compensator is connected upstream of the orifice (6). The flow is maintained largely independent of temperature due to the orifice design. Free return flow from channel B to channel A is directed via the check valve (5). The flow is only controlled from A to B. In order to control the flows in both directions a rectifier sandwich plate type DGMB can be installed below the flow control valve.

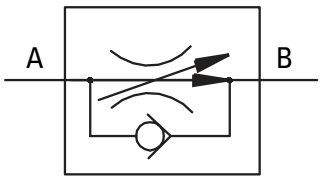




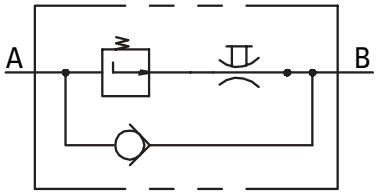
Functional Symbols

Flow Control Valve

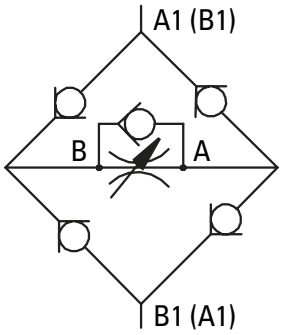
Simplified



Detailed

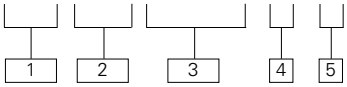


Rectifier sandwich plate



Series FCG-H02-H03
Model Code

(F3)-FCG-H02-50-(B)-10



1 Seal Options

F3 – Fluorocarbon seals, for Phosphate Ester (class L_HFD)
Blank – Nitrile, for Mineral oil Anti-wear hydraulic oil (class L-HFB), Water glycol (class L-HFC)

2 Flow Control Valve

3 Flow Range (A to B)

Size H02
50 - 50 litres/min
35 - 35 litres/min
25 - 25 litres/min
16 - 16 litres/min
10 - 12 litres/min
05 - 05 litres/min
02 - 02 litres/min

Size H03
160 - 160 litres/min
125 - 125 litres/min
100 - 100 litres/min
80 - 80 litres/min
60 - 60 litres/min
40 - 40 litres/min

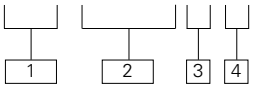
4 Pressure Compensator Stroke Limiter

Omit – without
B – with

5 Design Number

10

(F3) DGMB-3-10



1 Seal Options

F3 – Fluorocarbon seals, for Phosphate Ester (class L_HFD)
Blank – Nitrile, for Mineral oil Anti-wear hydraulic oil (class L-HFB), Water glycol (class L-HFC)

2 Rectifier Sandwich Plate

3 Size

3 - Size 6 (NG6)
(Used with F(C)G-3 valve)
02 - Size 10
03 - Size 16

4 Design Number

10

Hydraulic Technical Data

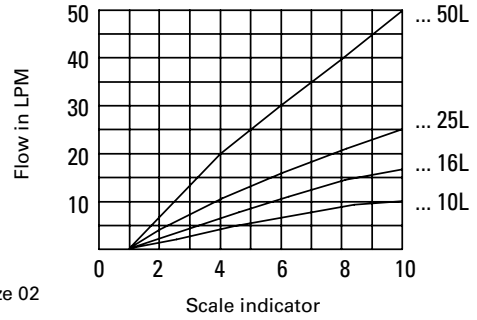
Flow (L/min)	Size 02				Size 03		
	10	16	25	50	60	100	160
△p with free return flow B→A (Bar)	Size 02				Size 03		
	2	2.5	3.5	6	2.8	4.3	7.3
Flow control							
Temperature compensation-20 to+80	± 2% at max flow						
Pressure-compensation (up to △p = 315 (Bar)	Size 02				Size 03		
	± 2% max				± 5% max		
Operating pressure, max. - port A (Bar)	up to 315						
Minimum pressure differential range (Bar)	Size 02				Size 03		
	3-7				5-12		
Weight (Kg)	Size 02				Size 03		
	5.6				11.3		
Hydraulic fluid	Mineral oil(for NBR seal) or Phospate ester (for FPM seal)						
Fluid temperature range (°C)	-30 up to + 80						
Fluid viscosity range (mm²/s)	10 to 800						
Fluid cleanliness	ISO 19/17/14						

Rectifier Sandwich Plate

Flow, maximum (L/min)	Size 3	Size 02	Size 03
	up to 25	up to 50	up to 160
Operating pressure (Bar)	up to 315		
Cracking pressure (Bar)	15		
Weight (Kg)	Size 3	Size 02	Size 03
	1	3.2	9.3

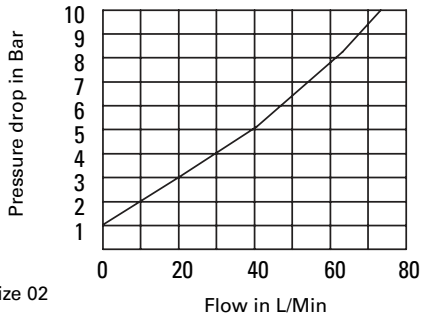
FCG-H02-H03
Flow Curves:
(measured at v = 41 mm²/s and t = 50°C)

Flow control (A→B)



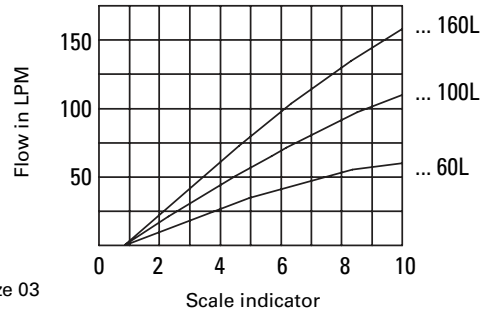
Size 02

Flow control (B→A)



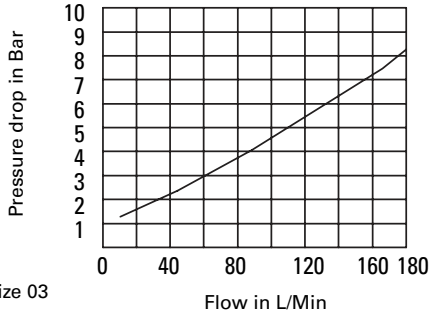
Size 02

Flow control (A→B)



Size 03

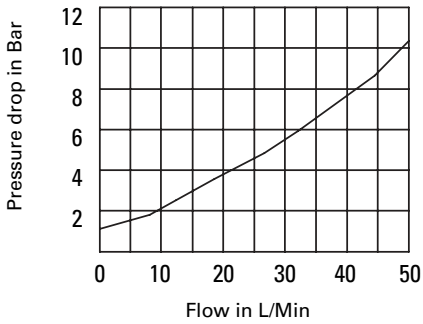
Flow control (B→A)



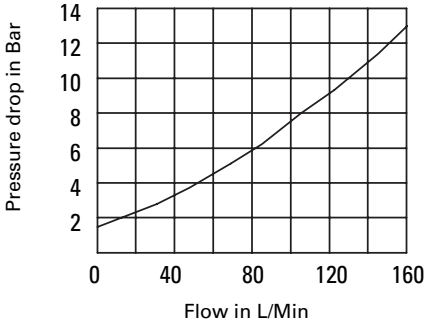
Size 03

Flow Curves: Rectifier Sandwich Plate
(measured at v = 41 mm²/s and t = 50°C)

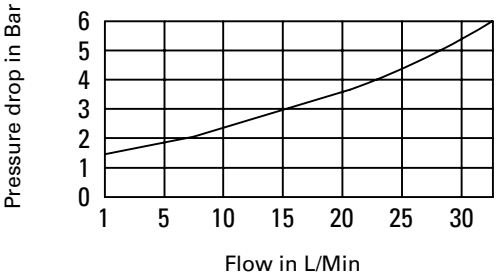
DGMB - 02



DGMB - 03

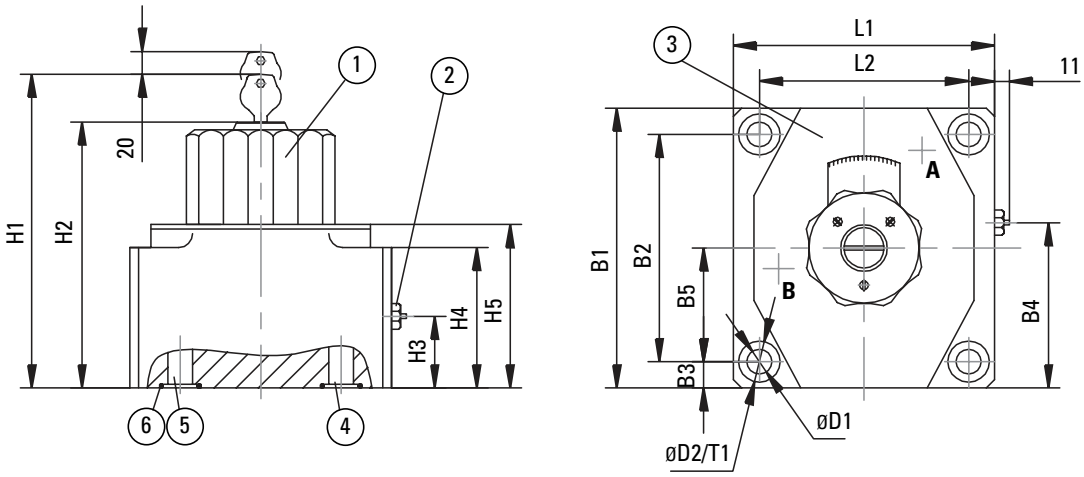


DGMB - 3



Pressure drop is the same for both directions of flow from A to B or B to A through rectifier sandwich plate.

FCG-H02-H03 Unit
Dimensions mm



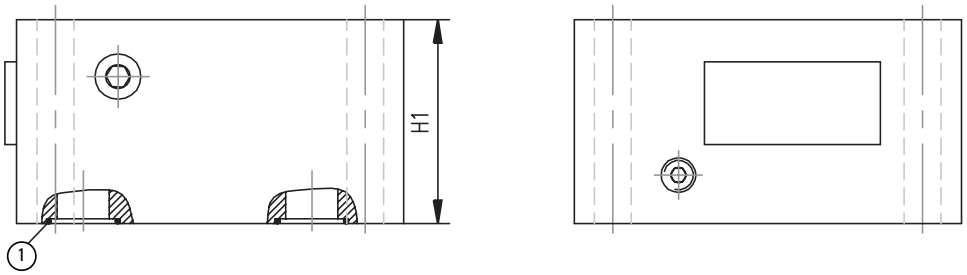
1 Lockable rotary knob(may be locked in any position
2. Pressure compensator stroke limiter, optional
3 Nameplate
4 Port “A”
5 Port “B”
6 O-ring 18.66 x 3.53 (size 02)
O-ring 26 x 3 (size 03)

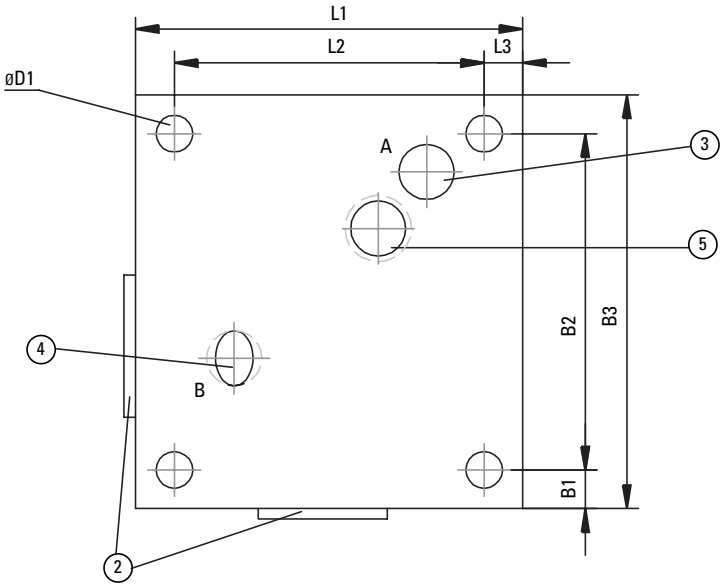
Mounting bolts:
Size 02
(4)M8 x 50mm or 5/16”-18 UNC x 2”
Size 03
(4)M10 x 80mm or 3/8”-16 UNC x 3”

Size	B1	B2	B3	B4	B5	D1	D2	H1	H2	H3	H4	H5	L1	L2	T1
02	101.5	82.5	9.5	68	35.5	9	15	125	95	26	51	60	95.0	76.0	13
03	123.5	101.5	11.0	81.5	41.5	11	18	147	117	34	72	82	123.5	101.5	12

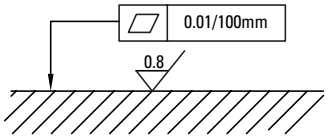
Rectifier sandwich plate
Dimensions mm

DGMB - 02 & 03



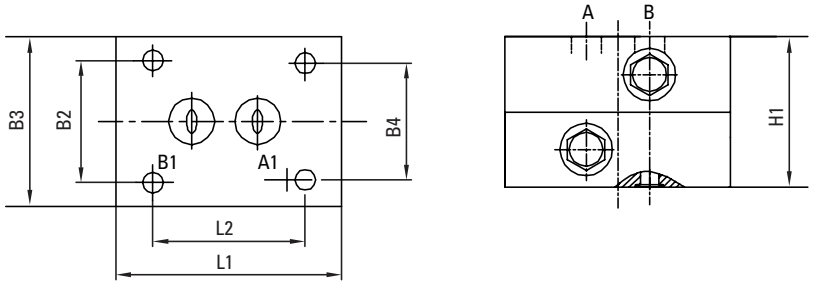


1 O-ring 18.66 x 3.53 (size 02)
O-ring 26.58 x 3.53 (size 03)
2 Nameplate
3 Port "A"
4 Port "B"
5 only for size 03, O-ring port to be sealed against mating plate



Required surface finsh of the mating face

DGMB - 3



Size	B1	B2	B3	B4	D1	H1	L1	L2	L3
02	9.50	82.50	101.50		9	50	95.00	76.00	9.50
03	11.00	101.50	123.50		11	85	123.50	101.50	11.00
3		31.00	45.00	32.50		40	60.00	45.00	N/A

Mounting Bolts	Size 3	Size 02	Size 03
FCG Valve only	M5x60mm (2)	M8x50mm (4)	M10x80mm (4)
	#10-24x2" (2)	5/16"-18 UNC x 2"(4)	3/8"-16 UNC x 3"(4)
FCG Valve with rectifier sandwich plate	M5x100mm (2)	M8x100mm (4)	M10x160mm (4)
	#10-24x4" (2)	5/16"-18 UNC x 4-1/4"(4)	3/8"-16 UNC x 6-1/4"(4)
Bolt torque value	9 Nm	37 Nm	75 Nm

Released Part Numbers

Eaton Model Code	Assembly Number
F3-FCG-H02-2-B-10	02-413776
F3-FCG-H02-5-B-10	02-413777
F3-FCG-H02-10-B-10	02-413778
F3-FCG-H02-16-B-10	02-413779
F3-FCG-H02-25-B-10	02-413780
F3-FCG-H02-35-B-10	02-413781
F3-FCG-H02-50-B-10	02-413782
FCG-H02-16-B-10	02-413815
FCG-H02-50-B-10	02-413817
F3-FCG-H03-40-B-10	02-413783
F3-FCG-H03-60-B-10	02-413784
F3-FCG-H03-80-B-10	02-413785
F3-FCG-H03-100-B-10	02-413786
F3-FCG-H03-125-B-10	02-413787
F3-FCG-H03-160-B-10	02-413788
F3-DGMB-3-10	02-413796
F3-DGMB-02-10	02-413797
F3-DGMB-03-10	02-413798
DGMB-3-10	02-413799
DGMB-02-10	02-413800
DGMB-03-10	02-413801
FCG-H03-100-B-10	02-413819
FCG-H03-160-B-10	02-413789

Seal Kit Part Numbers

Eaton Model Code	Assembly Number
FCG-H02 Seal Kit	02-413809
FCG-H03 Seal Kit	02-413810
DGMB-3 Seal Kit	02-413811
DGMB-02 Seal Kit	02-413812
DGMB-03 Seal Kit	02-413813
F3-FCG-H02 Seal Kit	02-413821
F3-FCG-H03 Seal Kit	02-413822
F3-DGMB-3 Seal Kit	02-413820
F3-DGMB-02 Seal Kit	02-413823
F3-DGMB-03 Seal Kit	02-413824

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Flow Controls

FN, F(C)G, FRG

Table of Contents

Introduction

General Data

Vickers temperature and pressure compensated flow controls allow precise volumetric control. These valves are available with (bypass type) or without (restrictor type) integral relief valves and are suitable for pressures up to 251 bar (3600 psi).

FN Valves (Regulator)

FN valves are ideally suited for a great number of applications requiring flow regulation without pressure compensation — applications where the relatively constant nature of the load minimizes the need for pressure compensation. They are not intended to be used as a shut-off valve.

F(C)G Valves (Restrictor)

F(C)G valves are pressure and temperature compensated to provide a precise adjustable flow rate, regardless of load pressure or temperature changes. The valve is adjustable over the entire flow range.

The optional trim adjustment on the F(C)G–02 size, permits adjustment of approximately $\pm$ 8% of flow setting when the valve locking device is in a locked position. Reverse free flow check option is available.

Tamper resistant adjustment of the feed rate is available in the F(C)G–02 size valve.

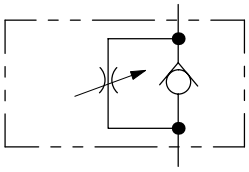
Valves are suitable for system pressures up to 248 bar (3600 psi) and cover a flow range up to 106 lpm (28 USgpm).

FRG Valves (Bypass)

FRG valves are pressure and temperature compensated to provide a precise adjustable flow rate regardless of load pressure or temperature changes. The valve incorporates an integral relief valve with maximum pressure settings of 69 bar (1000 psi), 138 (2000 psi), or 207 (3000 psi) and has a flow capacity of 28 USgpm (106 lpm)

FN 03/06/10 Model Series – Application Data

Functional Symbol



General Information

The regulator is ideally suited for a great number of applications requiring flow regulation without pressure compensation — applications where the relatively constant nature of the load minimizes the need for pressure compensation. It is not intended to be used a shut-off valve.

To obtain the accurate control required for machine tool feeds and similar applications, pressure and temperature compensation is essential.

Minimum controlled flow (approximate)

Pressure Diff. bar (psi)	Minimum Flow cm^3/min (in3/min)	
	Petrol. Oil (SAE 10W)	5% Soluble Oil-in-Water
35 (500)	410 (25)	1638 (100)
69 (1000)	819 (50)	2622 (160)
138 (2000)	1638 (100)	4916 (300)
207 (3000)	2458 (150)	————

■ Applies to –21 and later designs (06 size) and –11 and later designs (10 size). Does not apply to 03 size.

Pressure drop for free flow and maximum controlled flow (petroleum oil) – approximate

Model	Flow lpm (USgpm)	Pressure bar (psi)
FN–03 & FN–06	15,1 (4)	1,38 (20)
	30,3 (8)	2,06 (30)
	45,4 (12)	2,76 (40)
	60,56 (16)	3,79 (55)
	75,7 (20)	4,82 (70)
FN–10	38 (10)	0,34 (5)
	76 (20)	1,03 (15)
	113,6 (30)	2,4 (35)
	151,4 (40)	4,13 (60)
	189,3 (50)	6,89 (100)
	227,1 (60)	10,3 (150)
	265 (70)	13,8 (200)
	303 (80)	17,2 (250)
	340,7 (90)	22,4 (325)
	379 (100)	28,2 (410)

Maximum recommended controlled flow

FN–03 . . . . . 38 lpm (10 USgpm)
FN–06 . . . . . 75,7 lpm (20 USgpm)
FN–10 . . . . . 189,3 (50 USgpm)

Max. operating pressure

5% soluble oil-in-water solution
138 bar (2000 psi)
5% soluble oil-in-water solution
207 bar (3000 psi)

Fluids and Seals

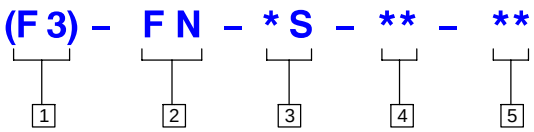
NOTE: –21 and later designs (06 size) and –11 and later designs (10 size) may be used with a 5–10% concentration of soluble oil in clean water (not applicable to 03 size). The oil should be a premium grade soluble oil designed specifically for heavy duty application. The pH should be maintained between 8 and 9.5)

The use of synthetic fire-resistant fluids requires a valve with special seals. Add the prefix "F3" to the model number when phosphate esters type fluids or its blends are to be used with standard seals.

Weights

FN–03 . . . . . 0,59 kg (1.3 lbs)
FN–06 . . . . . 1,04 kg (2.3 lbs)
FN–10 . . . . . 2.9 kg (6.5 lbs)

Model Code



1 Special Seals

Omit if not required
F3 – Special seals for use with phosphate ester type fluids

2 Type

FN – Flow control, non-compensated

3 Straight Threads

See chart in this catalog under “FN Series Installation Dimensions” section.
Omit for NPTF pipe threads

4 Nominal Valve Size

03 – 3/8”
06 – 3/4”
10 – 1-1/4”

5 Design Numbers

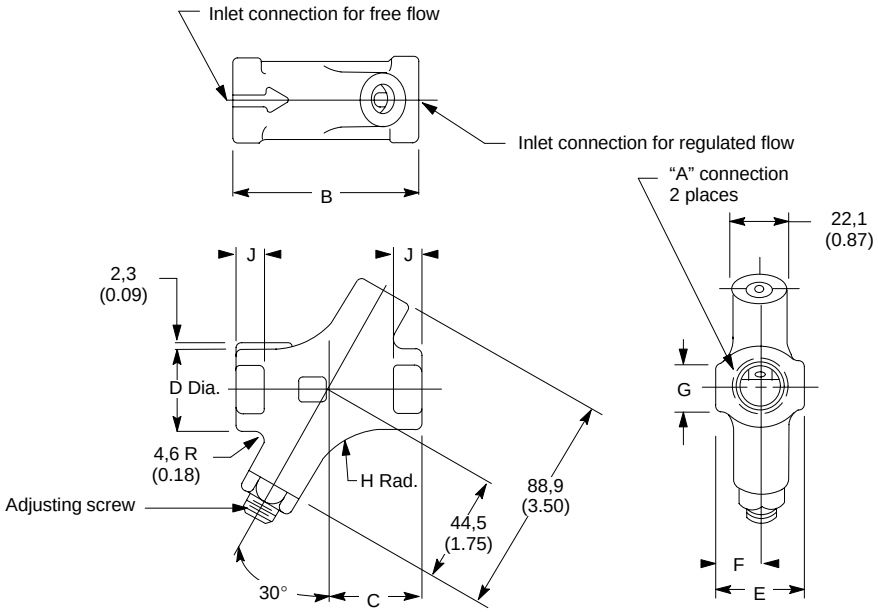
11 – FN-10
20 – FN-03
21 – FN-06

Installation dimensions remain the same for design numbers 10 through 19, and 20 through 29, respectively.

Installation Dimensions

FN–03/06

millimeter (inch)

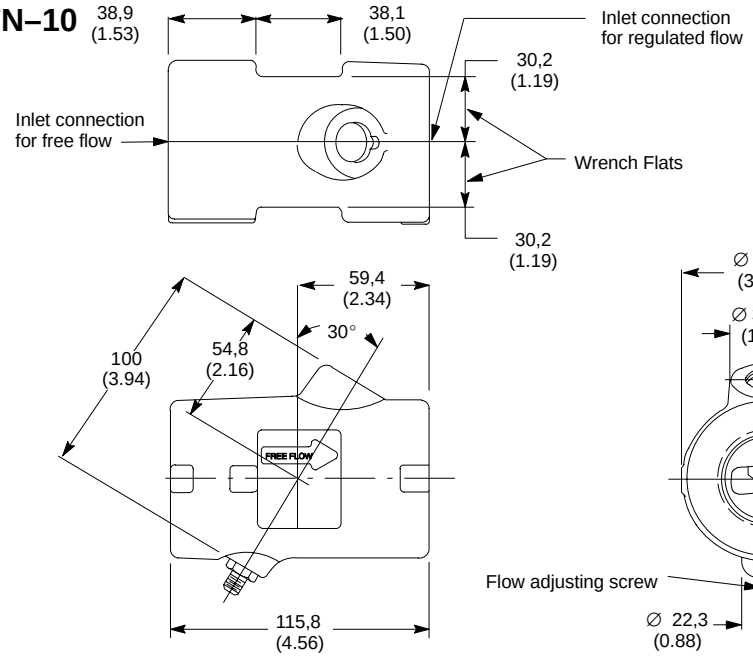


Model No.	Connection Size "A"	B	C	D	E	F	G	H	J
FN–03–20	3/8 NPTF Thd.▲	73,15 (2.88)	36,5 (1.44)	31,75 (1.25)	33,2 (1.31)	16,51 (0.65)	19,05 (0.75)	31,75 (1.25)	11,18 (0.44)
FN–8S–03–20	3/4–16 Straight Thd.●								
FN–06–21	3/4 NPTF Thd.▲	88,9 (3.50)	44,5 (1.75)	44,5 (1.75)	47,8 (1.88)	23,9 (0.94)	31,8 (1.25)	25,4 (1.00)	15,7 (0.62)
FN–12S–06–21	1–1/16–12 Straight Thd.■								

● For use with SAE straight thread fittings for 1/2" O.D. tubing. ▲ Not recommended

■ For use with SAE straight thread fittings for 7/8" O.D. tubing.

FN–10



Connection – 2 places

Model No.	Connection "A"
FN–10–11▲	1-1/4 NFTF thread
FN–20S–10–11■	1-5/8–12 SAE straight thread

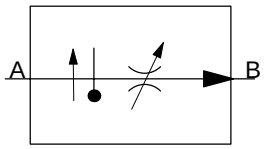
■ For use with SAE straight thread fittings for 1–1/4" O.D. tubing.

▲ Not recommended

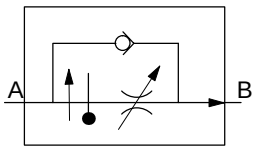
FG/FCG-02 Model Series – Application Data

Functional Symbols

FG–02



FCG–02



General Information

FG/FCG valves provide precise adjustable control of flow rates in hydraulic circuits. They are pressure and temperature compensated to minimize flow variation resulting from changes in fluid pressure and temperature. They can be used in meter-in, meter-out and bleed-off circuits, and are completely interchangeable with previous designs.

Application Guidance

Flow Adjustment

Flow rate is adjusted by rotating the dial. A lettered (“A” through “E”) indicator marks approximately 4 1/2 revolutions, from a fully closed to a fully opened position.

Maximum throttle openings may be limited by addition of spacers to the throttle shaft under the selector dial.

Trim Adjustment

This optional feature permits an adjustment of the flow setting when the valve locking device is in a locked position. Clockwise rotation increases the flow, counterclockwise decreases the flow.

Range of Adjustment

F*G–02–1500 & F*G–02–2300

± 8% of flow setting

F*G–02–300

± 3% of flow setting

Valve Locking

A standard key-locking device (2 keys furnished) is supplied with these valves. An optional device is also available. Instead of using the key, the valve is removed from its mounting to open the access hole, which is on the front of the valve. The valve is then returned to its mounting and the new setting is made. Then the access hole can be covered using a screwdriver in the keyhole and turning clockwise to trip the lock.

Subplate and Bolt Kits

Valves, subplates and mounting kits must be ordered separately.
For example:
One (1) FG-02-1500-5* Valve
One (1) FGM-02-20 Subplate
One (1) FGM-02X-20 Subplate
One (1) BKFG-02-640 Mounting Bolt Kit (Bolt length = 2 inch)

Maximum recommended mounting bolt torque: 34,5 Nm (305 lb. in.)
Mounting bolts, when provided by a customer, must be SAE grade 7, or better.

Ratings

Maximum Flow Capacity (based on oil viscosity of 150 SUS @ 100 °F)

F*G-02-2300-* * -5
37690 cm^3/min (2300 in^3/min)

F*G-02-1500-* * -5
24580 cm^3/min (1500 in^3/min)

F*G-02-300-* * -5
4916 cm^3/min (300 in^3/min)

Nominal Reverse Free Flow

FCG-02-*- * * -5 only
56,7 lpm (15 USgpm)

Maximum Operating Pressure

248 bar (3600 psi)

Minimum Pressure Differential Between Inlet and Outlet Ports

F*G-02-2300-* * -5
12 bar (175 psi)

F*G-02-1500-* * -5
10 bar (150 psi)

F*G-02-300-* * -5
7 bar (100 psi)

Pressure Drop

Pressure drop for reverse free flow over check valve.

Volume lpm (USgpm)	Pressure bar (psi)
19 (5)	3 (45)
38 (10)	8 (120)
57 (15)	12 (175)
76 (20)	20 (290)
95 (25)	30 (440)

NOTE: The pressures in the pressure drop chart give approximate pressure drops (ΔP) when passing a flow of 100 SSU fluids having 0.865 specific gravity.
For any other viscosity, the pressure drop (ΔP) will change as follows:

Other Viscosity	% of ΔP from table (approx.)
75	93
150	111
200	119
250	126
300	132
350	137
400	141

Specific gravity of fluid may be obtained from its producer. For fire resistant fluids, the value is higher than for oil.

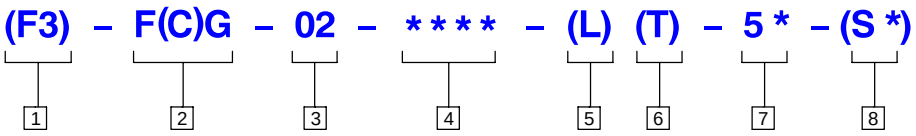
Fluids and Seals

The use of synthetic fire-resistant fluids requires a valve with special seals. Add the prefix “F3” to the model number when phosphate esters type fluids or its blends are to be used with standard seals. Refer to Vickers data sheet 694 , “Hydraulic Fluids and Temperature Recommendations for Industrial Machinery.

Weights

Valve . . . . . 3.8 kg (8.5 lbs.)
Subplate . . . . . 2.27 kg (5.0 lbs.)

Model Code



1 Special Seals

Omit if not required
F3 – Special seals for use with phosphate ester type fluids

2 Type

F – Flow control
C – Integral check
G – Manifold or subplate mounting

3 Nominal Valve Size

02 – 1/4”

4 Flow Range

300 – (2 to 300 in^3/min)
1500 – (10 to 1500 in^3/min)
2300 – (10 to 2300 in^3/min)

5 Lock Option

Blank – Standard Lock
L – Tamper resistant lock

6 Trim Adjustment Option

Omit if not required

7 Design Number

Subject to change

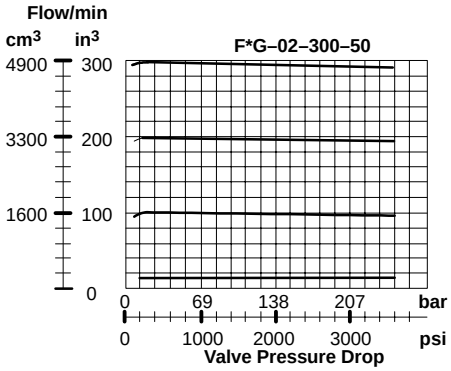
Installation dimensions remain the same for design numbers 50 through 59.

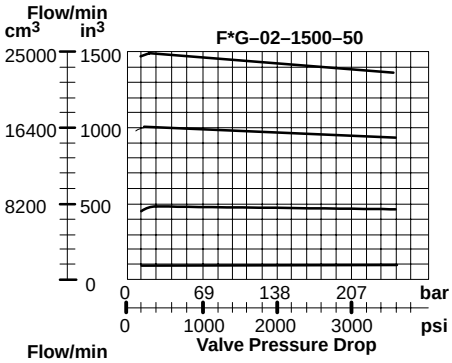
8 Special Feature

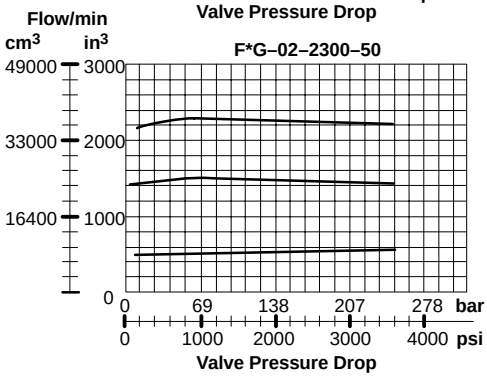
S10 – Overspeed control
S32 – Tamper resistant flow adjustment

Performance Data

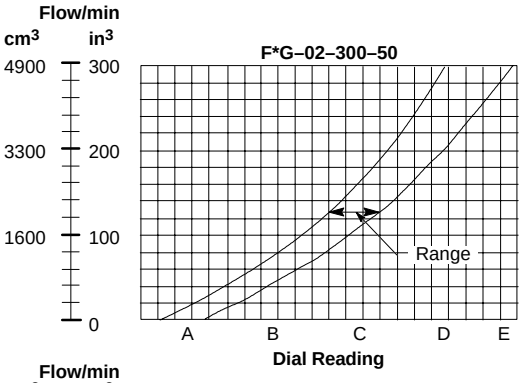
Typical Pressure Compensation

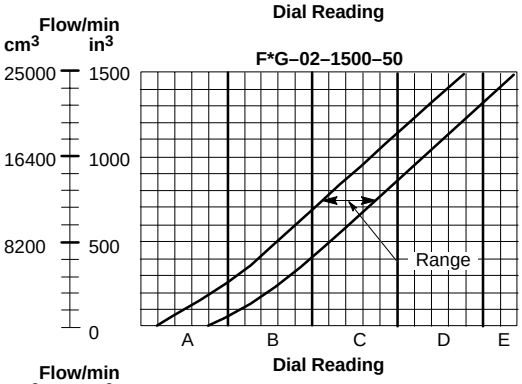


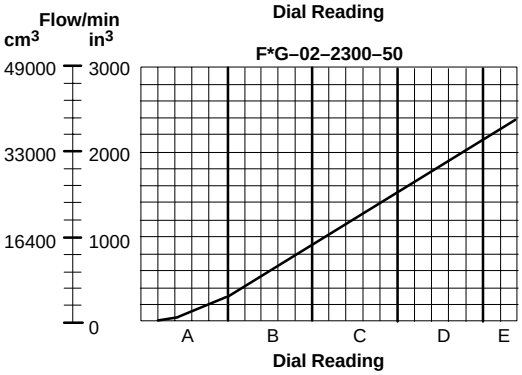




Flow vs Dial Reading







Low Flow Pressure Compensation (Minimum to 69 bar (1000 psi) valve pressure drop)

Model	Flow cm^3/min (in^3/min)	Typical Variation (%)	Maximum Variation (%)
F*G–02–300–**5*	33 (2) 164 (10)	5% 3%	15% 10%
F*G–02–1500–**5*	164 (10)	8%	15%

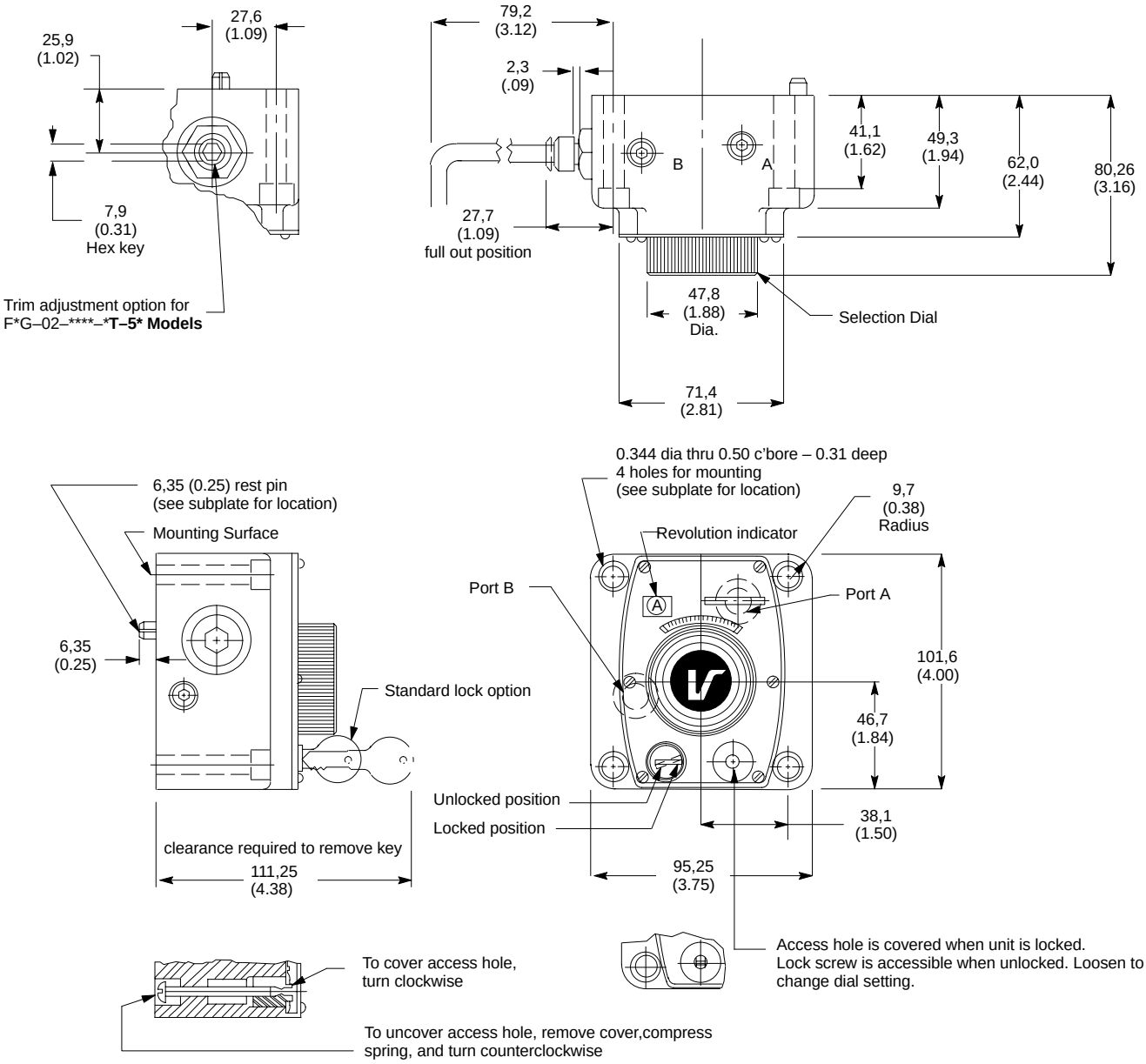
Flow Variation with Temperature, 27°C to 66°C (80°F to 150°F)

Flow cm^3/min (in^3/min)	Average Variation (%)	Maximum Variation (%)
32,8 (2.0)	7.5%	15%
163,8 (10.0)	5.5%	10%
1638,7 (100.0)	3.8%	7%
4916 (300.0)	3.0%	5%
12290,3 (750.0)	3.0%	5%
24581 (1500.0)	3.0%	5%

Installation Dimensions

FG/FCG–02 Model Series

millimeter (inch)

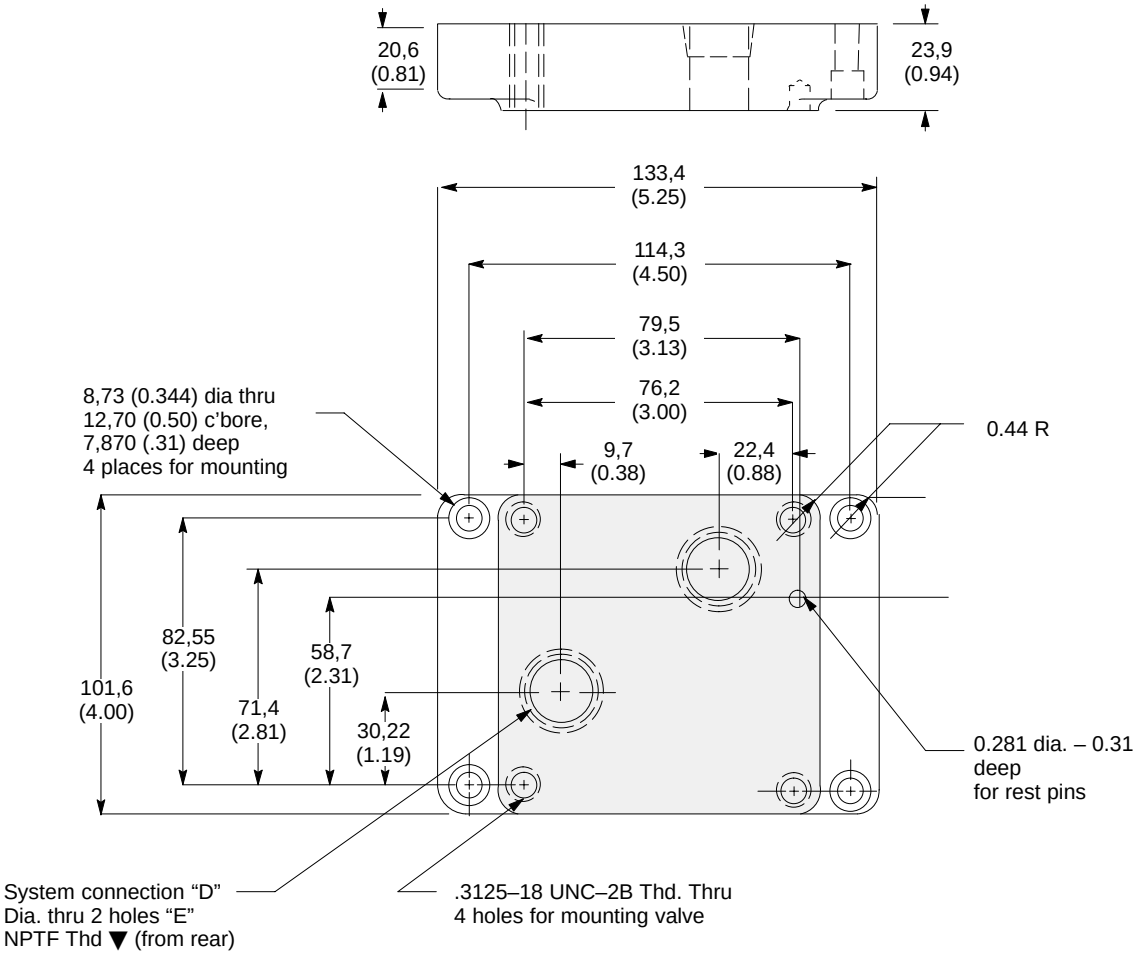


Model No.	Port A	Port B
F**C**G-02-*** -5*	Inlet connection for regulated flow or outlet connection for reversed free flow.	Outlet connection for regulated flow or inlet connection for reversed free flow.
FG-02-****-5*	Inlet connection	Outlet connection

Subplate

FGM–02(X)–20

millimeter (inch)



Subplate Model Code	D mm (inch)	"E" NPTF Thd.▼
FGM–02–20	14,27 (0.562)	3/8▼
FGM–02X–20	17,48 (0.688)	1/2▼

▼ Not Recommended

NOTE:
When the subplate is not used, a machined pad, as indicated by the shaded area on the subplate, must be provided for mounting. The pad must be flat within 0.0005 inch and smooth within 63 microinch. Mounting bolts, when provided by the customer, must be SAE grade 7 or better.

Special Features

Over Speed Control, –S10

The flow control hydrostat under zero flow conditions is spring offset to its full open position. This permits an initial flow greater than the throttle setting, and may result in a momentary over speed at the start of the feed cycle.

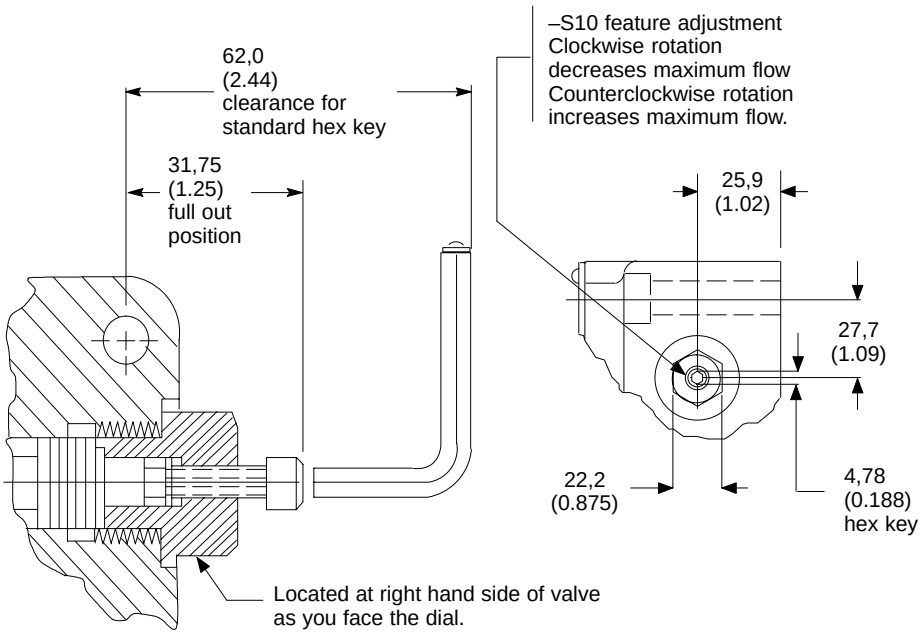
If this condition causes a problem in your application, it can be greatly reduced with the over speed control option, –S10.

The –S10 features a screw which can be adjusted to limit the hydrostat opening to a point just above the maximum flow requirements of the system.

Adjust the hydrostat as follows:

1. Back out the adjusting screw and operate the system in the feed mode. Adjust the throttle setting to the desired flow rate.

2. Turn in the adjusting screw until the feed rate drops, then back out the adjusting screw just enough to restore the original feed rate. The screw will remain in this position.

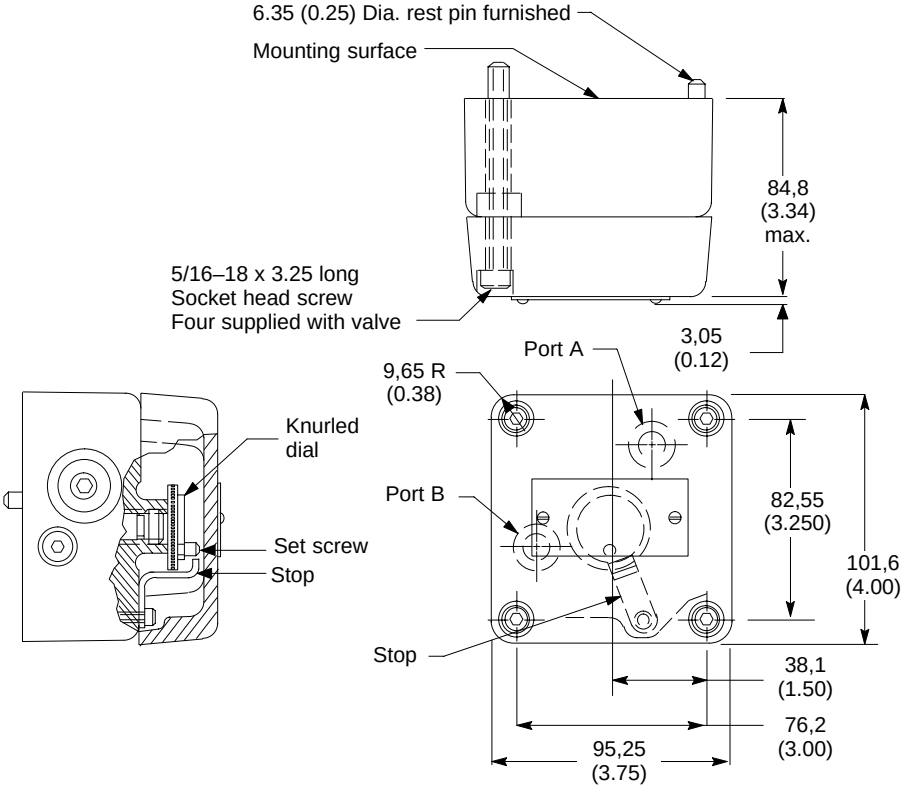


Tamper Resistant Flow Adjustment, –S32

To adjust the flow, the valve must be removed from its mounting. Install the valve back on its mounting with the cover removed using four 5/16–18 x 2 long socket head screws (not supplied with valve, must be SAE grade 7 or better).

To obtain correct screws, order separately as follows:
(1) BKFG–02–640 mounting bolt kit.

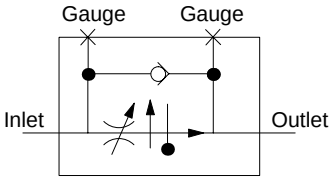
Loosen set screw in flange of throttle shaft and rotate shaft clockwise to increase flow or counterclockwise to decrease flow. When desired flow is set, tighten set screw in flange of throttle. Remove valve from mounting surface, replace cover and remount valve with the four 5/16–18 x 3.25 long screw provided with the valve.



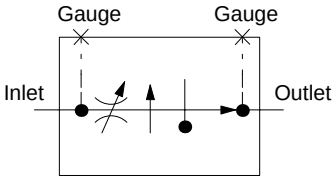
FG/FCG-03 Model Series – Application Data

Functional Symbols

FCG–03



FG–03



General Information

FC/FCG valves provide precise adjustable control of flow rates in hydraulic circuits. They are pressure and temperature compensated to minimize flow variation resulting from changes in fluid pressure and temperature. They can be used in meter-in, meter-out and bleed-off circuits.

Application Guidance

Flow Adjustment

Flow rate is adjusted by rotating the dial. A lettered (“A” through “E”) indicator marks approximately 4 1/2 revolutions, from a fully closed to a fully opened position.

Maximum throttle openings may be limited by the addition of spacers to the throttle shaft under the selector dial. Spacers are available from Vickers for installation by the user.

Number of Spacers	% of Maximum Flow
3	15–20
2	35–45
1	65–75
Use spacers – Part No. 211026	

Valve Locking

A standard key-locking device (2 keys furnished) is supplied with these valves. An optional device is also available. Instead of using the key, the valve is removed from its mounting to open the access hole, which is on the front of the valve. The valve is then returned to its mounting and the new setting is made. Then the access hole can be covered using a screwdriver in the keyhole and turning clockwise to trip the lock.

Ratings

Maximum Flow Capacity (based on oil viscosity of 100 SUS @ 49° C (100 °F)

106 lpm, 8833 ft^3/min
(28 USgpm, 6468 in^3/min)

Nominal Reverse Free Flow

FCG-03–28–22
5 bar @ 114 lpm (65 psi @30 USgpm)

Maximum Operating Pressure

207 bar (3000 psi)

Maximum Throttle Adj. Torque Req. Adjusting Torque Proportional to Outlet Pressure

2,26 Nm @210 bar
(20 in. lbs. @ 3000 psi)

Pressure Drop Information

Pressure Drop for reverse free flow over check valve.

Pressure bar (psi)	Volume lpm (USgpm)
3 (45)	19 (5)
8 (120)	38 (10)
12 (175)	57 (15)
20 (290)	76 (20)
30 (440)	95 (25)

NOTE: The pressures in the pressure drop chart give approximate pressure drops (ΔP) when passing a flow of 100 SSU fluids having 0.865 specific gravity. For any other viscosity, the pressure drop (ΔP) will change as follows:

Other Viscosity	% of *ΔP* from table (approx.)
75	93
150	111
200	119
250	126
300	132
350	137
400	141

For any other specific gravity (G_1) the pressure drop *(ΔP_1)* will be approximately: $\Delta P_1 = {}_{\Delta}P\ (G_1/G)$.

Fluids and Seals

The use of synthetic fire-resistant fluids requires a valve with special seals. Add the prefix “F3” to the model number when phosphate esters type fluids or its blends are to be used with standard seals. Refer to Vickers data sheet 694, “Hydraulic Fluids and Temperature Recommendations for Industrial Machinery.”

Subplate and Bolt Kits

Valves, subplates and mounting kits must be ordered separately.
For example:
One (1) F(C)G-03-28–22 Valve
One (1) FGM-03SZ-10 Subplate
One (1) BKFG-03-645 Bolt Kit
(Bolt length = 3 inch)
Maximum recommended mounting bolt torque: 40 Nm (350 lb. in.)
Mounting bolts, when provided by a customer, must be SAE grade 7, or better.

Weights

Valve . . . . . 8.2 kg (18 lbs.)
Subplate . . . . . 4.5 kg (10 lbs.)

Model Code

(F3) – F(C)G – 03 – 28 – 22 – (S *)

1 2 3 4 5 6

1 Special Seals

Omit if not required
F3 – Special seals for use with phosphate ester type fluids

2 Type

F – Flow control
C – Integral check (omit if not required)
G – Manifold or subplate mounting

3 Nominal Valve Size

03 – 3/8”

4 Flow Range

28 – 106 lpm (28 USgpm)

5 Design Number

Subject to change

Installation dimensions remain the same for design numbers 50 through 59.

6 Special Feature

–S10 – Overspeed control

Over Speed Control (–S10)

The flow control hydrostat under zero flow conditions is spring offset to its full open position. This permits an initial flow greater than the throttle setting, and may result in a momentary over speed at the start of the feed cycle.

If this condition causes a problem in your application, it can be greatly reduced with the over speed control option (S10).

The S10 features a screw which can be adjusted to limit the hydrostat opening to a point just above the maximum flow requirements of the system.

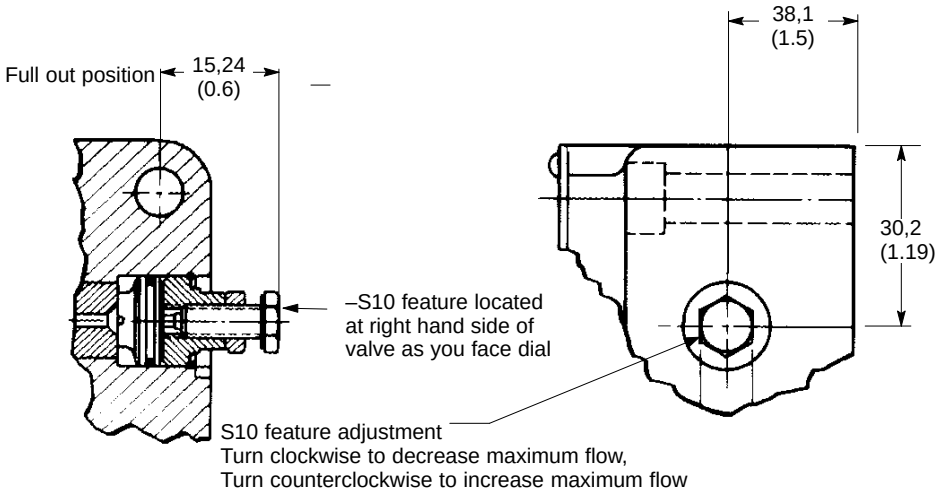
Adjust the hydrostat as follows:

1. Back out the adjusting screw and operate the system in the feed mode. Adjust the throttle setting to the desired flow rate.

2. Turn in the adjusting screw until the feed rate drops, then back out the adjusting screw just enough to restore the original feed rate. The screw will remain in this position.

Dimensions

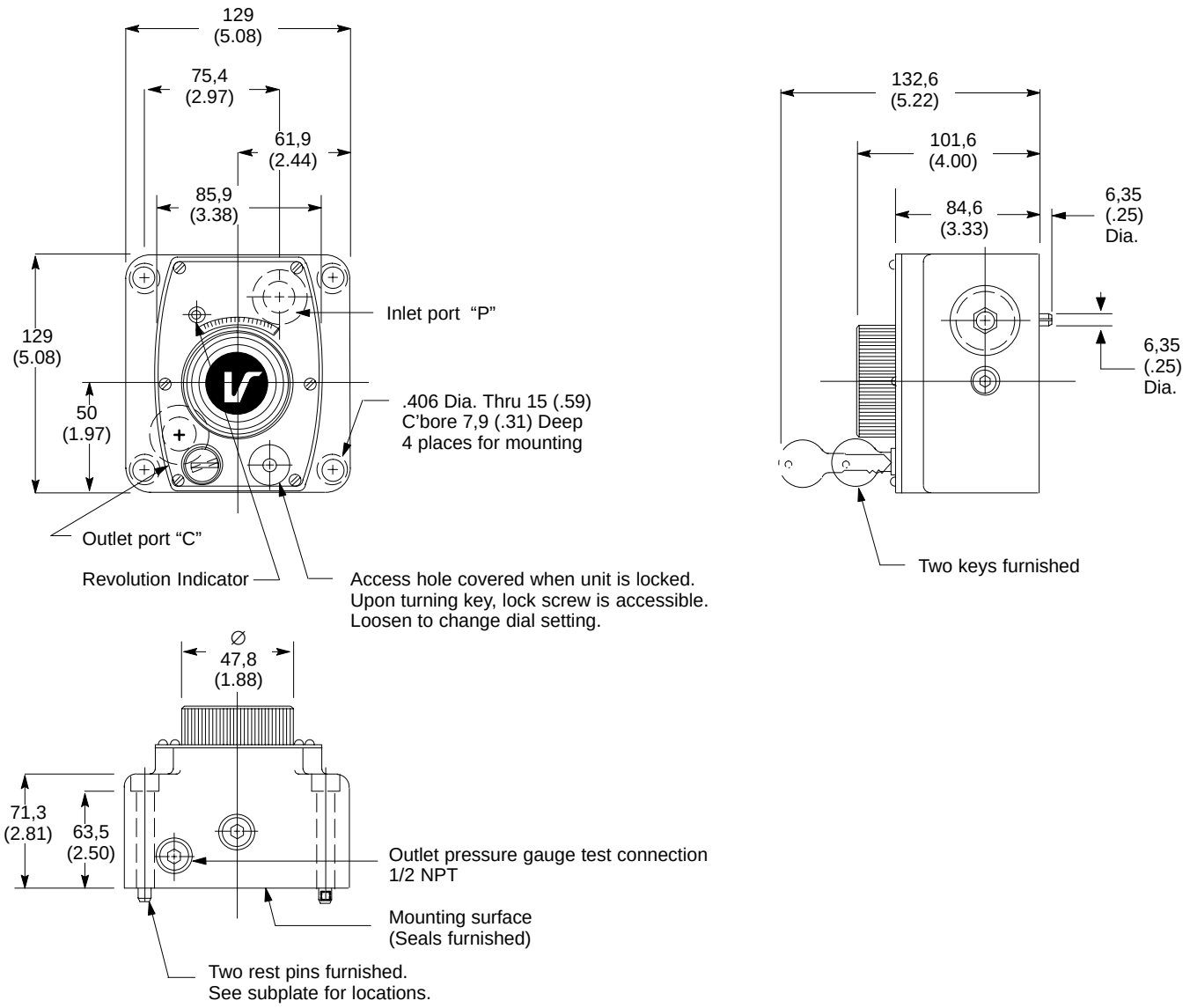
millimeterm (inch)



Installation Dimensions

FG/FCG–03 Model Series

millimeter (inch)



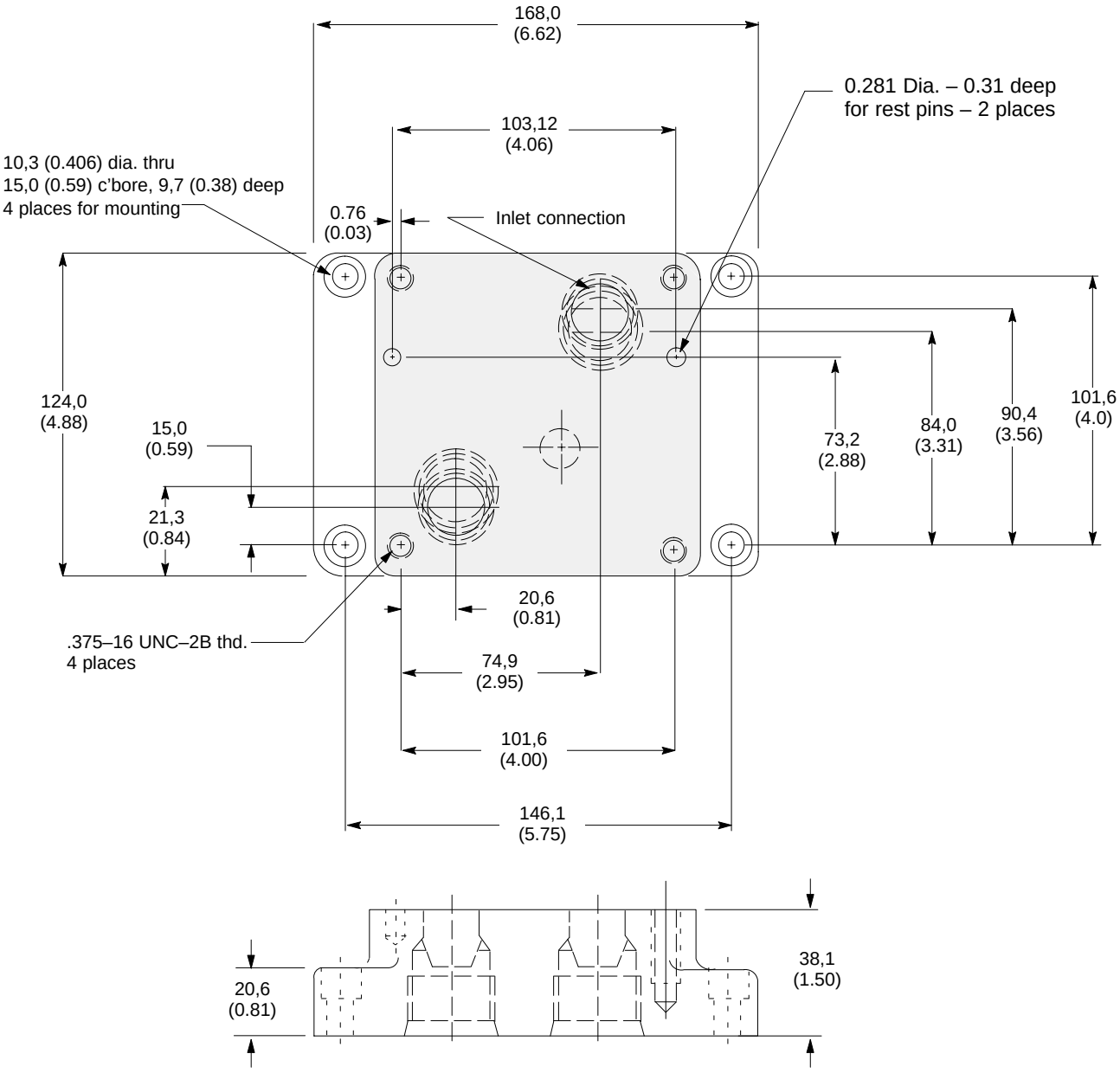
Model No.	Port P	Port C
FCG-03-28–22	Inlet connection for regulated flow or outlet connection for reversed free flow.	Outlet connection for regulated flow or inlet connection for reversed free flow.
FG-03–28–22	Inlet connection	Outlet connection

Subplate

FGM–03SZ–10

Installation Dimensions

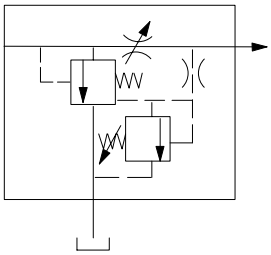
millimeter (inch)



NOTE: When the subplate is not used, a machined pad, as indicated by the shaded area on the subplate, must be provided for mounting. The pad must be flat within 0.0127mm (0.0005 inch) and smooth within 63 microinch. Mounting bolts, when provided by the customer, must be SAE grade 7 or better.

FRG Model Series – Application Data

Functional Symbol



General Information

This valve is used as a meter-in flow control. It permits the pump to operate at load pressure and provides precise, adjustable control of flow rates in hydraulic circuits. Some typical uses include controlling the speed of work spindles, and rates of travel of tool heads or slides

The valve is temperature and pressure compensated to reduce flow variation with changes in oil temperature and in pressure. An integral, adjustable relief valve protects the system against overloads.

Pump unloading can be accomplished by opening the vent connection to tank, or by closing the throttle – provided that oil under pressure is not trapped in the outlet port.

Application Guidance

Flow Adjustment

Adjust flow rate by rotating the dial. A lettered (A through E) indicator marks approximately four revolutions from full closed to fully opened.

Maximum flow may be limited by the addition of spacers to the throttle shaft under the selector dial.

Number of Spacers	Limit of Max. Flow lpm (USgpm)
3	68–79 (18–21)
2	38–49 (10–13)
1	17–22,7 (4.5–6)
Use spacers – Part No. 211026	

Pressure Adjustment

Adjust overload relief pressure by turning the screw on the side of the valve. Clockwise rotation increases pressure; counterclockwise rotation decreases pressure.

Proper adjustment will prevent excessively high working pressure upon pump or other equipment.

Tank Connection

Connect to tank. Any pressure at this connection must be added to the pressure setting.

Valve Locking

A locking screw prevents the selected flow rate setting from being inadvertently changed.

Interchangeability

The FRG–03–*–28–2* can be mounted in place of the FRG–03–*–28–2* models.

Ratings

Maximum Flow Capacity (based on oil viscosity of 100 SUS @ 49°C (120°F)

106 lpm, 8833 ft^3/min
(28 USgpm, 6468 in^3/min)

Maximum Relief Valve Pressure

FRG-03–B–28–2* . . . 69 bar (1000 psi)
FRG-03–C–28–2* . . 138 bar (2000 psi)
FRG-03–F–28–2* . . 207 bar (3000 psi)

Maximum Throttle Adjusting Torque Required

Adjusting Torque Proportional to Outlet Pressure . . . . . 2,26 Nm @210 bar
(20 in. lbs. @ 3000 psi)

NOTE: For consistent, satisfactory, regulation of flow, minimum pressure at the outlet port should be 6,2 bar (90 psi), and some fluid should always be passing across the integral relief valve to tank. The pump capacity should therefore be slightly greater than the maximum flow required. If 106 l/min (28 USgpm) of regulated flow is needed, the pump capacity should be at least 125 l/min (33 USgpm), (19 l/min (5 USgpm) to tank). For lesser maximum flows, reduce the 19 l/min (5 USgpm) flow to tank in proportion to the reduction in maximum flow.

Pressure Drop Information

Minimum metered flow rates	
Operating Pressure bar (psi)	Approximate Minimum Flow cm^3/min (in^3/min)
35 (500)	82 (5)
69 (1000)	164 (10)
103 (1500)	246 (15)
138 (2000)	327 (20)
172 (2500)	409 (25)
207 (3000)	491 (30)

Subplate and Bolt Kits

Valves, subplates and mounting kits must be ordered separately.
For example:
One (1) FRG–03–B–28–2* Valve
One (1) FRGM–03Y–10 Subplate
One (1) BKFG-03-645 Bolt Kit
(Bolt length = 3 inch)

When a subplate is not used, a machined pad (as indicated by the subplate shaded area) must be flat within 0.0127mm (0.0005 inch) and smooth within 63 microinch. Mounting bolts, when provided by the customer, must be SAE grade 7 or better.

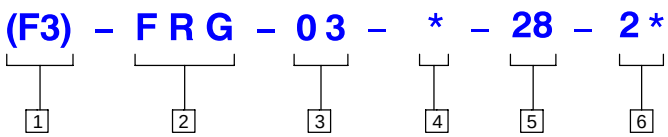
Maximum recommended mounting bolt torque: 40 Nm (350 lb. in.)
Mounting bolts, when provided by a customer, must be SAE grade 7, or better.

Weight

Valve . . . . . 7,7 kg (17 lbs.)

Subplates
FRGM–03Y–10 . . . . . 3,1 (7.0)
FRGM–03Z–10 . . . . . 4,5 (10)

Model Code



1 Special Seals

Omit if not required
F3 – Special seals for use with phosphate ester type fluids

2 Type

F – Flow control
R – Integral pressure control
G – Manifold or subplate mounting

3 Nominal Valve Size

03 – 3/8”

4 Adjustable Relief Valve Setting

B – 70 bar (1000 psi)
C – 138 bar (2000 psi)
F –210 bar (3000 psi)

5 Maximum Flow Capacity

28 – 106 lpm (28 USgpm)

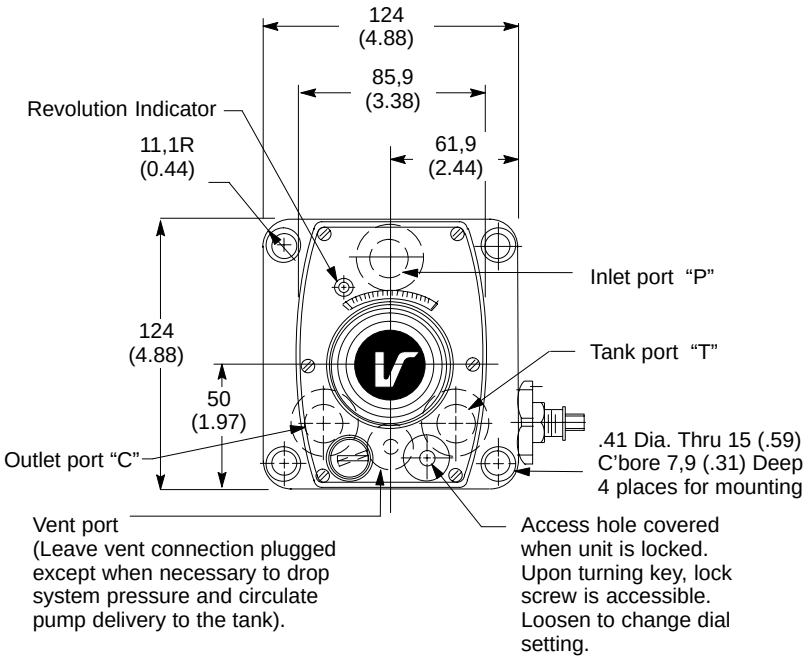
6 Design Number

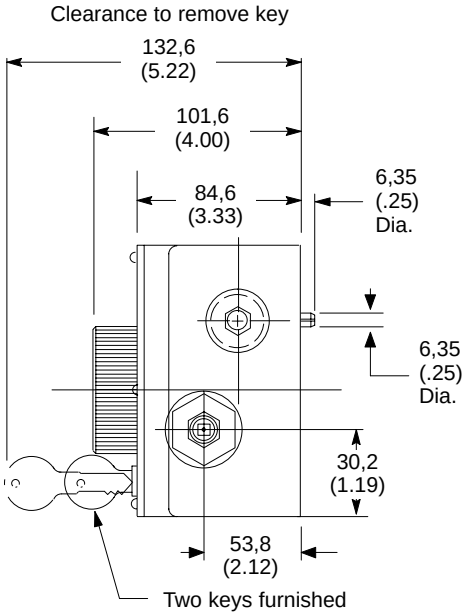
Subject to change. Installation dimensions remain as shown for desi numbers 20 through 29

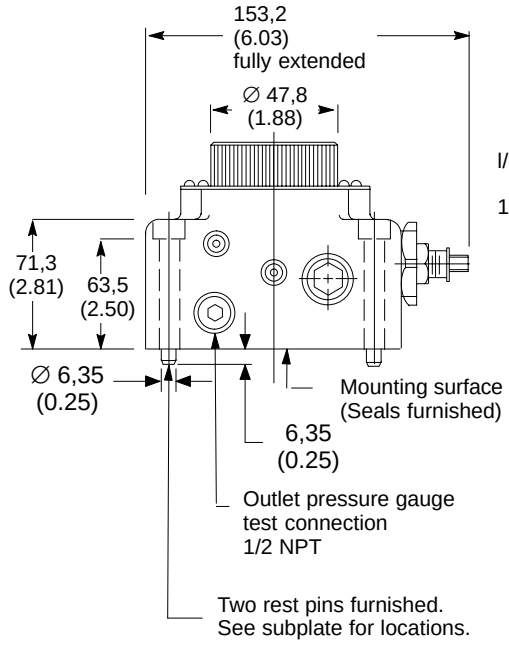
Installation Dimensions

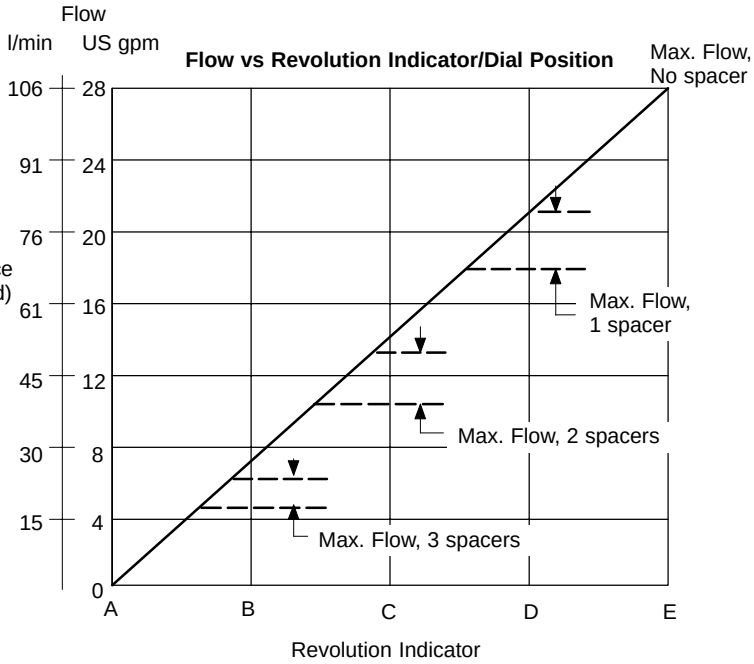
FRG–03 Model Series

millimeter (inch)







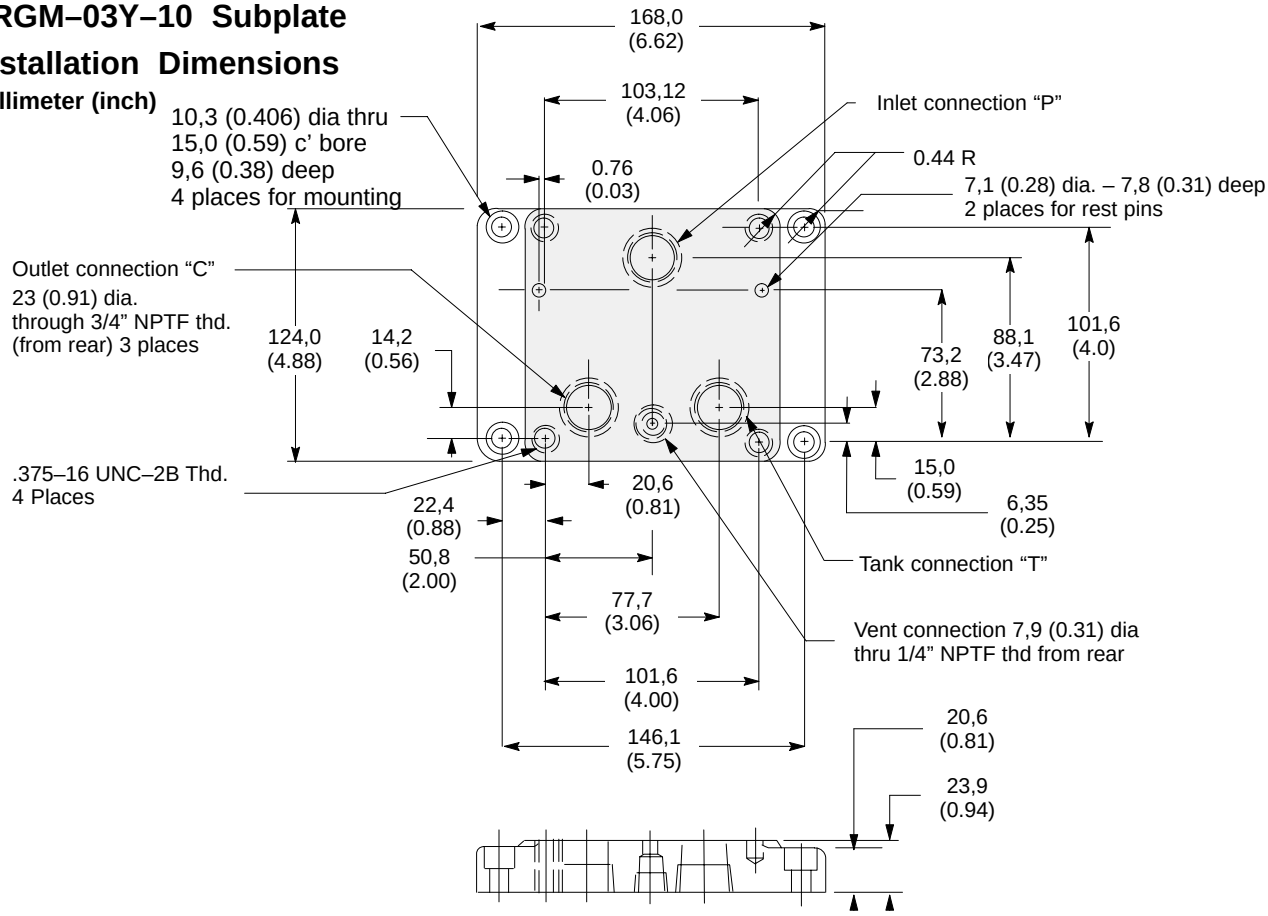


Example: With 3 spacers, indicator will read "A"
and dial maximum will read between 5 and 9

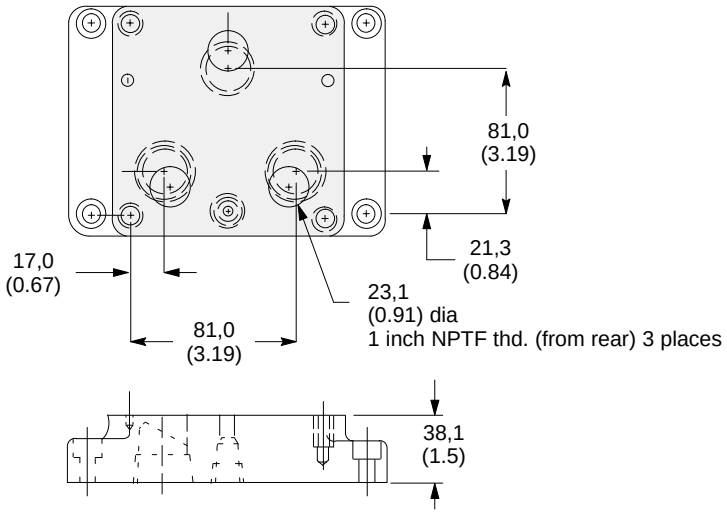
Subplate

FRGM–03Y–10 Subplate Installation Dimensions

millimeter (inch)



FRGM–03Z–10



NOTE:
When the subplate is not used, a machined pad, as indicated by the shaded area on the subplate, must be provided for mounting. The pad must be flat within 0.0127mm (0.0005 inch) and smooth within 63 microinch. Mounting bolts, when provided by the customer, must be SAE grade 7 or better.

Mounting Adapter Plate

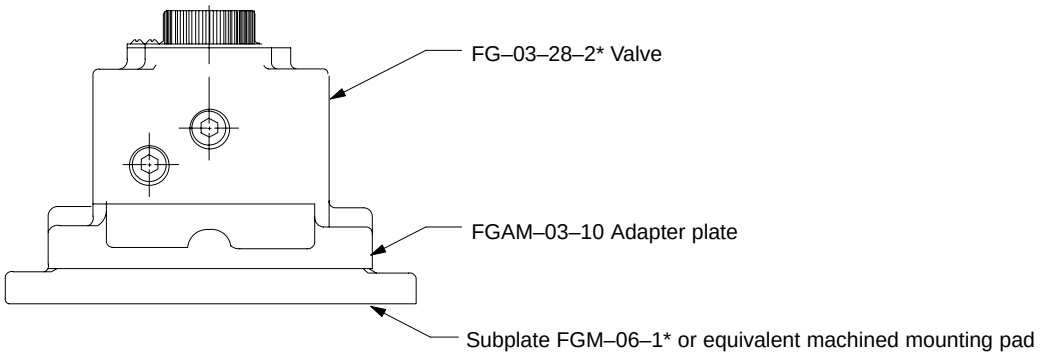
FGAM–03

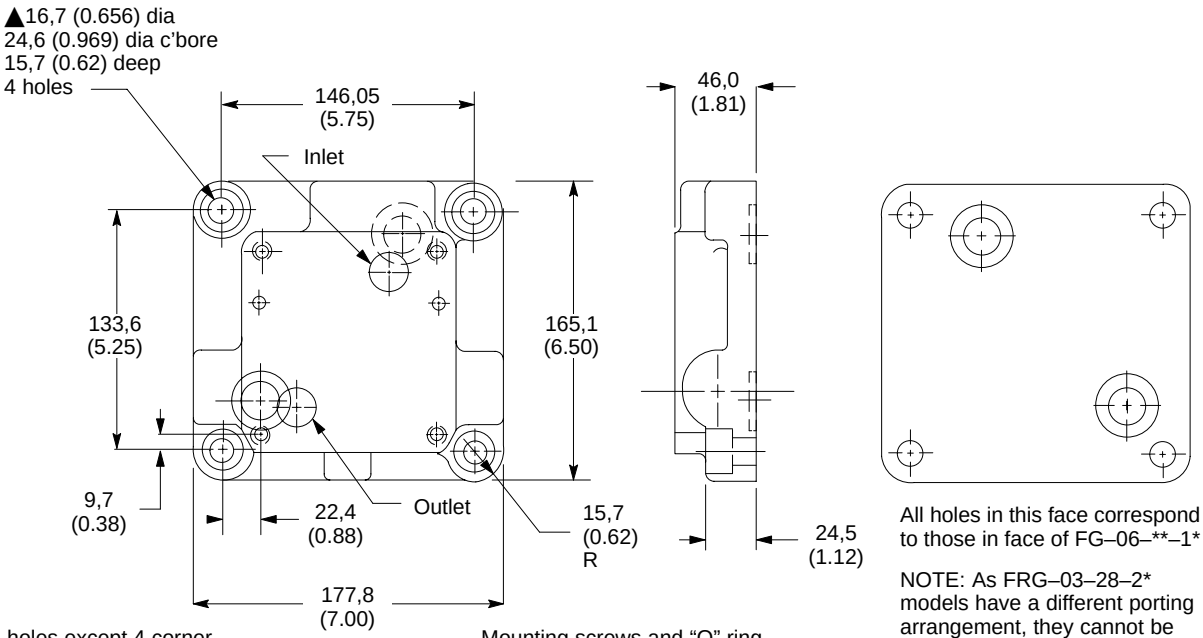
This adapter plate and the F(C)G–03–28–2* flow control valve can be used in place of the FG–06–**–1* flow control valve where flows of the existing installation do not exceed the 106 lpm (28 USgpm) flow rating of the F(C)G003028–2* size valve, or where pressures so not exceed the rating of the existing system.

As shown, the valve and the adapter plate are mounted on subplate FGM–06–10 or the equivalent customer machined pad, or manifold.

Installation Dimensions

millimeter (inch)





▲ All holes except 4 corner holes on this side correspond to those in face of F(C)–03–28–*

Mounting screws and "O" ring seals are furnished with this adapter plate.

All holes in this face correspond to those in face of FG–06–**–1*

NOTE: As FRG–03–28–2* models have a different porting arrangement, they cannot be adapted to the FRG–06 interface using this adapter plate.

Fluid Information

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 component 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.

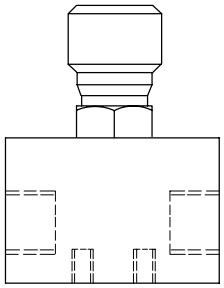
	System Pressure Level bar (psi)		
Product	**<70 (<1000)**	**70-210 (1000-3000)**	**210+ (3000+)**
Vane Pumps – Fixed	20/18/15	19/17/14	18/16/13
Vane Pumps – Variable	18/16/14	17/15/13	
Piston Pumps – Fixed	19/17/15	18/16/14	17/15/13
Piston Pumps – Variable	18/16/14	17/15/13	16/14/12
Directional Valves	20/18/15	20/18/15	19/17/14
Pressure/Flow Control Valves	**19/17/14**	**19/17/14**	**19/17/14**
CMX Valves	18/16/14	18/16/14	17/15/13
Servo Valves	16/14/11	16/14/11	15/13/10
Proportional Valves	17/15/12	17/15/12	15/13/11
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

Fluids and Seals

Flourocarbon seals are standard and are suitable for use with phosphate ester type fluids or their blends, water glycol, water-in-oil emulsion fluids and petroleum oil.

Flow Controls, Non-Compensated

FN-4, 20 Series



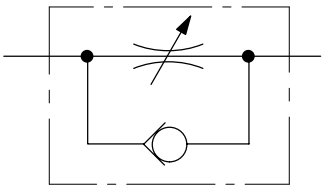
Basic Characteristics

Connection . . . . . Pipe mounted
Max. operating
pressure . . . . . 140 bar (2000 psi)
Nominal flow . . . . 9 L/min (2.38 USgpm)

General Description

The FN-4 valve is an adjustable restrictor valve fitted with an integral check. It allows restricted flow in one direction and free flow in the opposite direction.

Functional Symbol



Model Code

(F3-) FN (1) -4 (K) - 20

1 2 3 4

1 Seals for phosphate ester fluids
Omit when not required

2 Valve needle type
1 = For flows up to 2 L/min (0.53 USgpm)
Omit for high flows

3 Method of adjustment
K = Knurled screw
Omit for set screw and locknut

4 Design number, 20 series
Subject to change.
Installation dimensions remain as shown for designs 20-29 inclusive.

Operating Data

Max. Pressure . . . . . 140 bar (2000 psi)

Flow/Pressure Data
Typical with petroleum oil at 21 cSt (102 SUS).

Restrictor flow
FN models . . . . . up to 9 L/min (2.38 USgpm)
FN 1 models . . . . . 16 ml/min to 2 L/min (0.04 to 0.53 USgpm)

Return flow
Check valve
cracking pressure . . . . . 0,7 bar (10 psi)
Pressure drop at
9 L/min (2.38 USgpm) . . 3,5 bar (50 psi)

Hydraulic Fluids
All valves can be used with antiwear hydraulic oils, water-in-oil emulsions and water glycols. Add prefix “F3” to model designation when phosphate ester (not alkyl-based) or chlorinated hydrocarbons are to be used.

“F3” models can also operate on the same fluids as the other valves.

The extreme operating viscosity range is from 860 to 13 cSt (4000 to 70 SUS) but the recommended running range is from 54 to 13 cSt (250 to 70 SUS).

For further information about fluids see catalog 920.

Temperature Limits
Ambient
Min. . . . . –20°C (–4°F)
Max. . . . . +70°C (158°F)

Fluid temperatures

	Petroleum oil	Water-containing
Min.	–20°C (–4°F)	+10°C (50°F)
Max.*	+80°C (176°F)	+54°C (130°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 manufacturer or Vickers where limits are outside those for petroleum oil.

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

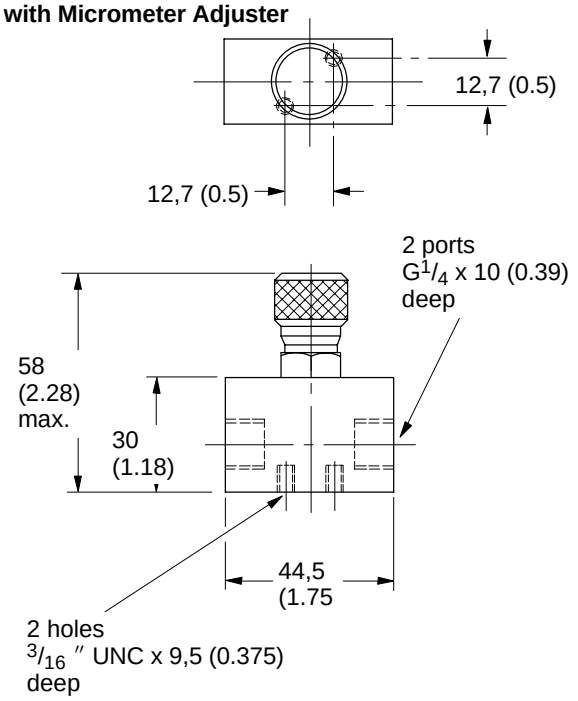
Contamination Control Requirements
Recommendations on contamination control methods and the selection of products to control fluid condition are included in Vickers publication 9132 or 561, “Vickers Guide to Systemic Contamination Control”. The book also includes information on the Vickers concept of “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:

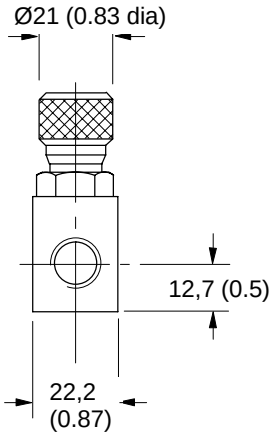
Up to 210 bar (3050 psi) 19/**17**/**14**
Above 210 bar (3050 psi) 19/**17**/**14**

Installation Dimensions
mm(inches)

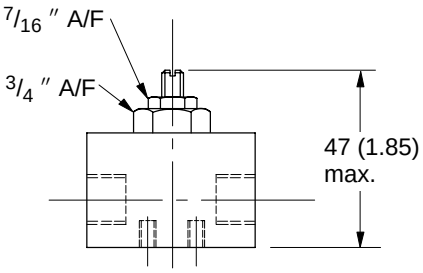
3rd angle projection

Model (F3-)FN*-4K-20
with Micrometer Adjuster





Model (F3-)FN*-4-20
with Screw and Locknut Adjuster



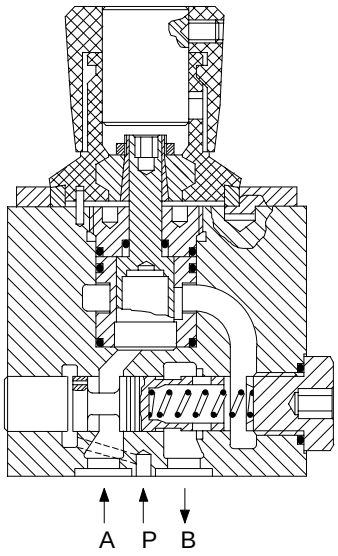
Mass
All models . . . . . 0,2 kg (0.1 lb)

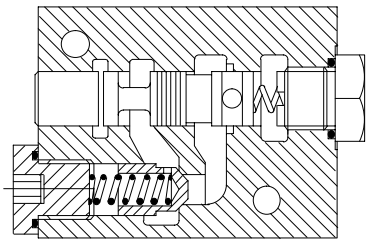
Mounting Attitude
Optional.

Ordering Procedure
Before ordering, check availability with the Vickers representative. Specify complete model designation when ordering:
e.g. 2 off FN1-4K-20 valve.

Pressure Compensated Flow Control Valves

F(C)G-3, 10 Series; ISO 4401, Size 03/NFPA D01





General Description

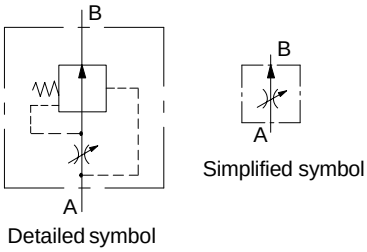
These pressure compensated valves are designed to provide adjustable controlled flow rates independent of changes in inlet and/or outlet pressures above a minimum pressure differential. Models are available with or without integral reverse flow check valves. Those with check valves are optionally available with an anti-jump feature designed to eliminate transient surges above the controlled flow rate setting whenever flow is first directed to the inlet port A.

All models have rotary adjustment of controlled flow and can be supplied with or without an integral key-lock feature.

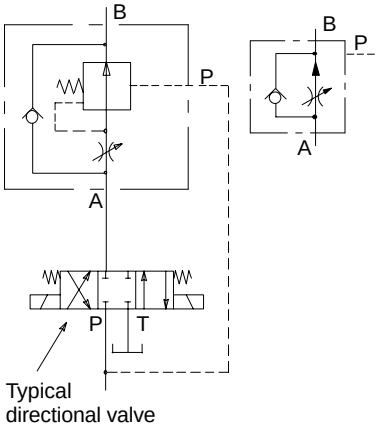
The construction of a typical model with integral check valve and anti-jump feature is shown opposite. Its operation is the same as for similar valves described in the “Industrial Hydraulics” manual although the spring-loaded hydrostat is functionally located downstream of the adjustable restrictor, as shown in the “Functional Symbols” section.

Functional Symbols

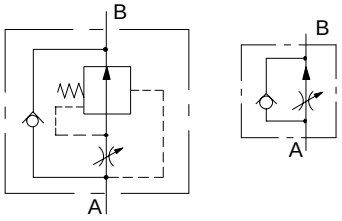
FG-3-***-*-10 models, without reverse flow check



FCG-3-***-A-*-10 models, with reverse flow check and anti-jump feature



FCG-3-***-*-10 models, with reverse flow check



*Note: FCG-3-***-A models are designed primarily for meter-in applications where the P port can be connected to an upstream point that provides continuous pilot pressure to the hydrostat to prevent “jump”. Consult your Vickers representative about alternative applications.*

Basic Characteristics

Max. flow rates . . . . . 1,0 to 18 L/min (0.42 to 4.75 USgpm), dependent on model

Max. pressure . . . . . 315 (4500 psi) or 160 bar (2325 psi), dependent on model

Functions . . . . . In line, with or without reverse flow check and anti-jump feature

Model Code

F(C)G -3- * (-A) - * - 10**

1 2 3 4 5

1 Type

FCG = Flow control with reverse flow check
FG = Flow control without reverse flow check

2 Max. controlled flow rate

10 = 1,0 L/min (0.26 USgpm)
16 = 1,6 L/min (0.42 USgpm)
32 = 3,2 L/min (0.85 USgpm)
63 = 6,3 L/min (1.66 USgpm)
120 = 12,0 L/min (3.17 USgpm)
180 = 18,0 L/min (4.75 USgpm)

3 Anti-jump feature (FCG model option)

Omit when not required and for all FG models.

4 Controlled flow adjustment

H = Manual without key lock
K = Manual with key lock

5 Design number, 10 series

Subject to change. Installation dimensions remain unchanged for design numbers 10-19 inclusive.

Operating Data

Pressure Limits

Max. pressure, all ports: FCG-3-***-A models All other models	 160 bar (2320 psi) 315 bar (4500 psi)
Min. pressure differential for effective controlled flow (port A pressure > port B pressure): F(C)G-3-10/16/32 models F(C)G-3- 63/120/180 models	 5 bar (75 psi) 8,5 bar (125 psi)

Flow Limits

Recommended controlled flow ranges: F(C)G-3-10 F(C)G-3-16 F(C)G-3-32 F(C)G-3-63 F(C)G-3-120 F(C)G-3-180	 0,015 to 1,0 L/min (0.004 to 0.26 USgpm) 0,015 to 1,6 L/min (0.004 to 0.42 USgpm) 0,025 to 3,2 L/min (0.007 to 0.85 USgpm) 0,025 to 6,3 L/min (0.007 to 1.66 USgpm) 0,08 to 12,0 L/min (0.02 to 3.17 USgpm) 0,08 to 18,0 L/min (0.02 to 4.75 USgpm)
Max. recommended reverse flow (FCG model)	30 L/min (7.9 USgpm)

Applications

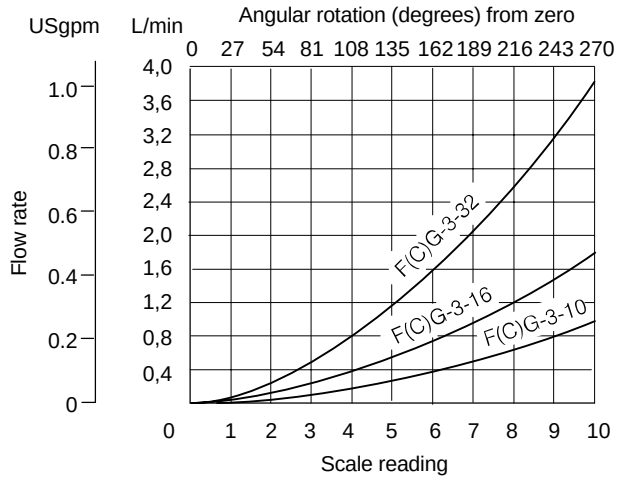
FG-3 models are for general use in meter-in, meter-out or bleed-off applications.
FCG-3-***-*-10 models are for general use in meter-in or meter-out applications in which high reverse flow rates can occur.

FCG-3-***-A-10 models are for similar use in those meter-in applications where the possibility of transient surges above the controlled flow rate setting, whenever flow is first directed to the inlet port, is undesirable, e.g.
– for feed speed control
– for successive fast approach/feed sequences (fine machining of interrupted bores).

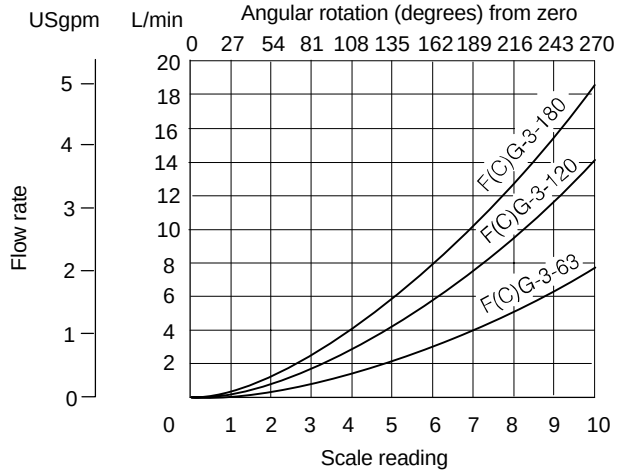
Performance Data

Typical with petroleum oil at 36 cSt (170 SUS) and at 50°C (122°F)

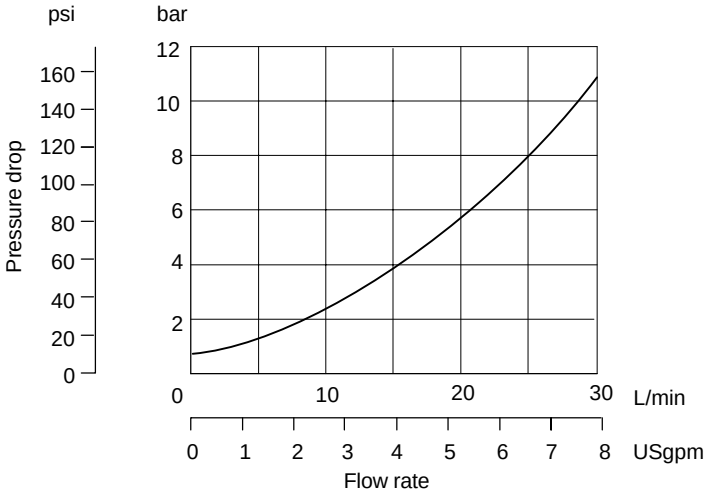
Controlled Flow, F(C)G-3-16/32 Models



Controlled Flow, F(C)G-3-63/120/180 Models



Reverse Flow Pressure Drop, FCG Models



Thermal stability of controlled flow, typical example:
Flow set at 20°C (68°F) . . . . 0,25 L/min (0.07 USgpm)
Flow increase at 70°C (158°F) . . . . . +12%

Hydraulic Fluids

All valves can be used with antiwear or other hydraulic petroleum oils. If fire-resistant fluids are required to be used, consult your Vickers representative. The extreme operating viscosity range is from 300 to 10 cSt (1460 to 54 SUS) but the recommended running range is from 54 to 13 cSt (245 to 70 SUS). For further information fluids see catalog 920.

Temperature Limits

Min. . . . . –20°C (–4°F)
Max.* . . . . . +80°C (176°F)

* *To obtain optimum service life from both fluid and hydraulic system, 65°C (150°F) is normally the maximum temperature for hydraulic petroleum oils.*

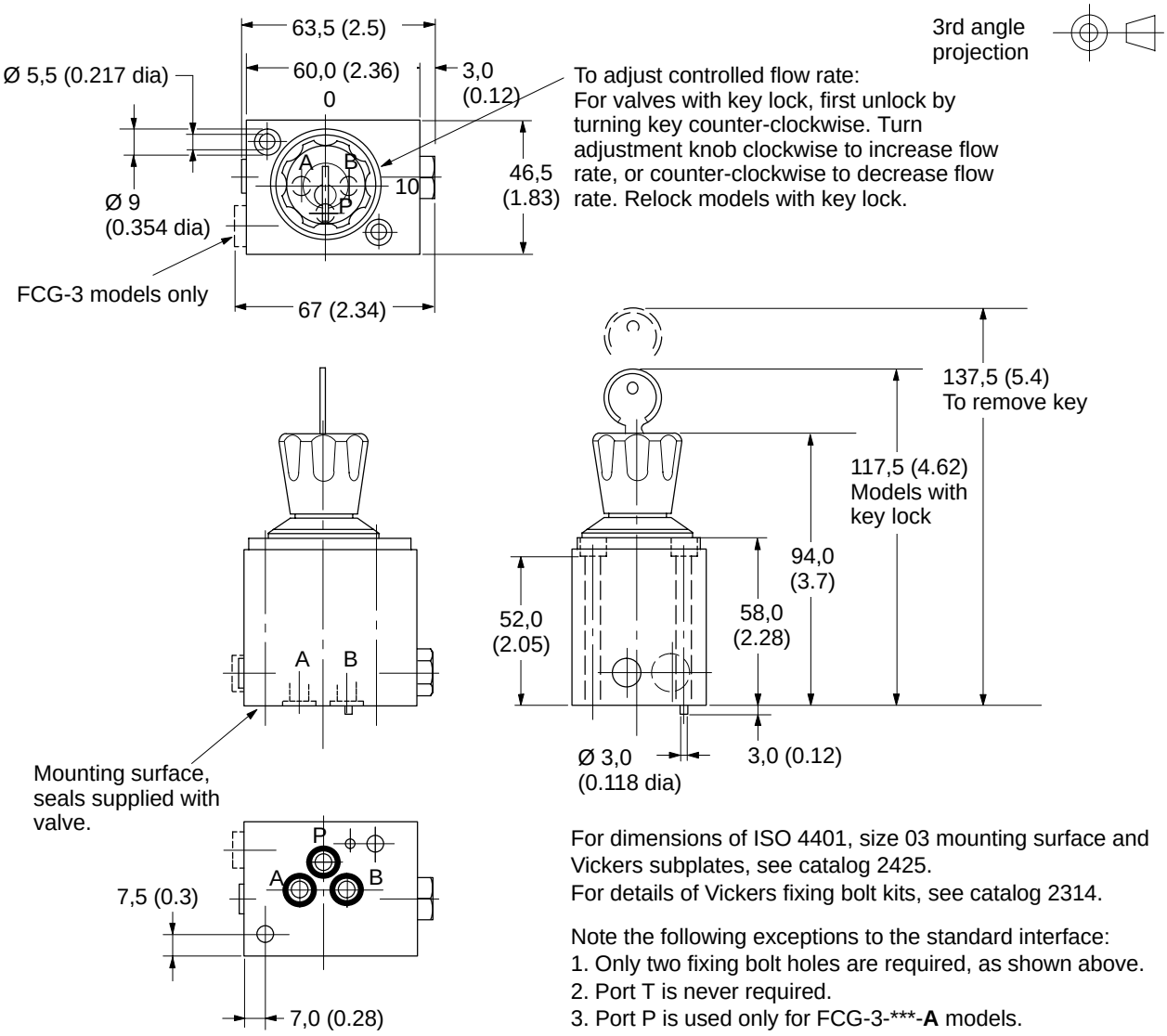
Whatever the actual temperature range, ensure that the viscosities stay within the limits specified in the “Hydraulic Fluids” section.

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) 19/**17**/**14**
Above 210 bar (3050 psi) 19/**17**/**14**

Installation Dimensions in mm (inches)



For dimensions of ISO 4401, size 03 mounting surface and Vickers subplates, see catalog 2425.
For details of Vickers fixing bolt kits, see catalog 2314.

Note the following exceptions to the standard interface:
1. Only two fixing bolt holes are required, as shown above.
2. Port T is never required.
3. Port P is used only for FCG-3-***-**A** models.

Mass

All models . . . . . 1,1 kg (2.4 lb) approx.

Installation Data

Mounting Attitude
Unrestricted

Mounting Surface, Subplates and Fixing Bolts
See note in “Installation Dimensions” section. F(C)G-3 valves cannot be used to top normal ISO 4401 size 03/NFPA D01 module stacks unless the application will be satisfactory with a two-bolt fixing and with the two or three-port arrangements of the F(C)G-3 valves; consult your Vickers representative if such an arrangement is required.

A two-bolt fixing kit BK 986743M containing M5 x 60 long soc. hd. cap screws is available separately for securing an F(C)G-3 valve direct to a subplate.

Ordering Procedure

Valves and fixing bolt kits must be ordered as separate items e.g.
2 off FCG-3-120-A-K-10 valve
2 off BK 986743M bolt kit

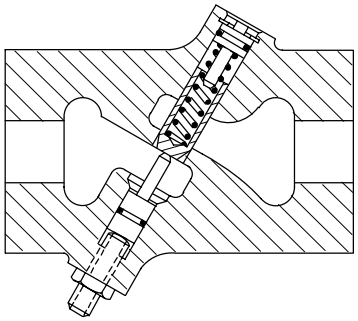
Service and Repair

The construction of these valves is such that the only spare parts available are the mounting surface seals (kit no. 986742 containing three seals). Experience shows that the only servicing likely to be needed is the possibility to dismantle the spring-loaded hydrostat for cleaning in cases where contaminant has accumulated through continuous use in less than ideal environments. For details see “Spare Parts” leaflet 40594.

Flow Controls, One Way Restrictor Type

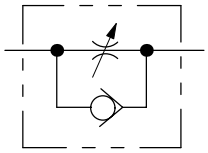
FN-03; EFN-06 and EFN-10

Typical Section



Functional Symbol

All models



Model Code

F3 - (E) FN - ** - ** - *

1 2 3 4 5 6

1 Special seals
For use with phosphate ester type fluids
Omit if not required

2 European product
Omit for FN-03

3 Flow control, one-way restrictor type

4 Nominal size
03 = 3/8″
06 = 3/4″
10 = 1 1/4″

5 Design number
11 = EFN-10
20 = FN-03
21 = EFN-06

6 System connections
B = G (BSPF)
F = SAE 4-bolt flange (EFN-06/10 only)

Basic Characteristics

Type . . . . . Restrictor valve
Mounting . . . . . Thread or flange
Maximum pressure . . . . . Up to 210 bar (3000 psi)
Maximum flow . . . . . Up to 190 L/min (50 USgpm)
Method of Adjustment . . . . . Manual

General Description

The FN-03 and EFN-06/10 adjustable one-way restrictors are designed for applications where fluid oil flow regulation without pressure compensation is required. They can be used whenever the working load remains relatively constant.

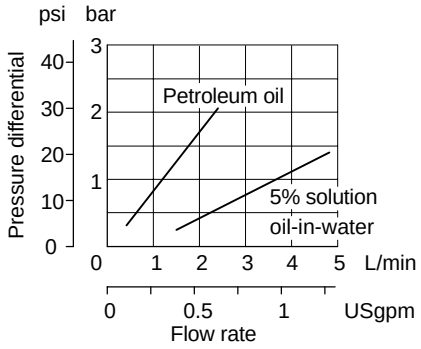
Flow regulation is for one direction only. When the flow is reversed the valve opens against a spring and flow passes through at near zero pressure. These valves therefore cannot be used as isolating valves.

Operating Data

Maximum Pressure bar (psi)
Hydraulic petroleum oils and common FR fluids 210 (3000)
5% – 95% oil-in-water emulsion 140 (2000)

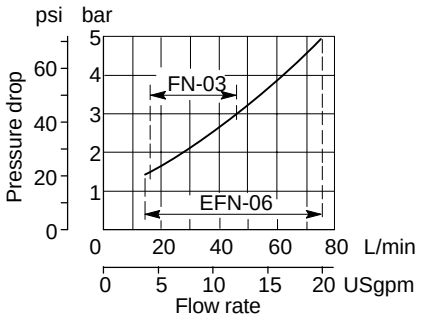
Flow/Pressure Data
Maximum recommended controlled flow, L/min (USgpm), with good regulation.
FN-03 . . . . . 38 (10)
EFN-06 . . . . . 76 (20)
EFN-10 . . . . . 189 (50)

Minimum Controlled Flow

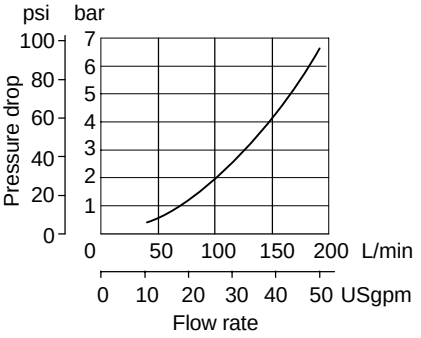


Pressure Drop for Free-Flow and Maximum Controlled Flow

Models FN-03 and EFN-06



Model EFN-10



Hydraulic Fluids
All models can be used with hydraulic oils, water-in-oil emulsions and water glycols. Add prefix "F3" to model designation when phosphate ester (not alkyl-based) to be used. EFN-06 and 10 models can also be used with a 5-10% concentration of soluble oil in clean water.

The extreme operating viscosity range is from 13 to 860 cSt (70 to 4000 SUS) but the recommended running range for all but soluble-oil-in-water emulsions is 13 to 54 cSt (70 to 245 SUS).

For further information about fluids see leaflet 920.

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 (3000 psi) 19/**17**/**14**

Temperature Limits
Ambient
Min. . . . . –20°C (–4°F)
Max. . . . . +40°C (+104°F)

Fluid Temperature

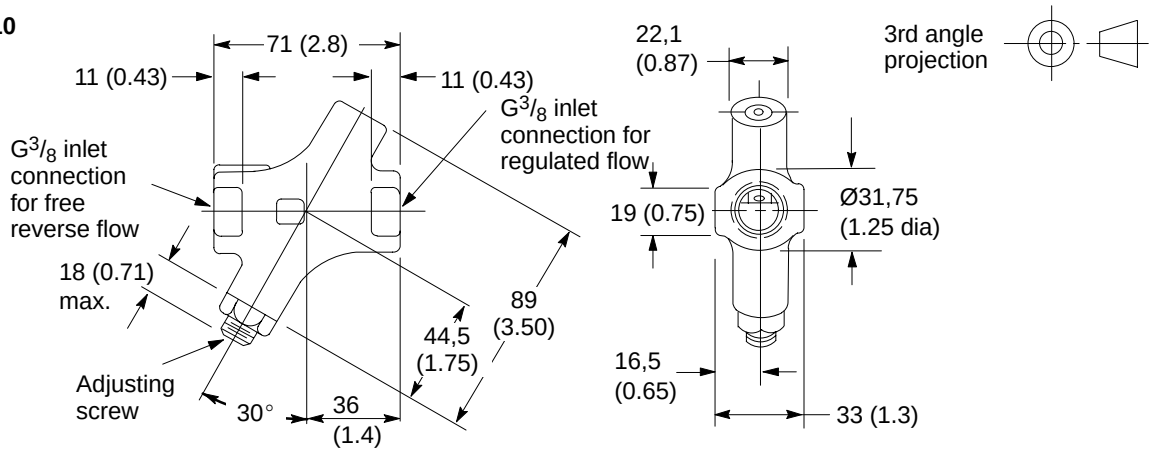
	Petroleum oil	**Water-containing**
Min.	–20°C (–4°F)	+10°C (+50°F)
Max.*	+80°C (+176°F)	+54°C (+130°F)

* *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.*

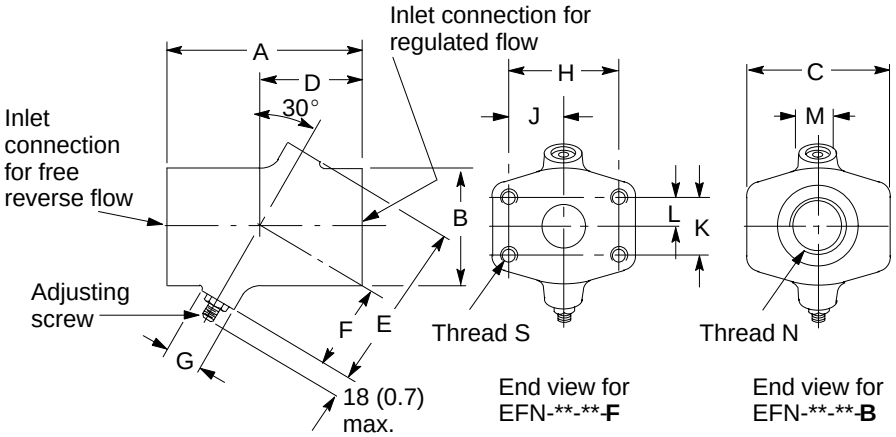
For synthetic fluids consult manufacturer or Vickers representative where limits are outside those for petroleum use. Whatever the actual temperature range, ensure that viscosities stay within the limits specified in the "Hydraulic Fluids" section.

Installation Dimensions in mm (inches)

EFN-06 and EFN-10



FN-03



Model	A	B	C	D	E	F	G	H	J	K	L	M
EFN-06-21-F	89 (3.50)	52 (2.04)	65 (2.56)	45 (1.77)	90 (3.54)	44,5 (1.75)	22 (0.87)	47,6 (1.87)	23,9 (0.94)	22,1 (0.87)	11 (0.43)	22 (0.87)
EFN-06-21-B	89 (3.50)	52 (2.04)	65 (2.56)	45 (1.77)	90 (3.54)	44,5 (1.75)	22 (0.87)	–	–	–	–	22 (0.87)
EFN-10-11-F	116 (4.57)	73 (2.87)	80 (3.15)	58 (2.28)	100 (3.94)	47 (1.85)	25 (0.98)	58,7 (2.31)	29,4 (1.16)	30,2 (1.19)	15 (0.59)	32 (1.26)
EFN-10-11-B	116 (4.57)	73 (2.87)	80 (3.15)	58 (2.28)	100 (3.94)	47 (1.85)	25 (0.98)	–	–	–	–	32 (1.26)

Model	Thread N	SAE flange sizes Nom. bore	Pipe O.D.	Thread S
EFN-06-21-F	–	$^{3}/_{4}$″	25	$^{3}/_{8}$″-16 UNC-2B x 19 (0.75) deep
EFN-10-11-F	–	$1^{1}/_{4}$″	38	$^{7}/_{16}$″-14 UNC x 19 (0.75) deep

Mass, kg (lb)

FN-03-20 . . . . . 0,6 (1.3)
EFN-06-21 . . . . . 1,7 (3.7)
EFN-10-11 . . . . . 3,7 (8.1)

Ordering Procedure

SAE 4-bolt flanges for the appropriate valves are available from Vickers and must be ordered as, and are supplied as, separate items.

Mounting Attitude

Optional.