

Vickers® by Danfoss

# Flow Controls



## Flow Controls

FN, F(C)G, FRG



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# Introduction

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## General Data

Vickers by Danfoss 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.

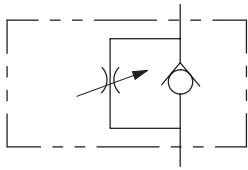
Valves are suitable for system pressures up to 248 bar (3600 psi) and cover a flow range up to 106 lpm (28 USgpm).

## 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 <sup>3</sup> /min (in <sup>3</sup> /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)

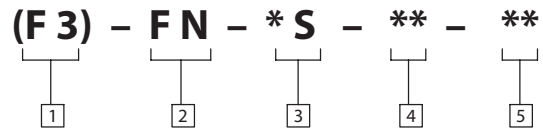
The use of synthetic fire-resistant fluids requires a valve with special seals. Add the prefix "F3" to the model number when phosphate esters type fluids or its blends are to be used with standard seals.

## 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

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**1** Special Seals

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

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**2** Type

FN – Flow control, non-compensated

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**3** Straight Threads

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

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**4** Nominal Valve Size

03 – 3/8”  
06 – 3/4”  
10 – 1-1/4”

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**5** Design Numbers

11 – FN-10  
20 – FN-03  
21 – FN-06

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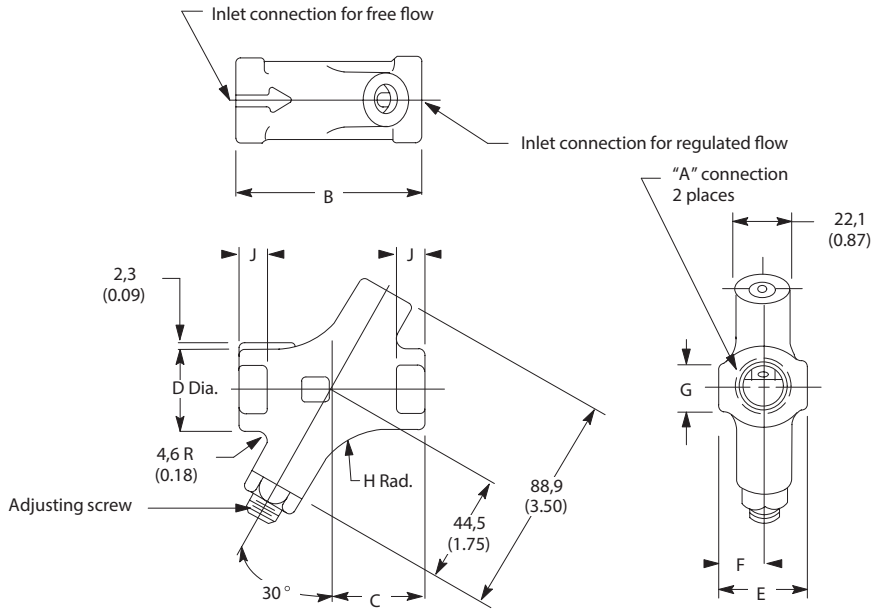
Installation dimensions remain  
the same for design numbers  
10 through 19, and 20 through 29,  
respectively.

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# Installation Dimensions

## FN-03/06

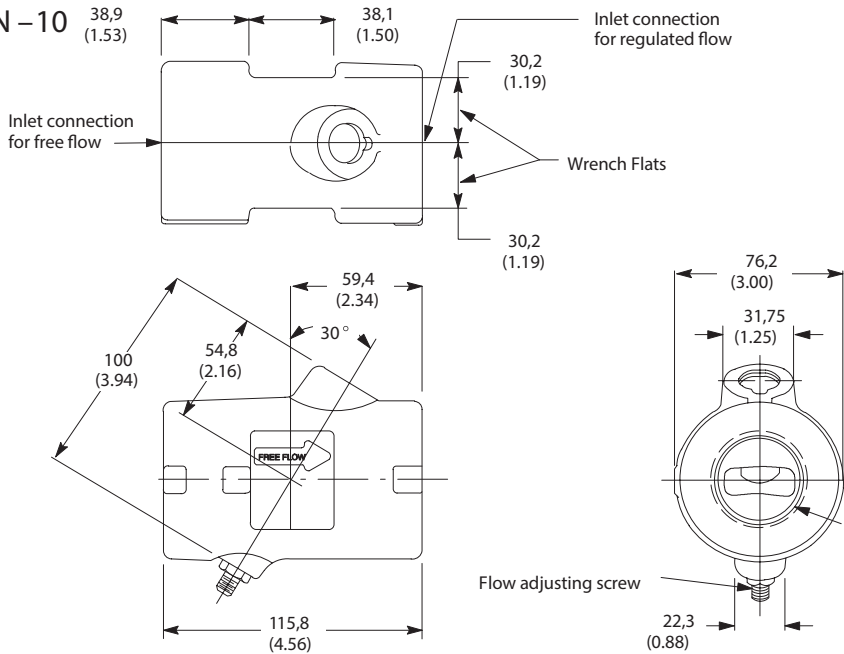
millimeter (inch)



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



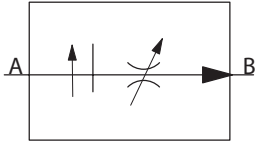
Connection - 2 places	
Model No.	Connection "A"
FN-10-11 ▲	1-1/4 NPTF thread
FN-20S-10-11 ■	1-5/8-12 SAE straight thread

- For use with SAE straight thread fittings for 1-1/4" O.D. tubing. ▲ Not recommended

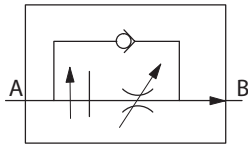
# FG/FCG-02 Model Series – Application Data

## 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<sup>3</sup>/min (2300 in<sup>3</sup>/min)

F\*G-02-1500-\*\*-5

24580 cm<sup>3</sup>/min (1500 in<sup>3</sup>/min)

F\*G-02-300-\*\*-5

4916 cm<sup>3</sup>/min (300 in<sup>3</sup>/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 (  $\Delta P$  ) when passing a flow of 100 SSU fluids having 0.865 specific gravity.

For any other viscosity, the pressure drop ( $\Delta P$ ) will change as follows:

Other Viscosity	% of $\Delta P$ 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.

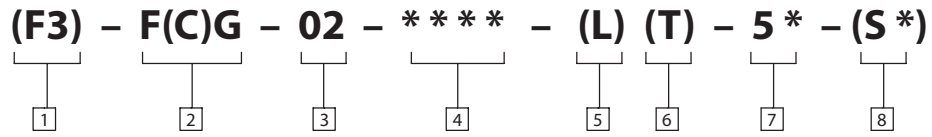
## Fluids and Seals

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 by Danfoss 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<sup>3</sup>/min)  
 1500 – (10 to 1500 in<sup>3</sup>/min)  
 2300 – (10 to 2300 in<sup>3</sup>/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.

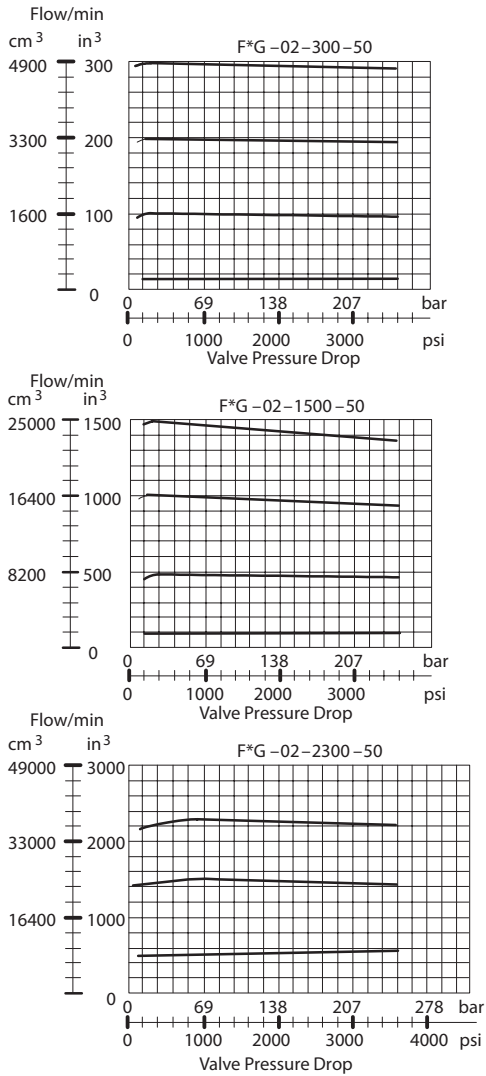
**8** Special Feature

S10 – Overspeed control  
 S32 – Tamper resistant flow adjustment

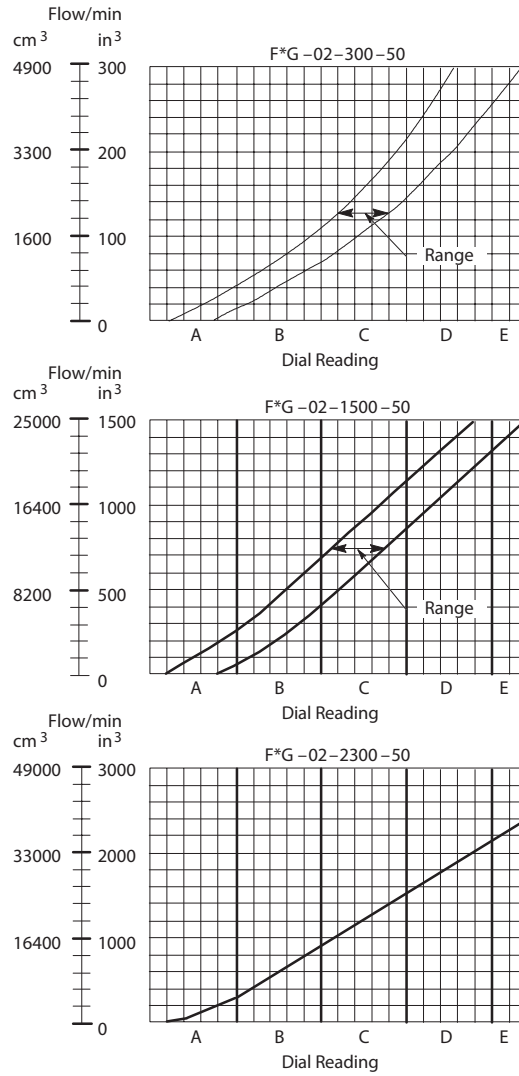


# Performance Data

## Typical Pressure Compensation



## Flow vs Dial Reading



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

Model	Flow cm <sup>3</sup> /min (in <sup>3</sup> /min)	Typical Variation (%)	Maximum Variation (%)
F*G-02-300-50	33 (2) 164 (10)	5% 3%	15% 10%
F*G-02-1500-50	164 (10)	8%	15%

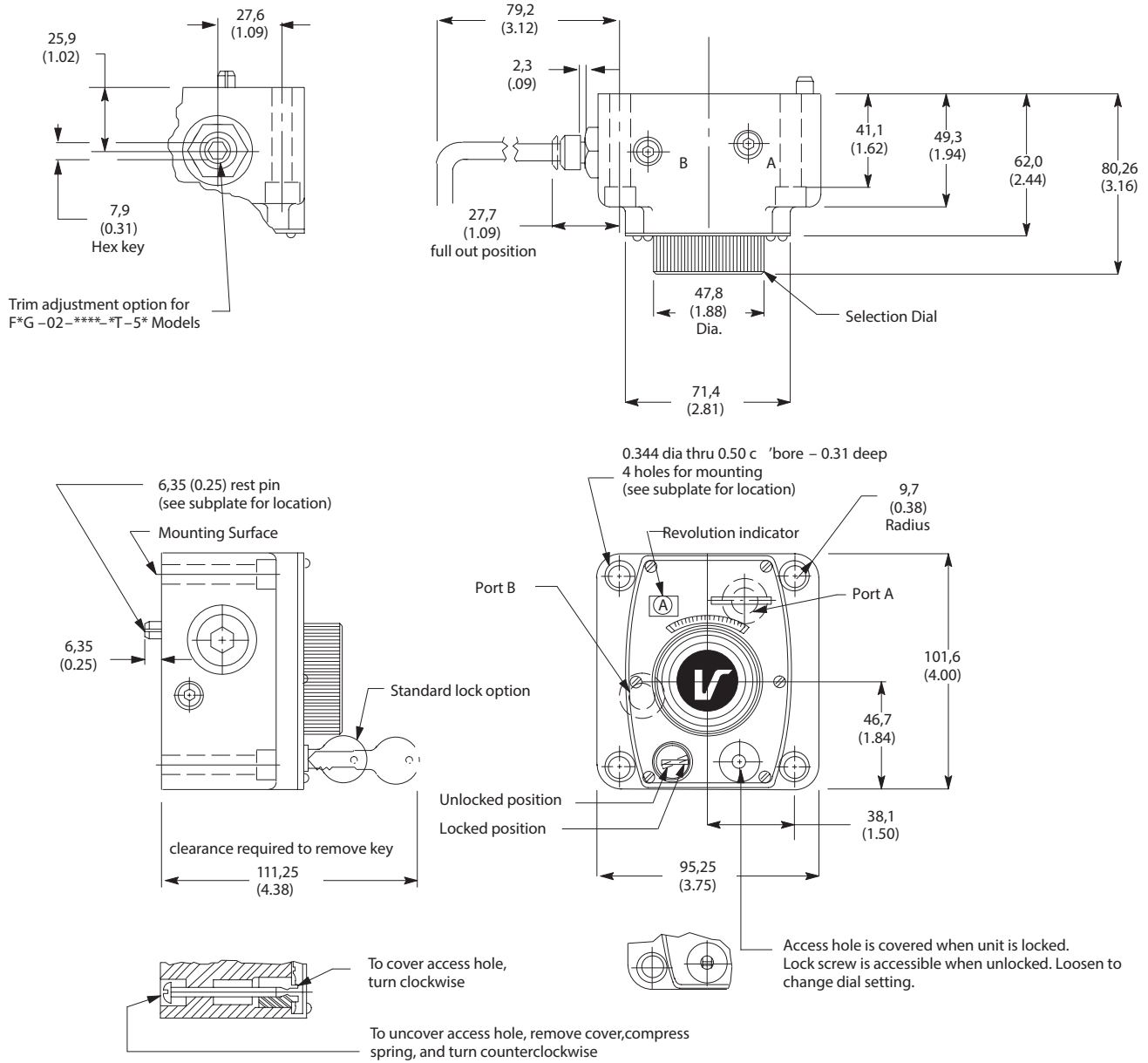
## Flow Variation with Temperature, 27 °C to 66 °C (80 °F to 150 °F)

Flow cm <sup>3</sup> /min (in <sup>3</sup> /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)

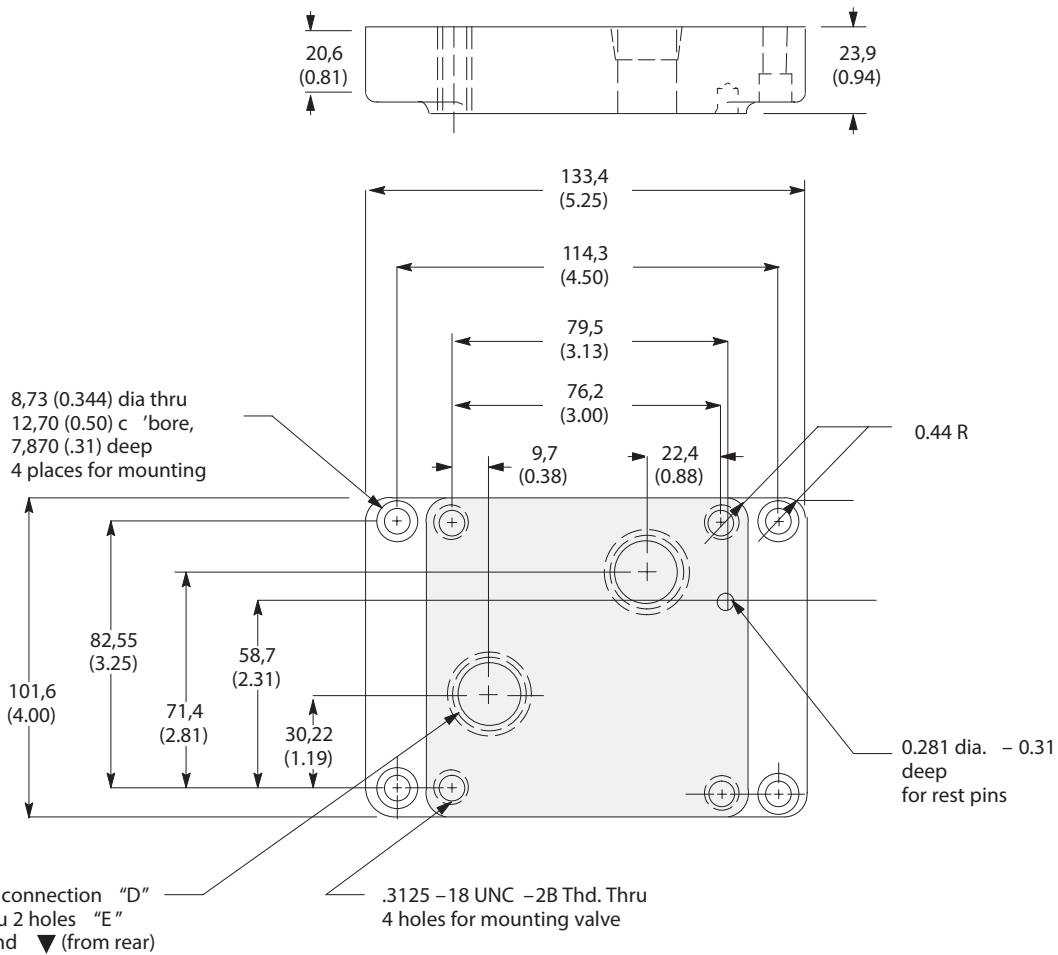


Model No.	Port A	Port B
FCG-02-***-5*	Inlet connection for regulated flow or outlet connection for reversed free flow.	Outlet connection for regulated flow or inlet connection for reversed free flow.
FG-02-***-5*	Inlet connection	Outlet connection

# 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

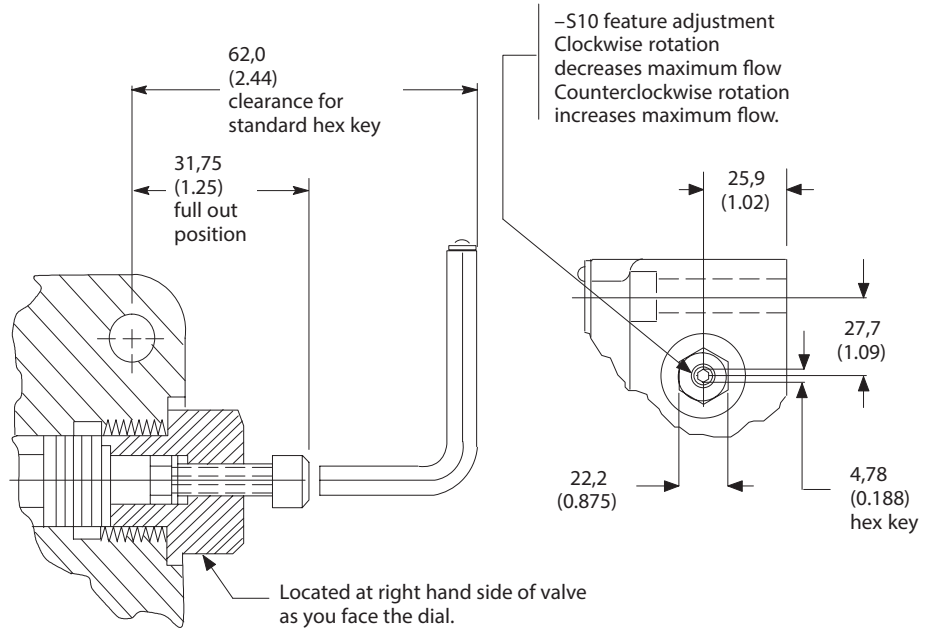
The flow control hydrostat under zero flow conditions is spring offset to its full open position. This permits an initial flow greater than the throttle setting, and may result in a momentary over speed at the start of the feed cycle.

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.



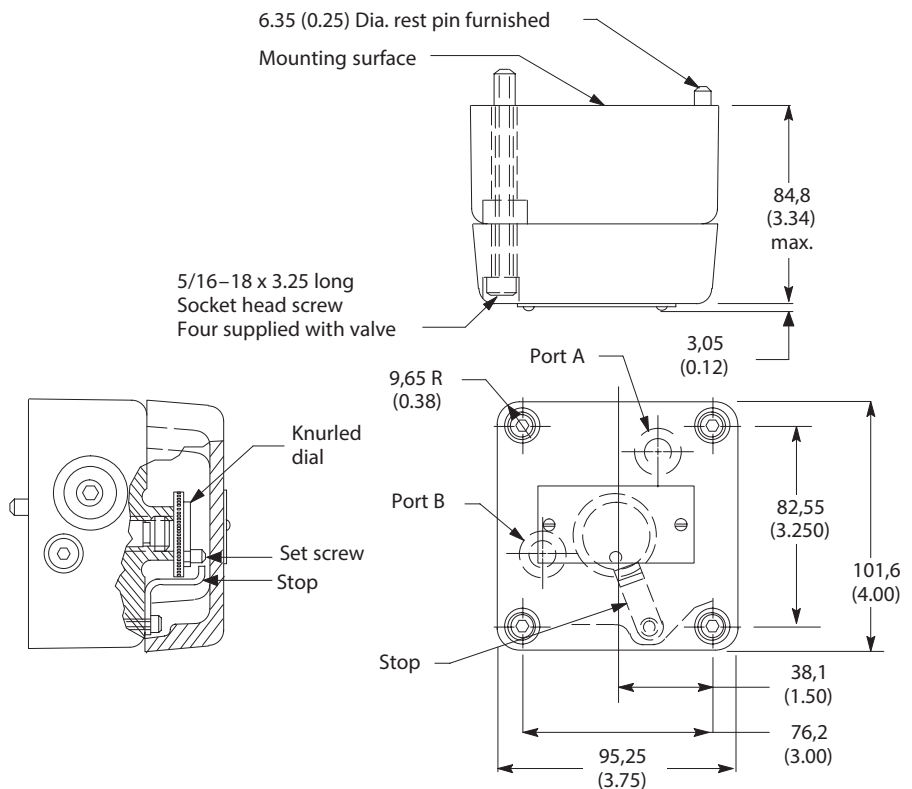
## Tamper Resistant Flow Adjustment, -S32

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.

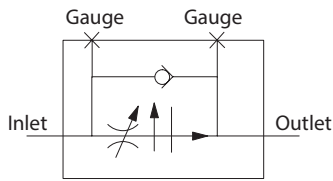
Loosen set screw in flange of throttle shaft and rotate shaft clockwise to increase flow or counterclockwise to decrease flow. When desired flow is set, tighten set screw in flange of throttle. Remove valve from mounting surface, replace cover and remount valve with the four 5/16 -18 x 3.25 long screw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



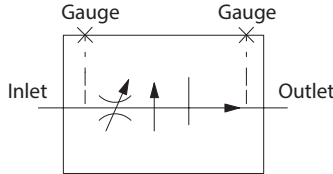
# FG/FCG-03 Model Series – Application Data

## 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 by Danfoss 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<sup>3</sup>/min  
 (28 USgpm, 6468 in<sup>3</sup>/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 ( $\Delta P$ ) when passing a flow of 100 SSU fluids having 0.865 specific gravity. For any other viscosity, the pressure drop ( $\Delta P$ ) will change as follows:

Other Viscosity	% of $\Delta P$ 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 ( $\Delta P_1$ ) 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

1 **(F3)** – 2 **F(C)G** – 3 **03** – 4 **28** – 5 **22** – 6 **(S\*)**

**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.

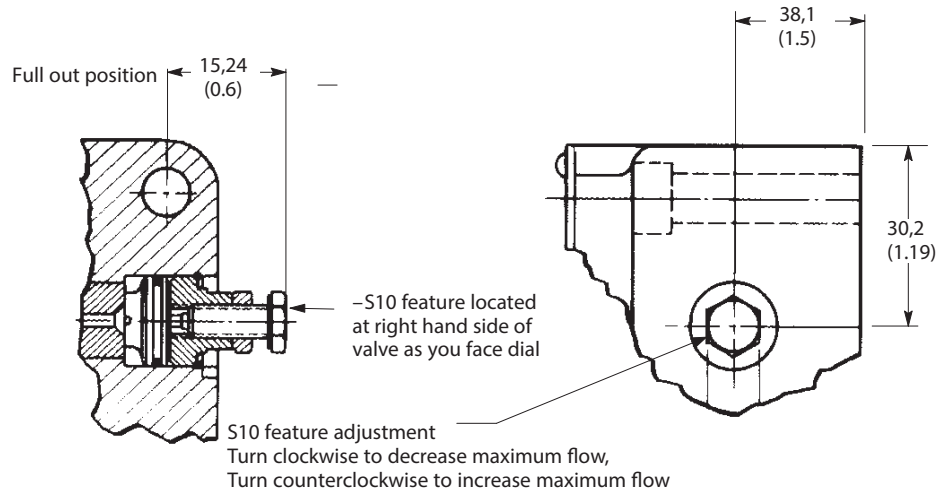
If this condition causes a problem in your application, it can be greatly reduced with the over speed control option (S10).

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.

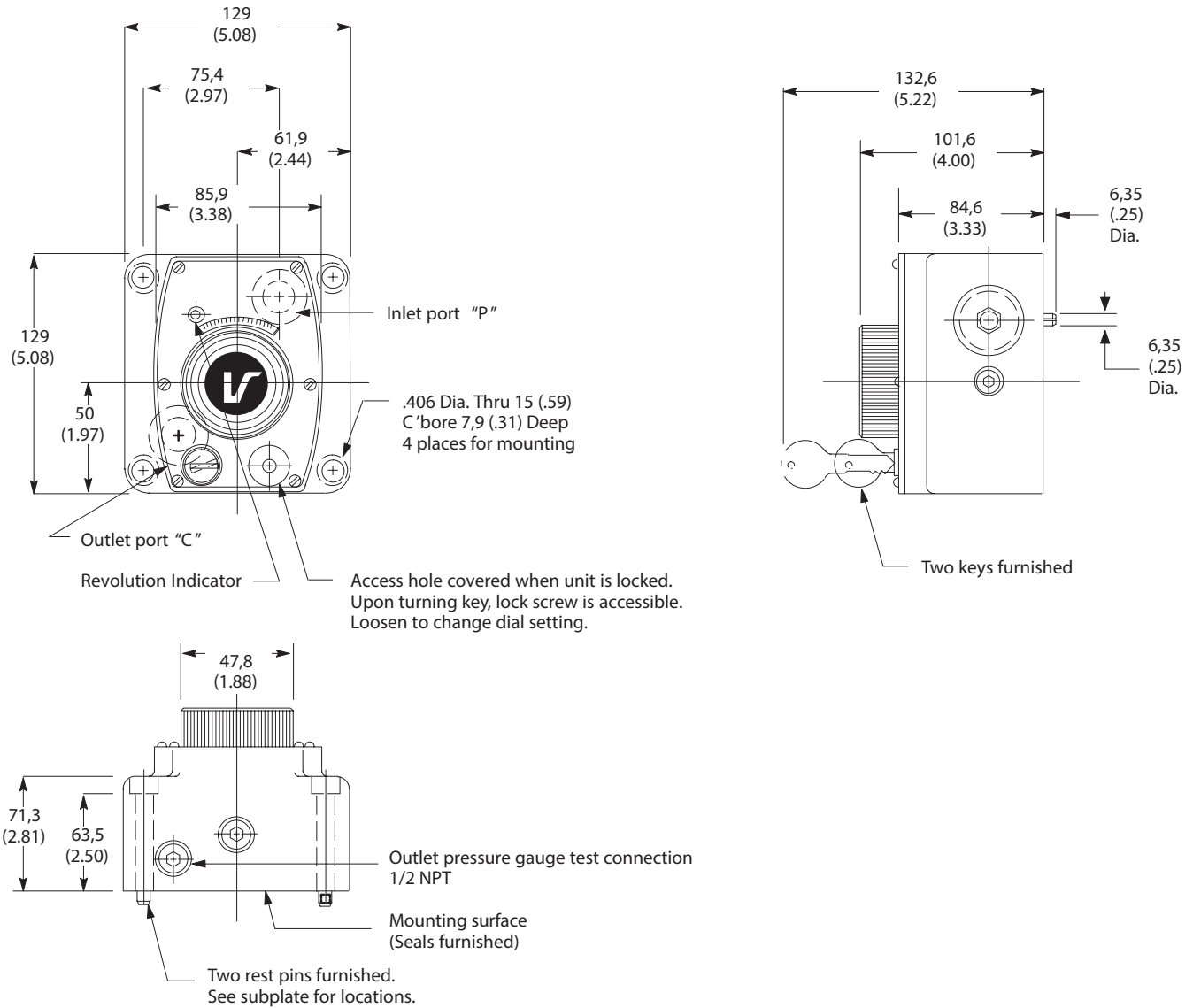
## Dimensions millimeter (inch)



# Installation Dimensions

FG/FCG -03 Model Series

millimeter (inch)



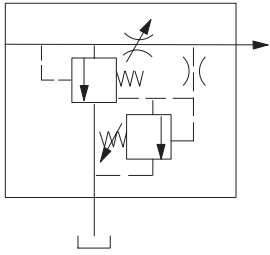
Model No.	Port P	Port C
FCG-03-28 -22	Inlet connection for regulated flow or outlet connection for reversed free flow.	Outlet connection for regulated flow or inlet connection for reversed free flow.
FG-03 -28-22	Inlet connection	Outlet connection





# 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<sup>3</sup>/min  
 (28 USgpm, 6468 in<sup>3</sup>/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 <sup>3</sup> /min (in <sup>3</sup> /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.)

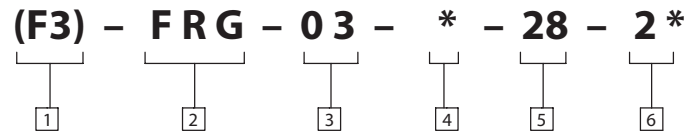
Mounting bolts, when provided by a customer, must be SAE grade 7, or better.

## Weight

Valve .....	7,7 kg (17 lbs.)
Subplates	
FRGM –03Y–10 .....	3,1 (7.0)
FRGM –03Z–10 .....	4,5 (10)

# Model Code

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**1** Special Seals

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

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**2** Type

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

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**3** Nominal Valve Size

03 – 3/8"

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**4** Adjustable Relief Valve Setting

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

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**5** Maximum Flow Capacity

28 – 106 lpm (28 USgpm)

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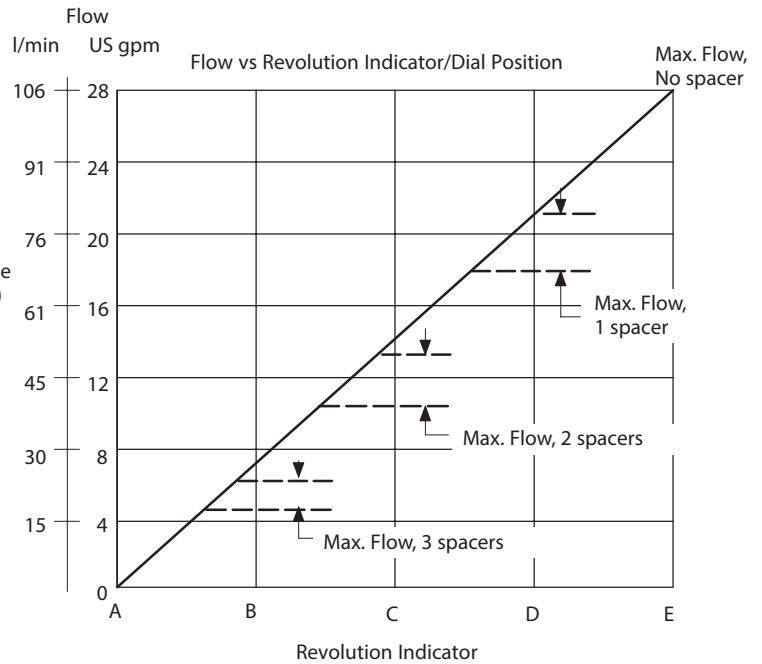
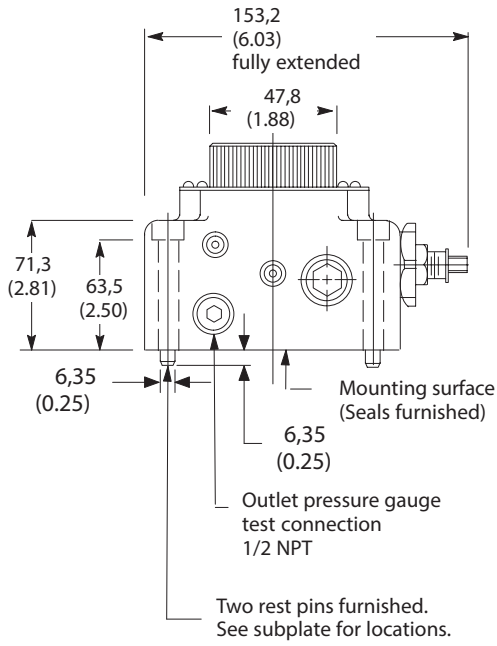
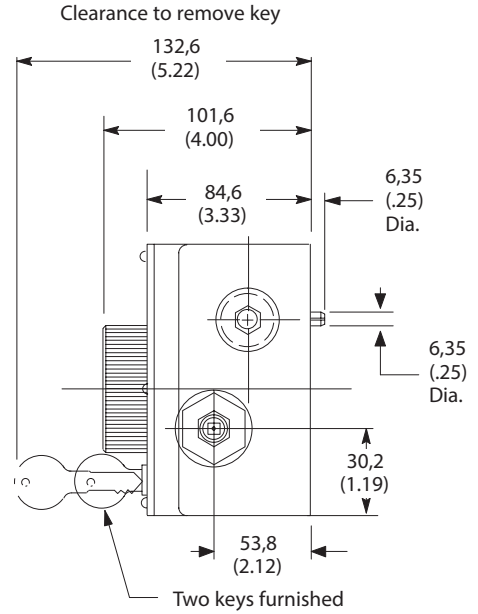
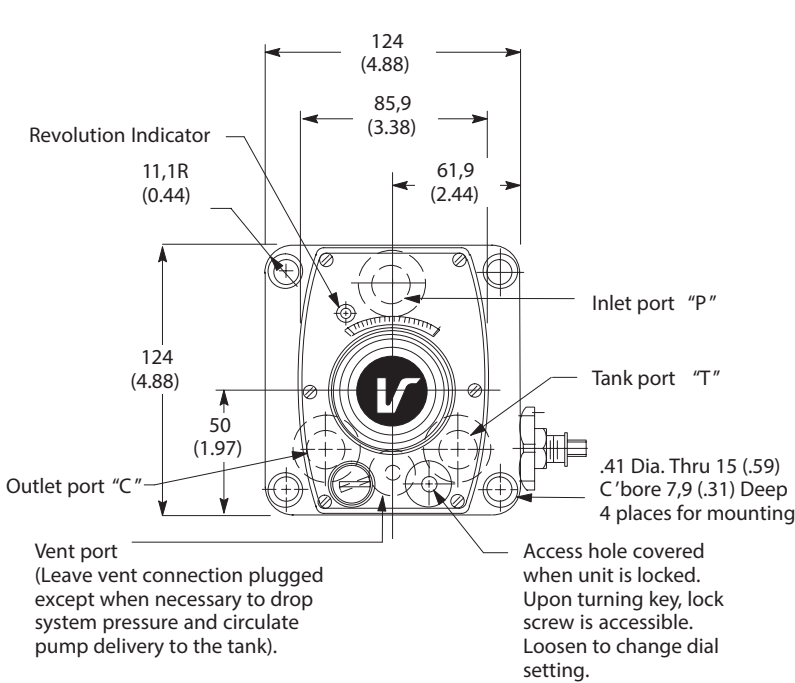
**6** Design Number

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

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# Installation Dimensions

FRG -03 Model Series  
millimeter (inch)



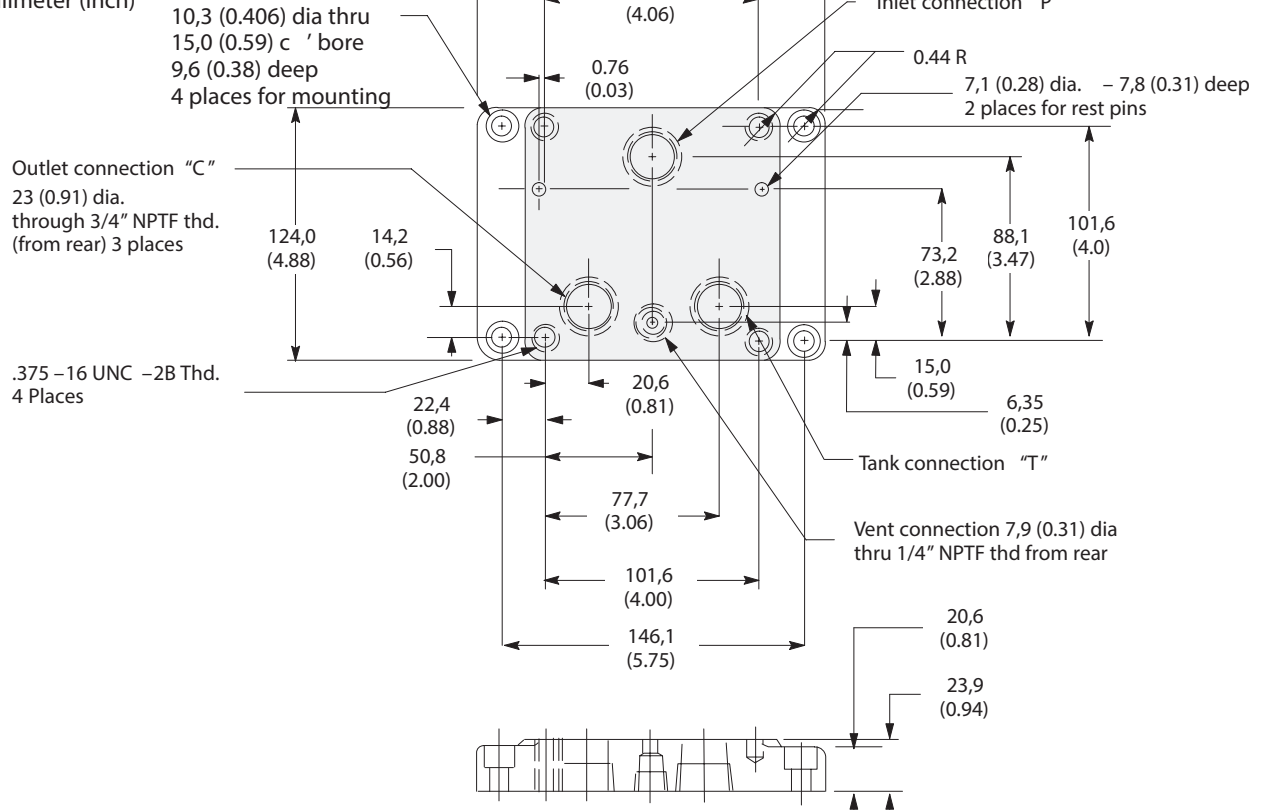
Example: With 3 spacers, indicator will read "A" and dial maximum will read between 5 and 9

# Subplate

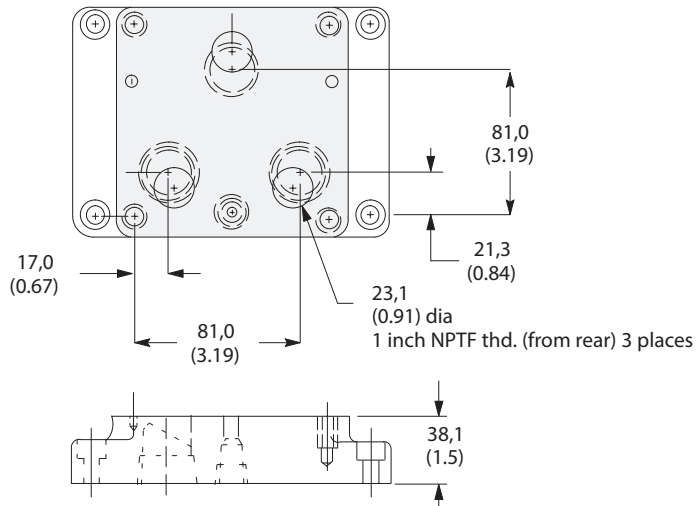
## FRGM -03Y-10 Subplate

### 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

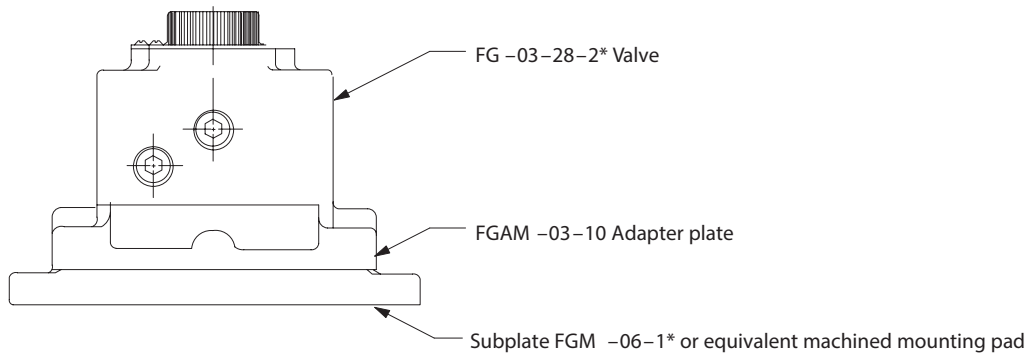
## FGAM -03

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 do not exceed the rating of the existing system.

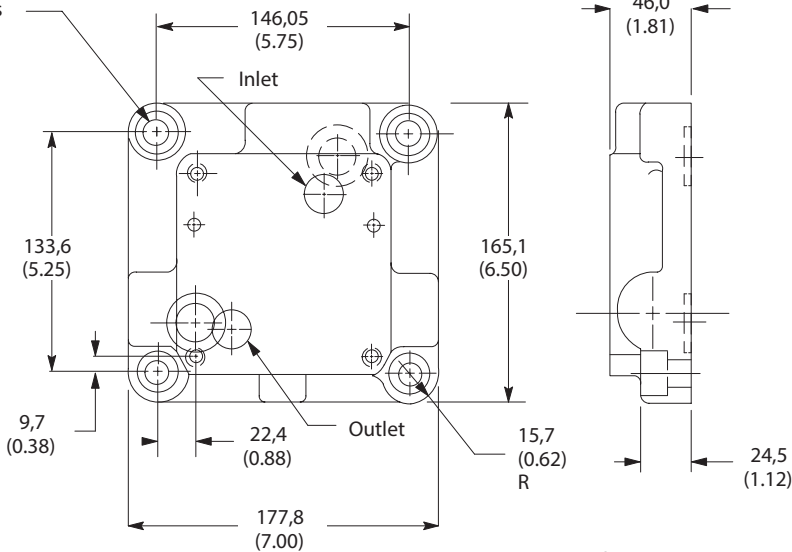
As shown, the valve and the adapter plate are mounted on subplate FGM -06-10 or the equivalent customer machined pad, or manifold.

## Installation Dimensions

millimeter (inch)



▲ 16,7 (0.656) dia  
24,6 (0.969) dia c 'bore  
15,7 (0.62) deep  
4 holes



▲ 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 by Danfoss publication 561 "Vickers Guide to Systemic Contamination Control " available from your local Vickers by Danfoss distributor or by

contacting Danfoss, 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 by Danfoss 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.

Product	System Pressure Level bar (psi)		
	<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

Flouorocarbon 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.

### Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1® controllers
- PLUS+1® displays
- PLUS+1® joysticks and pedals
- PLUS+1® operator interfaces
- PLUS+1® sensors
- PLUS+1® software
- PLUS+1® software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

**Danfoss Power Solutions** is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

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