Flow Controls
FN, F(C)G, FRG
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# 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 ± 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 as 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)

<table>
<thead>
<tr>
<th>Pressure Diff. bar (psi)</th>
<th>Minimum Flow cm³/min (in³/min)</th>
<th>5% Soluble Oil-in-Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol. Oil (SAE 10W)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 (500)</td>
<td>410 (25)</td>
<td>1638 (100)</td>
</tr>
<tr>
<td>69 (1000)</td>
<td>819 (50)</td>
<td>2622 (160)</td>
</tr>
<tr>
<td>138 (2000)</td>
<td>1638 (100)</td>
<td>4916 (300)</td>
</tr>
<tr>
<td>207 (3000)</td>
<td>2458 (150)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Flow lpm (USgpm)</th>
<th>Pressure bar (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN–03 &amp;</td>
<td>15.1 (4)</td>
<td>1.38 (20)</td>
</tr>
<tr>
<td>FN–06</td>
<td>45.4 (12)</td>
<td>2.76 (40)</td>
</tr>
<tr>
<td></td>
<td>60.56 (16)</td>
<td>3.79 (55)</td>
</tr>
<tr>
<td></td>
<td>75.7 (20)</td>
<td>4.82 (70)</td>
</tr>
<tr>
<td>FN–10</td>
<td>38 (10)</td>
<td>0.34 (5)</td>
</tr>
<tr>
<td></td>
<td>76 (20)</td>
<td>1.03 (15)</td>
</tr>
<tr>
<td></td>
<td>113.6 (30)</td>
<td>2.4 (35)</td>
</tr>
<tr>
<td></td>
<td>151.4 (40)</td>
<td>4.13 (60)</td>
</tr>
<tr>
<td></td>
<td>189.3 (50)</td>
<td>6.89 (100)</td>
</tr>
<tr>
<td></td>
<td>227.1 (60)</td>
<td>10.3 (150)</td>
</tr>
<tr>
<td></td>
<td>265 (70)</td>
<td>13.8 (200)</td>
</tr>
<tr>
<td></td>
<td>303 (80)</td>
<td>17.2 (250)</td>
</tr>
<tr>
<td></td>
<td>340.7 (90)</td>
<td>22.4 (325)</td>
</tr>
<tr>
<td></td>
<td>379 (100)</td>
<td>28.2 (410)</td>
</tr>
</tbody>
</table>

Maximum recommended controlled flow

<table>
<thead>
<tr>
<th>Model</th>
<th>Flow lpm (USgpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN–03</td>
<td>38 lpm (10 USgpm)</td>
</tr>
<tr>
<td>FN–06</td>
<td>75.7 lpm (20 USgpm)</td>
</tr>
<tr>
<td>FN–10</td>
<td>189.3 (50 USgpm)</td>
</tr>
</tbody>
</table>

Max. operating pressure

<table>
<thead>
<tr>
<th>5% soluble oil-in-water solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>138 bar (2000 psi)</td>
</tr>
<tr>
<td>5% soluble oil-in-water solution</td>
</tr>
<tr>
<td>207 bar (3000 psi)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN–03</td>
<td>0.59 kg (1.3 lbs)</td>
</tr>
<tr>
<td>FN–06</td>
<td>1.04 kg (2.3 lbs)</td>
</tr>
<tr>
<td>FN–10</td>
<td>2.9 kg (6.5 lbs)</td>
</tr>
</tbody>
</table>

• Applies to –21 and later designs (06 size) and –11 and later designs (10 size). Does not apply to 03 size.
## Model Code

![Model Code](image)

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

### Type
- FN – Flow control, non-compensated

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

### Nominal Valve Size
- 03 – 3/8”
- 06 – 3/4”
- 10 – 1-1/4”

### 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)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Connection Size “A”</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN–03–20</td>
<td>3/8 NPTF Thd. ▲</td>
<td>73.15</td>
<td>36.5</td>
<td>31.75</td>
<td>33.2</td>
<td>16.51</td>
<td>19.05</td>
<td>31.75</td>
<td>11.18</td>
</tr>
<tr>
<td>FN–8S–03–20</td>
<td>3/4–16 Straight Thd. ●</td>
<td>88.9 (3.50)</td>
<td>44.5 (1.75)</td>
<td>47.8 (1.88)</td>
<td>23.9 (0.94)</td>
<td>31.8 (1.25)</td>
<td>25.4 (1.00)</td>
<td>15.7 (0.62)</td>
<td></td>
</tr>
</tbody>
</table>

- For use with SAE straight thread fittings for 1/2” O.D. tubing.
- For use with SAE straight thread fittings for 7/8” O.D. tubing.
- Not recommended

**FN–10**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Connection “A”</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN–10–11</td>
<td>1-1/4 NPTF thread</td>
</tr>
<tr>
<td>FN–20S–10–11</td>
<td>1-5/8–12 SAE straight thread</td>
</tr>
</tbody>
</table>

- 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.

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 cm³/min (2300 in³/min)
F*G-02-1500-* * -5
24580 cm³/min (1500 in³/min)
F*G-02-300-* * -5
4916 cm³/min (300 in³/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)

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.)

Pressure Drop
Pressure drop for reverse free flow over check valve.

<table>
<thead>
<tr>
<th>Volume lpm (USgpm)</th>
<th>Pressure bar (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 (5)</td>
<td>3 (45)</td>
</tr>
<tr>
<td>38 (10)</td>
<td>6 (120)</td>
</tr>
<tr>
<td>57 (15)</td>
<td>12 (175)</td>
</tr>
<tr>
<td>76 (20)</td>
<td>20 (290)</td>
</tr>
<tr>
<td>95 (25)</td>
<td>30 (440)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Other Viscosity</th>
<th>% of ∆P from table (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>93</td>
</tr>
<tr>
<td>150</td>
<td>111</td>
</tr>
<tr>
<td>200</td>
<td>119</td>
</tr>
<tr>
<td>250</td>
<td>126</td>
</tr>
<tr>
<td>300</td>
<td>132</td>
</tr>
<tr>
<td>350</td>
<td>137</td>
</tr>
<tr>
<td>400</td>
<td>141</td>
</tr>
</tbody>
</table>

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

\[(F3) \quad F(C)G \quad 02 \quad **** \quad (L) \quad (T) \quad 5^* \quad (S\ ^*)\]

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
   G – Manifold or subplate mounting

3. Nominal Valve Size
   02 – 1/4"

4. Flow Range
   300 – (2 to 300 in³/min)
   1500 – (10 to 1500 in³/min)
   2300 – (10 to 2300 in³/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)

<table>
<thead>
<tr>
<th>Model</th>
<th>Flow cm³/min (in³/min)</th>
<th>Typical Variation (%)</th>
<th>Maximum Variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F*G–02–300–*<em>5</em></td>
<td>33 (2)</td>
<td>5%</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>164 (10)</td>
<td>3%</td>
<td>10%</td>
</tr>
<tr>
<td>F*G–02–1500–*<em>5</em></td>
<td>164 (10)</td>
<td>8%</td>
<td>15%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Flow cm³/min (in³/min)</th>
<th>Average Variation (%)</th>
<th>Maximum Variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32,8 (2.0)</td>
<td>7.5%</td>
<td>15%</td>
</tr>
<tr>
<td>163,8 (10.0)</td>
<td>5.5%</td>
<td>10%</td>
</tr>
<tr>
<td>1638,7 (100.0)</td>
<td>3.8%</td>
<td>7%</td>
</tr>
<tr>
<td>4916 (300.0)</td>
<td>3.0%</td>
<td>5%</td>
</tr>
<tr>
<td>12290,3 (750.0)</td>
<td>3.0%</td>
<td>5%</td>
</tr>
<tr>
<td>24581 (1500.0)</td>
<td>3.0%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Installation Dimensions

FG/FCG–02 Model Series
millimeter (inch)

Trim adjustment option for F*G–02–****–"T–5" Models

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Port A</th>
<th>Port B</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCG-02-**<em>-5</em></td>
<td>Inlet connection for regulated flow or outlet connection for reversed free flow.</td>
<td>Outlet connection for regulated flow or inlet connection for reversed free flow.</td>
</tr>
<tr>
<td>FG-02-***<em>-5</em></td>
<td>Inlet connection</td>
<td>Outlet connection</td>
</tr>
</tbody>
</table>
Subplate

FGM–02(X)–20

System connection “D”
Dia. thru 2 holes “E”
NPTF Thd ▼ (from rear)

<table>
<thead>
<tr>
<th>Subplate Model Code</th>
<th>D mm (inch)</th>
<th>“E” NPTF Thd ▼</th>
</tr>
</thead>
<tbody>
<tr>
<td>FGM–02–20</td>
<td>14.27 (0.562)</td>
<td>3/8▼</td>
</tr>
<tr>
<td>FGM–02X–20</td>
<td>17.48 (0.688)</td>
<td>1/2▼</td>
</tr>
</tbody>
</table>

▼ 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.
2. 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.
3. 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

FG–03

Functional Symbols

FCG–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.

<table>
<thead>
<tr>
<th>Number of Spacers</th>
<th>% of Maximum Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>15–20</td>
</tr>
<tr>
<td>2</td>
<td>35–45</td>
</tr>
<tr>
<td>1</td>
<td>65–75</td>
</tr>
</tbody>
</table>

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 ft³/min

(28 USgpm, 6468 in³/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.

<table>
<thead>
<tr>
<th>Pressure bar (psi)</th>
<th>Volume lpm (USgpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (45)</td>
<td>19 (5)</td>
</tr>
<tr>
<td>8 (120)</td>
<td>38 (10)</td>
</tr>
<tr>
<td>12 (175)</td>
<td>57 (15)</td>
</tr>
<tr>
<td>20 (290)</td>
<td>76 (20)</td>
</tr>
<tr>
<td>30 (440)</td>
<td>95 (25)</td>
</tr>
</tbody>
</table>

For any other viscosity (G₁) the pressure drop (ΔP₁) will be approximately: ΔP₁ = ΔP (G₁/G).

NOTE: The pressures in the pressure drop chart give approximate pressure drops (ΔP₁) 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:

<table>
<thead>
<tr>
<th>Other Viscosity</th>
<th>% of ΔP from table (approx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>93</td>
</tr>
<tr>
<td>150</td>
<td>111</td>
</tr>
<tr>
<td>200</td>
<td>119</td>
</tr>
<tr>
<td>250</td>
<td>126</td>
</tr>
<tr>
<td>300</td>
<td>132</td>
</tr>
<tr>
<td>350</td>
<td>137</td>
</tr>
<tr>
<td>400</td>
<td>141</td>
</tr>
</tbody>
</table>

For any other specific gravity (G₁) the pressure drop (ΔP₁) will be approximately:

ΔP₁ = ΔP (G₁/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) FCGG-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**

\[
\begin{array}{cccccccc}
(F3) & F(C)G & 0 & 3 & 28 & 22 & (S^*) \\
1 & 2 & 3 & 4 & 5 & 6 & 7
\end{array}
\]

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)

- Full out position 15.24 (0.6)
- S10 feature adjustment
  - Turn clockwise to decrease maximum flow
  - Turn counterclockwise to increase maximum flow

- S10 feature located at right hand side of valve as you face dial

- 38.1 (1.5)
- 30.2 (1.19)
Installation Dimensions

FG/FCG–03 Model Series
millimeter (inch)

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Port P</th>
<th>Port C</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCG-03-28–22</td>
<td>Inlet connection for regulated flow or outlet connection for reversed free flow.</td>
<td>Outlet connection for regulated flow or inlet connection for reversed free flow.</td>
</tr>
<tr>
<td>FG-03–28–22</td>
<td>Inlet connection</td>
<td>Outlet connection</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Number of Spacers</th>
<th>Limit of Max. Flow lpm (USgpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>68–79 (18–21)</td>
</tr>
<tr>
<td>2</td>
<td>38–49 (10–13)</td>
</tr>
<tr>
<td>1</td>
<td>17–22.7 (4.5–6)</td>
</tr>
</tbody>
</table>

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

Ratings

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

106 lpm, 8833 ft³/min (28 USgpm, 6468 in³/min)

Maximum Relief Valve Pressure


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

<table>
<thead>
<tr>
<th>Operating Pressure bar (psi)</th>
<th>Approximate Minimum Flow cm³/min (in³/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 (500)</td>
<td>82 (5)</td>
</tr>
<tr>
<td>69 (1000)</td>
<td>164 (10)</td>
</tr>
<tr>
<td>103 (1500)</td>
<td>246 (15)</td>
</tr>
<tr>
<td>138 (2000)</td>
<td>327 (20)</td>
</tr>
<tr>
<td>172 (2500)</td>
<td>409 (25)</td>
</tr>
<tr>
<td>207 (3000)</td>
<td>491 (30)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>(F3)</th>
<th>F</th>
<th>R</th>
<th>G</th>
<th>03</th>
<th>*</th>
<th>28</th>
<th>2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

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

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

#### Nominal Valve Size
- 03 – 3/8”

#### Adjustable Relief Valve Setting
- B – 70 bar (1000 psi)
- C – 138 bar (2000 psi)
- F – 210 bar (3000 psi)

#### Maximum Flow Capacity
- 28 – 106 lpm (28 USgpm)

#### Design Number
Subject to change. Installation dimensions remain as shown for design numbers 20 through 29
Installation Dimensions

FRG–03 Model Series

millimeter (inch)

Revolution Indicator

124 (4.88)

11.1R (0.44)

Outlet port “C”

Vent port
(Leave vent connection plugged except when necessary to drop system pressure and circulate pump delivery to the tank).

Inlet port “P”

124 (4.88)

Outlet port “C”

Tank port “T”

Access hole covered when unit is locked.
Upon turning key, lock screw is accessible.
Loosen to change dial setting.

.41 Dia. Thru 15 (.59)
C‘bore 7.9 (.31) Deep
4 places for mounting

153.2 (6.03)
fully extended

∅ 47.8 (1.88)

Mounting surface
(Seals furnished)

∅ 6.35 (0.25)

Outlet pressure gauge test connection
1/2 NPT

Two rest pins furnished.
See subplate for locations.

Clearance to remove key

132.6 (5.22)

101.6 (4.00)

84.6 (3.33)

6.35 (.25)
Dia.

6.35 (.25)

30.2 (1.19)

Two keys furnished

61.9 (2.44)

53.8 (2.12)

30.2 (1.19)

41 Dia. Thru 15 (.59)
C‘bore 7.9 (.31) Deep
4 places for mounting

Flow vs Revolution Indicator/Dial Position

Max. Flow, No spacer

Max. Flow, 1 spacer

Max. Flow, 2 spacers

Max. Flow, 3 spacers

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)

Outlet connection “C”
23 (0.91) dia.
through 3/4” NPTF thd.
(from rear) 3 places

.375–16 UNC–2B Thd.
4 Places

10.3 (0.406) dia thru
15.0 (0.59) c’ bore
9.6 (0.38) deep
4 places for mounting

Inlet connection “P”
7.1 (0.28) dia. – 7.8 (0.31) deep
2 places for rest pins

0.44 R

73.2 (2.88)
88.1 (3.47)
101.6 (4.0)

Tank connection “T”
Vent connection 7.9 (0.31) dia
thru 1/4” NPTF thd from rear

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.

FRGM–03Z–10

Outlet connection “C”
23 (0.91) dia.
through 3/4” NPTF thd.
(from rear) 3 places

17.0
(0.67)

81.0
(3.19)

21.3
(0.84)

23.1
(0.91) dia
1 inch NPTF thd. (from rear) 3 places

81.0
(3.19)

38.1
(1.5)
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)

![Diagram of FGAM–03](image)

- **FG–03–28–2** Valve
- **FGAM–03–10 Adapter plate**
- **Subplate FGM–06–1** or equivalent machined mounting pad

- ▲ 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.

- 146.05 (5.75) inlet
- 165.1 (6.50) outlet
- 46.0 (1.81)

**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.

<table>
<thead>
<tr>
<th>Product</th>
<th>System Pressure Level</th>
<th>Bar (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;70 (&lt;1000)</td>
<td>70-210 (1000-3000)</td>
</tr>
<tr>
<td>Vane Pumps – Fixed</td>
<td>20/18/15</td>
<td>19/17/14</td>
</tr>
<tr>
<td>Vane Pumps – Variable</td>
<td>18/16/14</td>
<td>17/15/13</td>
</tr>
<tr>
<td>Piston Pumps – Fixed</td>
<td>19/17/15</td>
<td>18/16/14</td>
</tr>
<tr>
<td>Piston Pumps – Variable</td>
<td>18/16/14</td>
<td>17/15/13</td>
</tr>
<tr>
<td>Directional Valves</td>
<td>20/18/15</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Pressure/Flow Control Valves</td>
<td>19/17/14</td>
<td>19/17/14</td>
</tr>
<tr>
<td>CMX Valves</td>
<td>18/16/14</td>
<td>18/16/14</td>
</tr>
<tr>
<td>Servo Valves</td>
<td>16/14/11</td>
<td>16/14/11</td>
</tr>
<tr>
<td>Proportional Valves</td>
<td>17/15/12</td>
<td>17/15/12</td>
</tr>
<tr>
<td>Cylinders</td>
<td>20/18/15</td>
<td>20/18/15</td>
</tr>
<tr>
<td>Vane Motors</td>
<td>20/18/15</td>
<td>19/17/14</td>
</tr>
<tr>
<td>Axial Piston Motors</td>
<td>19/17/14</td>
<td>18/16/13</td>
</tr>
<tr>
<td>Radial Piston Motors</td>
<td>20/18/14</td>
<td>19/17/13</td>
</tr>
</tbody>
</table>

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.