Load Control Valves

Counterbalance, Vented Counterbalance and Motion Control Valve Packages for applications up to 350 bar (5000 psi) and 190 L/min (50 USgpm)
### Section Contents

**Load Control Valves**

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<td>190 (50)</td>
<td>H-18</td>
</tr>
<tr>
<td><strong>Dual motion control valve with load lock</strong></td>
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<td></td>
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</tr>
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<td>MCV4-16</td>
<td>210 (3000)</td>
<td>151 (40)</td>
<td>H-20</td>
</tr>
</tbody>
</table>

**Note**

Pilot operated check valves are covered in Section G.
Load control valves
Eaton offers a broad range of Vickers load control valving including counterbalance, motion control and pilot operated check valves. The prime function of load controls is to prevent loads from running ahead of pump supply and/or to provide positive load holding. These valves provide precise and stable motion control. Load control valves are ideally suited for moving and positioning systems. These products include both threaded cartridge and inline housing valves to meet the majority of load control requirements.

Load control application tips

3-ported counterbalance valves
These valves are used with an open center on/off directional valve for:
• Precise control of overrunning loads
• Protection from pump cavitation
• Preventing actuator from running ahead of the pump supply and
• Providing load holding and hose failure safety

Vented (4-ported) counterbalance valves
These valves are used for:
• Precise control of overrunning loads
• Regenerative cylinder circuits
• Meter-out control and providing load holding and hose failure safety with proportional control valves

Pilot operated check valves
These valves are used:
• For position load locking
• As an alternative to counterbalance valves where neither the overrunning loads or release speed are factors in the application.
• Pilot operated check valves are covered in section G

Counterbalance cartridges, 3-ported
The CBV are single cartridge type counterbalance valves that have:
• A check feature allowing free flow in one direction
• A relief feature controlling flow in the other direction
• A pilot signal that overrides the relief setting providing the counterbalance function.

The CBV*-10 series products are capable of handling flows to up 60 L/min (15 USgpm) and pressures up to 350 bar (5000 psi).
The CBV*-12 series products are capable of handling flows up to 114 L/min (30 USgpm) and pressures up to 350 bar (5000 psi).

These valves are available with 4:1 and 10:1 pilot ratios. As a general rule, a low pilot ratio will provide better motion control and stability in systems with higher capacitance (spongy) and inductance (high inertial loads). A high pilot ratio improves the efficiency of a hydraulic system, but motion control stability may suffer.

The 3-ported counterbalance valves are offered with a wide variety of standard housings with SAE and BSPP port options. Aluminum and steel housings are available in the following styles:
• Inline single
• Inline dual
• Inline dual, with integral shuttle
• SAE 4-bolt, Code 61
• Close coupled, nipple mounted
• Gasket mounted single
• Gasket mounted dual
• Various bolt on manifolds for Eaton hydraulic motors

Vented counterbalance cartridges, 4-ported
The VCB1-10 and VCB1-12 are single cartridge type counterbalance valves that have:
• A check feature that allows free flow in one direction
• A relief feature that controls flow in the other direction and
• A pilot signal that overrides the relief setting, providing the counterbalance function

The additional 4th port on this valve provides an external drain that makes the valve insensitive to back pressure at port 2, when the valve is piloted open. This is particularly useful in regenerative circuits, meter-out circuits, servo valves and proportional valves circuits. This valve is available with a 4:1 pilot ratio. The 4-ported counterbalance valve is offered with a wide variety of standard housings with SAE and BSPP port options.

NOTE: For applications where the flow rate will not exceed 378 L/min (10 USgpm) for VCB1–10 and 95 L/min (25 USgpm) for VCB1-12, the standard C-***-4U housing can be used. For applications over those flows or those that require a reduced pressure drop, housings with the slot feature or a C-***-4U cavity are required.

Aluminum and steel housings are available in the following styles:
• Inline single
• Inline dual
• Gasket mounted single

Motion control valves
These are inline housing type motion control or counterbalance valves that utilize separate cartridges to perform the counterbalance function as described in the 3-ported version. The 16 and 20 series valves are available in both single and dual functions. The 16 series is capable of handling flows up to 151 L/min (40 USgpm) and pressures up to 210 bar (3000 psi). The 20 series valves are capable of handling 190 L/min (50 USgpm) and pressures up to 210 bar (3000 psi). Both series offer a 10:1 pilot ratio.
Do not remove the spring wire from the adjusting screw.

3. Tighten the jam nut to secure the desired pressure setting.

NOTE CBV*-10 spring wire must not be removed. Removal will affect the minimum adjustment of the valve.

CAUTION
Care should be taken to ensure the load is supported by mechanical means when servicing or removing the cartridge valve.

Hydraulically released “dead-man” brakes should be used to lock static loads due to motor and cylinder leakage.

CAUTION
Counterbalance valves can be damaged by severe decompression shock. To help prevent shock damage, a restriction may be added between the cylinder and the counterbalance valve.

Counterbalance valves are not relief valves or energy-saving devices. Stability problems may be encountered when system operating pressure goes below 50 bar (700 psi).

Pilot operated check valves are covered in section G.

Features and benefits of pilot operated check valves:

• Simple load holding device. Low cost alternative to more complex solutions when overrunning loads are not present and/or control of load release speed is not required.
• Provides high operational efficiency and low spring settings.
• Valves are offered with a wide variety of standard

The pilot-to-open valves positively lock a load from port 1 to port 2 until pilot pressure applied to port 3 is sufficient to unseat the valve. This then permits flow from port 1 to port 2. The load can also be released through means of an optional screw type override.

The POC*-10 covers flow up to 60 L/min (15 USgpm). The POC*-12 covers flow up to 114 L/min (30 USgpm). With infinite life qualification to a fatigue pressure rating of 310 bar (4500 psi), these POC valves are suitable for use in a broad range of load control applications with typical system operating pressures up to 350 bar (5000 psi). Tailoring of the circuit to gain energy savings while minimizing shock is obtained through the use of several standard cracking pressure ranges from 2,0 bar (30 psi) to 7 bar (100 psi). When anti-cavitation protection is required, the 0,30 bar (5 psi) spring should be used. For those applications where pilot pressure may not always be available, the valve can be ordered with an optional adjustable override.

Pilot-to-open valves are suitable for a wide range of applications including aerial work platforms, boom truck, machine tool and round bailer markets.
Functional Symbols
load Control Valves

CBV cartridges in housings
I - Inline Mounted
B - 4-Bolt Pad (Size 12 only)
N - Closed Coupled, Nipple Mounted
G - Gasket Mounted, Single
D - Dual Line Mounted
P - Dual Gasket Mounted
H - Dual, bolt on for H or T motor
2K - Dual, bolt on for 2000 series motor
M - Dual Counterbalance Line Mounted w/Integral Shuttle

VCB cartridges in housings
I - Inline Mounted
G - Gasket Mounted, Single
D - Dual Line Mounted

POC cartridges in housings*
I - Inline Mounted
B - 4-Bolt Pad (Size 12 only)
N - Close Coupled, Nipple Mounted
G - Gasket Mounted, Single
D - Dual Line Mounted
P - Dual Gasket Mounted

*Screw-In Cartridge Valves V-VLOV-MC001-E3 January 2006*

*Pilot operated check valve data sheets are included in Section G*
Description
The CBV*-10 is a 3-ported, externally piloted, screw-in cartridge type counterbalance valve.

Operation
The CBV counterbalance valve allows free flow from port 2 (inlet) to port 1 (load). Flow from port 1 to port 2 is blocked until either the predetermined pressure setting has been reached or sufficient pilot pressure has been applied to port 3 (pilot).

RATINGS AND SPECIFICATIONS

| Performance data is typical with fluid at 21.8 cSt (105 SUS) and 48˚C (120˚F) |
| Typical application pressure (all ports) | 350 bar (5000 psi) |
| Cartridge fatigue pressure (infinite life) | 350 bar (5000 psi) |
| Rated flow | 60 L/min (15 USgpm) |
| Cracking pressure @ 1 L/min (0.25 USgpm) | 30 - 62-210 bar (900-3000 psi) |
| 50 - 186-350 bar (2700-5000 psi) |
| Internal leakage | 5 drops/min. max. Port 1 to Port 2 @ 77% of crack pressure |
| Temperature range | -40˚ to 120˚C (-40˚ to 248˚F) |
| Cavity | C-10-3S |
| Pilot ratio | 4:1, 10:1 |
| Fluids | All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc. |
| Filtration | Cleanliness code 18/16/13 |
| Standard housing materials | Aluminum or steel |
| Weight cartridge only | 0.23 kg. (0.50 lbs.) |
| Seal kit | 02-173019 Buna-N |
| 02-173020 Viton® |

Viton is a registered trademark of E.I. DuPont

CAUTION
Adjustments exceeding 350 bar (5000 psi) may damage the body.

WARNING
For pressure over 210 bar (3000 psi) use steel housing.

Pressure Drop Curves

Cartridge only
Valve function
CBV - Counterbalance valve

Pilot ratio
1 - 4:1
2 - 10:1

Valve size
10 - Size 10

Seals
Blank - Buna-N
V - Viton

Adjustment options
S - Screw with locknut
C - Cap over screw
K - Hand knob

Valve Body
O - Cartridge only
I - Inline body
N - Close coupled, nipple mounting
G - Gasket mounted, single
D - Dual counterbalance, line mounted
M - Dual counterbalance, line mounted with integral shuttle valve
P - Dual counterbalance, gasket mounted
H - Dual counter balance, bolt on manifold for H or T series motor
2K - Dual counter balance, bolt on manifold for 2000 series motor

Free flow crack pressure
A - 1.4 bar (20 psi) (standard)
B - 0.28 bar (4 psi) (anti-cavitation)
C - 1.4 bar (20 psi) with low leak pilot *
D - 0.28 bar (4 psi) with low leak pilot *

Pressure range
30 - 62-210 bar (900-3000 psi)
50 - 186-350 bar (2700-5000 psi)

Pressure setting (optional)
(Specified by customer in 100 psi increments) for example:
20 - 140 bar (2000 psi)
35 - 240 bar (3500 psi)

Special features
00 - None
SS - 316 Stainless Steel external components
Note: SS option available only for CBV1-10

Dimensions
mm (inch)

“C” Adjustment (Cap over screw)

“K” Adjustment (Hand knob)

“S” Adjustment (Screw w/locknut)

Note
Torque cartridge in housing:
A - 47-54 Nm (35-40 ft.lbs)
S - 68-75 Nm (50-55 ft.lbs)

Turn screw or knob clockwise to reduce pressure setting and release load.
Description
The CBV*-12 is a 3-ported, externally piloted, screw-in cartridge type counterbalance valve.

Operation
The counterbalance valve allows free flow from port 2 to port 1. Flow from port 1 to port 2 is blocked until either the predetermined pressure setting has been reached or sufficient pilot pressure has been applied to port 3 (pilot).

RATINGS AND SPECIFICATIONS

Performance data is typical with fluid at 21.8 cSt (105 SUS) and 49°C (120°F)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Typical application pressure (all ports)</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Cartridge fatigue pressure (infinite life)</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Rated flow</td>
<td>114 L/min (30 USgpm)</td>
</tr>
<tr>
<td>Cracking pressure @ 1 L/min (0.25 USgpm)</td>
<td>30 - 62-210 bar (900-3000 psi)</td>
</tr>
<tr>
<td></td>
<td>50 - 186-350 bar (2700-5000 psi)</td>
</tr>
<tr>
<td>Internal leakage</td>
<td>5 drops/min. max. Port 1 to Port 2 @ 77% of crack pressure</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 120°C (-40° to 248°F)</td>
</tr>
<tr>
<td>Cavity</td>
<td>C-12-3S</td>
</tr>
<tr>
<td>Pilot ratio</td>
<td>4:1, 10:1</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.</td>
</tr>
<tr>
<td>Filtration Cleanliness code</td>
<td>18/16/13</td>
</tr>
<tr>
<td>Standard housing materials</td>
<td>Aluminum or steel</td>
</tr>
<tr>
<td>Weight cartridge only</td>
<td>0.36 kg. (0.79 lbs.)</td>
</tr>
<tr>
<td>Seal kit</td>
<td>02-180095 Buna-N 02-165887 Viton®</td>
</tr>
<tr>
<td></td>
<td>Viton is a registered trademark of E.I. Dupont</td>
</tr>
</tbody>
</table>

Pressure Drop Curves
Cartridge only

WARNING
For pressure over 210 bar (3000 psi) use steel housing.

CAUTION
Adjustments exceeding 350 bar (5000 psi) may damage the body.

For 4:1 Ratio
Pilot pressure, =
Cracking pressure + (5 x Port 2 pressure) - Port 1 pressure

For 10:1 Ratio
Pilot pressure, =
Cracking pressure + (11 x Port 2 pressure) - Port 1 pressure

For pressure over 210 bar (3000 psi) use steel housing.

Adjustments exceeding 350 bar (5000 psi) may damage the body.

For 4:1 Ratio
Pilot pressure, =
Cracking pressure + (5 x Port 2 pressure) - Port 1 pressure

For 10:1 Ratio
Pilot pressure, =
Cracking pressure + (11 x Port 2 pressure) - Port 1 pressure

WARNING
For pressure over 210 bar (3000 psi) use steel housing.

CAUTION
Adjustments exceeding 350 bar (5000 psi) may damage the body.
Model Code

CBV1/2-12

CBV* – 12 (V) – * – * * * * S – * ** – 00

1 2 3 4 5 6 7 8 9 10 11 12

Valve function
CBV - Counterbalance valve

Pilot ratio
1 - 4:1
2 - 10:1

Valve size
12 - Size 12

Seals
Blank - Buna-N
V - Viton

Valve body
O - Cartridge only
I - Inline body
B - SAE 4 - Bolt pad
N - Close coupled, nipple mounting
G - Gasket mounted, single
D - Dual counterbalance, line mounted
M - Dual counterbalance, line mounted with integral shuttle valve
P - Dual counterbalance, gasket mounted

Valve housing material
A - Aluminum
S - Steel

Housing port sizes

PORT SIZE VALVE BODY CODES

<table>
<thead>
<tr>
<th>PORT SIZE</th>
<th>I</th>
<th>B</th>
<th>N/G/P</th>
<th>D/M</th>
</tr>
</thead>
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<tr>
<td>SAE 8</td>
<td></td>
<td></td>
<td>8T</td>
<td></td>
</tr>
<tr>
<td>SAE 10</td>
<td></td>
<td></td>
<td>10T</td>
<td></td>
</tr>
<tr>
<td>SAE 12</td>
<td>12T</td>
<td></td>
<td></td>
<td>12T</td>
</tr>
<tr>
<td>1/2&quot; BSPP</td>
<td>4G</td>
<td>4G</td>
<td>4G</td>
<td></td>
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<tr>
<td>3/4&quot; BSPP</td>
<td>6G</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SAE-Code 61 6T

For housing part numbers and dimensions see section J.

Free flow crack pressure

A - 2,0 bar (25 psi) (standard)
B - 0,30 bar (4 psi) (anti-cavitation)
C - 1,4 bar (20 psi) with low leak pilot *
D - 0,28 bar (4 psi) with low leak pilot *
D - Low leak pilot is only available on CBV2-**.

Only apply B and D options if required in your application, these are not preferred options.

CBV Valves should not be applied with closed center directional valves.

Dimensions

mm (inch)

Torque cartridge in housing:
A - 81-96 Nm (60-70 ft.lbs)
S - 102-115 Nm (75-85 ft.lbs)

“C” Adjustment

“K” Adjustment

“S” Adjustment

Note

Turn screw or knob clockwise to reduce pressure setting and release load.

Pressure range

30 - 62-210 bar (900-3000 psi)
50 - 186-350 bar (2700-5000 psi)

Pressure setting (optional)

(Specified by customer in 100 psi increments) for example:

20 - 140 bar (2000 psi)
35 - 240 bar (3500 psi)

Special features

00 - None
(Only required if valve has special features, omit if 00)
**Description**
The VCB1-10 is a 4-port, externally piloted, screw-in cartridge type counterbalance valve with the separate vent. This separate vent makes the valve insensitive to back pressure at port 2.

**Operation**
The VCB1-10 counterbalance valve will allow free flow from port 2 to port 1 through a built-in check valve. Flow from port 1 to port 2 is blocked until either a predetermined pressure setting has been reached or sufficient pilot pressure has been sensed on port 3 (pilot). Port 4 is vented to tank.

**RATINGS AND SPECIFICATIONS**

*Performance data is typical with fluid at 21.8 cSt (105 SUS) and 49°C (120°F)*

<table>
<thead>
<tr>
<th>Specification</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application pressure</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Cartridge fatigue pressure</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Rated flow</td>
<td>60 L/min (15 USgpm)</td>
</tr>
<tr>
<td>Cracking pressure</td>
<td>30 - 62-210 bar (900-3000 psi)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40 to 120°C (-40°F to 248°F)</td>
</tr>
<tr>
<td>Cavity</td>
<td>C-10-4 or C-10-4U</td>
</tr>
<tr>
<td>Pilot ratio</td>
<td>4:1</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.</td>
</tr>
<tr>
<td>Filtration</td>
<td>Cleanliness code 18/16/13</td>
</tr>
<tr>
<td>Standard housing materials</td>
<td>Aluminum or steel</td>
</tr>
<tr>
<td>Weight cartridge only</td>
<td>0.36 kg. (0.79 lbs.)</td>
</tr>
<tr>
<td>Seal kit</td>
<td>889625 Buna-N 566080 Viton®</td>
</tr>
</tbody>
</table>

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**Pressure Drop Curves**

*Cartridge only*

**WARNING**
For pressure over 210 bar (3000 psi) use steel housing.

**CAUTION**
Adjustments exceeding 350 bar (5000 psi) may damage the body.

*Note*
Valve should be set 1.3 times load induced pressure.

For 4:1 Ratio

\[
Pilot \, pressure = \frac{Crack \, pressure - Load \, pressure}{Pilot \, ratio}
\]

- **A** - Piloted open port 1 to port 2
- **B** - Free flow port 2 to port 1

**FOR 4:1 RATIO**

\[
Pilot \, pressure = \frac{Crack \, pressure - Load \, pressure}{Pilot \, ratio}
\]
Model Code
VCB1-10

Valve function
VCB - Vented counterbalance valve

Pilot ratio
1 - 4:1

Valve size
10 - Size 10

Seals
Blank - Buna-N
V - Viton

Adjustment
S - Screw with locknut
C - Cap over screw
K - Hand knob

Valve body
O - Cartridge only
I - Inline body
G - Gasket mounted, single
D - Dual counterbalance, line mounted

Dimensions
mm (inch)
Torque cartridge in housing:
A - 47-54 Nm (35-40 ft.lbs)
S - 68-75 Nm (50-75 ft.lbs)

Note
Turn screw or knob clockwise to reduce pressure setting and release load.

Housing port sizes

<table>
<thead>
<tr>
<th>PORT SIZE</th>
<th>VALVE BODY CODES</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Alum.</td>
<td>Steel</td>
</tr>
<tr>
<td>D Alum.</td>
<td>Steel</td>
</tr>
<tr>
<td>G Alum.</td>
<td>Steel</td>
</tr>
</tbody>
</table>

SAE 6   A6H* S6T       A6H S6T       A6H S6T
SAE 8   A8H* S8T**     A8H** S8T"    A8H" S8T"
SAE 10  A10H** -       -            -
1/4" BSPP A2G -          -            -
3/8" BSPP A3G" S3G"     A3G" S3G"    A3G S3G"

* Light Duty Housing is available, to specify, substitute H with T respectively.
**Housings with slot.
Note - for housing part numbers and dimensions see section J.

Free flow crack pressure
A - 1,4 bar (20 psi) (standard)
B - 0,28 bar (4 psi) (anti-cavitation)

Pressure range
30 - 62-210 bar (900-3000 psi)
50 - 186-350 bar (2700-5000 psi)

Pressure setting (optional)
(Specified by customer in 100 psi increments) for example:
20 - 140 bar (2000 psi)
35 - 240 bar (3500 psi)

Special features
00 - None
(Only required if valve has special features, omit if 00)
Description
The VCB1-12 is a 4-ported, externally piloted, screw-in cartridge type counterbalance valve with the separate vent. This separate vent makes the valve insensitive to back pressure at port 2.

Operation
The VCB1-12 counterbalance valve will allow free flow from port 2 to port 1 through a built in check valve. Flow from port 1 to port 2 is blocked until either a predetermined pressure setting has been reached or sufficient pilot pressure has been sensed on port 3 (pilot). Port 4 is vented to tank.

RATINGS AND SPECIFICATIONS

**Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application pressure</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Cartridge fatigue pressure</td>
<td>350 bar (5000 psi)</td>
</tr>
<tr>
<td>Rated flow</td>
<td>114 L/min (30 USgpm)</td>
</tr>
<tr>
<td>Cracking pressure @ 1 L/min</td>
<td>30 - 35-210 bar (500-3000 psi)</td>
</tr>
<tr>
<td></td>
<td>50 - 175-350 bar (2500-5000 psi)</td>
</tr>
<tr>
<td>Internal leakage</td>
<td>5 drops/min. max. Port 1 to Port 2 @ 77% of crack pressure</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 120°C (-40° to 248°F)</td>
</tr>
<tr>
<td>Cavity</td>
<td>C-12-4 or C-12-4U</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as:</td>
</tr>
<tr>
<td></td>
<td>MIL-H-5606, SAE 10, SAE 20, etc.</td>
</tr>
<tr>
<td>Filtration</td>
<td>Cleanliness code 18/16/13</td>
</tr>
<tr>
<td>Standard housing materials</td>
<td>Aluminum or steel</td>
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<tr>
<td>Weight cartridge only</td>
<td>0.37 kg. (0.81 lbs.)</td>
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<tr>
<td>Seal kit</td>
<td>02-160979 Buna-N</td>
</tr>
<tr>
<td></td>
<td>02-160980 Viton®</td>
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</tbody>
</table>

Viton is a registered trademark of E.I. Dupont

**For 4:1 Ratio**

Pilot pressure = Relief setting – Load pressure / Pilot ratio

### WARNING

For pressure over 210 bar (3000 psi) use steel housing.

### CAUTION

Adjustments exceeding 350 bar (5000 psi) may damage the body.

Note
Valve should be set 1.3 times load induced pressure.

Note
Flow – L/min (21,8 cSt oil @ 49°C)

```
Flow - L/min
0  20  40  60  80  100  21
Pressure Drop - psi
0  100  200  300

Flow - USgpm (105 SUS oil @120°F)
0  6  12  18  24  30
Pressure Drop - bar
0  7  14  21
```

**A** - Piloted open port 1 to port 2
**B** - Free flow port 2 to port 1
Model Code
VCB1-12

VCB1 – 12 (V) – * – * **** – * – **/** – 00

1 Valve function
VCB - Vented counterbalance valve

2 Pilot ratio
1 - 4:1

3 Valve size
12 - Size 12

4 Seals
Blank - Buna-N
V - Viton

5 Adjustment
S - Screw with locknut
C - Cap over screw
K - Hand knob

6 Valve Body
O - Cartridge only
I - Inline body
G - Gasket mounted, single
D - Dual counterbalance, line mounted

7 Housing port sizes

Port Size | Valve Body Codes
--- | ---
SAE 8 | - - A8T S8T
SAE 10 | A10T S10T - -
SAE 12 | A12T S12T - -
3/8” BSPP | - - A4G S4G
1/2” BSPP | A4G S4G** - -
**Housing with slot

Note - for housing part numbers and dimensions see section J*

8 Free flow crack pressure
A - 1,7 bar (25 psi) (standard)
B - 0,28 bar (4 psi) (anti-cavitation)

9 Pressure range
30 - 35-210 bar (500-3000 psi)
50 - 175-350 bar (2700-5000 psi)

10 Pressure setting (optional)
(Specified by customer in 100 psi increments) for example:
20 - 140 bar (2000 psi)
35 - 240 bar (3500 psi)

11 Special features
00 - None
(Only required if valve has special features, omit if 00)

Dimensions

mm (inch)

Torque cartridge in housing:
A - 81-95 Nm (60-70 ft.lbs)
S - 102-115 Nm (75-85 ft.lbs)

Note
Turn screw or knob clockwise to reduce pressure setting and release load.
Description
The MCV1-16 is an inline housing type motion control or load holding valve. This valve controls a moving load and prevents loads from running ahead of a pump. It will also lock or hold a load in any position and provides for thermal expansion relief.

Operation
The MCV1-16 is an inline housing type motion control or load holding valve. This valve controls a moving load and prevents loads from running ahead of a pump. It will also lock or hold a load in any position and provides for thermal expansion relief.

RATINGS AND SPECIFICATIONS
Performance data is typical with fluid at 21.8 cSt (105 SUS) and 49°C (120°F)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application pressure (all ports)</td>
<td>210 bar (3000 psi)</td>
</tr>
<tr>
<td>Rated flow</td>
<td>151 L/min (40 USgpm)</td>
</tr>
<tr>
<td>Free flow cracking pressure @ 1 L/min (0.25 USgpm)</td>
<td>13 - 3.4-8.4 bar (50-1300 psi)</td>
</tr>
<tr>
<td>Internal leakage</td>
<td>Port “C” to “V” less than 5 drops/min. max. @ 210 bar (3000 psi)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 120°C (-40° to 248°F)</td>
</tr>
<tr>
<td>Pilot ratio</td>
<td>11:1</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.</td>
</tr>
<tr>
<td>Filtration</td>
<td>Cleanliness code 18/16/13</td>
</tr>
<tr>
<td>Standard housing material</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Weight</td>
<td>4.50 kg. (10.00 lbs.)</td>
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<tr>
<td>Seal kits (Check valve)</td>
<td>565810 Buna-N 889609 Viton®</td>
</tr>
<tr>
<td>Seal kits (Relief valve)</td>
<td>565810 Buna-N 889609 Viton®</td>
</tr>
</tbody>
</table>

Viton is a registered trademark of E.I. Dupont

Pilot pressure calculation for 11:1 Ratio
Nominal pressure to open valve by remote control
Pilot pressure =
Cracking pressure + (12 x Port V pressure) - Port C pressure

11

Pressure Drop Curves

Free Flow (V to C)
Flow = L/min (21.8 cSt oil @ 49°C)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
Flow = USgpm (105 SUS oil @120°F)
0 10 20 30 40
Pressure Drop – psi
0 50 100 150 200 250
Pressure Drop – bar
0 5 10 15 20

Piloted Open (C to V)
Flow = L/min (21.8 cSt oil @ 49°C)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
Flow = USgpm (105 SUS oil @120°F)
0 10 20 30 40
Pressure Drop (bar)
0 5 10 15 20
Pressure Drop (psi)
**Model Code**

**MCV1-16**

---

**PMV1 - 16 (V) - * - *** - **/** - 00**

1. **Valve Function**  
   **MCV1** - Motion control valve

2. **Size**  
   **16 - 16 Size**

3. **Seals**  
   **Blank** - “Buna-N”  
   **V** - “Viton”

4. **Adjustment**  
   **K** - Hand knob  
   **S** - Screw with locknut

5. **Port size**  
   **12T** - SAE 12 (light duty)  
   **6B** - 3/4” BSPP (light duty)

6. **Pressure setting**  
   Optional - specify in 100 psi ranges. If not specified, set at:  
   - **20** - 140 bar (2000 psi)  
   - **35** - 240 bar (3500 psi)

7. **Cracking pressure range**  
   **13** - 3.4-8.4 bar (50-1300 psi)  
   **35** - 13.6-240 bar (200-3500 psi)

8. **Special features**  
   **00** - None  
   (Only required if valve has special features, omit if 00)

---

**Installation Dimensions**

**mm (inch)**

Torque cartridge in housing: 108-122 Nm (80-90 ft.lbs)

---

**EATON Vickers** Screw-in Cartridge Valves  V-VLOV-MC001-E3 January 2006
**Description**

The MCV1-20 is an inline housing type motion control or load holding valve. This valve controls a moving load and prevents loads from running ahead of a pump. It will also lock or hold a load in any position and provides for thermal expansion relief.

**Operation**

This valve allows free flow from the “V” port to the “C” port and blocks flow in the opposite direction until either the relief setting is reached or until sufficient pilot pressure has been applied to the “Pilot” port.

**RATINGS AND SPECIFICATIONS**

*Performance data is typical with fluid at 21.8 cSt (105 SUS) and 49°C (120°F)*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical application pressure (all ports)</td>
<td>210 bar (3000 psi)</td>
</tr>
<tr>
<td>Rated flow</td>
<td>190 L/min (50 USgpm)</td>
</tr>
<tr>
<td>Free flow cracking pressure @ 1 L/min (0.25 USgpm)</td>
<td>13 - 3.4-8.4 bar (50-1300 psi)</td>
</tr>
<tr>
<td></td>
<td>35 - 13.6-240 bar (200-3500 psi)</td>
</tr>
<tr>
<td>Internal leakage</td>
<td>Port “C” to “V” less than 5 drops/min. max. @ 210 bar (3000 psi)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 120°C (-40° to 248°F)</td>
</tr>
<tr>
<td>Pilot ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.</td>
</tr>
<tr>
<td>Filtration</td>
<td>Cleanliness code 18/16/13</td>
</tr>
<tr>
<td>Standard housing material</td>
<td>Aluminum</td>
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<tr>
<td>Weight</td>
<td>5.40 kg. (12.00 lbs.)</td>
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<tr>
<td>Seal kits (Check valve)</td>
<td>889615 Buna-N</td>
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<tr>
<td></td>
<td>889619 Viton®</td>
</tr>
<tr>
<td>Seal kits (Relief valve)</td>
<td>565810 Buna-N</td>
</tr>
<tr>
<td></td>
<td>889609 Viton®</td>
</tr>
</tbody>
</table>

Viton is a registered trademark of E.I. Dupont

**Pilot pressure calculation for 10:1 Ratio**

Nominal pressure to open valve by remote control

Pilot pressure = Cracking pressure + (11 x Port V pressure) - Port C pressure

10

**Pressure Drop Curves**

*Free Flow (V to C)*

<table>
<thead>
<tr>
<th>Flow – L/min (21.8 cSt oil @ 49°C)</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Piloted Open (C to V)*

<table>
<thead>
<tr>
<th>Flow – L/min (21.8 cSt oil @ 49°C)</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
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<td>80</td>
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<tr>
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<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow – USgpm (105 SUS oil @ 120°F)</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
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<tr>
<td>80</td>
<td>80</td>
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<td>60</td>
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<td>0</td>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Flow – USgpm (105 SUS oil @ 120°F)</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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<td>80</td>
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<tr>
<td>60</td>
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</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**Model Code**

**MCV1-20**

---

**Installation Dimensions**

**mm (inch)**

- Torque CV2-20 cartridge in housing 128-155 Nm (95-115 ft.lbs)
- Torque RV3-16 cartridge in housing 108-122 Nm (80-90 ft.lbs)

---

**Valve Function**

- MCV1 - Motion control valve

---

**Adjustment**

- K - Hand knob
- S - Screw with locknut

---

**Seals**

- Blank - Buna-N
- V - Viton®

---

**Port size**

- 16T - SAE 16 (light duty)
- 8B - 1” BSPP (light duty)

---

**Cracking pressure range**

- 13 - 3,4-8,4 bar (50-1300 psi)
- 35 - 13,6-240 bar (200-3500 psi)

---

**Pressure setting**

Optional - specify in 100 psi ranges. If not specified, set at:
- 20 - 140 bar (2000 psi)
- 35 - 240 bar (3500 psi)

---

**Special features**

- 00 - None
  (Only required if valve has special features, omit if 00)
**MCV2-20**

**Dual-motion control valve**

**Description**

The MCV2-20 is a dual inline housing type motion control or load holding valve. This valve controls a moving load and prevents loads from running ahead of a pump. It will also lock or hold a load in any position and provides for thermal expansion relief.

**Functional Symbol**

```
C1 C2
V1 V2
```

**Sectional View**

**Operation**

This valve allows free flow from the “V” port to the “C” ports and blocks flow in the opposite direction until either the relief setting is reached or until sufficient pilot pressure has been applied from the opposite “V” port.

**RATINGS AND SPECIFICATIONS**

*Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)*

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Typical application pressure (all ports)</td>
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</tr>
<tr>
<td>Rated flow</td>
<td>190 L/min (50 USgpm)</td>
</tr>
<tr>
<td>Free flow cracking pressure @ 1 L/min (0.25 USgpm)</td>
<td>13 - 3,4-8,4 bar (50-1300 psi) 35 - 13,6-240 bar (200-3500 psi)</td>
</tr>
<tr>
<td>Internal leakage, Port “C” to “V”</td>
<td>less than 5 drops/min. max. @ 210 bar (3000 psi)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-40° to 120°C (-40° to 248°F)</td>
</tr>
<tr>
<td>Pilot ratio</td>
<td>10:1</td>
</tr>
<tr>
<td>Fluids</td>
<td>All general purpose hydraulic fluids such as:</td>
</tr>
<tr>
<td>Standard housing material</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Weight</td>
<td>10,0 kg. (21.50 lbs.)</td>
</tr>
<tr>
<td>Seal kits (Check valve)</td>
<td>889615 Buna-N 889619 Viton®</td>
</tr>
<tr>
<td>Seal kits (Relief valve)</td>
<td>565810 Buna-N 889609 Viton®</td>
</tr>
</tbody>
</table>

**Pilot pressure calculation for 10:1 Ratio**

Pilot pressure, nominal at port 3 - Cracking pressure + (11 x Port 2 pressure) - Port 1 pressure

**Pressure Drop Curves**

**Free Flow**

*(V1 to C1 or V2 to C2)*

Flow – L/min (21,8 cSt oil @ 49°C)

**Piloted Open**

*(C1 to V1 or C2 to V2)*

Flow – L/min (21,8 cSt oil @ 49°C)

**Flow – USgpm (105 SUS oil @120°F)**

**Pressure Drop – psi**

<table>
<thead>
<tr>
<th>Flow</th>
<th>Pressure Drop – psi</th>
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<tbody>
<tr>
<td>40</td>
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<tr>
<td>160</td>
<td>3</td>
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<tr>
<td>200</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>Flow</th>
<th>Pressure Drop – bar</th>
</tr>
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<tbody>
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<td>0</td>
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<tr>
<td>20</td>
<td>1</td>
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<td>40</td>
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<tr>
<td>60</td>
<td>3</td>
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<tr>
<td>80</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
</tbody>
</table>

**Flow – USgpm (105 SUS oil @120°F)**

**Pressure Drop – psi**

<table>
<thead>
<tr>
<th>Flow</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>0</td>
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<tr>
<td>80</td>
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<td>160</td>
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</table>

<table>
<thead>
<tr>
<th>Flow</th>
<th>Pressure Drop – bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
<td>20</td>
<td>1</td>
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<td>80</td>
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<tr>
<td>100</td>
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</tr>
</tbody>
</table>
Model Code

MCV2 – 20 (V) – * – *** – **/** – 00

Valve Function
MCV2 - Dual-motion control valve

Seals
Blank - Buna-N
V - Viton®

Adjustment
K - Hand knob
S - Screw with locknut

Port size
20T - SAE 12 (light duty)
8B - 1” BSPP (light duty)

Cracking pressure range
13 - 3,4-8,4 bar (50-1300 psi)
35 - 13,6-240 bar (200-3500 psi)

Special features
00 - None
(Only required if valve has special features, omit if 00)

Installation
Dimensions

mm (inch)
Torque CV2-20 cartridge in housing 128-155 Nm (95-115 ft.lbs)
Torque RV3-16 cartridge in housing 108-122 Nm (80-90 ft.lbs)

EATON Vickers Screw-In Cartridge Valves  V-VLOV-MC001-E3 January 2006
**Description**

The MCV4-16 is a dual inline housing type motion control or load holding valve. This valve controls a moving load and prevents loads from running ahead of a pump. It will also lock or hold a load in any position and provides for thermal expansion relief and make-up oil.

**Functional Symbol**

![Diagram of Functional Symbol]

**Sectional View**

![Diagram of Sectional View]

**Operation**

This valve allows free flow from the “V” ports to the “C” ports and blocks flow in the opposite direction until either the relief setting is reached or until sufficient pilot pressure has been applied from the opposite “V” port.

**RATINGS AND SPECIFICATIONS**

*Performance data is typical with fluid at 21,8 cSt (105 SUS) and 49°C (120°F)*

- **Typical application pressure (all ports):** 210 bar (3000 psi)
- **Rated flow:** 151 L/min (40 USgpm)
- **Free flow cracking pressure @ 1 L/min (0.25 USgpm):** 13 - 3.4-8.4 bar (50-1300 psi) 35 - 13.6-240 bar (200-3500 psi)
- **Internal leakage Port “C” to “V”:** less than 5 drops/min. max. @ 210 bar (3000 psi)
- **Temperature range:** -40˚ to 120˚C (-40˚ to 248˚F)
- **Pilot ratio:** 11:1
- **Fluids:** All general purpose hydraulic fluids such as: MIL-H-5606, SAE 10, SAE 20, etc.
- **Filtration:** Cleanliness code 18/16/13
- **Standard housing material:** Aluminum
- **Weight:** 8.0 kg. (18 lbs.)
- **Seal kits (Check valve):** 565810 Buna-N 889609 Viton®
- **Seal kits (Relief valve):** 565810 Buna-N 889609 Viton®

889609 Viton® is a registered trademark of E.I. Du Pont

**Pilot pressure calculation for 11:1 Ratio**

Nominal pressure to open valve by remote control

Pilot pressure =

\[
\text{Cracking pressure} + (12 \times \text{Port V pressure}) - \text{Port C pressure}
\]

11

**Pressure Drop Curves**

*Free Flow (V1 to C1 or V2 to C2)*

Flow – L/min (21,8 cSt oil @ 49°C)

<table>
<thead>
<tr>
<th>Flow – USgpm (105 SUS oil @120°F)</th>
<th>Pressure Drop – psi</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tbody>
</table>

*Piloted Open (C1 to V1 or C2 to V2)*

Flow – L/min (21,8 cSt oil @ 49°C)

<table>
<thead>
<tr>
<th>Flow – USgpm (105 SUS oil @120°F)</th>
<th>Pressure Drop – bar</th>
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<tbody>
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**Model Code**

**MCV4 – 16 (V) – * – *** – **/** – 00**

<table>
<thead>
<tr>
<th>8</th>
<th>Valves Function</th>
<th>9</th>
<th>Seals</th>
<th>10</th>
<th>Port size</th>
<th>11</th>
<th>Pressure setting</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>MCV4 - Dual-motion</td>
<td></td>
<td>Blank - Buna-N</td>
<td></td>
<td>12T - SAE 12 (light)</td>
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<td>Optional - specify</td>
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<td></td>
<td>control valve</td>
<td></td>
<td>V - Viton®</td>
<td></td>
<td>6B - 3/4” BSPP (light)</td>
<td></td>
<td>in 100 psi ranges.</td>
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<td>If not specified,</td>
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<td>set at:</td>
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<td></td>
<td></td>
<td>20 - 140 bar (2000 psi)</td>
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<td></td>
<td>35 - 240 bar (3500 psi)</td>
</tr>
<tr>
<td>7</td>
<td>Size</td>
<td>5</td>
<td>Adjustment</td>
<td>6</td>
<td>Cracking pressure range</td>
<td>7</td>
<td>Special features</td>
</tr>
<tr>
<td></td>
<td>16 - 16 Size</td>
<td></td>
<td>K - Hand knob</td>
<td></td>
<td>13 - 3,4-6,4 bar (50-1300 psi)</td>
<td></td>
<td>00 - None</td>
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<td></td>
<td></td>
<td></td>
<td>S - Screw with locknut</td>
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<td>35 - 13,6-240 bar</td>
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<td>(Only required if</td>
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<td>(200-3500 psi)</td>
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<td>valve has special</td>
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<td>features, omit if 00)</td>
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<td>Installation Dimensions</td>
<td>3</td>
<td>Seals</td>
<td>4</td>
<td>Port size</td>
<td>5</td>
<td>Special features</td>
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<tr>
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<td>mm (inch)</td>
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<td>Blank - Buna-N</td>
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<td>12T - SAE 12 (light)</td>
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<td>00 - None</td>
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<td>V - Viton®</td>
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<td>6B - 3/4” BSPP (light)</td>
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**Installation Dimensions**

Torque cartridge in housing 108-122 Nm (80-90 ft.lbs)