MOOG DDV PCV features the following advantages:

- Direct drive with high force level permanent magnet linear motor for high reliability
- No pilot stage oil flow
- Low hysteresis, high resolution, excellent linearity
- Pressure independent dynamic performance of servo valve
- Pressure control in mainstream and bypass function
- Standardised, accurate pressure feedback signal for monitoring
- 2 x 2 way operation extends the flow capacity in bypass mode
- At loss of supply voltage, the valve returns to its spring centered safe position and connects ports A with T or P with A.
- Improved false polarity protection and over voltage protection
- IP 65 (DIN 40050) degree of protection

General

The series D635 is a direct driven pressure control valve (PCV) of size NG 6 (Cetop 3). The PCV consists of a DDV servovalve, pressure control electronics, pressure sensor and ramp circuit for the pressure command signal. All elements are integrated in a compact unit. This provides the control of the PCV direct from the machine control without interface electronics.

Our quality management system is certified in accordance with DIN EN ISO 9001.

This catalogue is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has to check the suitability of the products described here. In case of doubt please contact MOOG.
**Pressure Control function**
The actual pressure in port A is measured by a pressure transducer and the output signal is conditioned and compared with the pressure command signal. If there is an error between pressure command signal and actual pressure value, the pressure controller changes current to the linear motor in such a way that the error becomes zero.

The pressure command signal can be directed via a ramp circuit with 20 s ramp up / ramp down time or direct to the comparison point (see block diagram page 3).

**Valve Flow function**
The valve flow function is a sub function within the pressure control valve and not controllable externally. With zero current through the linear motor, the output force is zero and the centering spring moves the spool to its neutral position, where port A is connected to port T, and port P to B. Port B is normally blanked off. This position is defined as fail safe, (e.g. at loss of supply voltage).

As the motor current increases, the flow paths A ÷ T and P ÷ B start to close and eventually are fully closed. For the 2 x 2 way version (valve in bypass) this is the case at 90 % and for the 3 - way version at approx. 50 % of total spool stroke (see flow functions page 4). Further increasing of the current through the linear motor in the 3-way version causes the flow path to open again to their max. opening for max. valve flow Q (Qn at ΔpN).

**Valve Flow and Pressure Drop**
At maximum valve opening, the valve flow at rated valve pressure drop, ΔpN = 5 bar per metering land, is rated flow, QN, per land. For other than rated pressure drop, the valve flow changes at constant valve opening according to the following function for a sharp edged orifice (metering land).

The valve flow Q calculated in this way should result in an average flow velocity in ports P, A, B or T of no more than 30 m/s.

\[ Q = Q_N \sqrt{\frac{\Delta p}{\Delta p_N}} \]

- Q \[\text{[l/min]}\] = calculated flow per land at Δp
- Q_N \[\text{[l/min]}\] = rated flow per land at ΔpN
- Δp \[\text{[bar]}\] = actual valve pressure drop per land
- Δp_N \[\text{[bar]}\] = rated valve pressure drop per land

**Principle of Permanent magnet linear motor operation**
The linear motor is a permanent magnet excited differential motor. The permanent magnets provide a part of the required magnet force. For a linear motor, the current needed is considerably lower than would be required for a comparable proportional solenoid.

The spool driving linear motor has a neutral position at zero coil current given by the centering spring. The spool driving force is proportional to coil current and moving the spool against the centering spring. The linear motor needs no current in the spring centered (neutral) position. The high spool driving force ensures a reliable spool movement against flow and friction forces. This makes the valve very insensitive to contamination.
Series D635

Typical Characteristic Curves

**Flow Function**

at $\Delta p_n = 35$ bar per land

![Diagram showing flow function with Q = 36 l/min per land.]

**3 - Way function**

Example 1:
Symmetric flow characteristic with $Q_n = 20$ l/min

![Diagram showing 3-way function.]

**2 x 2 - Way function**

Example 2:
By-pass flow characteristic (standard) with $Q_n = 36$ l/min per land
Double flow: $2 \times Q_n = 72$ l/min

![Diagram showing 2x2-way function.]

**Application note**

The pressure controller needs to be adapted to the load to optimise dynamic performance.

The load is mainly influenced by:
- valve rated flow $Q_n$
- actual valve pressure drop per land $\Delta p$
- fluid volume to be controlled connected to port A
- mechanical load stiffness etc.

Contact our application engineers for assistance.
Valve design
Actuation
Mounting pattern DIN 24340 / ISO 4401 / Cetop
Port diameter P, A, B, T
Pilot supply
Mounting direction
Seal material
Degree of protection DIN 40050, with mating connector
Mass
Rated flow \( Q_n \)
\[ \Delta p_n = 35 \text{ bar per land, tolerance } \pm 10\% \]

Null leakage flow \( Q_L \)
\[ \begin{align*}
&0.15 / 0.3 / 0.6 / 1.2 \text{ l/min} \\
&\text{max.} \\
\end{align*} \]

Operating pressure \( p_{\text{max}} \)
ports P, A, B
port T without Y
port T with Y
port Y
Mating connector standard (DIN 43563)
Supply voltage for integrated electronics \( U_{\text{nom}} \)
Tolerance range
\[ U_{\text{min}} \leq U \leq U_{\text{max}} \]
Current consumption at \( U_{\text{nom}} = +24 \text{ V DC} \)
\[ I_{\text{min}} \text{ at pressure command zero} \]
\[ I_{\text{max}} \text{ (linearmotor without current)} \]
Pressure command signals
Actual pressure signal
Ramp up time = Ramp down time
Relative duty cycle
External fuse per valve
Threshold \[ 1 \]
Hysteresis \[ 1 \]
Nullshift at \( \Delta T = 55 \text{ K} \)
Linearity
Operating fluid DIN 51524
Fluid temperatur range
Viscosity recommended
\[ \beta \geq 75 \]
allowable
Filter rating recommended
\[ \beta \geq 75 \]
allowable
Class of cleanliness according to
NAS 1638 at least
ISO 4406 at least
System filter

1) measured at \( p_p = 140 \text{ bar pressure and viscosity of } \nu = 32 \text{ mm}^2/\text{s} \)
2) leakage port \( Y \) must be used at \( p_T > 50 \text{ bar} \)
3) for long life wear protection of metering lands
Series D635
Connector wiring
Dimensions

Notes:
Supply voltage $U_{\text{nom}} = + 24 \text{ VDC}$.
Current consumption $I_{\text{max}} = 1 \text{ A}$
Power supply according to VDE 0551

All signal lines (also those of external transducers) are shielded.
Shielding connected radially to $\perp (0\text{V})$ on power supply

Connector wiring

Valve with 6+PE pole connector to DIN 43563 and mating connector (metal shell) with leading protective grounding connection ($\perp$).
Thread 7/8-20 UNF 2A.

<table>
<thead>
<tr>
<th>Function</th>
<th>Voltage command</th>
<th>Current command</th>
<th>Current command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>0 to ± 10 VDC</td>
<td>0 to ± 10 mA</td>
<td>+ 4 to + 20 mA</td>
</tr>
<tr>
<td>Supply / Signal ground</td>
<td></td>
<td>$\perp (0 \text{V})$</td>
<td></td>
</tr>
<tr>
<td>Not used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure command signal</td>
<td>0 to + 10 VDC</td>
<td>0 to + 10 mA</td>
<td>+ 4 to + 20 mA</td>
</tr>
<tr>
<td></td>
<td>Input resistance 10 kΩ</td>
<td>load resistance 200 Ω</td>
<td></td>
</tr>
<tr>
<td>Pressure inverted command signal</td>
<td>0 to – 10 VDC</td>
<td>0 to – 10 mA</td>
<td>Not used</td>
</tr>
<tr>
<td></td>
<td>Input resistance 10 kΩ</td>
<td>load resistance 200 Ω</td>
<td></td>
</tr>
<tr>
<td>Actual pressure value</td>
<td>+ 4 to + 20 mA</td>
<td>load resistance 300 to 500 Ω, with respect to $\perp (0 \text{V})$</td>
<td></td>
</tr>
<tr>
<td>Protective grounding</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Dimensions

[Diagram of connector and valve with dimensions]
Series D635
Ordering information

D635

Specification status

- Series-
Specification
E Preseries-
Specification
Z Special-
Specification

Model designation
assigned at the factory

Factory identification

Valve version
P Proportional valve

Rated flow

\[ Q_n \ (l/min) \ at \ \Delta p_n \ per \ land \]

<table>
<thead>
<tr>
<th></th>
<th>5 bar</th>
<th>35 bar</th>
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<tbody>
<tr>
<td>01</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>02</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>04</td>
<td>4</td>
<td>10</td>
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<td>08</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>40</td>
</tr>
</tbody>
</table>

Pressure ranges

<table>
<thead>
<tr>
<th></th>
<th>Rated pressure</th>
<th>max. operating pressure</th>
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</thead>
<tbody>
<tr>
<td>C</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>F</td>
<td>210</td>
<td>250</td>
</tr>
<tr>
<td>J</td>
<td>315</td>
<td>400</td>
</tr>
<tr>
<td>K</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>X</td>
<td>Special range on request</td>
<td></td>
</tr>
</tbody>
</table>

Bushing / spool type

B 3 way: P A, A T: ~ Axis cut, linear characteristic
Z 2 x 2 way: P B, A T: 10 % overlap, linear characteristic (only bypass)
X Special version on request

Valve type

P Pressure control without ramp
B Valve in by-pass
M Valve in main stream
R Pressure control with ramp
P Valve in by-pass
R Valve in main stream

Electrical supply

Z + 24 VDC (19 to 32 VDC)

Signals for pressure control

<table>
<thead>
<tr>
<th>Command</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>0 to 10 V +4 to +20 mA</td>
</tr>
<tr>
<td>P</td>
<td>0 to 10 mA +4 to +20 mA</td>
</tr>
<tr>
<td>S</td>
<td>+4 to +20 mA +4 to +20 mA</td>
</tr>
</tbody>
</table>

Valve connector

S 6 + PE-pole DIN 43563

Seal material

N NBR (Buna N) Standard version
V FPM (Viton) Special version
others on request

Y - Port

0 Closed with plug \( p_{\text{max}} = 50 \text{ bar} \)
1 Open, with filter insert \( p_0 > 50 \text{ bar} \)

Spool position without electrical supply

A defined end position A T connected
B defined end position P A connected

Linear motor

1 Standard

All combinations may not be available. Options may increase price. Technical changes are reserved.
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If there are questions or concerns, please contact MOOG.