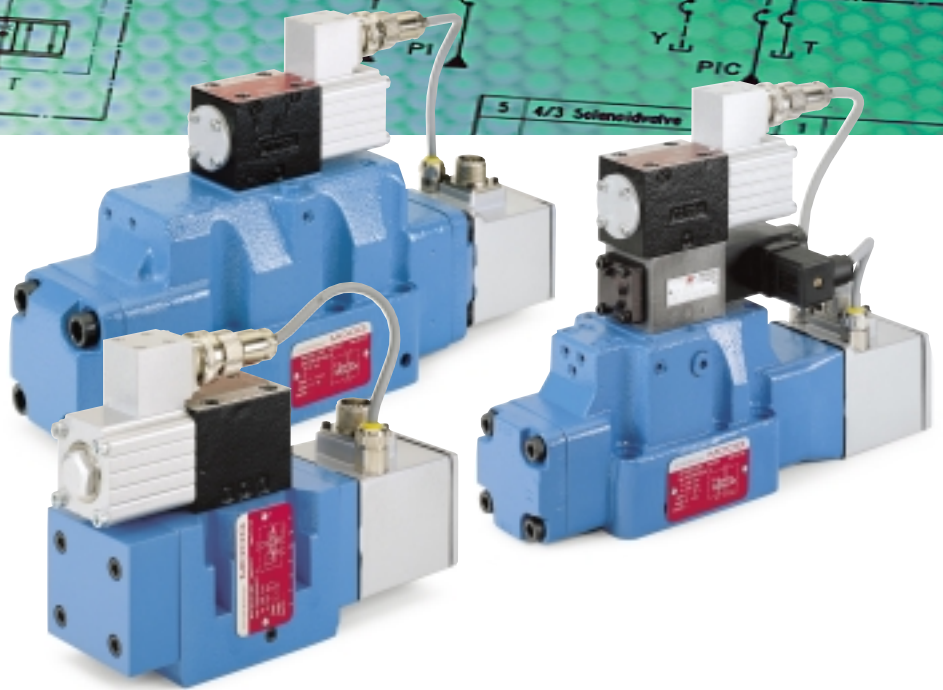
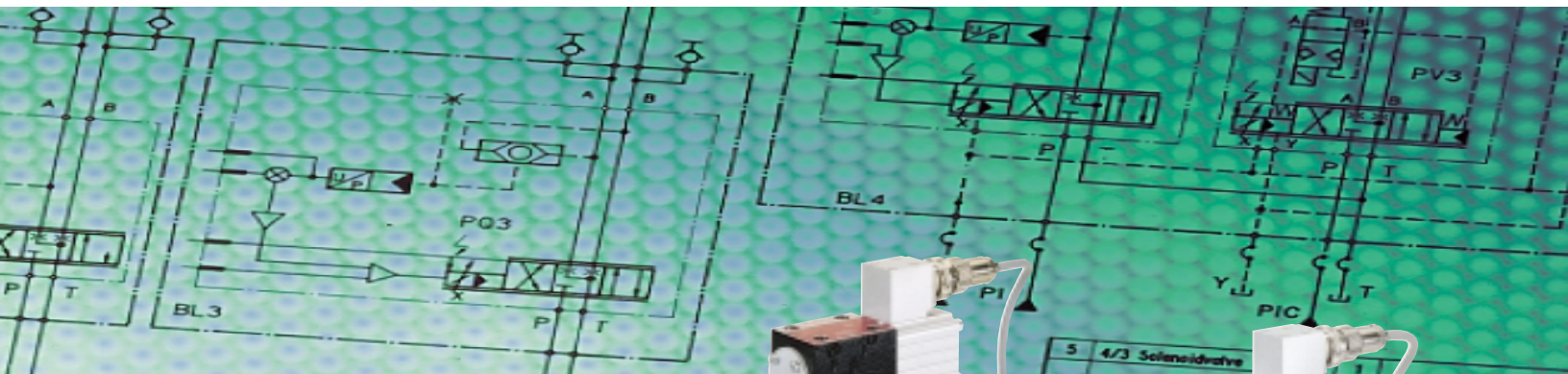


**D680 Series  
Mini Direct Drive Valve Piloted  
Servo-Proportional Control Valves  
with Integrated Electronics  
ISO 4401 Size 05 to 08**



| Section              | Page  |
|----------------------|-------|
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## MOOG SERVO-PROPORTIONAL CONTROL VALVES

For over 25 years Moog has manufactured proportional control valves with integrated electronics. During this time over 150,000 valves have been delivered. These proportional control valves have been proven to provide reliable control of including injection and blow molding equipment, die casting machines, presses, heavy industry equipment, paper and lumber processing and other applications.

## D680 SERIES SERVO-PROPORTIONAL CONTROL VALVES

The D680 Series Direct Drive Piloted Servo-Proportional Control Valves are throttle valves for 2-, 3-, 4- and 5-way applications. These valves are suitable for electrohydraulic position, velocity, pressure or force control systems including those with high dynamic response requirements.

The D680 Series, is a line of direct-drive piloted valves that complement the company's D660 Series ServoJet models.

Like all Moog DDVs, this DDV pilot has a permanent magnet linear force motor that operates the spool directly.

The D680 Series offers these improvements:

- Reduced pilot stage leakage to save energy
- Dynamic performance less dependent on system pressure levels
- Faster step and frequency response to increase system dynamics

The D680 Servo-Proportional Control Valves are equipped with the company's newly developed integrated 24V DC electronics with a pulse-width modulated current driver.

The line's many safety characteristics include enabled signal for the supply voltage, release confirmation, supply voltage monitoring and failsafe spool position confirmation. The two-stage D680 comes in three sizes, which correspond to ISO 4401 sizes 05, 07 and 08. Flow ranges are from 8 gpm to 145 gpm [30 to 550 l/min] at 150-psi [10 bar] drop, while the valves are designed to operate with up to 5,000-psi [345 bar] system pressure.

### Fail-safe Option

D680 valves are available with either a mechanical or electrically controlled fail-safe option. Certain conditions must exist for the fail-safe to work reliably. See the type designation section for fail-safe (page 22) and technical data for fail-safe versions (page 18) for more information.



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



The valve series described in this catalogue have successfully passed EMC tests required by EC Directive. Please refer to the respective references in the electronics section.

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 herein. In case of doubt please contact Moog.

## FEATURES & BENEFITS

### Flexible Design Elements Optimize the Valve to Your Application

The D680 Series Proportional Control Valves are of two-stage design. By combining a fast first stage, a suitable spool drive area and integrated electronics, an optimum proportional valve can be offered.

### Highest Flow Capability for High Velocity Applications

The D07 and D08 (NG 16 to NG 25) D680 Series valves offer the highest flow per body size.

### Reduced Spool Drive Area for Improved Dynamic Response

The D08 (NG 25) D683 and D684 Series valves are available with a stub shaft spool for higher valve dynamic.

### Fail-Safe Versions for Defined Spool Position at Loss of Power

Mechanical and electrically controlled fail-safe versions provide defined safe spool position by a spring and/or a poppet valve, and/or by external hydraulic supply cut off.

### High Dynamics and Higher Flow Capability of Direct Drive Pilot Valve for Highest Dynamic Valve Design.

The high natural frequency of the Direct Drive pilot stage (300 Hz  $\pm$  10%) in conjunction with its high flow capability results in one of the highest dynamic servo-proportional valves on the market.

### Direct Drive Pilot Valve for Dynamic Performance Independent of System Pressure

The electro-mechanical design of the direct drive pilot valve results in dynamic performance of the valve that is nearly independent of system pressure.

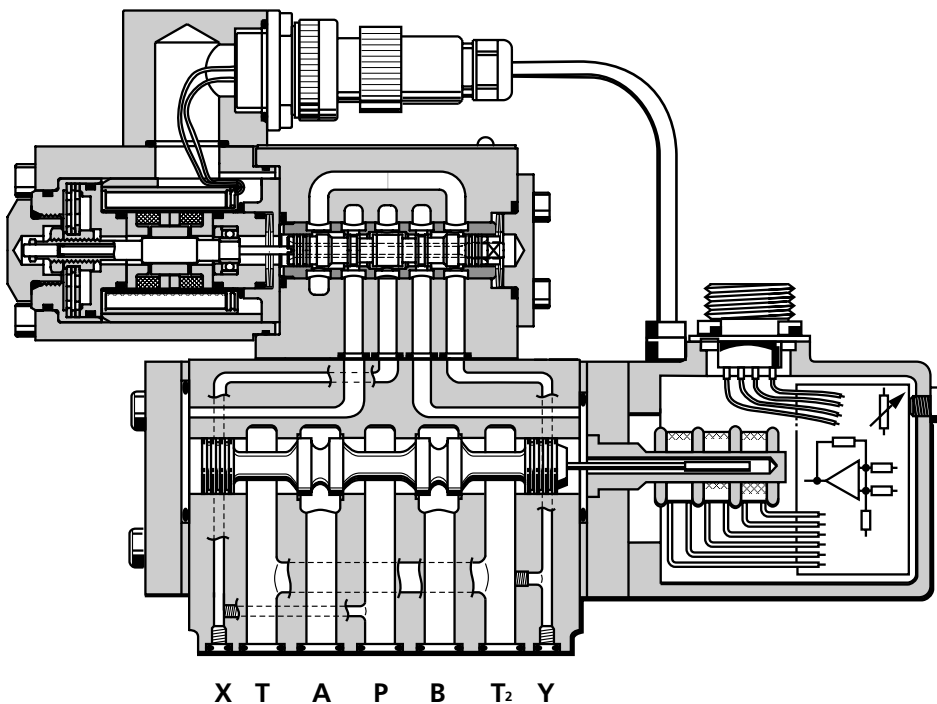
### High Pressure Gain of Direct Drive Pilot Valve for Reliable Operation

The pilot valve's high pressure gain improves the spool driving forces of the main stage. This ensures enhanced main stage spool position control even in situations with high internal flow forces and contaminated fluids.

### Improved Resistance to Contamination Reduces Down Time

The Direct Drive pilot stage valves have high spool driving forces offering greater chip shearing forces, making the valve more tolerant to contamination.

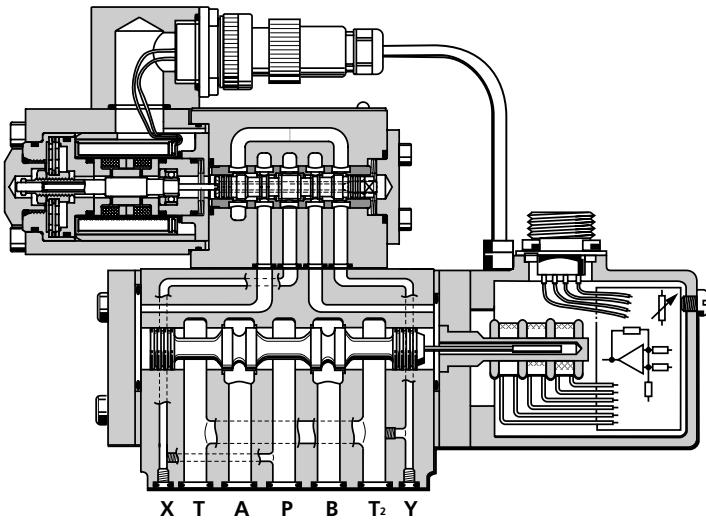
2-Stage Proportional Control Valve



**OPERATING PRINCIPLE OF THE DIRECT DRIVE PILOT STAGE**

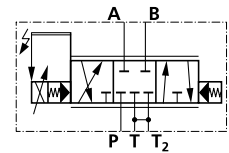
The D633 Series pilot valve consists of a permanent magnet linear force motor, a drive rod connecting motor armature and the spool, guided within a bushing. The linear force motor contains a coil, permanent magnets, pole pieces, an armature and a centering spring. The 4-way spool controls fluid flow from the pressure port to one of the load ports and also from the other load port to return. Deflection of the centering spring, due to spool displacement, provides a return force for the armature. An electric current applied to the coil of the linear force motor

produces an electromagnetic flux dependent on the current polarity and amplitude. This electromagnetic flux is superimposed on the permanent magnetic flux in the airgaps between armature and pole pieces. This results in a polarity dependent displacement of the armature against the centering spring force. The spool being connected to the armature by a rod shares the armature motion. Flow forces acting on the spool due to the fluid flow through the valve and friction forces between spool and bushing due to contaminated fluid are also overcome by the force motor. The position of the spool is approximately proportional to the coil current. Spring force and motor force work together in the same direction when the valve spool travels back to center position. At centered position the linear force motor requires no current.



**Hydraulic symbol:**

Symbol shown with pilot pressure and electric supply on and zero command signal.

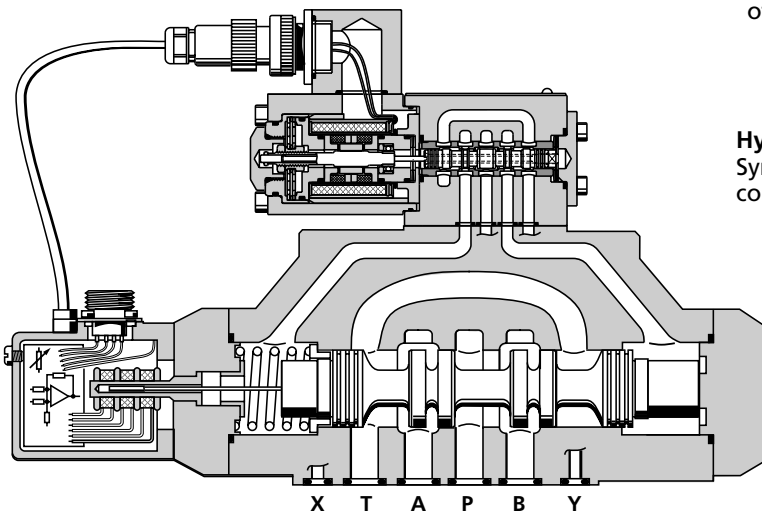


**D681 Series, 2-Stage Proportional Control Valve with D633-7 Series Pilot Valve**

**OPERATING PRINCIPLE OF THE TWO-STAGE VALVE**

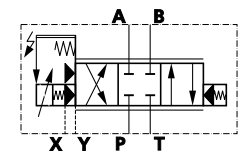
The main stage spool position control loop, consisting of main stage spool, position transducer and pilot valve, is closed by the integrated electronics. An electric command signal (flow rate set point) is applied to the integrated position controller which drives the current in the pilot valve coil.

The position transducer (LVDT) which is excited via an oscillator measures the position of the main spool (actual value, position voltage). This signal is then demodulated and fed back to the controller where it is compared with the command signal. The controller drives the pilot valve until the error between command signal and feedback signal is zero. Thus the position of the main spool is proportional to the command signal.



**Hydraulic symbol:**

Symbol shown with pilot pressure and electric supply on and zero command signal.



**D683 Series 2-stage Proportional Valve with D633-7 Series Pilot Valve**

## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

### Operating pressure Range

|                  |                               |
|------------------|-------------------------------|
| Ports P, A and B | up to 5,000 psi [350 bar]     |
| Port T           | see data of individual series |

### Temperature Range

|         |                                   |
|---------|-----------------------------------|
| Ambient | -4 °F to +140 °F [-20°C to +60°C] |
| Fluid   | -4 °F to +176 °F [-20°C to +80°C] |

### Seal Material

NBR, FPM and others on request

### Operating Fluid

mineral oil based hydraulic fluid (DIN 51524, part 1 to 3), other fluids on request

### Viscosity

|             |                       |
|-------------|-----------------------|
| Recommended | 15 to 45 centistrokes |
| Allowable   | 5 to 400 centistrokes |

### System Filtration

Pilot stage or pilot valve: high pressure filter (without bypass, but with dirt alarm) mounted in the main flow and if possible directly upstream of the valve.

Main stage: high pressure filter as for the pilot stage. When used in combination with a fast regulating VD-pump a bypass filter is recommended.

### Class of Cleanliness

The cleanliness of the hydraulic fluid greatly effects the performance (spool positioning, high resolution) and wear (metering edges, pressure gain, leakage) of the valve.

### Recommended Cleanliness Class

|                      |                    |
|----------------------|--------------------|
| For normal operation | ISO 4406 < 16 / 13 |
| For longer life      | ISO 4406 < 14 / 11 |

### Filter Rating recommended

|                      |  |
|----------------------|--|
| For normal operation | $\beta_{10} \geq 75$ (10 $\mu\text{m}$ absolute) |
| For longer life      | $\beta_5 \geq 75$ (6 $\mu\text{m}$ absolute)     |

### Installation Options

any position, fixed or movable

### Vibration

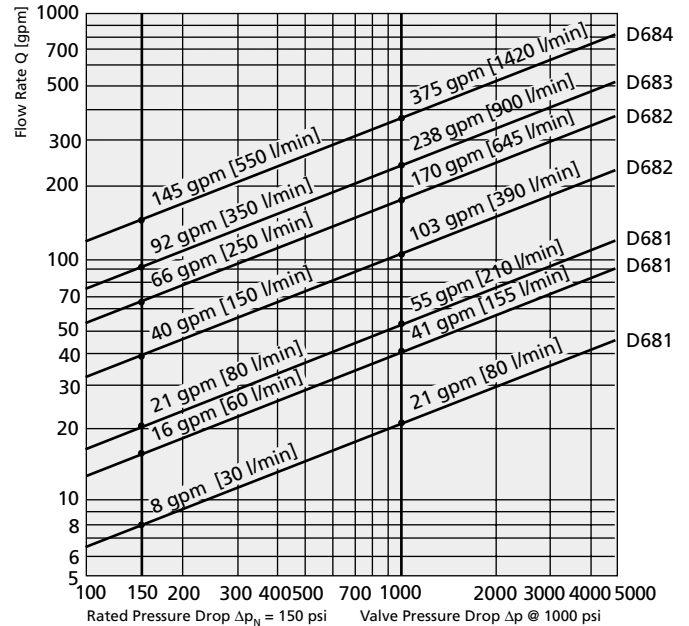
30 g, 3 axes

### Degree of Protection

EN60529: class IP 65, with mating connector mounted

### Shipping Plate

Delivered with an oil sealed shipping plate under the mounting surface.



### Valve Flow Diagram

Valve flow for maximum valve opening (100% command signal) as a function of the valve pressure drop

## VALVE FLOW CALCULATIONS

A valve's flow is dependent upon its electrical command signal and valve pressure drop. The flow for a given valve pressure drop can be calculated using the square root function for sharp edged orifices as follows:

$$Q = Q_N \sqrt{\frac{\Delta p}{\Delta p_N}}$$

Q [gpm] = calculated flow

$Q_N$  [gpm] = rated flow

$\Delta p$  [psi] = actual valve pressure drop

$\Delta p_N$  [psi] = rated valve pressure drop

If large flow rates with high valve pressure drop are required an appropriate higher pilot pressure has to be selected in order to overcome the flow forces. An approximate value can be calculated as follows:

$$P_x \geq .012 \times \frac{Q}{A_k} \times \sqrt{\Delta p}$$

Q [gpm] = max. flow

$\Delta p$  [psi] = valve pressure drop with Q

$A_k$  [in<sup>2</sup>] = spool drive area

$P_x$  [psi] = pilot pressure

The pilot pressure  $p_x$  has to be at least 215 psi [15 bar] above the return pressure of the pilot stage.

---

**GENERAL REQUIREMENTS FOR VALVE ELECTRONICS**

- > Supply 24 VDC, min. 18 VDC, max. 32 VDC. Current consumption max. 800 mA
- > All signal lines, also those of external transducers, shielded
- > Shielding connected radially to  $\perp$  (0 V), power supply side and connected to the mating connector housing (EMC)
- > **EMC:** Meets the requirements of EN 55011:1998 class B, EN 50082-2:1995, performance criteria class A
- > Protective grounding lead  $\geq .75 \text{ mm}^2$  [18 AWG]  
Consider voltage losses between cabinet and valve.
- > Note: When making electrical connections to the valve (shield, protective earth), appropriate measures must be taken to ensure that locally different earth potentials do not result in excessive ground currents. See also Moog Application Note AM 353 E.

**VALVE ELECTRONICS WITH SUPPLY VOLTAGE 24 VOLT AND 6+PE POLE CONNECTOR**

**Command signal 0 to ±10 mA floating,  
Valves with current command input**

The spool stroke of the valve is proportional to  $I_D = -I_E$ . 100 % valve opening P → A and B → T is achieved at  $I_D = +10$  mA. At 0 mA command the spool is in its center position. The input pins D and E are inverting. Either pin D or E is used according to the required operating direction. The other pin is connected to signal ground at cabinet side.

**Command signal 0 to ±10 V,  
Valves with voltage command input**

The spool stroke of the valve is proportional to  $(U_D - U_E)$ . 100 % valve opening P → A and B → T is achieved at  $(U_D - U_E) = +10$  V. At 0 V command the spool is in its center position. The input stage is a differential amplifier. If only one command signal is available, pin D or E is connected to signal ground at cabinet side, according to the required operating direction.

**Actual value 4 to 20 mA**

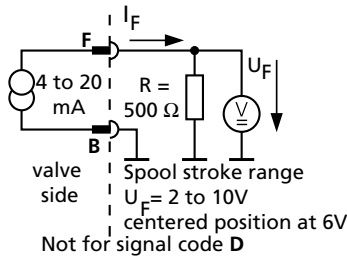
The actual spool position value can be measured at pin F (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P → A and B → T.

The position signal output 4 to 20 mA can be used to detect a cable break when  $I_F = 0$  mA.

For failure detection purposes it is recommended to connect pin F of the mating connector and route this signal to the control cabinet.

**CIRCUIT DIAGRAM**

**Circuit diagram for measurement of actual  $I_F$  (position of main spool) for valves with 6+PE pole connector**



**Note: Enable input**

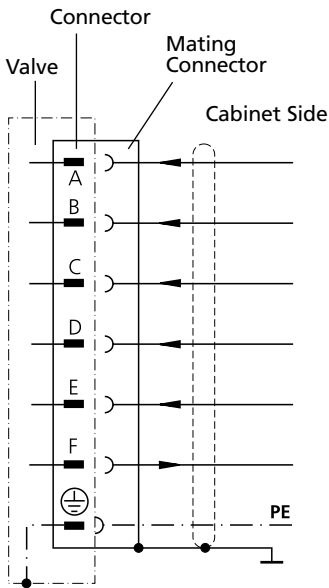
With enable signal off, the main spool will move to a safe position.

- a) Centered position (unbiased pilot valve function code A')
- b) End position (biased pilot valve function code B')

')} see type designation

**CONNECTOR WIRING**

Wiring for valves with 6+PE pole connector to EN 175201 Part 804<sup>2)</sup>, and mating connector (type E, metal shell) with leading protective earth connection ⊕.



| Function                           | Voltage Command   | Current Command   |
|------------------------------------|---|---|
| Supply                             | 24 VDC (min. 18 VDC, max. 32 VDC)   | Static: $I_{max}$ 200 mA<br>Dynamic: $I_{max}$ 800 mA   |
| Supply/Signal Ground               | ⊥ (0 V)   |   |
| Enabled<br>Not Enabled             | $U_{C-B} > +8.5$ VDC<br>$U_{C-B} < +6.5$ VDC  | $I_e = 2.0$ mA at +24 VDC (see note above)  |
| Input Rated Command (differential) | $U_{D-E} = 0$ to $\pm 10$ V<br>$R_e = 10$ kΩ  | Input Command $I_D = -I_E: 0$ to $\pm 10$ mA ( $R_e=200$ Ω)<br>Input Command (Inverted) $I_E = -I_D: 0$ to $\pm 10$ mA<br>Inputs for $U_{D-B}$ and $U_{E-B}$ for both signal types is limited to: min. -15 V and max. +32 V |
| Output Actual Value spool position | $I_{F-B}: = 4$ to 20 mA. At 12 mA spool is in centered position. $R_L = 100$ to 500Ω<br>Signal code D: $U_{F-B} = 2$ to 10 V. At 6 V spool is in centered position. $R_a = 500$ Ω |   |
| Protective Earth                   |   |   |

<sup>2)</sup> formerly DIN 43563

**VALVE ELECTRONICS WITH SUPPLY VOLTAGE 24 VOLT AND 11+PE POLE CONNECTOR**

**Command signal**

**0 to ±10 mA floating, Valves with current command input**

The spool stroke of the valve is proportional to  $I_4 = -I_5$ . 100 % valve opening P → A and B → T is achieved at  $I_4 = +10$  mA. At 0 mA command the spool is in its center position. The input pins 4 and 5 are inverting. Either pin 4 or 5 is used according to the required operating direction. The other pin is connected to signal ground at cabinet side.

**Command signal**

**0 to ±10 V, Valves with voltage command input**

The spool stroke of the valve is proportional to  $(U_4 - U_5)$ . 100% valve opening P → A and B → T is achieved at  $(U_4 - U_5) = +10$  V. At 0 V command the spool is in its center position. The input stage is a differential amplifier. If only one command signal is available, pin 4 or 5 is connected to signal ground at cabinet side, according to the required operating direction.

**Actual value 4 to 20 mA**

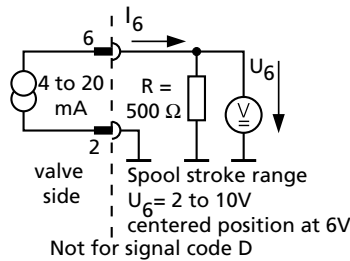
The actual spool position value can be measured at pin 6 (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P → A and B → T.

The position signal output 4 to 20 mA can be used to detect a cable break when  $I_6 = 0$  mA.

For failure detection purposes it is recommended to connect pin 6 of the mating connector and route this signal to the control cabinet.

**CIRCUIT DIAGRAM**

**Circuit diagram for measurement of actual  $I_6$  (position of main spool) for valves with 11+PE pole connector**



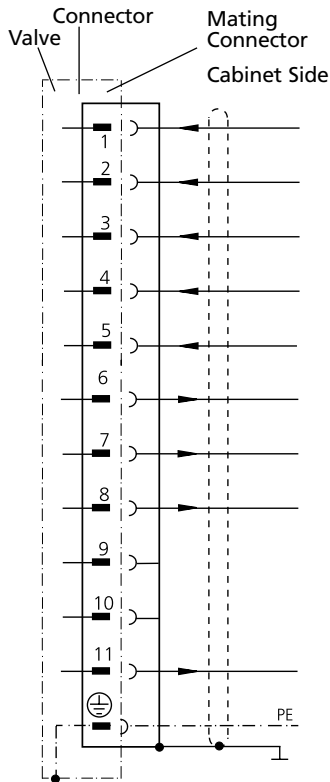
**Note: Enable input**

With enable signal off, the main spool will move to a safe position.

- a) Centered position (unbiased pilot valve function code E<sup>1)</sup>)
- b) End position (biased pilot valve function code F<sup>1)</sup>)

<sup>1)</sup> see type designation

**CONNECTOR WIRING**



Wiring for valves with 11+PE pole connector to EN 175201 Part 804<sup>2)</sup>, and mating connector (type E, metal shell) with leading protective earth connection ⊕.

| Function                           | Voltage Command  | Current Command   |
|------------------------------------|--|---|
| Supply                             | 24 VDC (min. 18 VDC, max. 32 VDC)  | Static: $I_{max}$ : 200 mA<br>Dynamic: $I_{max}$ : 800 mA   |
| Supply/Signal Ground               | ⊥ (0 V)  |   |
| Enabled<br>Not Enabled             | $U_{3-2} > 8.5$ VDC<br>$U_{3-2} < 6.5$ VDC   | $I_e = 2.0$ mA at +24 VDC (see note above)  |
| Input Rated Command (differential) | $U_{4-5} = 0$ to $\pm 10$ V<br>$R_e = 10$ kΩ   | Input Command $I_4 = -I_5$ : 0 to $\pm 10$ mA ( $R_e=200$ Ω)<br>Input Command (Inverted) $I_5 = -I_4$ : 0 to $\pm 10$ mA ( $R_e=200$ Ω) |
| Output Actual Value Spool Position | Input voltage for $U_{4-2}$ and $U_{5-2}$ for both signal types is limited to min. -15 V and max. +32 V<br>$I_{6-2} = 4$ to 20 mA. At 12 mA spool is in centered position. $R_i = 100$ to 500 Ω<br>Signal code D: $U_{6-2} = 2$ to 10 V. At 6 V spool is in centered position. $R_s = 500$ Ω |   |
| Auxiliary Signal                   | Spool position $U_{7-2} = 13$ to 3 V. At 8 V spool is in centered position. $R_s = 5$ kΩ   |   |
| Valve Ready                        | $U_{8-2} > 8.5$ VDC: Enable and supply ok<br>$U_{8-2} < 6.5$ VDC: Not enabled or supply not ok   | Output $I_{max}$ : 20 mA  |
| Not Used                           |  |   |
| Not Used                           |  |   |
| Position Error, Logic              | $U_{11-2} > 8.5$ VDC: < 30%<br>$U_{11-2} < 6.5$ VDC: > 30%   | Output $I_{max}$ : 20 mA  |
| Protective Earth                   |  |   |

<sup>2)</sup> formerly DIN 43651



**FAIL-SAFE VALVE ELECTRONICS WITH SUPPLY VOLTAGE 24 VOLT AND 11+PE POLE CONNECTOR**

**Command signal**

**0 to ±10 mA floating, Valves with current command input**

The spool stroke of the valve is proportional to  $I_4 = -I_5$ . 100 % valve opening P → A and B → T is achieved at  $I_4 = +10$  mA. At 0 mA command, the spool is in its center position. The input pins 4 and 5 are inverting. Either pin 4 or 5 is used according to the required operating direction. The other pin is connected to signal ground at cabinet side.

**Command signal**

**0 to ±10 V Valves with voltage command input**

The spool stroke of the valve is proportional to  $(U_4 - U_5)$ . 100 % valve opening P → A and B → T is achieved at  $(U_4 - U_5) = +10$  V. At 0 V command the spool is in its center position. The input stage is a differential amplifier. If only one command signal is available, pin 4 or 5 is connected to signal ground at cabinet side, according to the required operating direction.

**Actual value 4 to 20 mA**

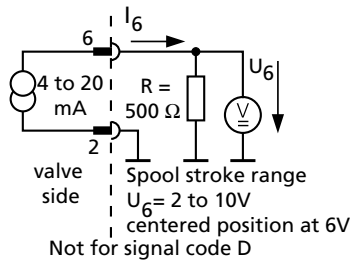
The actual spool position value can be measured at pin 6 (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P → A and B → T.

The position signal output 4 to 20 mA allows to detect a cable break when  $I_6 = 0$  mA.

For failure detection purposes it is advised to connect pin 6 of the mating connector and route this signal to the control cabinet.

**CIRCUIT DIAGRAM**

**Circuit diagram for measurement of actual  $I_6$  (position of main spool) for valves with 11+PE pole connector**



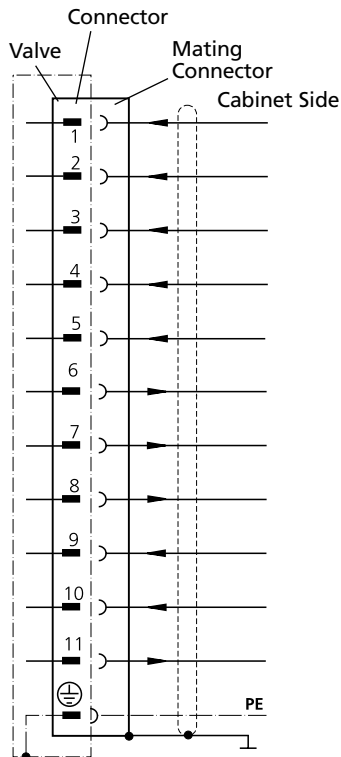
**Note: Enable input**

With enable signal off, the main spool will move to a safe position.

- a) Centered position (unbiased pilot valve function code G<sup>1)</sup>)
- b) End position (biased pilot valve function code H<sup>1)</sup>)

<sup>1)</sup> see type designation

**CONNECTOR WIRING**



Wiring for valves with 11+PE pole connector to EN 175201 (Part 804<sup>2)</sup>) and mating connector (type E, metal shell) with leading protective earth connection ⊕.

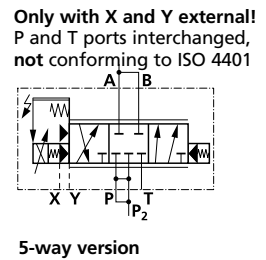
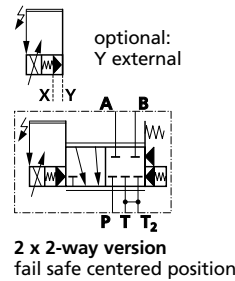
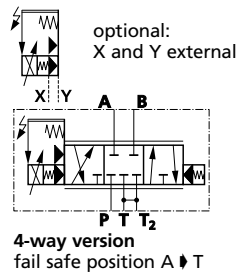
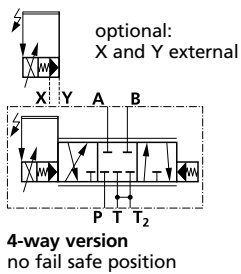
| Function                                      | Voltage Command   | Current Command  |
|---|---|--|
| Supply  | 24 VDC (min. 18 VDC, max. 32 VDC)   | Static: $I_{max} = 200$ mA<br>Dynamic: $I_{max} = 800$ mA  |
| Supply/Signal Ground                          | ⊥ (0 V)   |  |
| Enabled<br>Not Enabled                        | $U_{3-2} > 8.5$ VDC<br>$U_{3-2} < 6.5$ VDC  | $I_e = 2.0$ mA at +24 VDC (see note above)   |
| Input Rated Command (differential)            | $U_{4-5} = 0$ to $\pm 10$ V<br>$R_e = 10$ kΩ  | Input Command $I_4 = -I_5$ ; 0 to $\pm 10$ mA<br>Input Command (Inverted) $I_5 = -I_4$ ; 0 to $\pm 10$ mA ( $R_e = 200 \Omega$ ) |
| Output Actual Value Spool Position            | Inputs $U_{4-2}$ and $U_{5-2}$ for both signal types limited to min. -15 V and max. +32 V<br>$I_{6-2} = 4$ to 20 mA. At 12 mA spool is in centered position. $R_s = 100$ to 500 Ω<br>Signal code D: $U_{6-2} = 2$ to 10 V. At 6 V spool is in centered position. $R_s = 500 \Omega$ |  |
| Auxiliary Signal                              | Spool position $U_{7-2} = 13$ to 3 V. At 8 V spool is in centered position. $R_s = 5$ kΩ  |  |
| Valve Ready                                   | $U_{8-2} > 8.5$ VDC: Enabled and supply ok<br>$U_{8-2} < 6.5$ VDC: Not enabled or supply not ok   | Output $I_{max} = 20$ mA   |
| Supply, 4/2-way solenoid valve                | 24 VDC (min. 22.8 VDC, max. 26.4 VDC)   |  |
| Supply, 4/2-way solenoid valve, signal ground | ⊥ (0 V)   |  |
| Position Error, Logic                         | $U_{11-2} > 8.5$ VDC: < 30%<br>$U_{11-2} < 6.5$ VDC: > 30%  | Output $I_{max} = 20$ mA   |
| Protective Earth                              |   |  |

<sup>2)</sup> formerly DIN 43651

## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

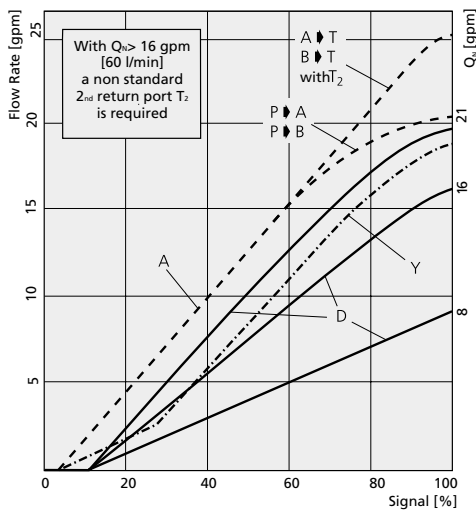
|                    |   | English [Metric]                   | D681 - P . H.UO/W                                | D681 - P . H.UF   |
|--------------------|---|------------------------------------|--|---|
| Mounting Pattern   | ISO with additional 2nd T port  |                                    | ISO 4401 - 05 - 05 - 0 - 94                      | ISO 4401 - 05 - 05 - 0 - 94                                   |
| Valve Body Version |   |                                    | 4-way, 2 x 2-way and 5-way                       | 4-way, 2 x 2-way and 5-way                                    |
| Pilot Valve Series | $Q_N$ ( $\pm 10\%$ ) at $\Delta p_N = 1,015$ psi [70 bar]<br>D633-7...  | gpm [l/min]                        | 2-stage, standard spool<br>O/W (spring centered) | 2-stage, standard spool<br>F spring A $\blacktriangleright$ T |
| Pilot Connection   |   |                                    | 0.92 [3.5]                                       | 0.97 [3.7]  |
| Mass               |   | lb [kg]                            | Standard<br>X and Y                              | Biased<br>X and Y   |
| Rated Flow         | ( $\pm 10\%$ ) at $\Delta p_N = 75$ psi [5 bar] per land  | gpm [l/min]                        | O = 15 [6.8] / W = 17.6 [8.0]                    | 15 [6.8]  |
| Operating Pressure | max.  | psi [bar]                          | 8 [30] / 16 [60] / 21[80]                        | 8 [30] / 16 [60] / 20 [80]                                    |
| Response Time*     | port P, A, B, T and X with Y external<br>port T with Y internal and<br>Y (pressure peaks 3,045 psi [210 bar])<br>for 0 to 100% stroke | ms                                 | 5,075 [350]                                      | 5,075 [350]   |
| Threshold*         |   | psi [bar]                          | 1,015 [70]                                       | 1,015 [70]  |
| Hysteresis*        |   | [%]                                | 11.0   | 11.0  |
| Null Shift*        | with $\Delta T = 100^\circ\text{F}$ [38°C]  | [%]                                | < 0.03   | < 0.03  |
| Null Leakage Flow* | total max. (~ critical lap)   | [%]                                | < 0.20   | < 0.20  |
| Null Leakage Flow* | pilot stage only, max.  | [%]                                | < 1.5  | < 1.5   |
| Pilot Flow*        | max., for 100% step input   | gpm [l/min]                        | 0.58 [2.2]                                       | 0.58 [2.2]  |
| Main Spool Stroke  |   | gpm [l/min]                        | 0.11 [0.40]                                      | 0.11 [0.40]   |
| Spool Drive Area   |   | gpm [l/min]                        | 1.6 [6.0]  | 1.7 [6.5]   |
|                    |   | in [mm]                            | $\pm 0.12$ [ $\pm 3.0$ ]                         | $\pm 0.12$ [ $\pm 3.0$ ]                                      |
|                    |   | in <sup>2</sup> [cm <sup>2</sup> ] | 0.31 [2.0]                                       | 0.31 [2.0]  |

\* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]



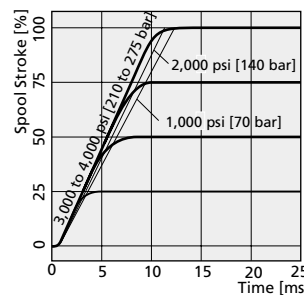
## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

Flow vs. Signal Curve  
at  $\Delta p_N = 75$  psi [5 bar] per land

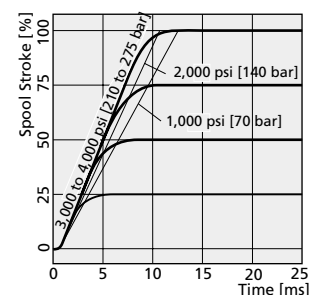


Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]

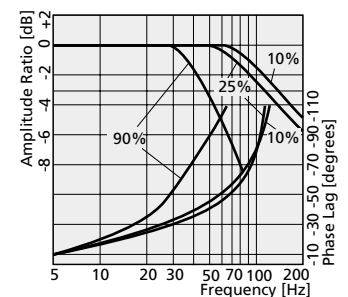
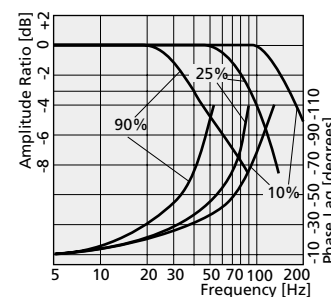
D681 - P . H.UO/W  
Step Response



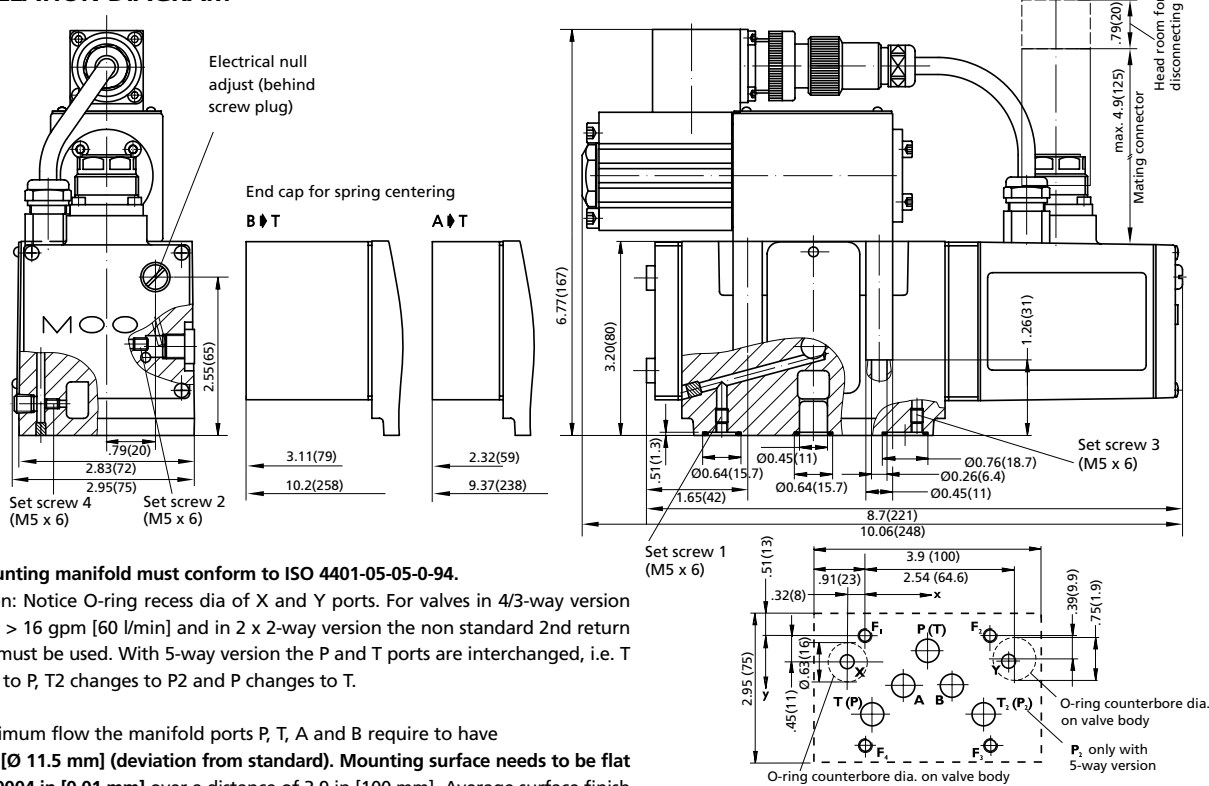
D681 - P . H.UF



Frequency Response



**INSTALLATION DIAGRAM**



The mounting manifold must conform to ISO 4401-05-05-0-94.  
 Attention: Notice O-ring recess dia of X and Y ports. For valves in 4/3-way version with QN > 16 gpm [60 l/min] and in 2 x 2-way version the non standard 2nd return port T2 must be used. With 5-way version the P and T ports are interchanged, i.e. T changes to P, T2 changes to P2 and P changes to T.

For maximum flow the manifold ports P, T, A and B require to have  $\varnothing .45$  in [ $\varnothing 11.5$  mm] (deviation from standard). Mounting surface needs to be flat within  $.0004$  in [ $0.01$  mm] over a distance of 3.9 in [100 mm]. Average surface finish value, Ra, better than  $\sqrt{3}$

|   | P                         | A                         | B                         | T                         | T <sub>2</sub>            | X                        | Y                        | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|--------------------------|----------------|----------------|----------------|----------------|
|   | $\varnothing 0.45$ [11.5] | $\varnothing 0.45$ [11.5] | $\varnothing 0.45$ [11.5] | $\varnothing 0.45$ [11.5] | $\varnothing 0.45$ [11.5] | $\varnothing 0.25$ [6.3] | $\varnothing 0.25$ [6.3] | M6             | M6             | M6             | M6             |
| x | 1.1 [27.0]                | 0.66 [16.7]               | 1.5 [37.3]                | 0.15 [3.2]                | 2.0 [50.8]                | -0.32 [-8.0]             | 2.4 [62.0]               | 0              | 2.1 [54.0]     | 2.1 [54.0]     | 0              |
| y | 0.25 [6.3]                | 0.84 [21.4]               | 0.84 [21.4]               | 1.3 [32.5]                | 1.3 [32.5]                | 0.43 [11.0]              | 0.43 [11.0]              | 0              | 0              | 1.8 [46.0]     | 1.8 [46.0]     |

**CONVERSION INSTRUCTION**

|   |                          |                          |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw M5 x 6         |                          | Pilot Flow Return        | Set Screw M5 x 6         |                          |
|   | Internal P<br>External X | bore 1<br>closed<br>open | bore 2<br>open<br>closed | Internal T<br>External Y | bore 3<br>closed<br>open | bore 4<br>open<br>closed |

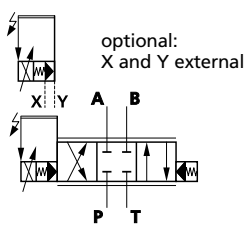
**SPARE PARTS AND ACCESSORIES**

|  |   |   |   |
|--|---|---|---|
| O-rings (included in delivery)                               |   | NBR 85 Shore                                  | FPM 85 Shore  |
| for P, T, T <sub>2</sub> , A, B, X                           | 6 pieces ID 0.49 [12.4] x $\varnothing$ 0.07 [1.8]  | 45122-004                                     | 42082-004   |
| for Y  | 1 piece ID 0.61 [15.6] x $\varnothing$ 0.07 [1.8]   | 45122-011                                     | 42082-011   |
| Mating connector, waterproof IP65 (not included in delivery) |   | for cable diameter                            |   |
| 6+PE pole  | B97007-061  | DIN 43563                                     | min. $\varnothing$ 0.39 [10.0] max. $\varnothing$ 0.47 [12.0] |
| 11+PE pole   | B97067-111  | DIN 43651                                     | min. $\varnothing$ 0.43 [11.0] max. $\varnothing$ 0.51 [13.0] |
| Flushing plates  | for P, A, B, T, T <sub>2</sub> , X, Y<br>B67728-001 | for P, T, T <sub>2</sub> , X, Y<br>B67728-002 | for P, T, T <sub>2</sub> , and X, Y<br>B67728-003             |
| Mounting manifolds   | see special data sheet                              |   |   |
| Mounting bolts (not included in delivery)                    |   | required torque                               | required  |
| M6 x 40 DIN EN ISO 4762-10.9                                 | A03665-060-040                                      | 115 in-lb [13 Nm]                             | 4 pieces  |

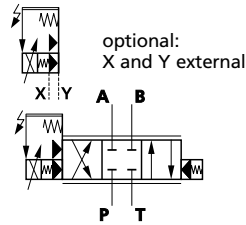
## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

|  | English [Metric]   | D682 -P. H.UO/W   | D682 -P. H.UF/D   |
|--|--|---|---|
| Mounting pattern   |  | ISO 4401 - 07 - 06 - 0 - 94   | ISO 4401 - 07 - 06 - 0 - 94   |
| Valve version  |  | 4-way, 2 x 2-way<br>2-stage, standard spool<br>O/W (spring centred) | 4-way, 2 x 2-way<br>2-stage, standard spool<br>F/D (spring A/B $\blacktriangleright$ T) |
| Pilot Valve Series   | $Q_N$ ( $\pm 10\%$ ) at $\Delta p_N = 1,015$ psi         | 5.3 [20.0]  | 4.0 [15.0]  |
| Pilot connection   | D633-7...  | Standard  | Biased  |
| Mass   |  | X and Y   | X and Y   |
| Rated flow   | ( $\pm 10\%$ ) at $\Delta p_N = 75$ psi [5 bar] per land | O = 26.4 [12.0] / W = 29.5 [13.4]                                   | 26.4 [12.0]   |
| Operating pressure max.  |  | 39.6 [150] / 66.0 [250]   | 39.6 [150] / 66.0 [250]   |
| ports P, A, B, T and X with Y external                             |  | psi [bar]   | 5,075 [350]   |
| ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar]) |  | psi [bar]   | 1,015 [70]  |
| Response time*   | for 0 to 100 % stroke                                    | [ms]  | 11.0  |
| Threshold*   |  | [%]   | < 0.02  |
| Hysteresis*  |  | [%]   | < 0.20  |
| Null shift*  | at $\Delta T = 100^\circ\text{F}$ [38°C]                 | [%]   | < 1.2   |
| Null leakage flow*   | total max. (~ critical lap)                              | gpm [l/min]   | 0.79 [3.0]  |
| Null leakage flow*   | pilot stage only, max.                                   | gpm [l/min]   | 0.13 [0.50]   |
| Pilot flow*  | max., at 100% step input                                 | gpm [l/min]   | 6.6 [25.0]  |
| Main spool stroke  |  | in [mm]   | $\pm 0.20$ [ $\pm 5.0$ ]  |
| Spool drive area   |  | in <sup>2</sup> [cm <sup>2</sup> ]                                  | 0.78 [5.0]  |

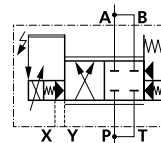
\* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]



4-way version  
no fail-safe position



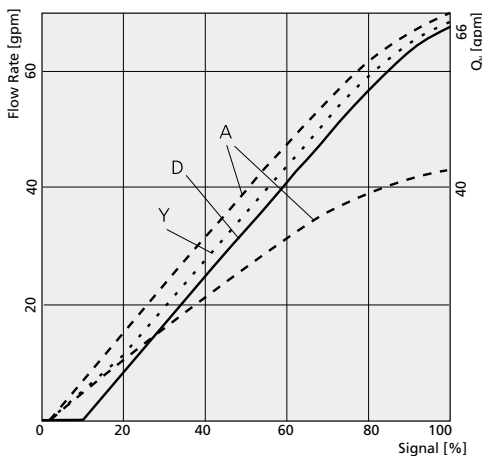
4-way version  
fail-safe position A  $\blacktriangleright$  T



2 x 2-way version  
fail-safe centered position by mechanical spool stop

## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

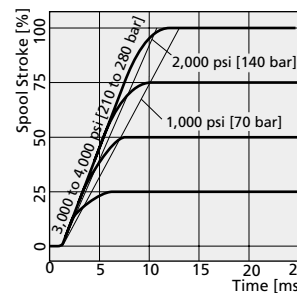
Flow vs. Signal Curve  
at  $\Delta p_N = 75$  psi [5 bar] per land



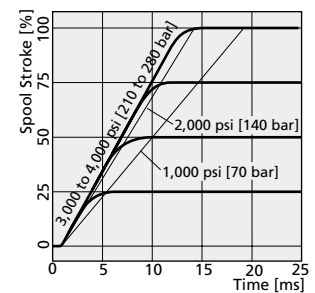
A: ~critical lap, linear characteristic  
D: 10% overlap, linear characteristic  
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]

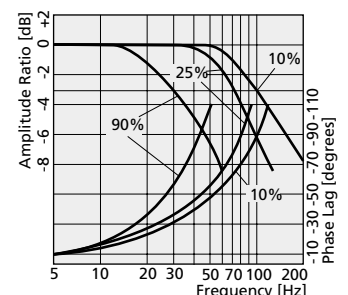
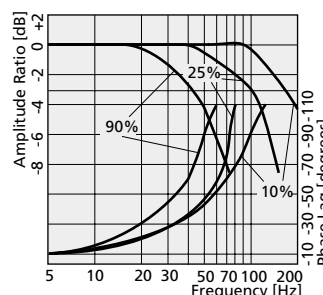
D682 -P. H. UO/W  
Step Response



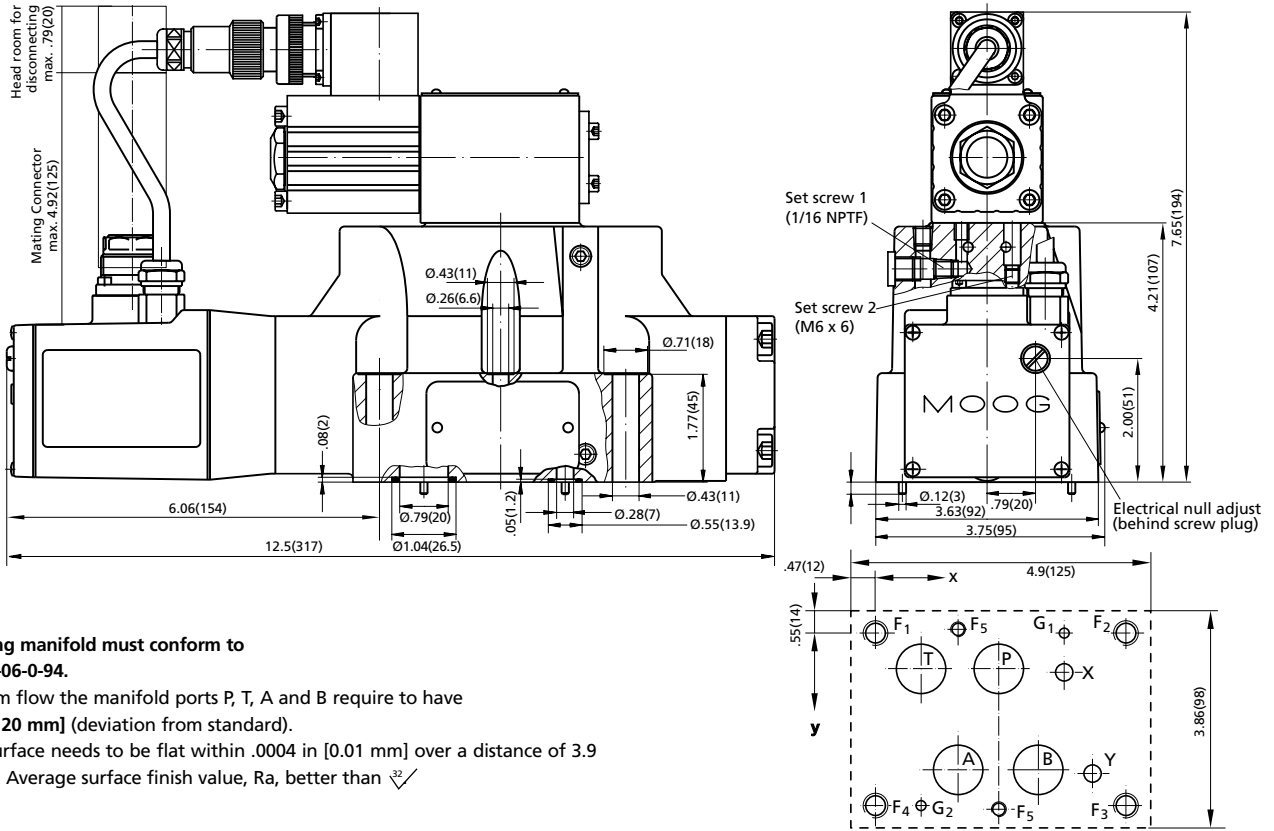
D682 -P. H. UF/D



Frequency Response



**INSTALLATION DIAGRAM**



The mounting manifold must conform to ISO 4401-07-06-0-94.  
 For maximum flow the manifold ports P, T, A and B require to have Ø 0.79 in [Ø 20 mm] (deviation from standard).  
 Mounting surface needs to be flat within .0004 in [0.01 mm] over a distance of 3.9 in [100 mm]. Average surface finish value, Ra, better than  $\sqrt{32}$

|   | P            | A            | T            | B            | X           | Y           | G <sub>1</sub> | G <sub>2</sub> | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> | F <sub>5</sub> | F <sub>6</sub> |
|---|--------------|--------------|--------------|--------------|-------------|-------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|   | Ø0.79 [20.0] | Ø0.79 [20.0] | Ø0.79 [20.0] | Ø0.79 [20.0] | Ø0.25 [6.3] | Ø0.25 [6.3] | Ø0.16 [4.0]    | Ø0.16 [4.0]    | M10            | M10            | M10            | M10            | M6             | M6             |
| x | 2.0 [50.0]   | 1.3 [34.1]   | 0.72 [18.3]  | 2.6 [65.9]   | 3.0 [76.6]  | 3.5 [88.1]  | 3.0 [76.6]     | 0.72 [18.3]    | 0              | 4.0 [102]      | 4.0 [102]      | 0              | 1.3 [34.1]     | 2.0 [50.0]     |
| y | 0.56 [14.3]  | 2.2 [55.6]   | 0.56 [14.3]  | 2.2 [55.6]   | 0.63 [15.9] | 2.3 [57.2]  | 0              | 2.8 [69.9]     | 0              | 0              | 2.8 [69.9]     | 2.8 [69.9]     | -0.06 [1.6]    | 2.8 [71.5]     |

**CONVERSION INSTRUCTION**

|   |                          |                              |                          |                           |
|---|--------------------------|------------------------------|--------------------------|---------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw-bore 1 (1/16 NPTF) | Pilot Flow Return        | Set Screw-bore 2 (M6 x 6) |
|   | Internal P<br>External X | open<br>closed               | Internal T<br>External Y | open<br>closed            |

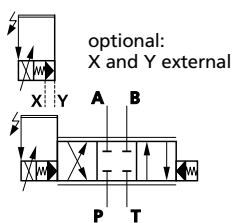
**SPARE PARTS AND ACCESSORIES**

|  |   |                   |  |              |
|--|---|-------------------|--|--------------|
| O-rings (included in delivery)                               |   |                   | NBR 85 Shore                           | FPM 85 Shore |
| for P, T, A, B   | 4 pieces ID 0.86 [21.89] x Ø 0.10 [2.6] |                   | 45122-129                              | 42082-129    |
| for X, Y   | 2 pieces ID 0.43 x Ø 0.07               |                   | 45122-022                              | 42082-022    |
| Mating connector, waterproof IP65 (not included in delivery) |   |                   | for cable dia                          |              |
| 6+PE pole  | B97007-061                              | DIN 43563         | min. Ø 0.39 [10.0], max. Ø 0.47 [12.0] |              |
| 11+PE pole   | B97067-111                              | DIN 43651         | min. Ø 0.43 [11.0], max. Ø 0.51 [13.0] |              |
| Flushing plate   | 76741                                   |                   |  |              |
| Mounting manifolds   | B46891-001                              |                   |  |              |
| Mounting bolts (not included in delivery)                    |   | required torque   | required                               |              |
| M 10 x 60 DIN EN ISO 4762 -10.9                              | A03665-100-060                          | 575 in-lb [65 Nm] | 4 pieces                               |              |
| M 6 x 55 DIN EN ISO 4762 -10.9                               | A03665-060-055                          | 115 in-lb [13 Nm] | 2 pieces                               |              |

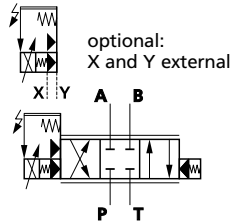
## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

|  | English [Metric]  | D683 -N. . H.UO/W   | D683 -N. . H.UF/D   |
|--|---|---|---|
| Mounting pattern   |   | ISO 4401 - 08 - 07 - 0 - 94   | ISO 4401 - 08 - 07 - 0 - 94   |
| Valve version  |   | 4-way, 2 x 2-way<br>2-stage, stub shaft spool<br>O/W (spring centred) | 4-way, 2 x 2-way<br>2-stage, stub shaft spool<br>F/D (spring A/B $\blacktriangleright$ T) |
| Pilot valve  | $Q_N$ ( $\pm 10\%$ ) at $\Delta p_N = 1,015$ psi [70 bar] | gpm [l/min]   | 5.3 [20.0]  |
| Series   | D633-7...   | Standard  | 4.0 [15.0]  |
| Pilot connection   |   | X and Y   | biased<br>X and Y   |
| Mass   |   | lb [kg]   | 44.0 [20.0]   |
| Rated flow   | ( $\pm 10\%$ ) at $\Delta p_N = 75$ psi per land          | gpm [l/min]   | O = 44.0 [20.0] / W = 47.4 [21.5]<br>92.5 [350]   |
| Operating pressure   | max.  | psi [bar]   | 5,075 [350]   |
| ports P, A, B, T and X with Y external                             |   | psi [bar]   | 1,015 [70]  |
| Ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar]) |   | [ms]  | 13.0  |
| Response time*   | for 0 to 100 % stroke                                     | [%]   | < 0.02  |
| Threshold*   |   | [%]   | < 0.20  |
| Hysteresis*  |   | [%]   | < 1.2   |
| Null shift*  | with $\Delta T = 100^\circ\text{F}$ [38°C]                |   | < 1.0   |
| Null leakage flow*   | total max. (~ critical lap)                               | gpm [l/min]   | 0.92 [3.5]  |
| Null leakage flow*   | pilot stage only, max.                                    | gpm [l/min]   | 0.13 [0.50]   |
| Pilot flow*  | max., for 100% step input                                 | gpm [l/min]   | 5.3 [20.0]  |
| Main spool stroke  |   | in [mm]   | $\pm 0.18$ [ $\pm 4.5$ ]  |
| Spool drive area   |   | in <sup>2</sup> [cm <sup>2</sup> ]                                    | $\pm 0.18$ [ $\pm 4.5$ ]<br>0.76 [4.9]  |

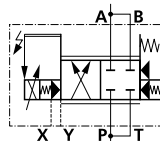
\* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]



4-way version  
no fail-safe position



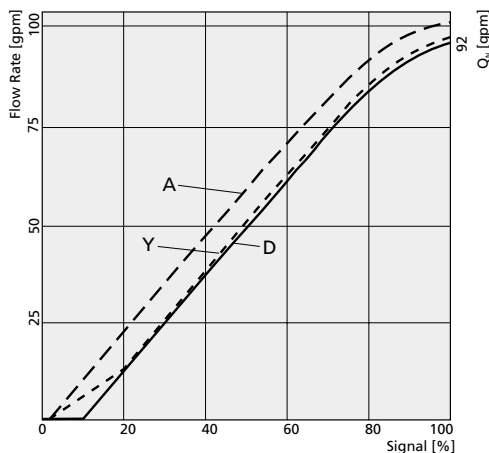
4-way version  
fail-safe position A  $\blacktriangleright$  T



2 x 2-way version  
fail-safe centered position by mechanical spool stop

## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

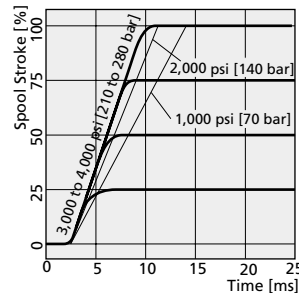
Flow vs. Signal Curve  
at  $\Delta p_N = 75$  psi [5 bar] per land



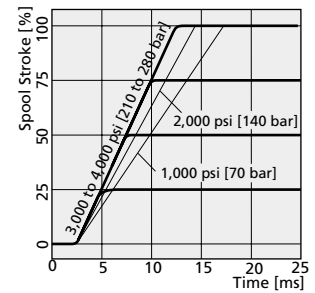
A: ~critical lap, linear characteristic  
D: 10% overlap, linear characteristic  
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]

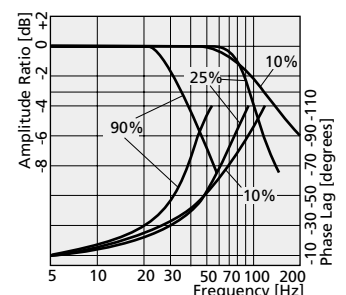
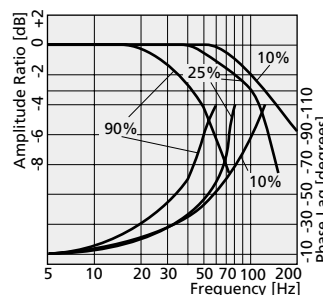
D683 -N. . H.UO/W  
Step Response



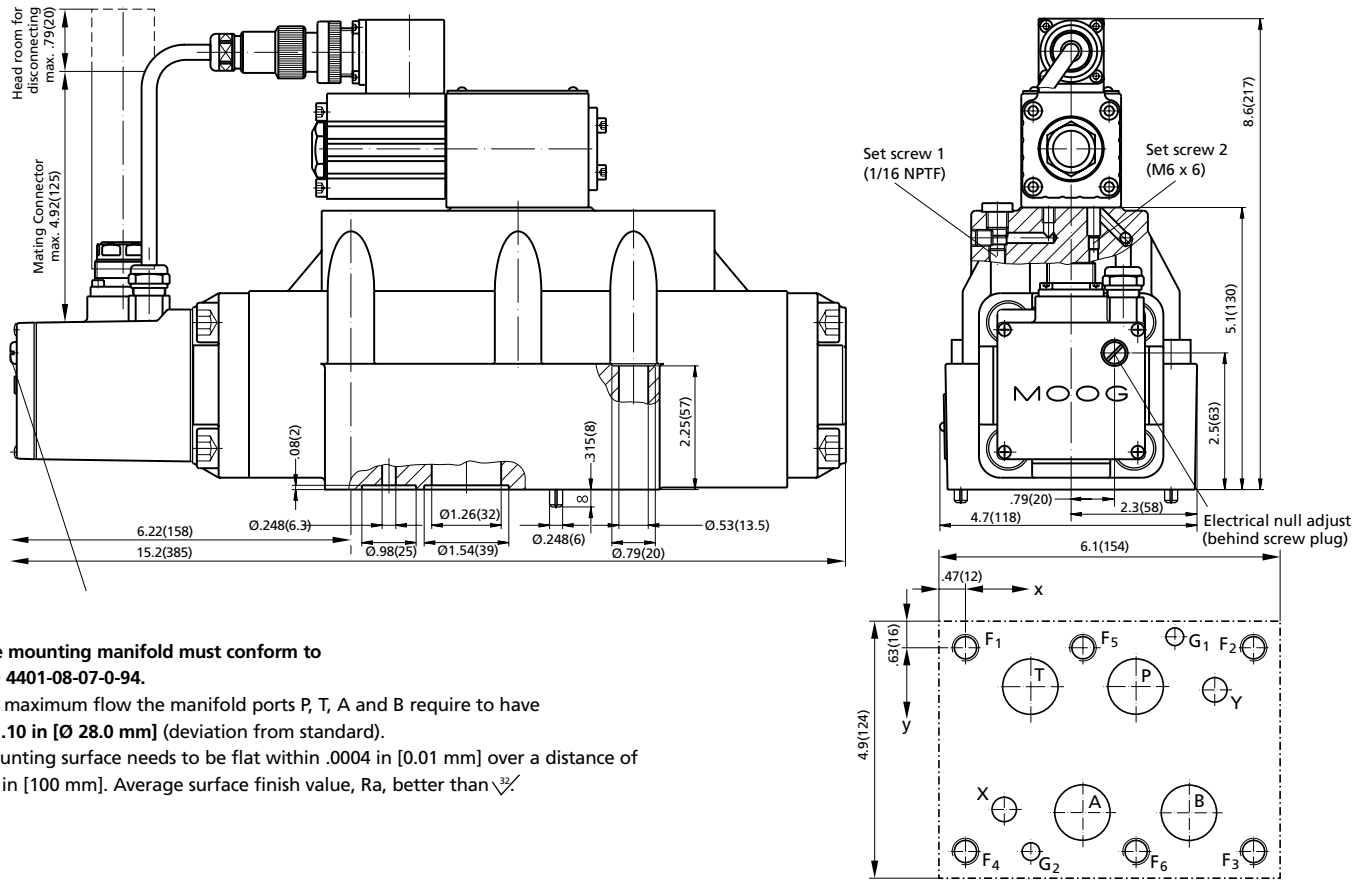
D683 -N. . H.UF/D



Frequency Response



## INSTALLATION DIAGRAM



The mounting manifold must conform to ISO 4401-08-07-0-94.

For maximum flow the manifold ports P, T, A and B require to have  $\varnothing 1.10$  in [ $\varnothing 28.0$  mm] (deviation from standard).

Mounting surface needs to be flat within .0004 in [0.01 mm] over a distance of 3.9 in [100 mm]. Average surface finish value, Ra, better than  $\sqrt{3}$ .

|   | P                         | A                         | T                         | B                         | X                         | Y                         | G <sub>1</sub>           | G <sub>2</sub>           | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> | F <sub>5</sub> | F <sub>6</sub> |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|--------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
|   | $\varnothing 1.10$ [28.0] | $\varnothing 1.10$ [28.0] | $\varnothing 1.10$ [28.0] | $\varnothing 1.10$ [28.0] | $\varnothing 0.44$ [11.2] | $\varnothing 0.44$ [11.2] | $\varnothing 0.30$ [7.5] | $\varnothing 0.30$ [7.5] | M12            | M12            | M12            | M12            | M12            | M12            |
| x | 3.0 [77.0]                | 2.1 [53.2]                | 1.2 [29.4]                | 4.0 [101]                 | 0.69 [17.5]               | 4.4 [113]                 | 3.7 [94.5]               | 1.2 [29.4]               | 0              | 5.1 [130]      | 5.1 [130]      | 0              | 2.1 [53.2]     | 3.0 [77.0]     |
| y | 0.69 [17.5]               | 2.9 [74.6]                | 0.69 [17.5]               | 2.9 [74.6]                | 2.9 [73.0]                | 0.75 [19.0]               | -0.19 [-4.8]             | 3.6 [92.1]               | 0              | 0              | 3.6 [92.1]     | 3.6 [92.1]     | 0              | 3.6 [92.1]     |

## CONVERSION INSTRUCTION

| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw-bore 1 (1/16 NPTF) | Pilot Flow Return        | Set Screw-bore 2 (M6 x 6) |
|---|--------------------------|------------------------------|--------------------------|---------------------------|
|   | Internal P<br>External X | open<br>closed               | Internal T<br>External Y | open<br>closed            |

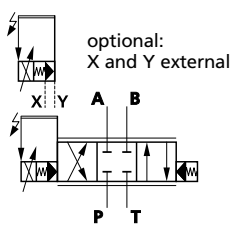
## SPARE PARTS AND ACCESSORIES

|  |  |                    |  |              |
|--|--|--------------------|--|--------------|
| O-rings (included in delivery)                               |  |                    | NBR 85 Shore   | FPM 85 Shore |
| for P, T, A, B:  | 4 pieces ID 1.36 [34.6] x $\varnothing$ 0.10 [2.6] |                    | 45122-113  | 42082-113    |
| for X, Y:  | 2 pieces ID 0.80 [20.3] x $\varnothing$ 0.10 [2.6] |                    | 45122-195  | 42082-195    |
| Mating connector, waterproof IP65 (not included in delivery) |  |                    | for cable dia  |              |
| 6+PE pole  | B97007-061   | DIN 43563          | min. $\varnothing$ 0.39 [10.0], max. $\varnothing$ 0.47 [12.0] |              |
| 11+PE pole   | B97067-111   | DIN 43651          | min. $\varnothing$ 0.43 [11.0], max. $\varnothing$ 0.51 [13.0] |              |
| Flushing plate   | 76047  |                    |  |              |
| Mounting manifolds   | A25855-009   |                    |  |              |
| Mounting bolts (not included in delivery)                    |  | required torque    | required   |              |
| M 12 x 75 DIN EN ISO 4762 -10.9                              | A03665-120-075                                     | 974 in-lb [110 Nm] | 6 pieces   |              |

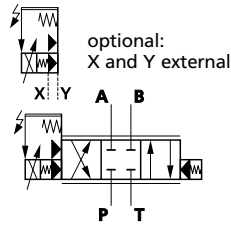
## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

|  | English [Metric]   | D684 -N. . H.UO/W   | D684 -N. . H.UF/D   |
|--|--|---|---|
| Mounting pattern   |  | ISO 4401 - 08 - 07 - 0 - 94   | ISO 4401 - 08 - 07 - 0 - 94   |
| Valve version  |  | 4-way, 2 x 2-way<br>2-stage, stub shaft spool<br>O/W (spring centred) | 4-way, 2 x 2-way<br>2-stage, stub shaft spool<br>F/D (spring A/B $\blacktriangleright$ T) |
| Pilot valve  | $Q_N (\pm 10\%)$ at $\Delta p_N = 1,015$ psi [70 bar]    | gpm [l/min]   | 5.3 [20.0]  |
| Series   | D633-7...  | Standard  | 4.0 [15.0]  |
| Pilot connection   |  | X and Y   | biased<br>X and Y   |
| Mass   | lb [kg]  | O = 44.0 [20.0] / W = 47.4 [21.5]                                     | 44.0 [20.0]   |
| Rated flow   | ( $\pm 10\%$ ) at $\Delta p_N = 75$ psi [5 bar] per land | gpm [l/min]   | 145 [550]   |
| Operating pressure   | max.   |   |   |
| ports P, A, B, T and X with Y external                             |  | psi [bar]   | 5,075 [350]   |
| Ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar]) |  | psi [bar]   | 1,015 [70]  |
| Response time*   | for 0 to 100 % stroke                                    | [ms]  | 12.0  |
| Threshold*   |  | [%]   | < 0.02  |
| Hysteresis*  |  | [%]   | < 0.20  |
| Null shift*  | with $\Delta T = 100^\circ\text{F}$                      | [%]   | < 1.2   |
| Null leakage flow*   | total max. (~ critical lap)                              | gpm [l/min]   | 0.92 [3.5]  |
| Null leakage flow*   | pilot stage only, max.                                   | gpm [l/min]   | 0.13 [0.50]   |
| Pilot flow*  | max., for 100% step input                                | gpm [l/min]   | 5.3 [20.0]  |
| Main spool stroke  |  | in [mm]   | $\pm 0.24 [\pm 6.0]$  |
| Spool drive area   |  | in <sup>2</sup> [cm <sup>2</sup> ]                                    | 0.76 [4.9]  |

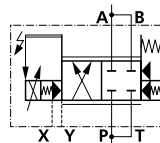
\* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]



4-way version  
no fail-safe position

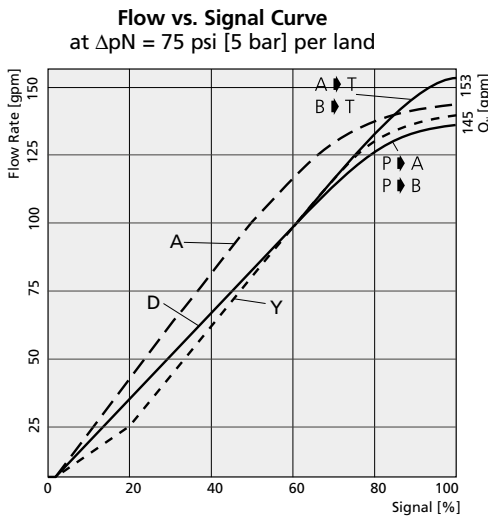


4-way version  
fail-safe position A  $\blacktriangleright$  T



2 x 2-way version  
fail-safe centered position by mechanical spool stop

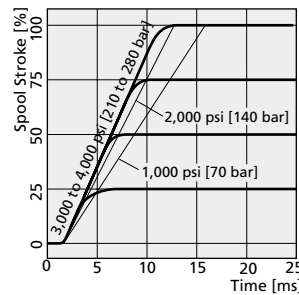
## PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS



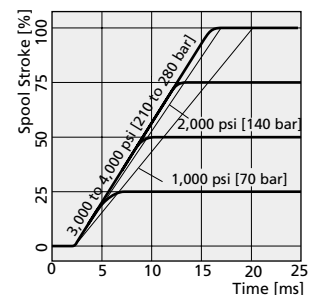
A: ~critical lap, linear characteristic  
D: 10% overlap, linear characteristic  
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm<sup>2</sup>/s and fluid temperature of 104°F [40°C]

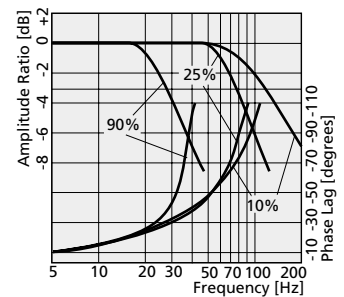
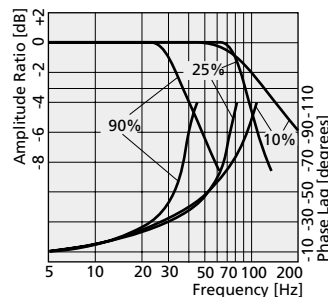
D684 -N. . H.UO/W  
Step Response



D684 -N. . H.UF/D

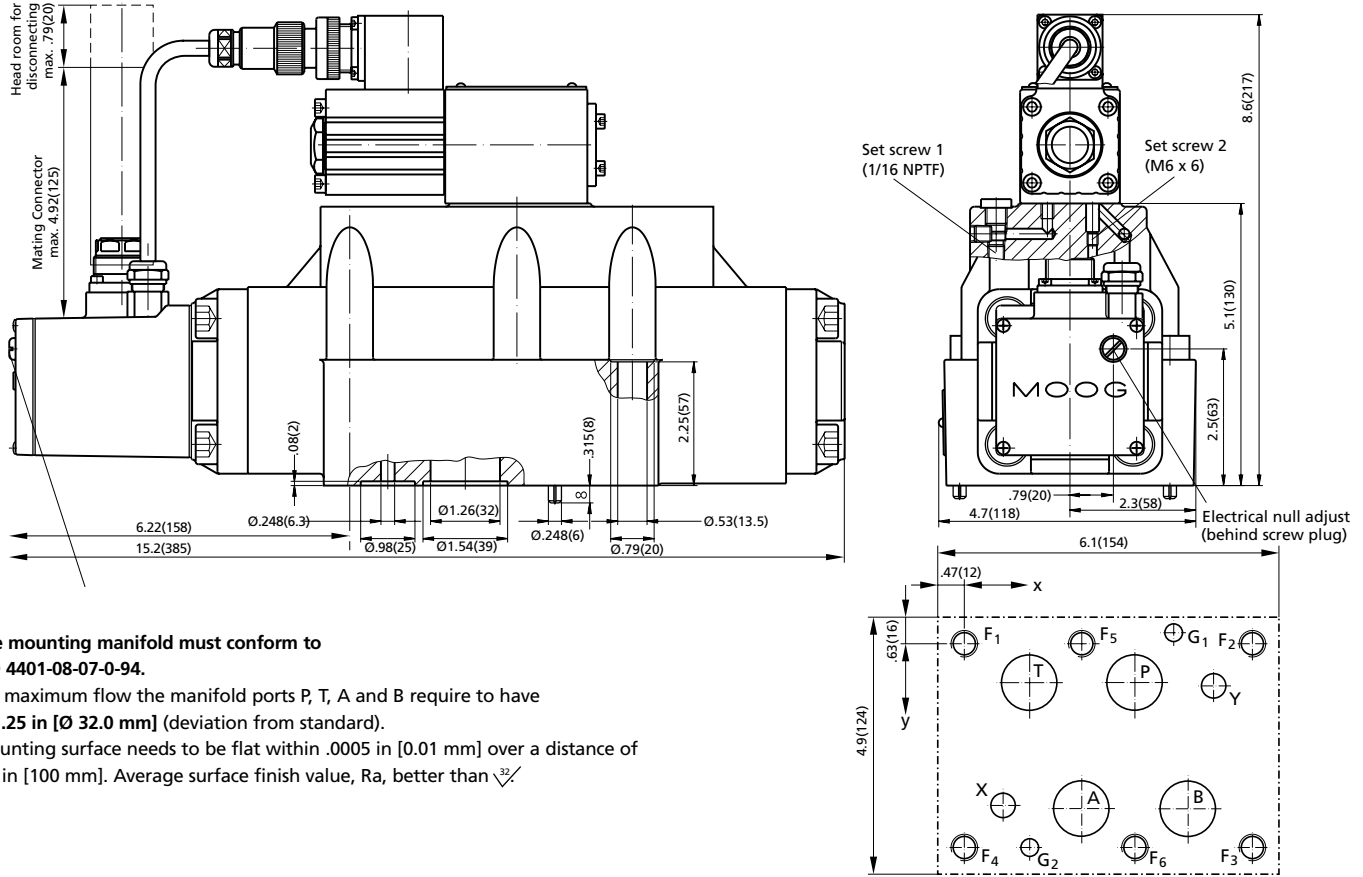


Frequency Response





**INSTALLATION DIAGRAM**



The mounting manifold must conform to ISO 4401-08-07-0-94.

For maximum flow the manifold ports P, T, A and B require to have  $\varnothing$  1.25 in [ $\varnothing$  32.0 mm] (deviation from standard).

Mounting surface needs to be flat within .0005 in [0.01 mm] over a distance of 4.0 in [100 mm]. Average surface finish value, Ra, better than  $\sqrt{32}$ .

|   | P            | A            | T            | B            | X            | Y            | G <sub>1</sub> | G <sub>2</sub> | F <sub>1</sub> | F <sub>2</sub> | F <sub>3</sub> | F <sub>4</sub> | F <sub>5</sub> | F <sub>6</sub> |
|---|--------------|--------------|--------------|--------------|--------------|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|   | Ø1.26 [32.0] | Ø1.26 [32.0] | Ø1.26 [32.0] | Ø1.26 [32.0] | Ø0.44 [11.2] | Ø0.44 [11.2] | Ø0.30 [7.5]    | Ø0.30 [7.5]    | M12            | M12            | M12            | M12            | M12            | M12            |
| x | 3.0 [77.0]   | 2.1 [53.2]   | 1.2 [29.4]   | 4.0 [101]    | 0.69 [17.5]  | 4.4 [113]    | 3.7 [94.5]     | 1.2 [29.4]     | 0              | 5.1 [130]      | 5.1 [130]      | 0              | 2.1 [53.2]     | 3.0 [77.0]     |
| y | 0.69 [17.5]  | 2.9 [74.6]   | 0.69 [17.5]  | 2.9 [74.6]   | 2.9 [73.0]   | 0.75 [19.0]  | -0.19 [-4.8]   | 3.6 [92.1]     | 0              | 0              | 3.6 [92.1]     | 3.6 [92.1]     | 0              | 3.6 [92.1]     |

**CONVERSION INSTRUCTION**

|   |                          |                              |                          |                           |
|---|--------------------------|------------------------------|--------------------------|---------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw-bore 1 (1/16 NPTF) | Pilot Flow Return        | Set Screw-bore 2 (M6 x 6) |
|   | Internal P<br>External X | open<br>closed               | Internal T<br>External Y | open<br>closed            |

**SPARE PARTS AND ACCESSORIES**

|  |  |                    |  |              |
|--|--|--------------------|--|--------------|
| O-rings (included in delivery)                               |  |                    | NBR 85 Shore                           | FPM 85 Shore |
| for P, T, A, B:  | 4 pieces ID 1.36 [34.6] x Ø 0.10 [2.6] |                    | 45122-113                              | 42082-113    |
| for X, Y:  | 2 pieces ID 0.80 [20.3] x Ø 0.10 [2.6] |                    | 45122-195                              | 42082-195    |
| Mating connector, waterproof IP65 (not included in delivery) |  |                    | for cable dia                          |              |
| 6+PE pole  | B97007-061                             | DIN 43563          | min. Ø 0.39 [10.0], max. Ø 0.47 [12.0] |              |
| 11+PE pole   | B97067-111                             | DIN 43651          | min. Ø 0.43 [11.0], max. Ø 0.51 [13.0] |              |
| Flushing plate   | 76047                                  |                    |  |              |
| Mounting manifolds   | A25855-009                             |                    |  |              |
| Mounting bolts (not included in delivery)                    |  | required torque    | required                               |              |
| M 12 x 75 DIN EN ISO 4762 -10.9                              | A03665-120-075                         | 974 in-lb [110 Nm] | 6 pieces                               |              |

## OPERATING PRINCIPLE OF THE FAIL-SAFE VALVE

Application safety is dependent on the application itself, local safety requirements and design preferences. For applications where certain safety regulations are applicable, a defined metering spool position is needed in order to avoid potential damage. Various fail-safe versions are available for Moog servo-proportional control valves. To define the fail-safe version in a D680 Series Valve, a complete understanding of the hydraulic circuit and country specific safety regulations is required.

With fail-safe valves it is possible to check whether the main spool is in its predefined position. If the main spool is within its defined range, the logic output signal at pin 11 is  $> + 8.5 \text{ V}$ . If this signal is  $< + 6.5 \text{ V}$ , then the main spool is outside the defined range. This logic signal may be delayed up to 500 ms. To reduce the fail-safe switching time it is advised to both switch off the supply of the 4/2-way valve and the enable signal at the same time.

The following information applies to W, U and V electrically controlled fail-safe functionality. Contact Moog for additional information.

### Fail Safe Functionality

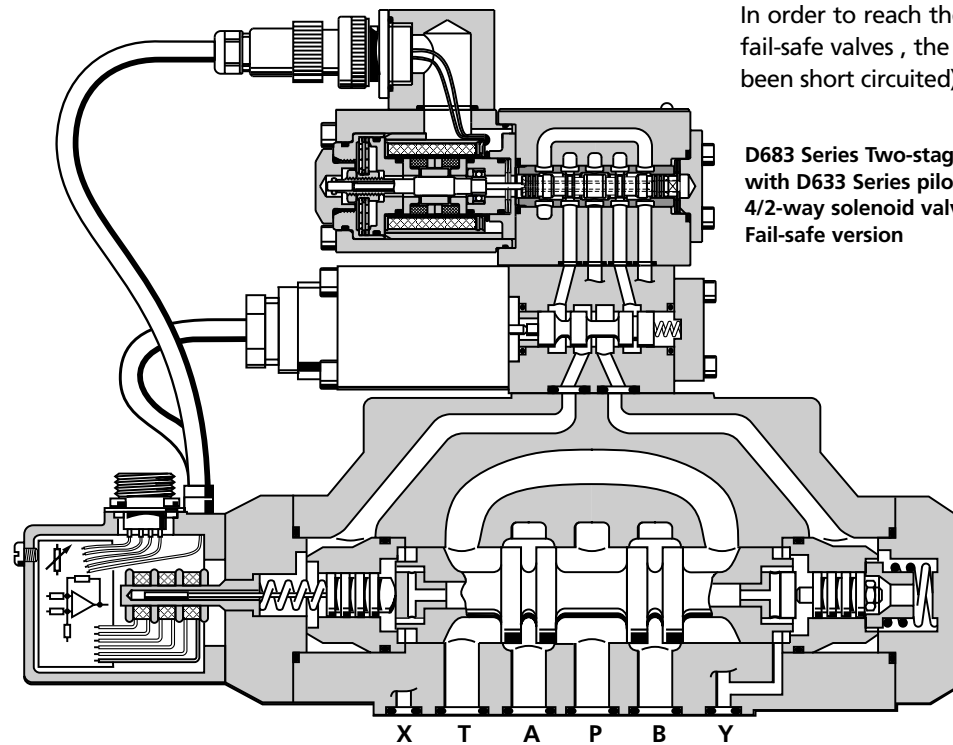
After switching off the 24 V supply to the safety solenoid valve, this fail-safe function creates a defined metering spool position: overlapped centered position or fully opened A  $\blacktriangleright$  T.

### Fail-Safe Version W or U

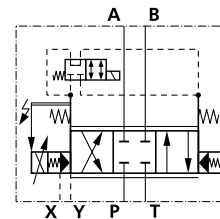
In order to move the spool to the safe centered position with D680 Series fail-safe valves, the two control chambers of the main stage are hydraulically short circuited by a 4/2-way solenoid valve. The spring force moves the spool into the overlapped centered position.

### Fail-Safe Version V

In order to reach the fully opened position A  $\blacktriangleright$  T with D680 Series fail-safe valves, the spring force (after the control chambers have been short circuited) pushes the spool to the end position A  $\blacktriangleright$  T.



D683 Series Two-stage Proportional Control Valve with D633 Series pilot valve and 4/2-way solenoid valve for the Fail-safe version



Hydraulic symbol:  
Symbol shown with pilot pressure and electric supply on and solenoid off.

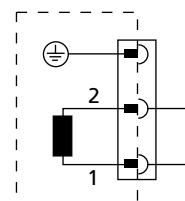
**Note:**  
According to EN 954-1, a higher safety category can be achieved if a fail-safe valve is used.

## ELECTRICAL CHARACTERISTICS

Electrical characteristics of the 4/2-way solenoid valve for the fail-safe version.

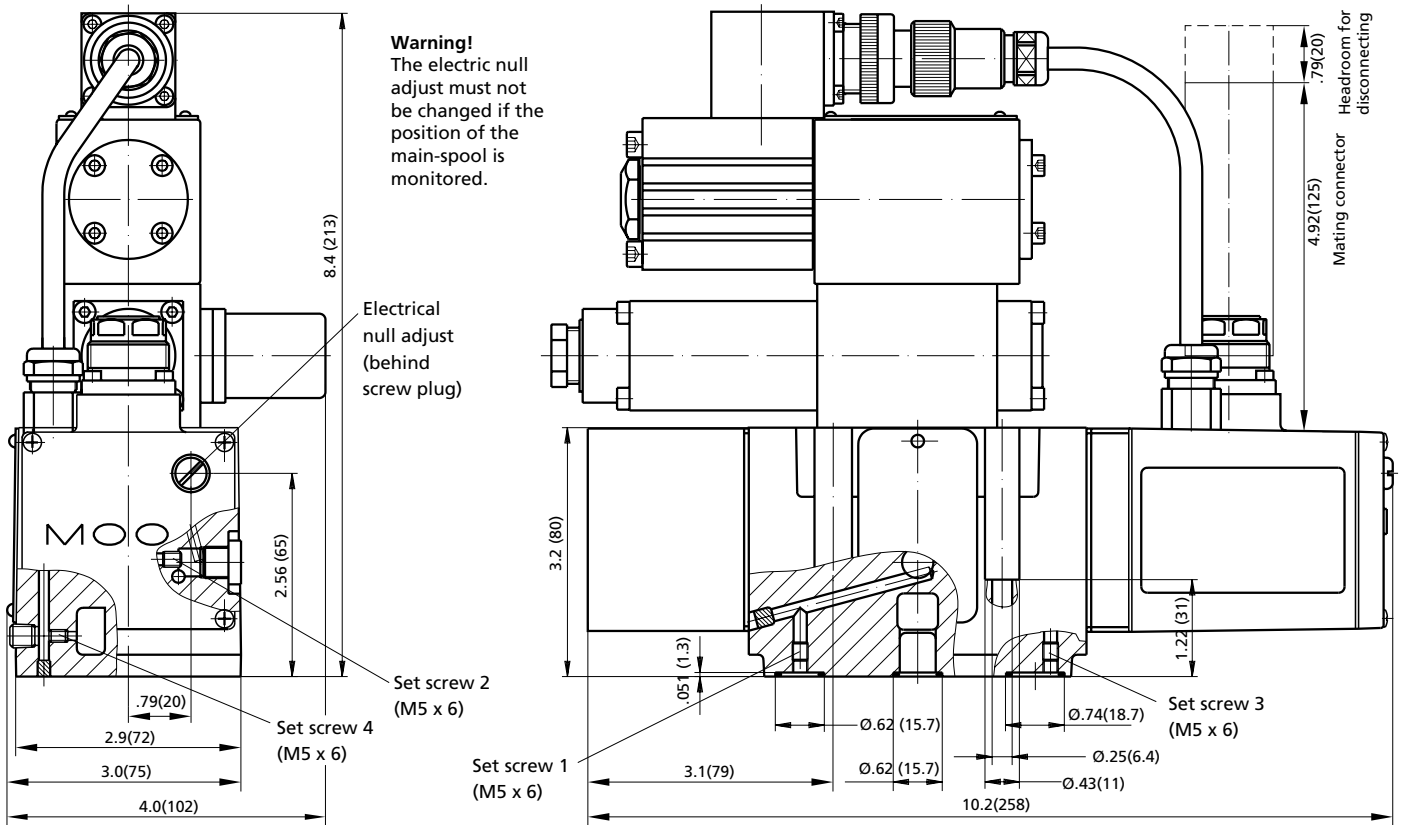
|                        |  |
|------------------------|--|
| Valve version          | 4/2-way solenoid valve                 |
| Function               | electromagnetic                        |
| Nominal voltage $U_N$  | 24 VDC<br>(min 22.8 VDC, max 26.4 VDC) |
| Nominal current, $I_N$ | 1.35 A                                 |
| Nominal power, $P_N$   | 33 W                                   |

### Connector wiring



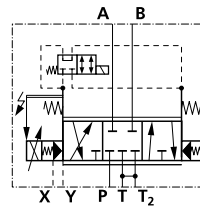
DIN 43650-1  
Form A: 2+PE - PG9

**INSTALLATION DIAGRAM**

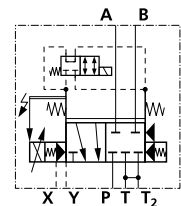


The mounting manifold must conform to ISO 4401-05-05-0-94 (see page 11).

**Fail-safe**  
Centered position



**Fail-safe**  
Centered position by mechanical spool stop



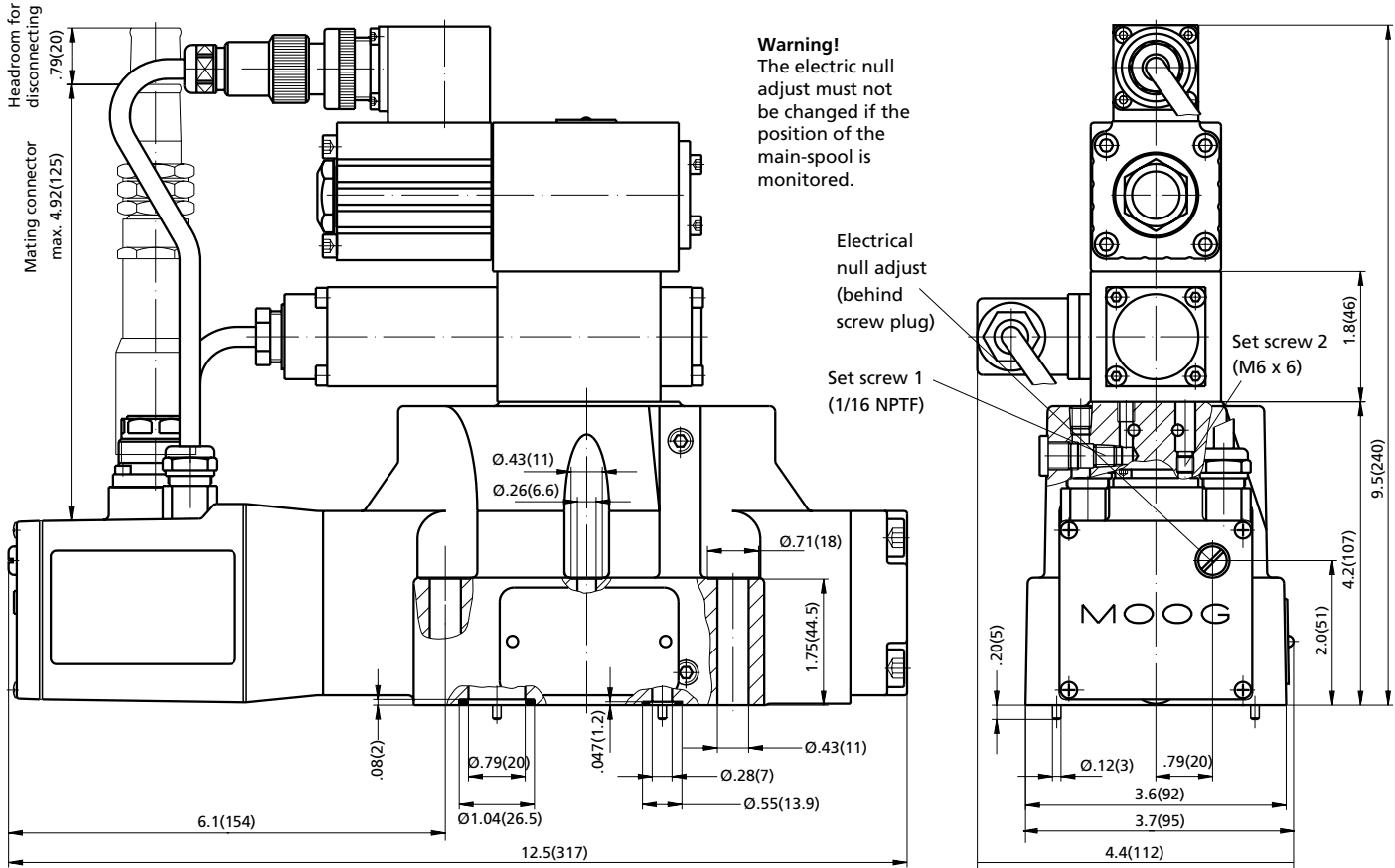
**CONVERSION INSTRUCTION**

|   |                          |                         |                         |                          |                         |                         |
|---|--------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw M5 x 6 bore 1 | Set Screw M5 x 6 bore 2 | Pilot Flow Return        | Set Screw M5 x 6 bore 3 | Set Screw M5 x 6 bore 4 |
|   | Internal P<br>External X | closed<br>open          | open<br>closed          | Internal T<br>External Y | closed<br>open          | open<br>closed          |

**SPARE PARTS AND ACCESSORIES**

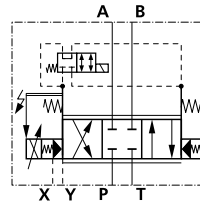
Spare parts and accessories: Page 11

**INSTALLATION DIAGRAM**

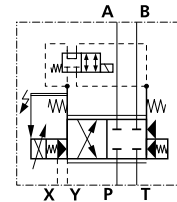


The mounting manifold must conform to ISO 4401-07-06-0-94 (see page 13).

**Fail-safe Centered position**



**Fail-safe Centered position by mechanical spool stop**



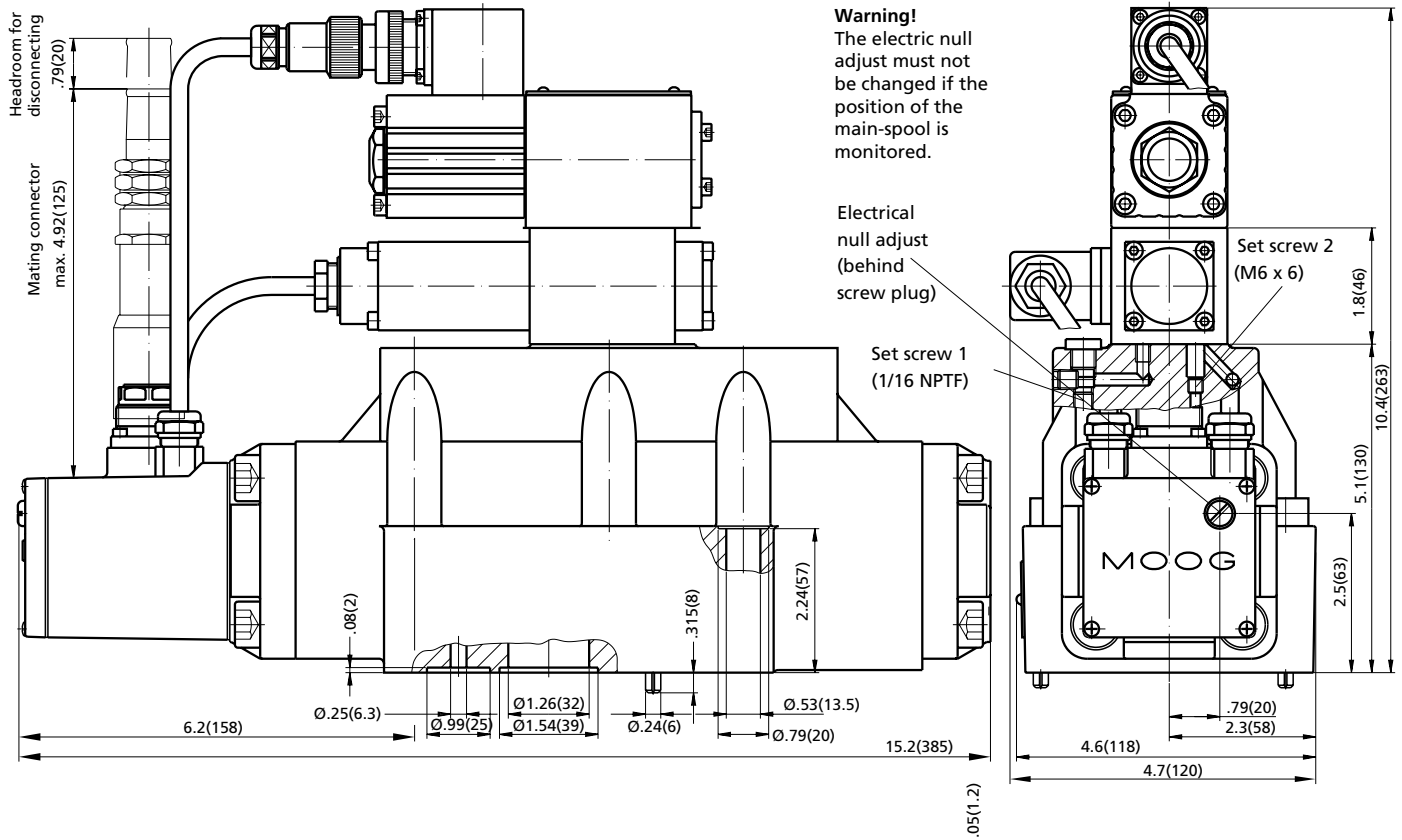
**CONVERSION INSTRUCTION**

|   |                          |                              |                          |                           |
|---|--------------------------|------------------------------|--------------------------|---------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw bore 1 (1/16 NPTF) | Pilot Flow Return        | Set Screw bore 2 (M6 x 6) |
|   | Internal P<br>External X | open<br>closed               | Internal T<br>External Y | open<br>closed            |

**SPARE PARTS AND ACCESSORIES**

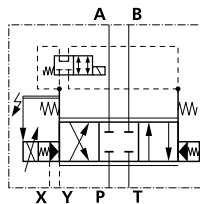
Spare parts and accessories: Page 13

**INSTALLATION DIAGRAM**

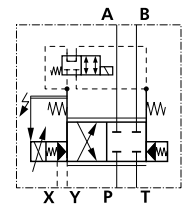


The mounting manifold must conform to ISO 4401-08-07-0-94 (see pages 15 and 17).

**Fail-safe**  
Centered position



**Fail-safe**  
Centered position by mechanical spool stop



**CONVERSION INSTRUCTION**

|   |                          |                              |                          |                           |
|---|--------------------------|------------------------------|--------------------------|---------------------------|
| for main stage operation with internal or external pilot connection | Pilot Flow Supply        | Set Screw bore 1 (1/16 NPTF) | Pilot Flow Return        | Set Screw bore 2 (M6 x 6) |
|   | Internal P<br>External X | open<br>closed               | Internal T<br>External Y | open<br>closed            |

**SPARE PARTS AND ACCESSORIES**

Spare parts and accessories: Pages 15 and 17

|   |   |   |        |
|---|---|---|--------|
| <b>Model Number</b>                             |   | <b>Type Designation</b>   |        |
| D681 to D684                                    |   | . . . . . 2 . .   |        |
| <b>Specification Status</b>                     |   |   |        |
| -   | Series specification  |   |        |
| E   | Pre-series specification  |   |        |
| Z   | Special specification   |   |        |
| <b>Model Designation</b>                        |   |   |        |
| Assigned at the factory                         |   |   |        |
| <b>Factory Identification</b>                   |   |   |        |
| <b>Valve Version</b>                            |   | <b>Series</b>   |        |
| P   | Standard spool  | D681 and D682   |        |
| N   | Stub shaft spool  | D683 and D684   |        |
| <b>Rated Flow</b>                               |   |   |        |
|   | Q <sub>v</sub> [gpm]  | l/min at Δp <sub>N</sub> = 150 psi [10 bar]                       | Series |
| 30  | 8   | 30  | D681   |
| 60  | 16  | 60  | D681   |
| 80  | 21  | 80  | D681   |
| 01  | 40  | 150   | D682   |
| 02  | 67  | 250   | D682   |
| 03  | 94  | 350   | D683   |
| 05  | 148   | 550   | D684   |
| <b>Maximum Operating Pressure p<sub>p</sub></b> |   |   |        |
| B   | 1,000 psi [70 bar]  | Pilot valve D633-7...; p <sub>max</sub> = 5,000 psi [350 bar]     |        |
| H   | 4,000 psi [280 bar]   | The integrated valve electronics is adapted to the pilot pressure |        |
| K   | 5,000 psi [350 bar]   |   |        |
| <b>Main Spool Type</b>                          |   |   |        |
| A   | 4-way: ~ critical lap, linear characteristic  |   |        |
| D   | 4-way: 10% overlap, linear characteristic   |   |        |
| P   | 4-way: P↗A, A↘T: ~ critical lap, curvilinear characteristic<br>P↗B: 60% overlap, curvilinear characteristic<br>B↘T: 50% underlap, linear characteristic |   |        |
| U   | 5-way: P↗A, P <sub>2</sub> ↘B, A↘T: ~ critical lap, curvilinear characteristic (D681 only)  |   |        |
| R   | 4-way: 10% overlap, curvilinear characteristic  |   |        |
| Y   | 4-way: ~ critical lap, curvilinear characteristic   |   |        |
| Z   | 2x2-way: A↗T, B↘T: ~ critical lap, linear characteristic  |   |        |
| X   | Special spool on request  |   |        |
| <b>Direct Drive Pilot Valve</b>                 |   |   |        |
| U   | D633-7...   |   |        |
| X   | Special valve version on request  |   |        |

Preferred configurations are highlighted. Options may increase price. Technical changes are reserved. All combinations may not be available. For special options, letters not on the information above may be applied. Please contact Moog.

| Function Code | Connector  |
|---------------|--|
| O             | No enable input. Pin C not used  |
| A             | Without enable signal applied the spool moves to adjustable centered position  |
| B             | Without enable signal applied the spool moves into defined end position A↗T or B↘T (see page 8).                           |
| E             | Without enable signal applied the spool moves to adjustable centered position. Position error monitored (see page 9)       |
| F             | Without enable signal applied the spool moves into defined end position A↗T or B↘T. Position error monitored (see page 9)  |
| G             | Without enable signal applied the spool moves to adjustable centered position. Spool position monitored (see page 19)      |
| H             | Without enable signal applied the spool moves into defined end position A↗T or B↘T. Spool position monitored (see page 19) |

| Supply Voltage |                       |
|----------------|-----------------------|
| 2              | 24 VDC (18 to 32 VDC) |

| Signals for 100% Spool Stroke |                   |                                       |           |
|-------------------------------|-------------------|---------------------------------------|-----------|
|                               | Command           | Output                                | Connector |
| A                             | ±10 V             | ±10 V(diff.)                          | E         |
| D                             | ±10 V             | 2 to 10 V                             | E/S       |
| F                             | ±10 V             | 2.5 to 13.5 V, with enable input      | S         |
| M                             | ±10 V             | 4 to 20 mA                            | E/S       |
| T                             | ±10 V             | ±10 V with dead band compens. (diff.) | E         |
| X                             | ±10 mA            | 4 to 20 mA                            | E/S       |
| Y                             | others on request |                                       |           |

| Valve Connector |            |           |
|-----------------|------------|-----------|
| E               | 11+PE pole | DIN 43651 |
| S               | 6+PE pole  | DIN 43563 |

| Seal Material |                            |
|---------------|----------------------------|
| N             | NBR (Buna) Standard        |
| V             | FPM (Viton) optional       |
| X             | Other materials on request |

| Pilot Connections and Pilot Pressure |          |          |  |
|--------------------------------------|----------|----------|--|
|                                      | Supply X | Return Y |  |
| 4                                    | internal | internal | Parameters of the control electronics are adapted to the pilot pressure. See operating pressure on the nameplate and in this ordering information. |
| 5                                    | external | internal |  |
| 6                                    | external | external |  |
| 7                                    | internal | external |  |

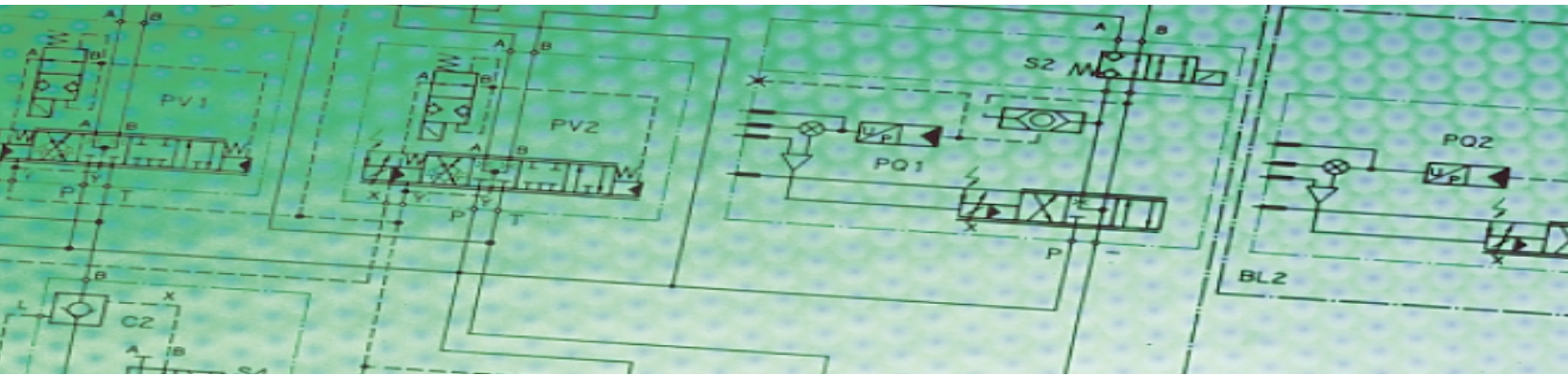
| Spool Position of Main Stage with/without Electrical or Hydraulic Supply |                             |                      |                               |     |       |
|--|-----------------------------|----------------------|-------------------------------|-----|-------|
| O  | Undefined                   |                      |                               |     |       |
| <b>Mechanical fail-safe version</b>                                      |                             |                      |                               |     |       |
|  | Position                    | p <sub>e</sub> [psi] | p <sub>x</sub> external [psi] |     |       |
| F  | P↗B, A↘T                    | ≥ 145                | ≥ 145                         |     |       |
|  |                             | < 145                | < 15                          |     |       |
| D  | P↗A, B↘T                    | ≥ 145                | ≥ 145                         |     |       |
|  |                             | < 145                | < 15                          |     |       |
| <b>Electrically controlled fail-safe version</b>                         |                             |                      |                               |     |       |
|  | Position                    | p <sub>e</sub> [psi] | p <sub>x</sub> ext            | WV* | VEL** |
| W  | Centered position defined   | ≥ 15                 | ≥ 15                          | off | on    |
|  | undefined                   | ≥ 145                | ≥ 145                         | on  | off   |
| U  | Centered position defined   | ≥ 15                 | ≥ 15                          | off | on    |
|  | P↗B, A↘T                    | ≥ 145                | ≥ 145                         | on  | off   |
| S  | P↗A, B↘T                    | ≥ 15                 | ≥ 15                          | off | on    |
|  | P↗A, B↘T                    | ≥ 145                | ≥ 145                         | on  | off   |
| V  | P↗B, A↘T                    | ≥ 15                 | ≥ 15                          | off | on    |
|  | P↗B, A↘T                    | ≥ 145                | ≥ 145                         | on  | off   |
| X  | Special versions on request |                      |                               |     |       |

\*WV: Solenoid Valve  
\*\*VEL: Valve Electronics  
15 psi = 1 bar, 145 psi = 10 bar





Argentina  
Australia  
Austria  
Brazil  
China  
England  
Finland  
France  
Germany



India  
Ireland  
Italy  
Japan  
Korea  
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# MOOG

Moog Industrial Controls Division  
East Aurora, NY 14052-0018  
Telephone: 716/655-3000  
Fax: 716/655-1803  
Toll Free: 1-800-272-MOOG  
[www.moog.com](http://www.moog.com)