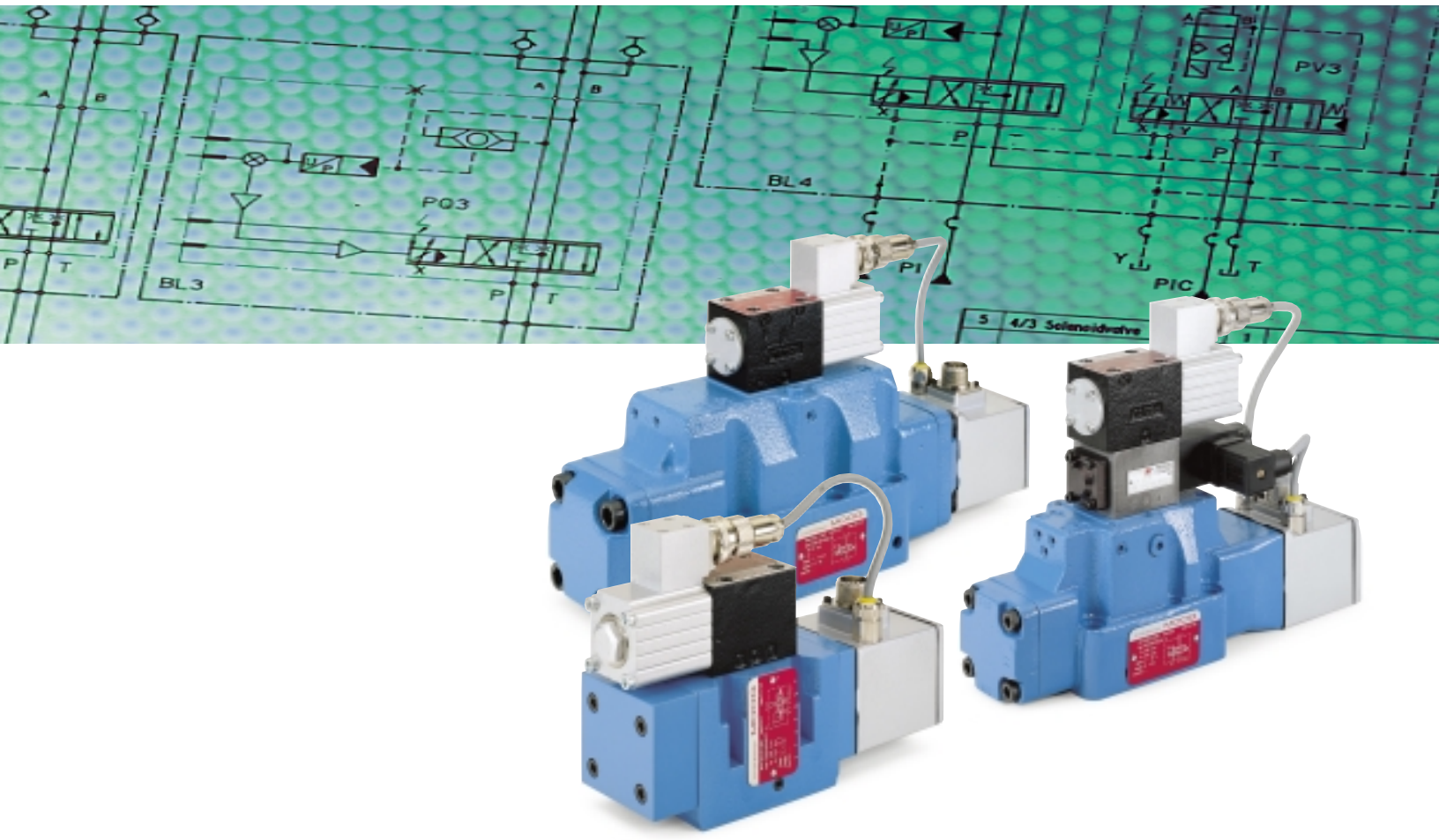
MOOG

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



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 succesfully 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.

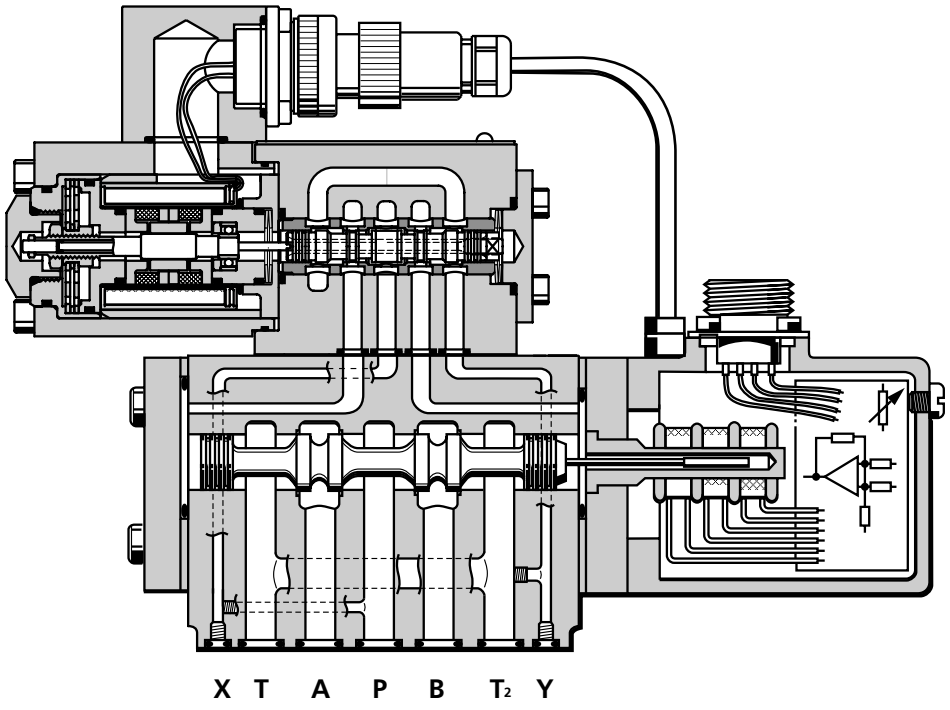
High Dynamics and Higher Flow Capability of Direct Drive Pilot Valve for Highest Dynamic Valve Design.
The high natural frequency of the Direct Drive pilot stage (300 Hz ± 10%) in conjunction with the its high flow capability results in one of the highest dynamic servo-proportional valves on the market.

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.

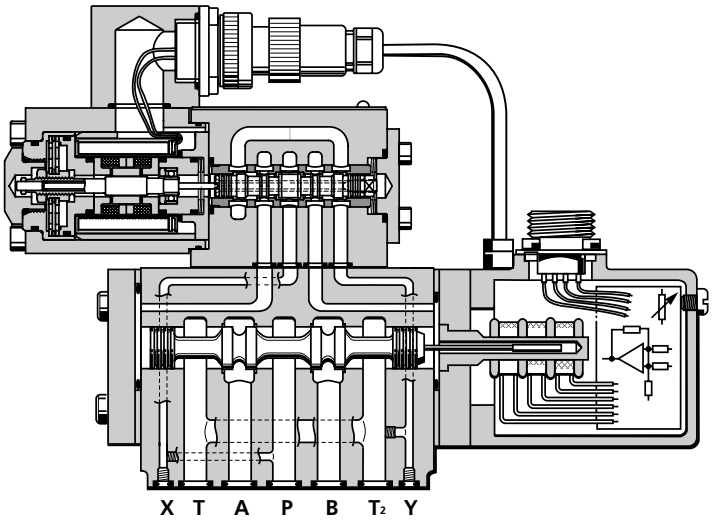
Improved Resistance to Contamination Reduces Down Time
The Direct Drive pilot stage valves have high spool driving forces offering greater chip shearing forces, making the valve more tolerant to contamination.

2-Stage Poroportional Control Valve

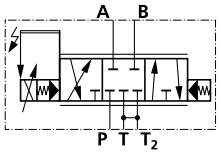


OPERATING PRINCIPLE OF THE DIRECT DRIVE PILOT STAGE

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.

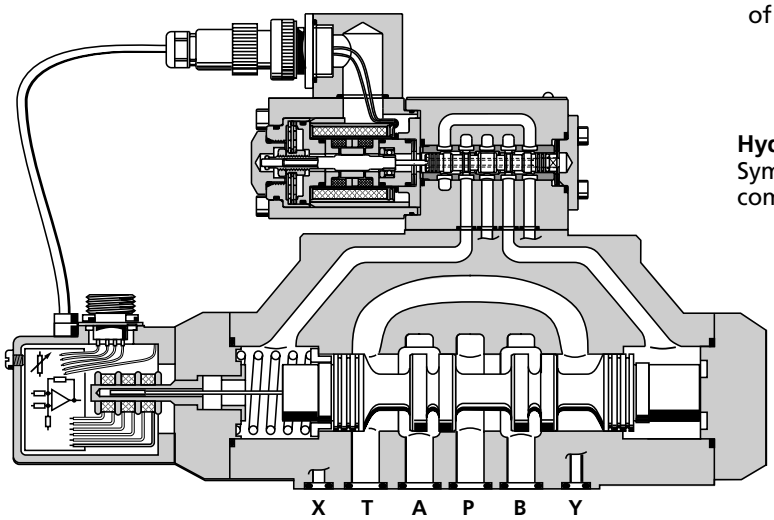


D681 Series, 2-Stage Proportional Control Valve
with D633-7 Series Pilot Valve

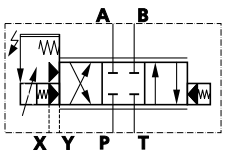
OPERATING PRINCIPLE OF THE TWO-STAGE VALVE

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.

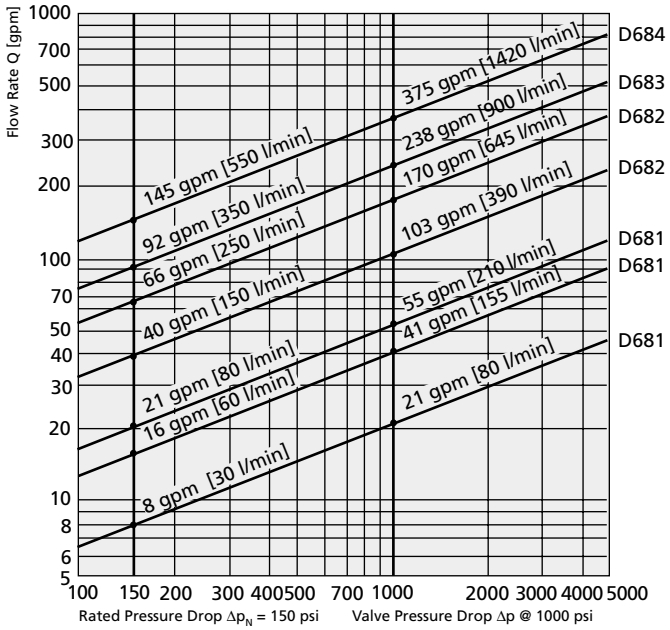
Recommended Cleanliness Class

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 µm absolute)
For longer life	$\beta_{6} \geq 75$ (6 µm 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
Δp [psi] = actual valve pressure drop
Δp_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:

$$P_X \geq .012 \ X \ \frac{Q}{A_K} \ X \sqrt{\Delta p}$$

Q [gpm] = max. flow
Δp [psi] = valve pressure drop with Q
A_K [in²] = 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 ⊥ (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 ≥ .75 mm²[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 ID = –IE. 100 % valve opening P ◗ A and B ◗ T is achieved at ID = +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 (UD – UE). 100 % valve opening P ◗ A and B ◗ T is achieved at (UD – UE) = +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.

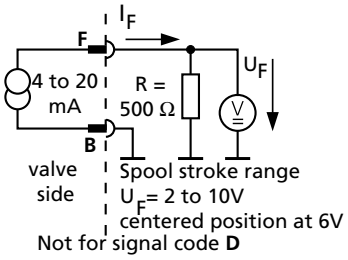
Actual value 4 to 20 mA
The actual spool position value can be measured at pin F (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P ◗ A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

The position signal output 4 to 20 mA can be used to detect a cable break when IF = 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

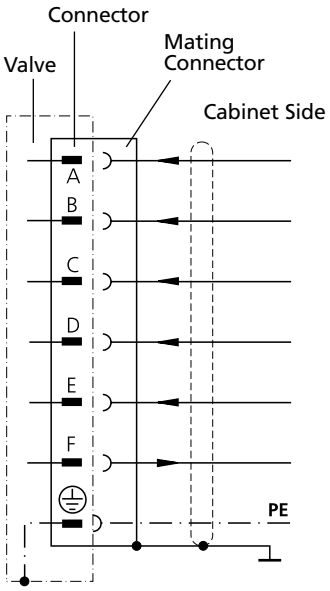
Circuit diagram for measurement of actual I_F (position of main spool) for valves with 6+PE pole connector



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[1])
b) End position (biased pilot valve function code B[1])

[1]) see type designation

CONNECTOR WIRING



Wiring for valves with 6+PE pole connector to EN 175201 Part 804[2]), 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 Dynamic: $I_{max.}$ 800 mA
Supply/Signal Ground	⊥ (0 V)	
Enabled Not Enabled	U_{C-B} > +8.5 VDC 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 ±10 V R_e = 10 kΩ	Input Command $I_D = -I_E$: 0 to ±10 mA (R_e=200 Ω) Input Command (Inverted) $I_E = -I_D$: 0 to ±10 mA
	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 Signal code **D**: U_{F-B} = 2 to 10 V. At 6 V spool is in centered position. R_a = 500 Ω	
Protective Earth		

[2]) 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 I4 = –I5. 100 % valve opening P ◗ A and B ◗ T is achieved at I4 = +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 (U4 – U5). 100% valve opening P ◗ A and B ◗ T is achieved at (U4 – U5) = +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.

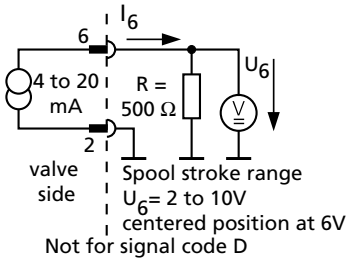
Actual value 4 to 20 mA
The actual spool position value can be measured at pin 6 (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P ◗ A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

The position signal output 4 to 20 mA can be used to detect a cable break when I6 = 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

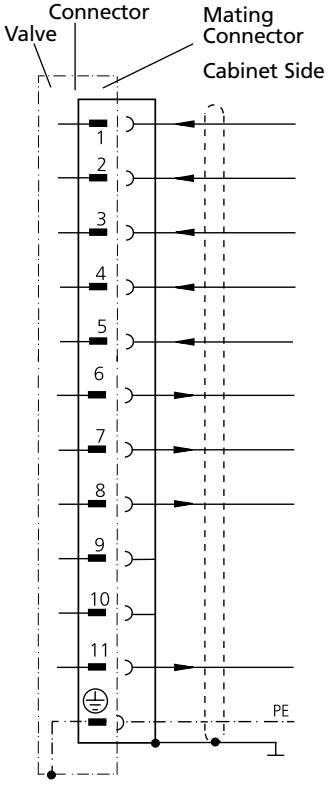
Circuit diagram for measurement of actual I_6 (position of main spool) for valves with 11+PE pole connector



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[1])
b) End position (biased pilot valve function code F[1])

[1]) see type designation

CONNECTOR WIRING



Wiring for valves with 11+PE pole connector to EN 175201 Part 804[2]), 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 Dynamic: I_{max}: 800 mA
Supply/Signal Ground	⊥ (0 V)	
Enabled Not Enabled	U_{3-2} > 8.5 VDC 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 ±10 V R_e = 10 kΩ	Input Command $I_4 = -I_5$: 0 to ±10 mA (R_e=200 Ω) Input Command (Inverted) $I_5 = -I_4$: 0 to ±10 mA (R_e=200 Ω) Input voltage for U_{4-2} and U_{5-2} for both signal types is limited to min. -15 V and max. +32 V
Output Actual Value Spool Position	I_{6-2} = 4 to 20 mA. At 12 mA spool is in centered position. R_L = 100 to 500 Ω Signal code **D**: U_{6-2} = 2 to 10 V. At 6 V spool is in centered position. R_a = 500 Ω	
Auxiliary Signal	Spool position U_{7-2} = 13 to 3 V. At 8 V spool is in centered position. R_a = 5 kΩ	
Valve Ready	U_{8-2} > 8.5 VDC:Enable and supply ok 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% U_{11-2} < 6.5 VDC: > 30%	Output I_{max}: 20 mA
Protective Earth		

[2]) 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 I4 = –I5.
100 % valve opening P ◗ A and B ◗ T is achieved at I4 = +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 (U4 – U5). 100 % valve opening P ◗ A and B ◗ T is achieved at (U4 – U5) = +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.

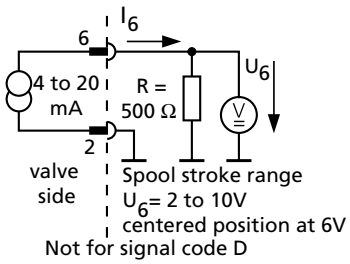
Actual value 4 to 20 mA
The actual spool position value can be measured at pin 6 (see diagram below). This signal can be used for monitoring and fault detection purposes. The spool stroke range corresponds to 4 to 20 mA. The centred position is at 12 mA. 20 mA corresponds to 100 % valve opening P ◗ A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

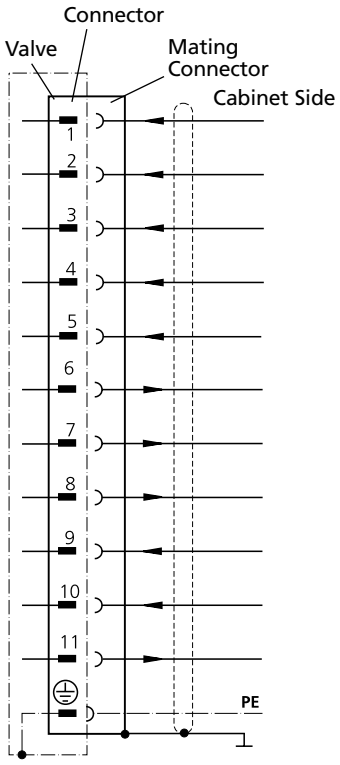
Circuit diagram for measurement of actual I_6 (position of main spool) for valves with 11+PE pole connector



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**[1])
b) End position (biased pilot valve function code **H**[1])

[1]) see type designation

CONNECTOR WIRING



Wiring for valves with 11+PE pole connector to EN 175201 (Part 804[2]) and mating connector (type E, metal shell) with leading protective earth connection ⏚.

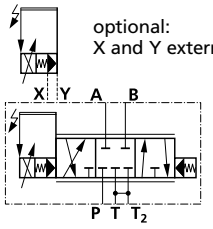
Function	Voltage Command	Current Command
Supply	24 VDC (min. 18 VDC, max. 32 VDC)	Static: I_{max}: 200 mA Dynamic: I_{max}: 800 mA
Supply/Signal Ground	⊥ (0 V)	
Enabled Not Enabled	U_{3-2} > 8.5 VDC U_{3-2} < 6.5 VDC	I_e = 2.0 mA at +24 VDC (see note above)
Input Rated Command (differential)	U_{4-5}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

[2]) formerly DIN 43651

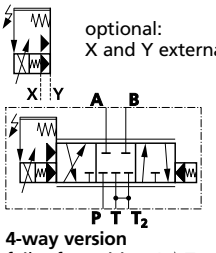
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		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 2-stage, standard spool O/W (spring centered)	4-way, 2 x 2-way and 5-way 2-stage, standard spool F spring A ◗ T
Pilot Valve	Q_N (±10%) at Δp_N = 1,015 psi [70 bar]	gpm [l/min]	0.92 [3.5]	0.97 [3.7]
Series	D633-7...		Standard	Biased
Pilot Connection			X and Y	X and Y
Mass		lb [kg]	O = 15 [6.8] / W = 17.6 [8.0]	15 [6.8]
Rated Flow	(±10%) at Δp_N = 75 psi [5 bar] per land	gpm [l/min]	8 [30] / 16 [60] / 21[80]	8 [30] / 16 [60] / 20 [80]
Operating Pressure	max.			
	port P, A, B, T and X with Y external	psi [bar]	5,075 [350]	5,075 [350]
	port T with Y internal and			
	Y (pressure peaks 3,045 psi [210 bar])	psi [bar]	1,015 [70]	1,015 [70]
Response Time*	for 0 to 100% stroke	[ms]	11.0	11.0
Threshold*		[%]	< 0.03	< 0.03
Hysteresis*		[%]	< 0.20	< 0.20
Null Shift*	with ΔT = 100°F [38°C]	[%]	< 1.5	< 1.5
Null Leakage Flow*	total max. (~ critical lap)	gpm [l/min]	0.58 [2.2]	0.58 [2.2]
Null Leakage Flow*	pilot stage only, max.	gpm [l/min]	0.11 [0.40]	0.11 [0.40]
Pilot Flow*	max., for 100% step input	gpm [l/min]	1.6 [6.0]	1.7 [6.5]
Main Spool Stroke		in [mm]	± 0.12 [± 3.0]	± 0.12 [± 3.0]
Spool Drive Area		in² [cm²]	0.31 [2.0]	0.31 [2.0]

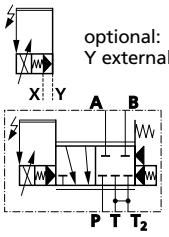
* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]



4-way version
no fail safe position

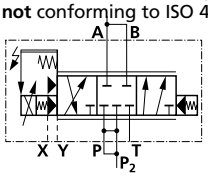


4-way version
fail safe position A ◗ T



2 x 2-way version
fail safe centered position

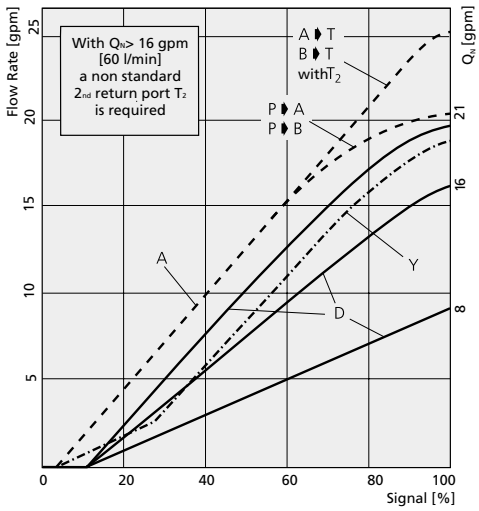
Only with X and Y external!
P and T ports interchanged,
not conforming to ISO 4401



5-way version

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

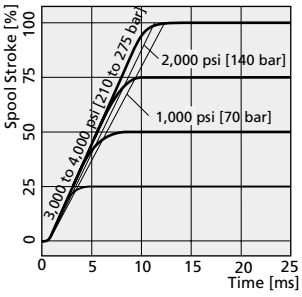
Flow vs. Signal Curve
at Δp_N = 75 psi [5 bar] per land



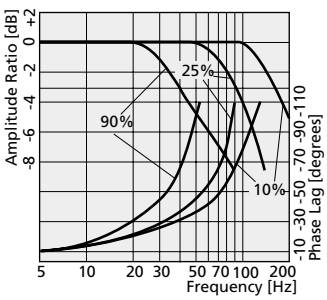
Spool version A: **~critical lap, linear characteristic (21)**
Spool version D: **10% overlap, linear characteristic**
Spool version Y: **~critical lap, curvilinear characteristic (21)**

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm2/s and fluid temperature of 104°F [40°C]

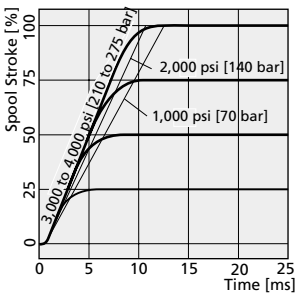
D681 - P. . H.UO/W
Step Response

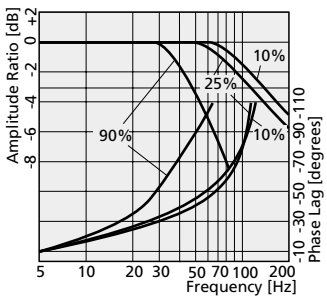


Frequency Response

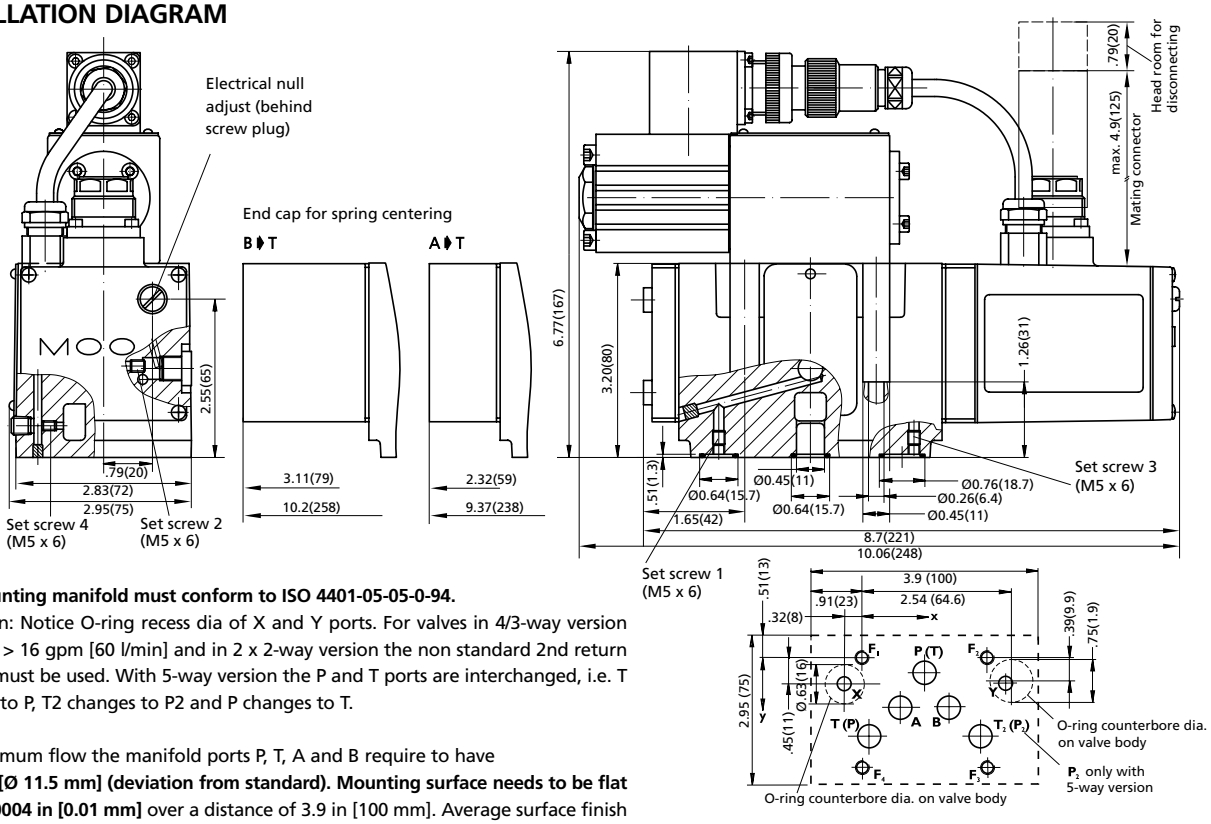


D681 - P. . H.UF





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 **Ø .45 in [Ø 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 32.

	P	A	B	T	T_2	X	Y	F_1	F_2	F_3	F_4
	Ø0.45 [11.5]	**Ø0.45 [11.5]**	**Ø0.45 [11.5]**	**Ø0.45 [11.5]**	**Ø0.45 [11.5]**	Ø0.25 [6.3]	Ø0.25 [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 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	closed	open	Internal T	closed	open
	External X	open	closed	External Y	open	closed

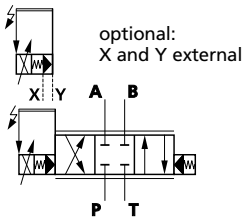
SPARE PARTS AND ACCESSORIES

O-rings (included in delivery)			NBR 85 Shore	FPM 85 Shore
for P, T, T_2, A, B, X	6 pieces ID 0.49 [12.4] x Ø 0.07 [1.8]		45122-004	42082-004
for Y	1 piece ID 0.61 [15.6] x Ø 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. 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 plates	for P, A, B, T, T_2, X, Y	for P, T, T_2, X, Y	for P, T, T_2, and X, Y	
	B67728-001	B67728-002	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	

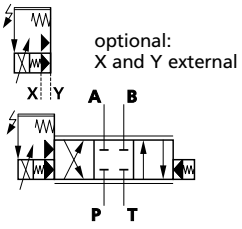
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		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 2-stage, standard spool O/W (spring centred)	4-way, 2 x 2-way 2-stage, standard spool F/D (spring A/B ⧫ T)
Pilot Valve	Q_N (±10%) at Δp_N = 1,015 psi	gpm [l/min]	5.3 [20.0]	4.0 [15.0]
Series	D633-7...		Standard	Biased
Pilot connection			X and Y	X and Y
Mass		lb[kg]	O = 26.4 [12.0] / W = 29.5 [13.4]	26.4 [12.0]
Rated flow	(±10%) at Δp_N = 75 psi [5 bar] per land	gpm[l/min]	39.6 [150] / 66.0 [250]	39.6 [150] / 66.0 [250]
Operating pressure	max.			
ports P, A, B, T and X with Y external		psi [bar]	5,075 [350]	5,075 [350]
ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar])		psi [bar]	1,015 [70]	1,015 [70]
Response time*	for 0 to 100 % stroke	[ms]	11.0	13.0
Threshold*		[%]	< 0.02	< 0.02
Hysteresis*		[%]	< 0.20	< 0.20
Null shift*	at ΔT = 100°F [38°C]	[%]	< 1.2	< 1.0
Null leakage flow*	total max. (~ critical lap)	gpm [l/min]	0.79 [3.0]	0.79 [3.0]
Null leakage flow*	pilot stage only, max.	gpm [l/min]	0.13 [0.50]	0.13 [0.50]
Pilot flow*	max., at 100% step input	gpm [l/min]	6.6 [25.0]	5.3 [20.0]
Main spool stroke		in [mm]	±0.20 [± 5.0]	±0.20 [± 5.0]
Spool drive area		in² [cm²]	0.78 [5.0]	0.78 [5.0]

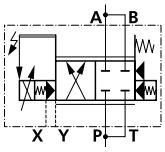
* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]



4-way version
no fail-safe position



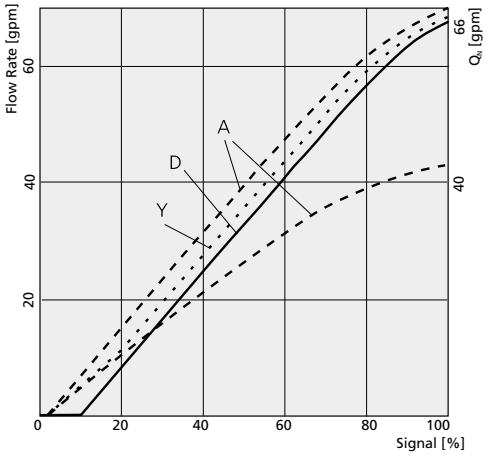
4-way version
fail-safe position A ⧫ T



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

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

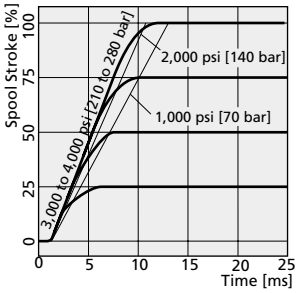
Flow vs. Signal Curve
at Δp_N = 75 psi [5 bar] per land



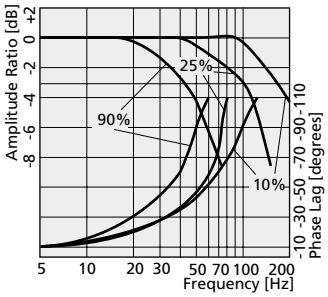
A: ~critical lap, linear characteristic
D: 10% overlap, linear characteristic
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]

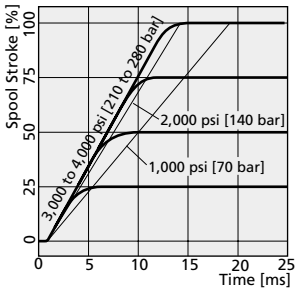
D682 -P. .H. UO/W
Step Response

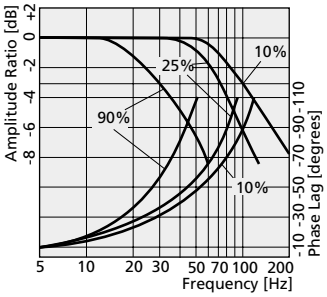


Frequency Response

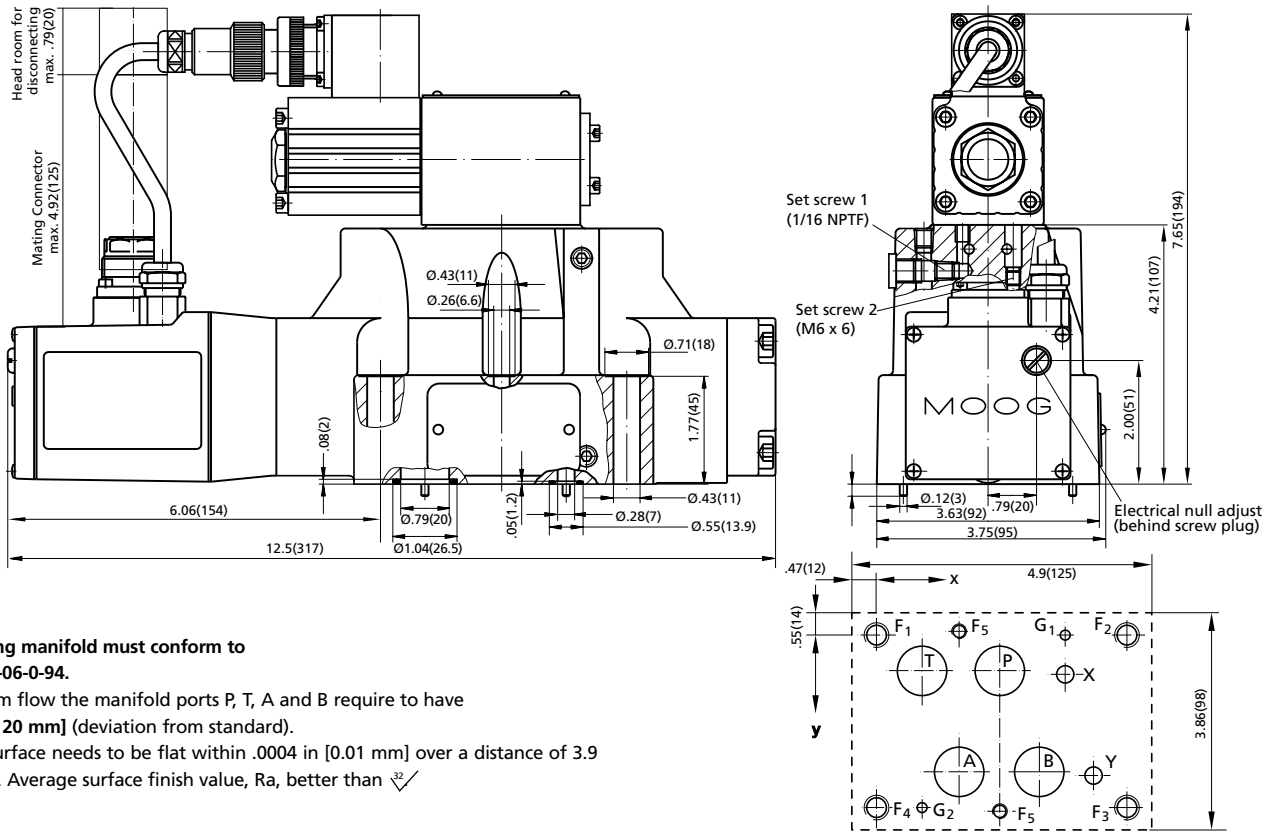


D682 -P. .H. UF/D





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_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	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 External X	open closed	Internal T External Y	open closed

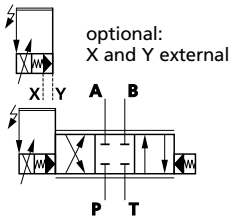
SPARE PARTS AND ACCESSORIES

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	

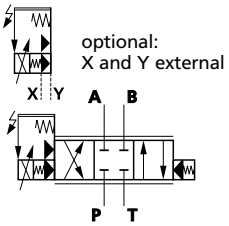
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		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 2-stage, stub shaft spool O/W (spring centred)	4-way, 2 x 2-way 2-stage, stub shaft spool F/D (spring A/B ◗ T)
Pilot valve	Q_N (±10%) at Δp_N = 1,015 psi [70 bar]	gpm [l/min]	5.3 [20.0]	4.0 [15.0]
Series	D633-7...		Standard	biased
Pilot connection			X and Y	X and Y
Mass		lb [kg]	O = 44.0 [20.0] / W = 47.4 [21.5]	44.0 [20.0]
Rated flow	(±10%) at Δp_N = 75 psi per land	gpm [l/min]	92.5 [350]	92.5 [350]
Operating pressure	max.			
ports P, A, B, T and X with Y external		psi [bar]	5,075 [350]	5,075 [350]
Ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar])		psi [bar]	1,015 [70]	1,015 [70]
Response time*	for 0 to 100 % stroke	[ms]	10.0	13.0
Threshold*		[%]	< 0.02	< 0.02
Hysteresis*		[%]	< 0.20	< 0.20
Null shift*	with ΔT = 100°F [38°C]		< 1.2	< 1.0
Null leakage flow*	total max. (~ critical lap)	gpm [l/min]	0.92 [3.5]	0.92 [3.5]
Null leakage flow*	pilot stage only, max.	gpm [l/min]	0.13 [0.50]	0.13 [0.50]
Pilot flow*	max., for 100% step input	gpm [l/min]	5.3 [20.0]	4.2 [16.0]
Main spool stroke		in [mm]	±0.18 [± 4.5]	±0.18 [± 4.5]
Spool drive area		in² [cm²]	0.76 [4.9]	0.76 [4.9]

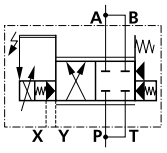
* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]



4-way version
no fail-safe position



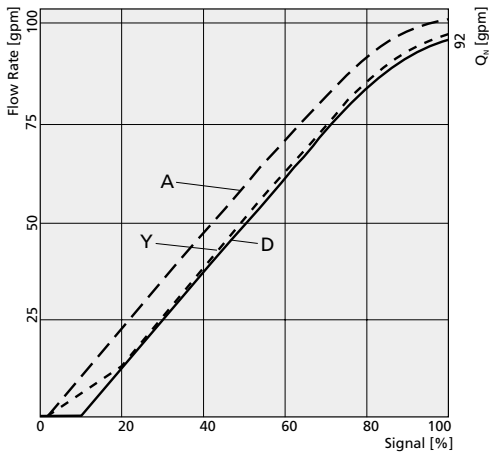
4-way version
fail-safe position A ◗ T



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

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

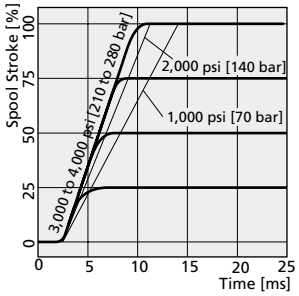
Flow vs. Signal Curve
at Δp_N = 75 psi [5 bar] per land



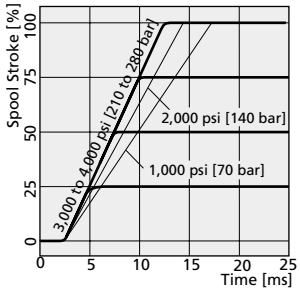
A: ~critical lap, linear characteristic
D: 10% overlap, linear characteristic
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]

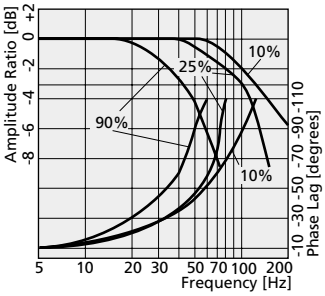
D683 -N. . H.UO/W
Step Response

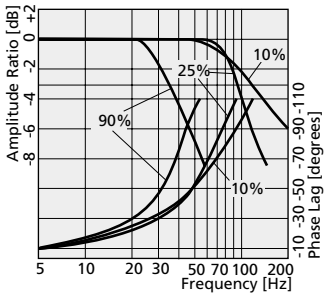


D683 -N. . H.UF/D

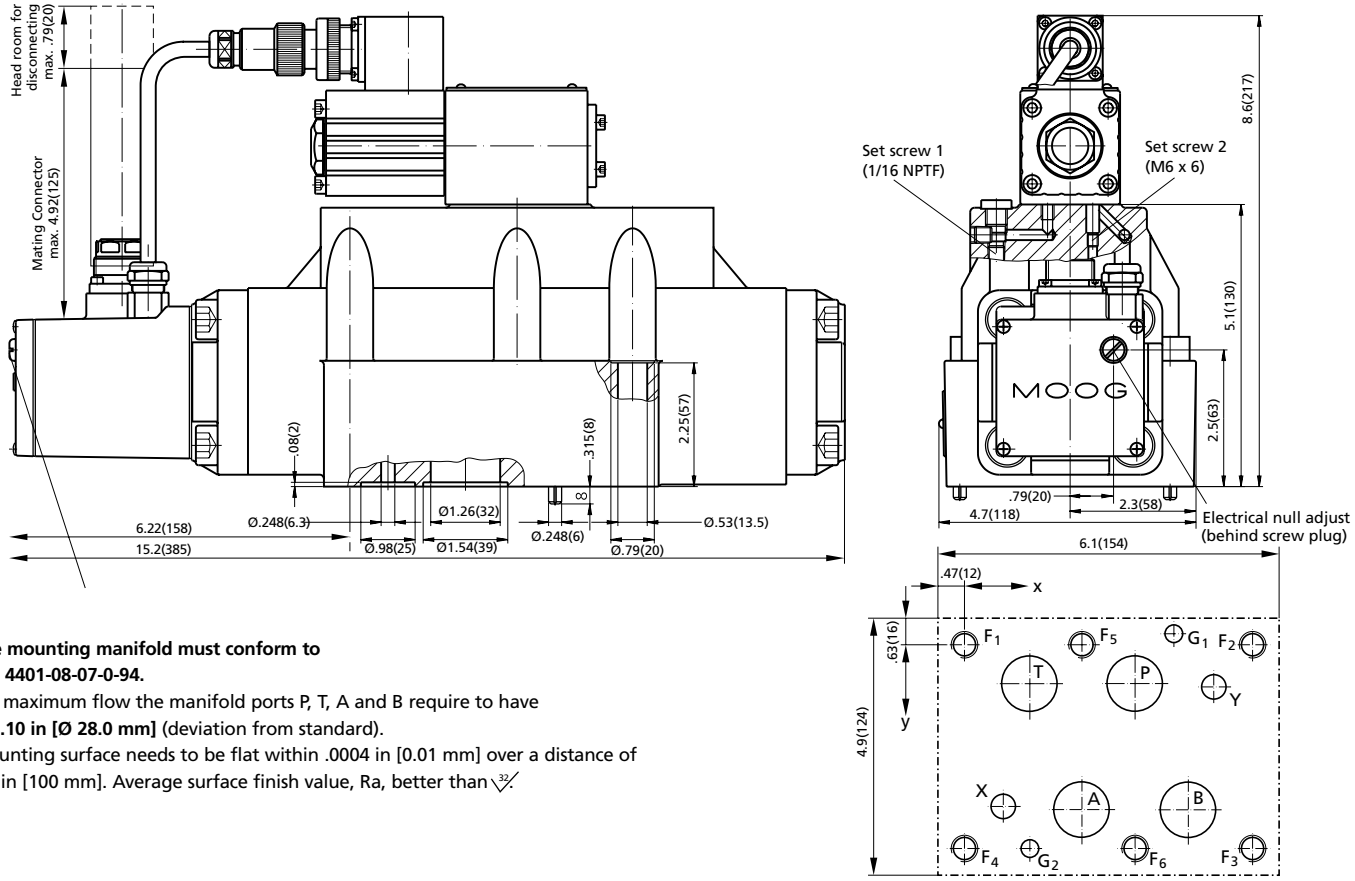


Frequency Response





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 **Ø 1.10 in [Ø 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 $\sqrt{32}$.

	P	A	T	B	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	Ø1.10 [28.0]	**Ø1.10 [28.0]**	**Ø1.10 [28.0]**	**Ø1.10 [28.0]**	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 External X	open closed	Internal T External Y	open closed

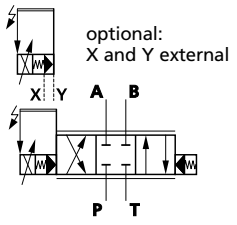
SPARE PARTS AND ACCESSORIES

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	

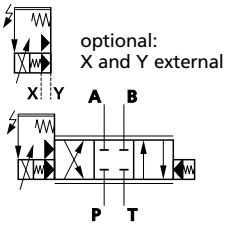
PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

		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 2-stage, stub shaft spool O/W (spring centred)	4-way, 2 x 2-way 2-stage, stub shaft spool F/D (spring A/B ◗ T)
Pilot valve	Q_N (±10%) at Δp_N = 1,015 psi [70 bar]	gpm [l/min]	5.3 [20.0]	4.0[15.0]
Series	D633-7...		Standard	biased
Pilot connection			X and Y	X and Y
Mass		lb [kg]	O = 44.0[20.0] / W = 47.4 [21.5]	44.0 [20.0]
Rated flow	(±10%) at Δp_N = 75 psi [5 bar] per land	gpm [l/min]	145 [550]	145 [550]
Operating pressure	max.			
ports P, A, B, T and X with Y external		psi [bar]	5,075 [350]	5,075 [350]
Ports T with Y internal and Y (pressure peaks 3,000 psi [210 bar])		psi [bar]	1,015 [70]	1,015 [70]
Response time*	for 0 to 100 % stroke	[ms]	12.0	16.0
Threshold*		[%]	< 0.02	< 0.02
Hysteresis*		[%]	< 0.20	< 0.20
Null shift*	with ΔT = 100°F	[%]	< 1.2	< 1.0
Null leakage flow*	total max. (~ critical lap)	gpm [l/min]	0.92 [3.5]	0.92 [3.5]
Null leakage flow*	pilot stage only, max.	gpm [l/min]	0.13 [0.50]	0.13 [0.50]
Pilot flow*	max., for 100% step input	gpm [l/min]	5.3 [20.0]	4.2 [16.0]
Main spool stroke		in [mm]	±0.24 [± 6.0]	±0.24 [± 6.0]
Spool drive area		in² [cm²]	0.76 [4.9]	0.76 [4.9]

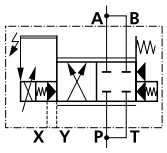
* measured at 3,000 psi [210 bar] pilot or operating pressure, respectively, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]



4-way version
no fail-safe position



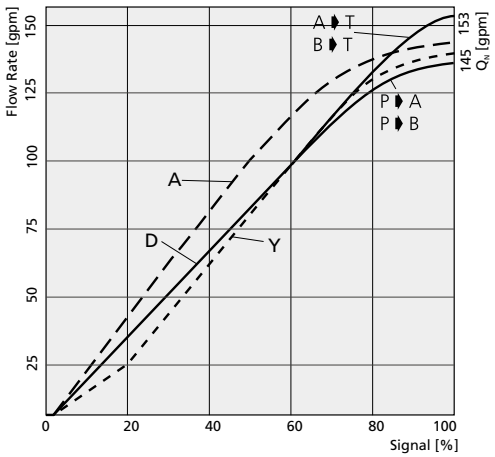
4-way version
fail-safe position A ◗ T



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

PERFORMANCE SPECIFICATIONS FOR STANDARD MODELS

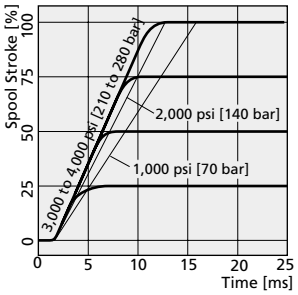
Flow vs. Signal Curve
at ΔpN = 75 psi [5 bar] per land



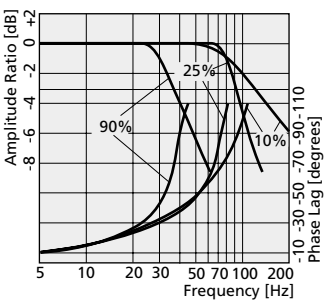
A: ~critical lap, linear characteristic
D: 10% overlap, linear characteristic
Y: ~critical lap, curvilinear characteristic

Typical characteristic curves measured at 3,000 psi [210 bar] pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 104°F [40°C]

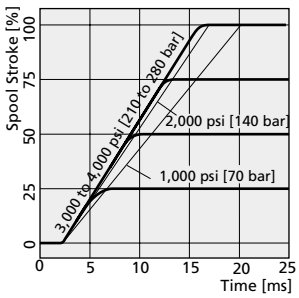
D684 -N. . H.UO/W
Step Response

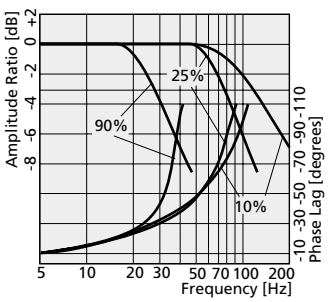


Frequency Response

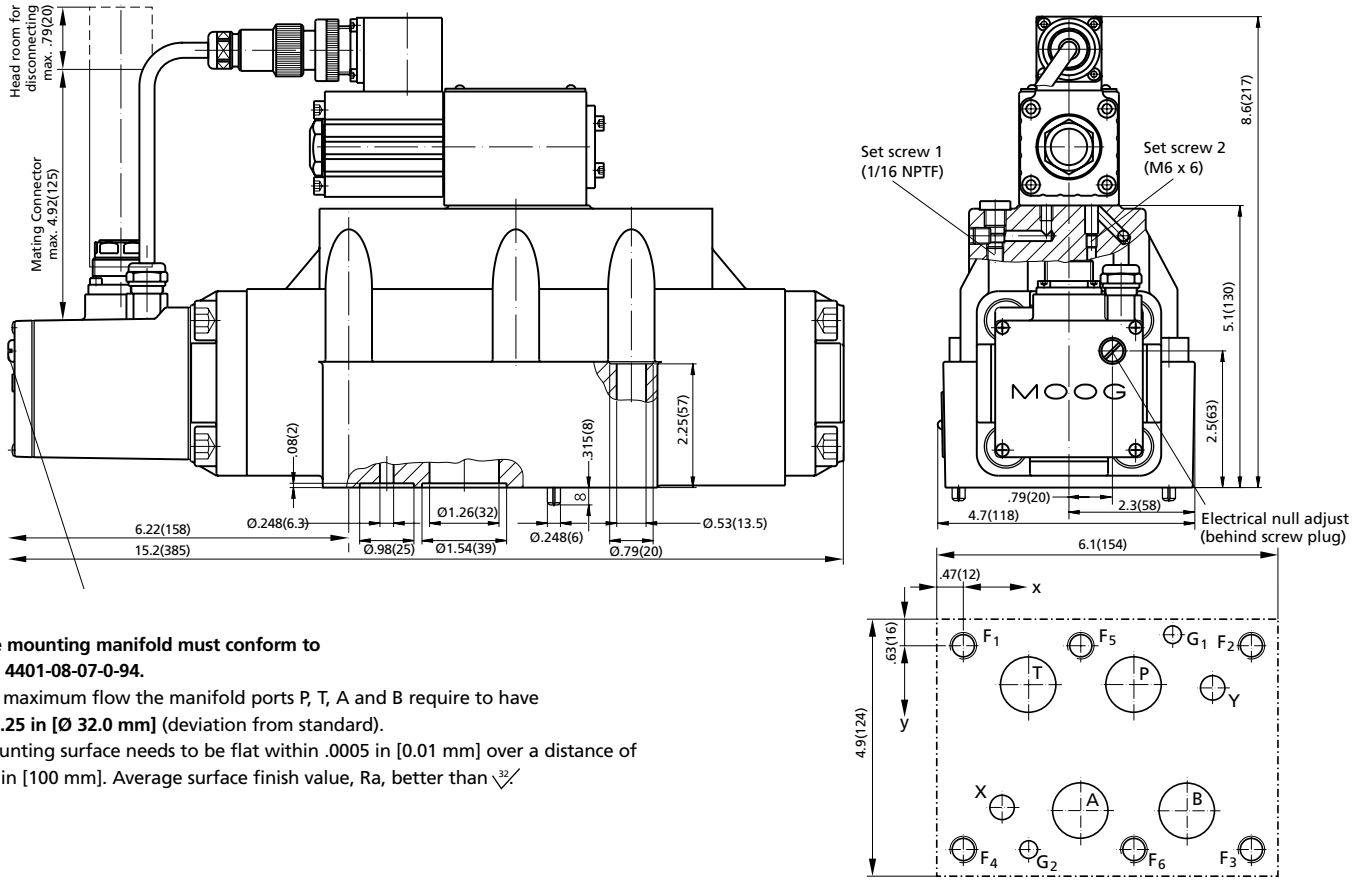


D684 -N. . H.UF/D





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 **Ø 1.25 in [Ø 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_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	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 External X	open closed	Internal T External Y	open 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.

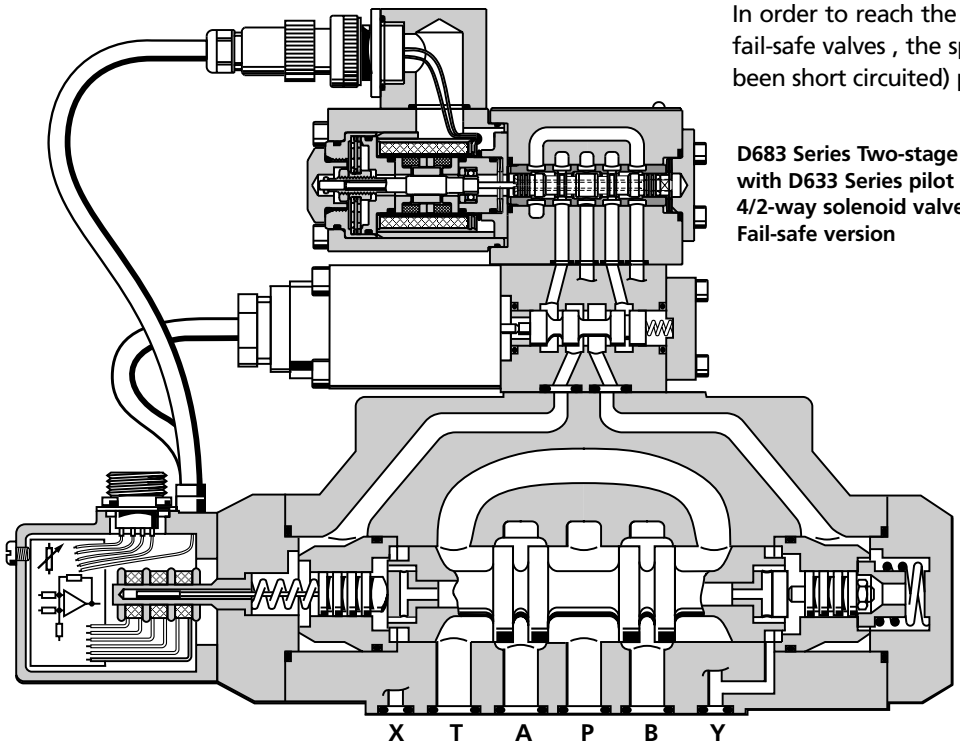
With fail-safe valves it is possible to check whether the main spool is in its predefined position. If the main spool is within its defined range, the logic output signal at pin 11 is > + 8.5 V. If this signal is < + 6.5 V, then the main spool is outside the defined range. This logic signal may be delayed 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.

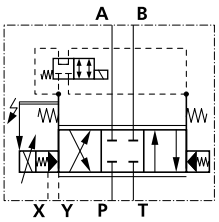
Fail Safe Functionality
After switching off the 24 V supply to the safety solenoid valve, this fail-safe function creates a defined metering spool position: overlapped centered position or fully opened A ◗ T.

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 ◗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 ◗ 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.

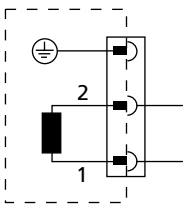
Note:
According to EN 954-1, a higher safety category can be achieved if a fail-safe valve is used.

ELECTRICAL CHARACTERISTICS

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

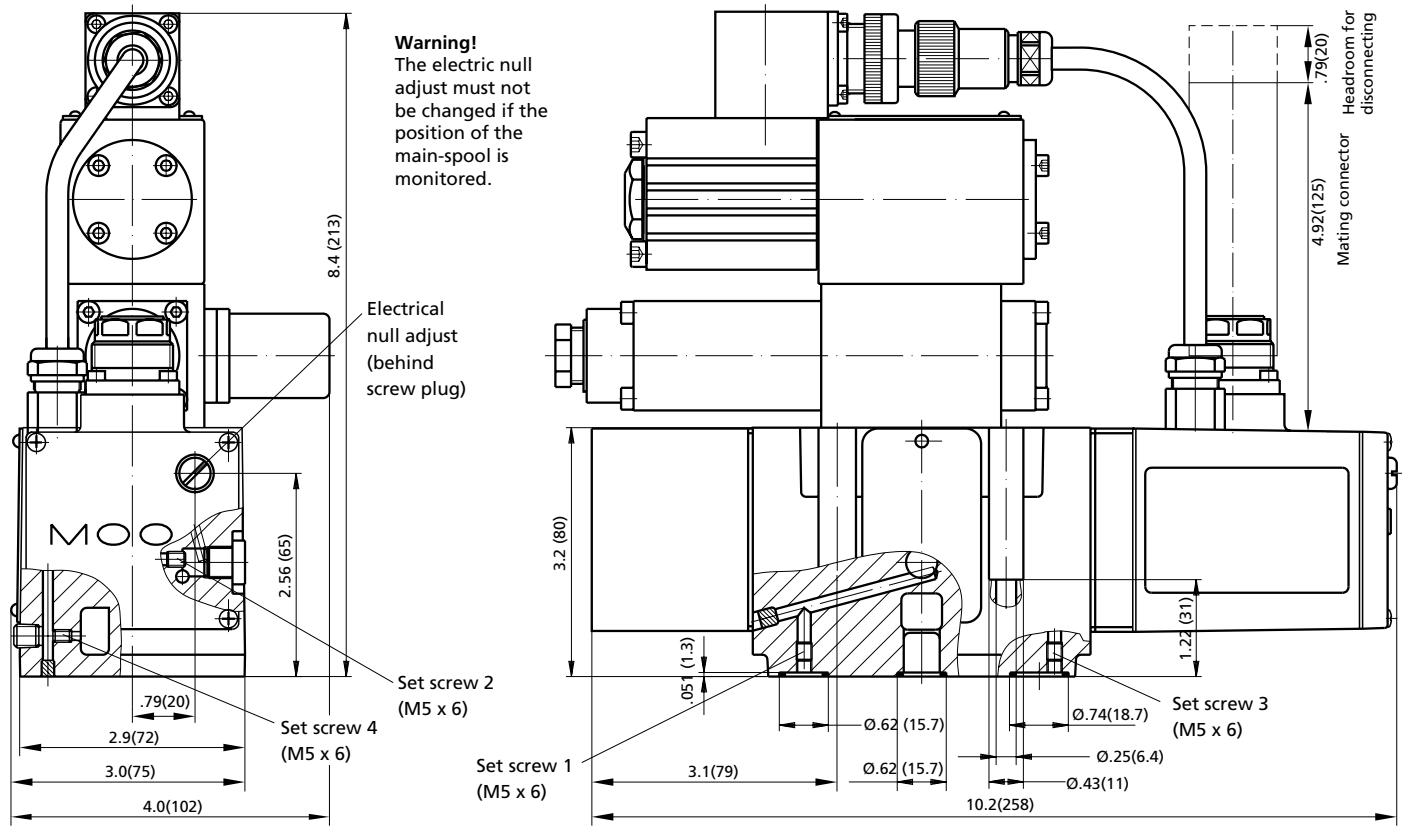
Valve version	4/2-way solenoid valve
Function	electromagnetic
Nominal voltage U_N	24 VDC (min 22.8 VDC, max 26.4 VDC)
Nominal current, I_N	1.35 A
Nominal power, P_N	33 W

Connector wiring



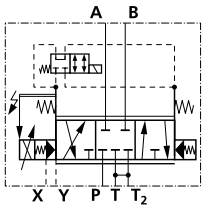
DIN 43650-1
Form A: 2+PE - PG9

INSTALLATION DIAGRAM

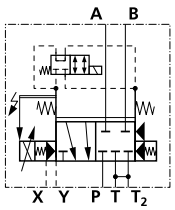


The mounting manifold must conform to ISO 4401-05-05-0-94 (see page 11).

Fail-safe
Centered position



Fail-safe
Centered position by mechanical spool stop



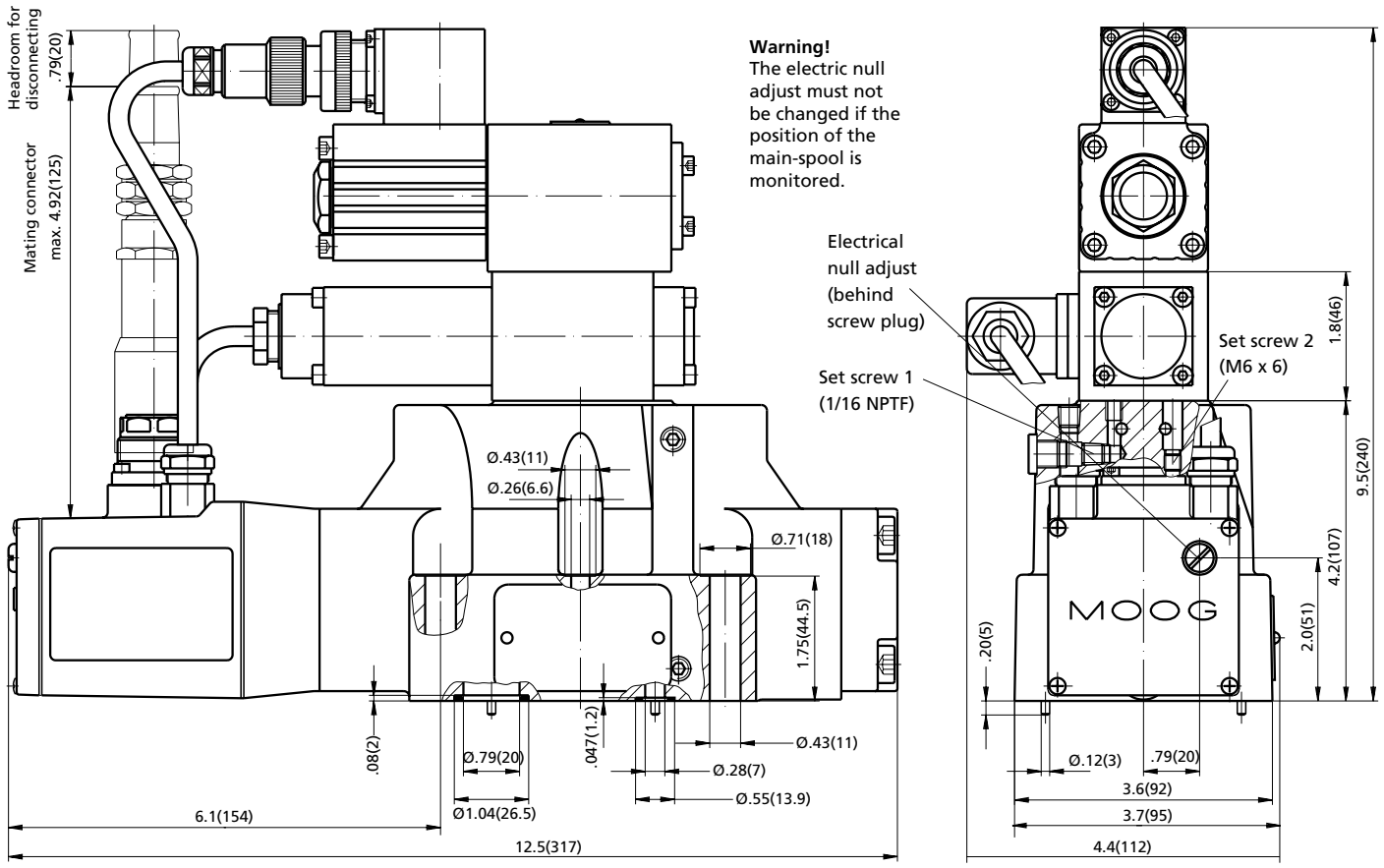
CONVERSION INSTRUCTION

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

SPARE PARTS AND ACCESSORIES

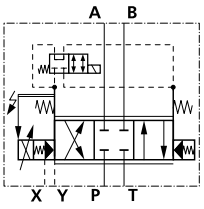
Spare parts and accessories: Page 11

INSTALLATION DIAGRAM

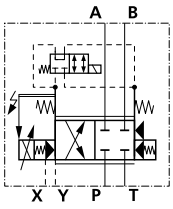


The mounting manifold must conform to ISO 4401-07-06-0-94 (see page 13).

Fail-safe
Centered position



Fail-safe
Centered position by mechanical spool stop



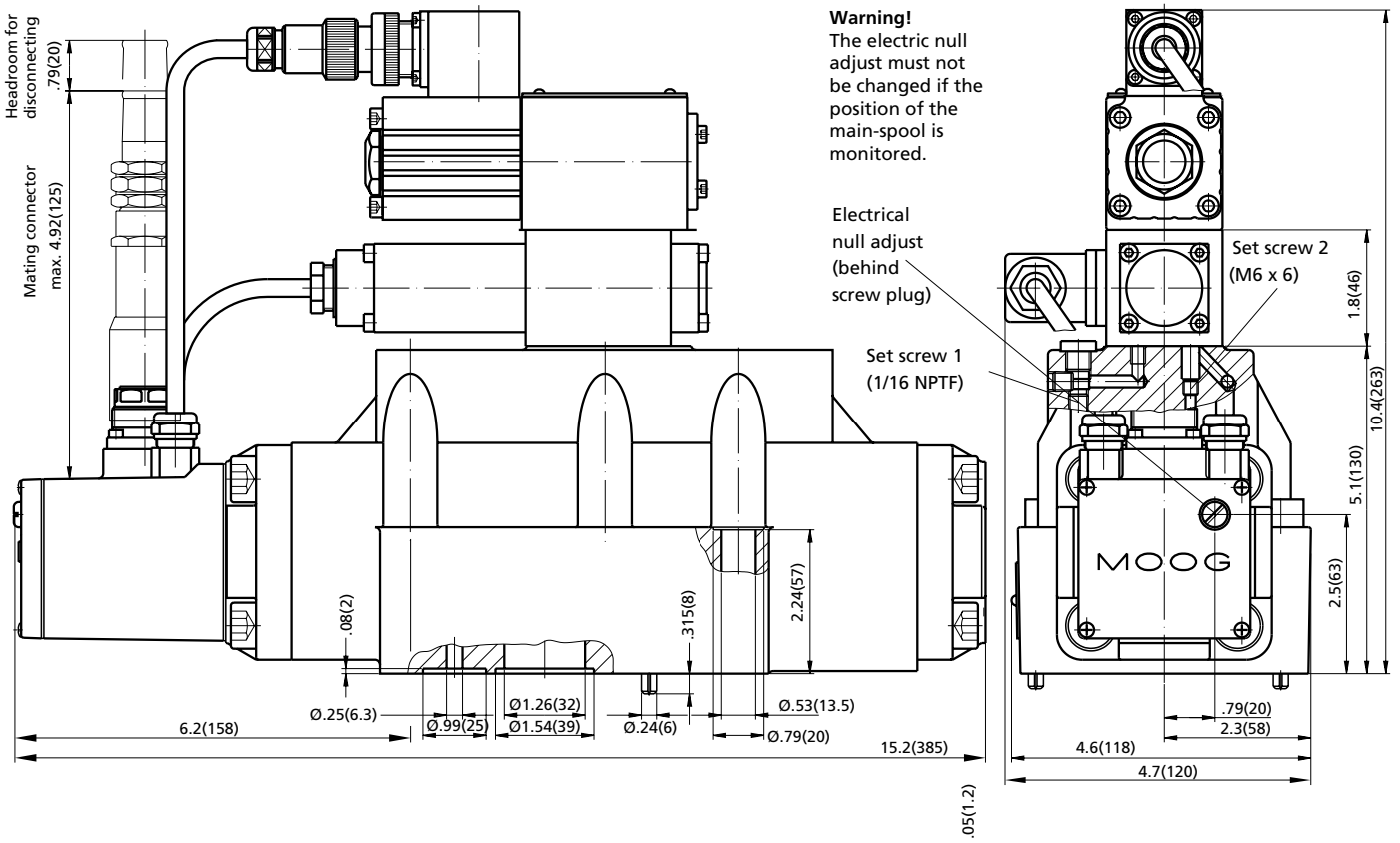
CONVERSION INSTRUCTION

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 External X	open closed	Internal T External Y	open closed

SPARE PARTS AND ACCESSORIES

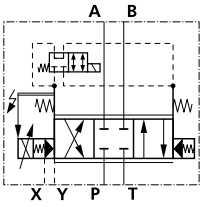
Spare parts and accessories: Page 13

INSTALLATION DIAGRAM

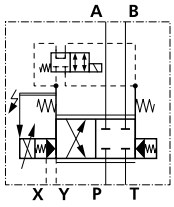


The mounting manifold must conform to ISO 4401-08-07-0-94 (see pages 15 and 17).

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 External X	open closed	Internal T External Y	open closed

SPARE PARTS AND ACCESSORIES

Spare parts and accessories: Pages 15 and 17

ORDERING INFORMATION

Model Number

D681 to D684 [. . . . . . .]

Type Designation

[. . . . . 2 - .]

Specification Status	
–	Series specification
E	Preseries specification
Z	Special specification

Model Designation	
	Assigned at the factory

Factory Identification

Valve Version		Series
P	Standard spool	D681 and D682
N	Stub shaft spool	D683 and D684

Rated Flow			
	Q_N[gpm]	[l/min] at Δp_N = 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

Maximum Operating Pressure p_P		
B	1,000 psi [70 bar]	Pilot valve D633-7..., P_{max} = 5,000 psi [350 bar]
H	4,000 psi [280 bar]	The integrated valve electronics is adapted
K	5,000 psi [350 bar]	to the pilot pressure

Main Spool Type	
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 P ◗ B: 60% overlap, curvilinear characteristic B ◗ T: 50% underlap, linear characteristic
U	5-way: P ◗ A, P_2 ◗ 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_2: ~ critical lap, linear characteristic
X	Special spool on request

Direct Drive Pilot Valve	
U	D633-7...
X	Special valve version on request

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

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

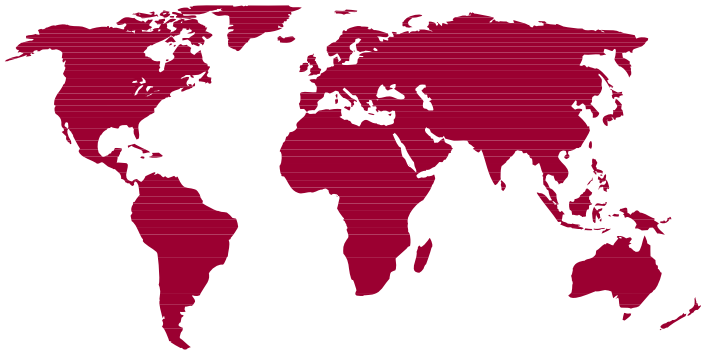
Pilot Connections and Pilot Pressure			
	Supply X	Return Y	
4	internal	internal	Parameters of the control electronics are adapted to the pilot pressure. See operating pressure on the nameplate and in this ordering information.
5	external	internal	
6	external	external	
7	internal	external	

Spool Position of Main Stage with/without Electrical or Hydraulic Supply					
O	Undefined				
	Mechanical fail-safe version				
	Position	p_p[psi]	px external [psi]		
F	P ◗ B, A ◗ T	≥ 145 < 145	≥ 145 < 15		
D	P ◗ A, B ◗ T	≥ 145 < 145	≥ 145 < 15		
	Electrically controlled fail-safe version				
	Position	p_P[psi]	p_x 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

**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.**



Argentina
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Austria
Brazil
China
England
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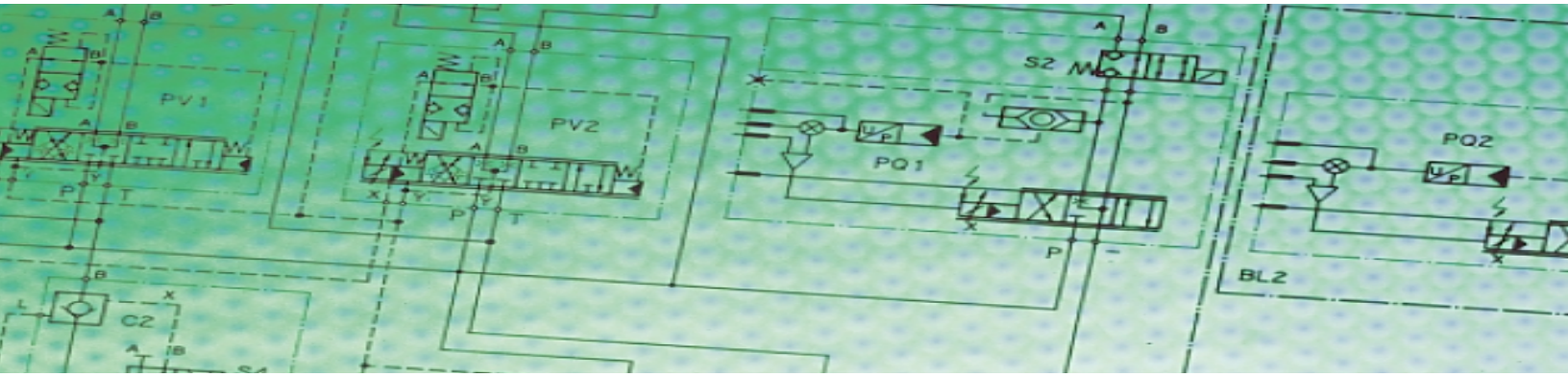

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MOOG

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