Proportional Control Valves
with integrated 24 Volt Electronics
D660 Series
ISO 4401 Size 05 to 10

D661 to D665 Series

Proportional control valves

❒ *two-stage with SERVO JET*

❒ *three-stage*

The D660 Series proportional flow 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.

For over 50 years Moog has manufactured proportional control valves with integrated electronics. More than 200 000 valves have been supplied. These proportional control valves have been proven to provide reliable control for many applications, including injection and blow moulding, die casting, presses, heavy industry, paper and lumber processing.

The valves have been continually developed. With Moog´s new ServoJet pilot stage a further step has been made in the direction of energy saving and robustness.

This pilot stage uses the jet pipe principle which for over 10 years has been applied reliably with different Moog valves.

The integrated electronics of the D660 Series is also a new development featuring SMD technology and requires 24 VDC power supply.

CE 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.

Operational features of the SERVO JET pilot stage

- ❒ Considerably ***improved flow rate recovery*** (more than 90% of the pilot stage internal leakage flow) contributes to energy saving, especially for machines with multiple valves.
- ❒ ***Improved dynamics due to high natural frequency*** (500 Hz) of the ServoJet pilot stage.
- ❒ ***Reliable operation***. The high pressure recovery of the ServoJet stage (more than 80% Δp at 100% command signal) provides higher spool driving forces and ensures enhanced spool position repeatability.
- ❒ ***Operational with only 25 bar pilot pressure.*** With this a robust proportional control valve for low pressure systems such as turbine controls is available.
- ❒ Pilot stage ***filter*** with almost unlimited life due to ***200 µm nominal*** fineness.
- ❒ ***Improved frequency response*** allows high spool position loop gain. The high loop gain provides excellent static and dynamic response, resulting in superior control system performance.

Operational features of the complete valve

- ❒ Valve body for high rated flow, optional with external pilot supply using X and Y ports.
- ❒ Reduced spool drive area results in following advantages:
  - improved dynamic response
  - reduction in pilot fluid flow for fast movements of the spool.
- ❒ Fail-safe version available provides defined safe spool position by a spring and a poppet valve, or by external hydraulic supply cut off.
- ❒ The D660 Series proportional control valves are of two-stage or three-stage design.

The spool motion of the main stage is produced by either a single-stage or a two-stage pilot valve. Two-stage proportional valves are mainly used when low threshold and good dynamic response with small signals are required. The three-stage proportional valves are suitable for good dynamic response with large signals.
By combining a fast first stage, a suitable spool drive area and integrated electronics, an optimum proportional valve can be offered.

Ex Valves available with explosion protection to EN 50018, class EEx d II C-C_2H_2 T5.
Note: Installation dimensions and electric connection altered. Special data sheet on request.

Our quality management system is conform to DIN EN ISO 9001.

This catalogue is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has to check the suitability of the products described herein.
In case of doubt please contact Moog.

Operating principle of the ServoJet pilot stage

The ServoJet pilot stage consists mainly of torque motor, jet pipe and receiver.
A current through the coil displaces the jet pipe from neutral. This displacement combined with the special shape of the nozzle directs a focussed fluid jet more into one receiver opening than the other.

The jet now produces a pressure difference in the control ports. This pressure difference results in a pilot flow, which in turn causes a spool displacement. The pilot stage drain is through the annular area around the nozzle to tank.

Operating principle of the multi-stage valve

The position control loop for the main stage spool is closed by the integrated electronics. An electric command signal (flow rate set point) is applied to the integrated position controller which drives the valve coils. 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 electric command signal.

The flow is dependent upon electric 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:

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

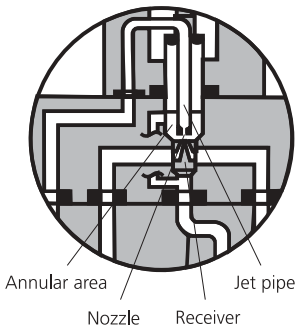
Q [l/min] = calculated flow
Q_N [l/min] = rated flow
Δp [bar] = calculated flow
Δp_N [bar] = rated valve pressure drop

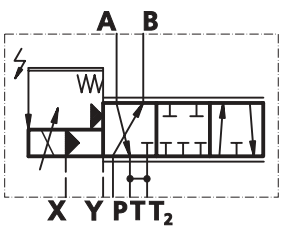
If large flow rates with high valve pressure drop are required an appropriate higher pilot pressure has to be chosen to overcome the flow forces. An approximate value can be calculated as follows:

$$p_X \geq 1{,}7 \cdot 10^{-2} \cdot \frac{Q}{A_K} \cdot \sqrt{\Delta p}$$

Q [l/min] = max. flow
Δp [bar] = valve pressure drop with Q
A_K [cm²] = spool drive area
p_X [bar] = pilot pressure

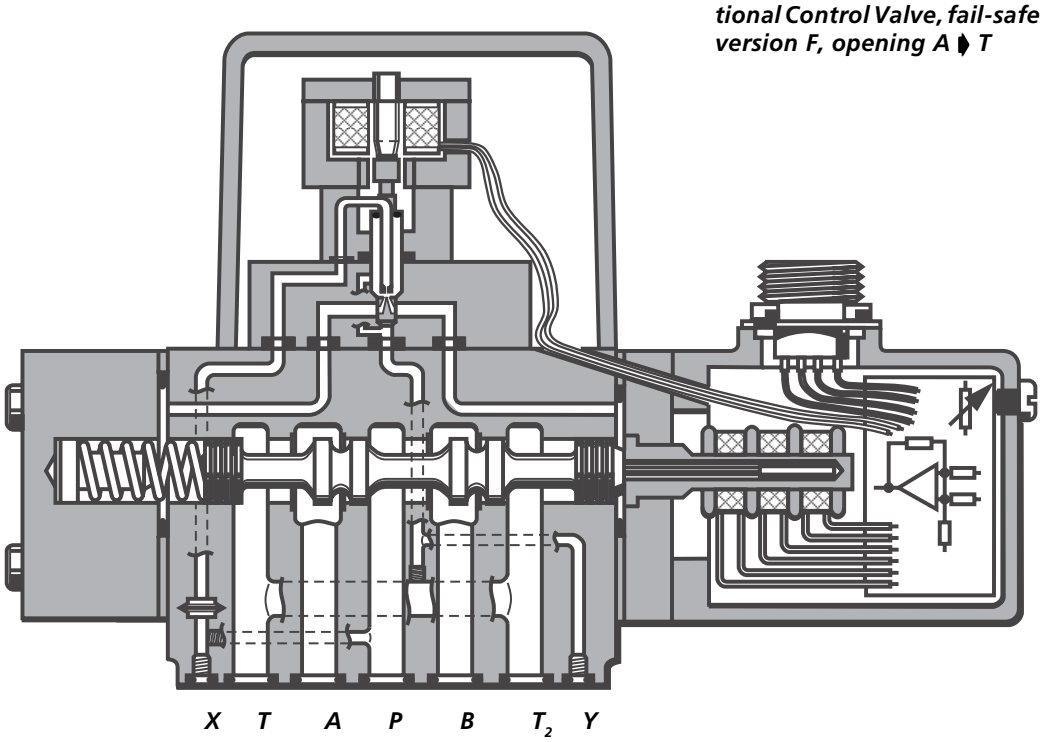
The pilot pressure p_X has to be at least 25 bar above the return pressure of the pilot stage.





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

D661 Series 2-stage Proportional Control Valve, fail-safe version F, opening A ◗ T



General technical data

Operating pressure range

Ports P, A and B	up to 350 bar
Port T	see data of individual series

Temperature range

Ambient	-20 ° to +60 °C
Fluid	-20 ° to +80 °C

Seal material NBR, FPM and others on request

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

Viscosity	recommended	15 to 45 mm^2/s
	allowed	5 to 400 mm^2/s

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. In combination with a fast regulating variable displacement pump an off-line filter is recommended

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

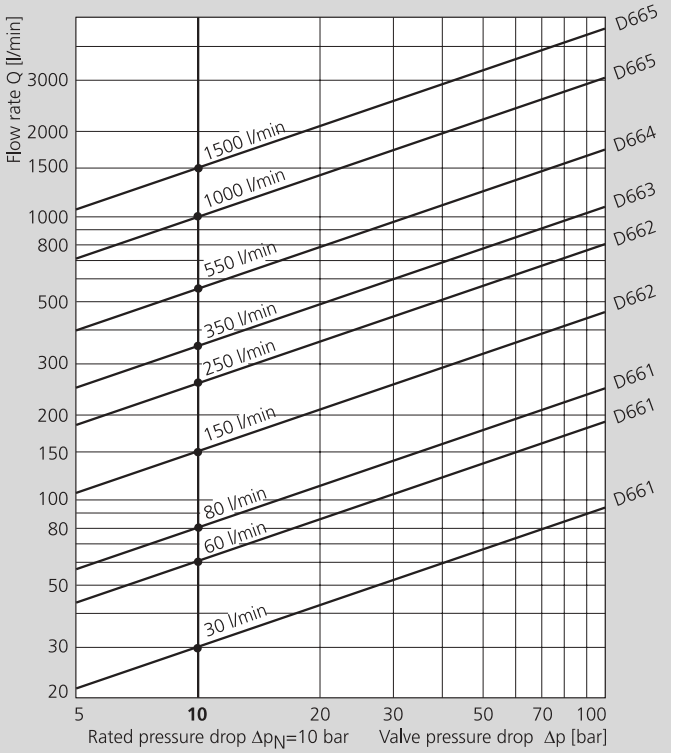
Recommended cleanliness class

For normal operation	ISO 4406 <19/16/13
For longer life	ISO 4406 <17/14/11

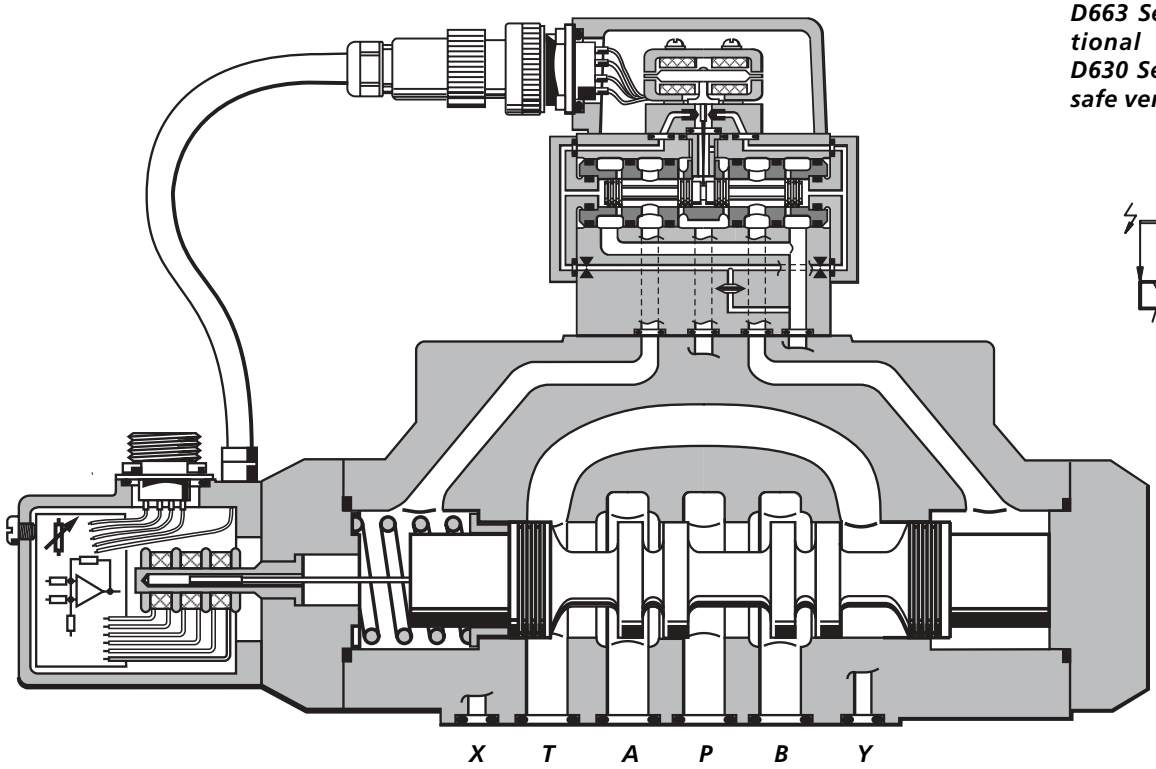
Filter rating recommended

For normal operation	$\beta_{15} \geq 75$ (15 µm absolute)
For longer life	$\beta_{10} \geq 75$ (10 µm absolute)

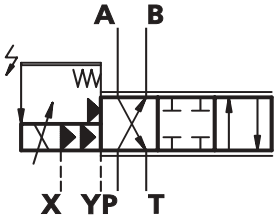
Installation options	any position, fixed or mov able
Vibration	30 g, 3 axes
Degree of protection	EN60529: class IP 65 with mating connector mounted
Shipping plate	Delivered with an oil sealed shipping plate



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



D663 Series 3-stage Proportional Control Valve with D630 Series pilot valve, fail-safe version F, opening A ◗ T



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

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 centred 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 centred 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.

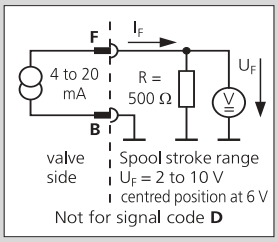
Actual value 4 to 20 mA

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.

General requirements

- ❒ Supply 24 VDC, min. 18 VDC, max. 32 VDC. Current consumption max. 300 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 emissionEN55011:1998+A1:1999(limit class:B) and immunity:EN61000-6-2:1999.
- ❒ Minimum cross-section of all leads ≥ 0,75 mm². Consider voltage losses between cabinet and valve.
- ❒ Note: When making electric 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 TN 353.

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



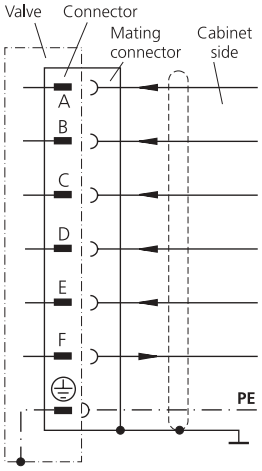
Note: Enable input

With enable signal off, the main spool will move to a safe position.
a) Centred position (unbiased pilot valve) function code ***A***[1])
b) End position (biased pilot valve) function code ***B***[1])

[1]) see type designation

Wiring for valves with 6+PE pole connector

to EN 175201 Part 804[2]), and mating connector (type R and S , metal shell) with leading protective earth connection (≒). See also wiring instructions TN 353.



Function	***Current command***	***Voltage command***
Supply	24 VDC (min. 18 VDC, max. 32 VDC). I_{max} = 300 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)	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 Input voltage for U_{D-B} and U_{E-B} for both signal types is limited to min. –15 V and max. +32 V	U_{D-E} = 0 to ±10 V R_e = 10 kΩ
Output actual value spool position	I_{F-B}= 4 to 20 mA. At 12 mA spool is in centred position. R_L = 100 to 500 Ω Signal code ***D*** (see page 23): U_{F-B} = 2 to 10 V. At 6 V spool is in centred position. R_a = 500 Ω	
Protective earth		

[2]) formerly DIN 43563

D661 to D665 Series
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 centred 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 centred 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.

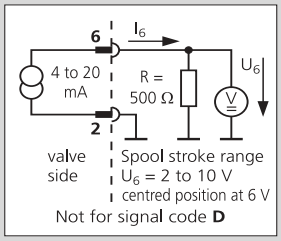
The position signal output 4 to 20 mA allows to detect a cable break when I_6 = 0 mA.

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

General requirements

- ❒ Supply 24 VDC, min. 18 VDC, max. 32 VDC
  Current consumption max. 300 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 emissionEN55011:1998+A1:1999(limit class:B) and immunity:EN61000-6-2:1999.
- ❒ Minimum cross-section of all leads ≥ 0,75 mm².
  Consider voltage losses between cabinet and valve.
- ❒ Note: When making electric 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 TN 353.

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



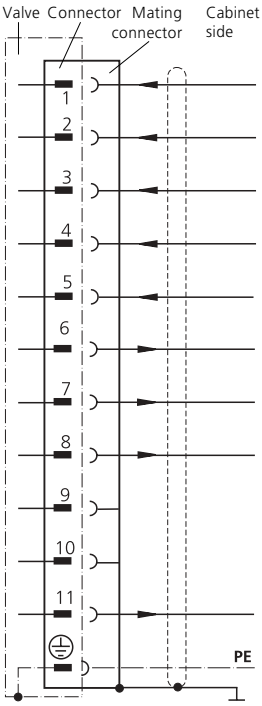
Note: Enable input

With enable signal off, the main spool will move to a safe position.
a) Centred position
(unbiased pilot valve)
function code ***E***[1])
b) End position
(biased pilot valve)
function code ***F***[1])

[1]) see type designation

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 (⏚). See also wiring instructions AM 426 E.



Function	***Current command***	***Voltage command***
Supply	24 VDC (min. 18 VDC, max. 32 VDC). I_{max} = 300 mA	
Supply / Signal ground	⊥ (0 V)	
Enable Not enable	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)	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 Input voltage for U_{4-2} and U_{5-2} for both signal types is limited to min. –15 V and max. +32 V	U_{4-5} = 0 to ±10 V R_e = 10 kΩ
Output actual value spool position	I_{6-2} = 4 to 20 mA. At 12 mA spool is in centred position. R_L = 100 to 500 Ω Signal code ***D*** (see page 23): U_{6-2} = 2 to 10 V. At 6 V spool is in centred position. R_a = 500 Ω	
Auxiliary signal	Spool position U_{7-2}= 13 to 3 V. At 8 V spool is in centred 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 $I_4 = -I_5$.
100 % valve opening P ◗ A and B ◗ T is achieved at I_4 = +10 mA.
At 0 mA command the spool is in centred 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 centred 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.

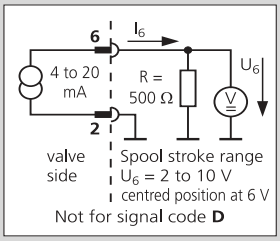
The position signal output 4 to 20 mA allows to detect a cable break when I_6 = 0 mA.

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

General requirements

- ❒ Supply 24 VDC, min. 18 VDC, max. 32 VDC
  Current consumption max. 300 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 emissionEN55011:1998+A1:1999(limit class:B) and immunity:EN61000-6-2:1999.
- ❒ Minimum cross-section of all leads ≥ 0,75 mm².
  Consider voltage losses between cabinet and valve.
- ❒ Note: When making electric 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 TN 353.

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



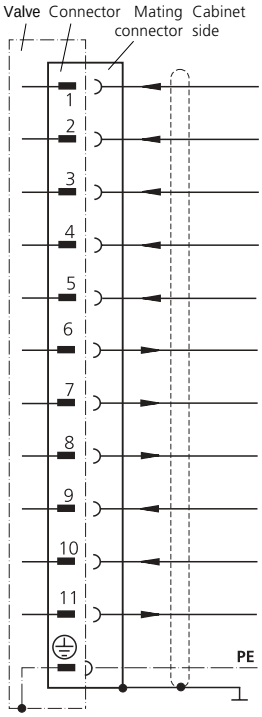
Note: Enable input

With enable signal off, the main spool will move to a safe position.
a) Centred position
   (unbiased pilot valve)
   function code ***G***[1])
b) End position
   (biased pilot valve)
   function code ***H***[1])

[1]) see type designation

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 (⏚). See also wiring instructions AM 426 E



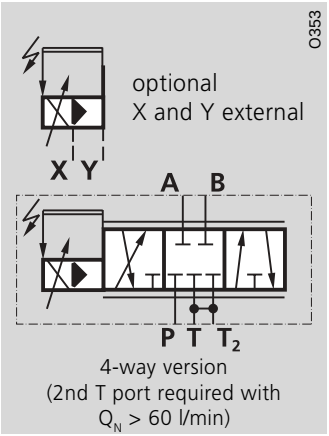
Function	***Current command***	***Voltage command***
Supply	24 VDC (min. 18 VDC, max. 32 VDC). I_{max} = 300 mA	
Supply / Signal ground	⊥ (0 V)	
Enable Not enable	U_{3-2} > +8,5 VDC U_{3-2} < +6,5 VDC I_e = 2,0 mA at 24 VDC (see note above)	
Input rated command (differential)	Input command $I_4 = -I_5$: 0 to ±10 mA (R_e = 200 Ω) Input command (inverted) $I_5 = -I_4$: 0 to ±10 mA Input voltage for U_{4-2} and U_{5-2} for both signal types is limited to min. –15 V and max. +32 V	U_{4-5} = 0 to ±10 V R_e = 10 kΩ
Output actual value spool position	I_{6-2} = 4 to 20 mA. At 12 mA spool is in centred position. R_L = 100 to 500 Ω Signal code ***D*** (see page 23): U_{6-2} = 2 to 10 V. At 6 V spool is in centred position. R_a = 500 Ω	
Auxiliary signal	Spool position U_{7-2} = 13 to 3 V. At 8 V spool is in centred 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: safe position U_{11-2} < +6,5 VDC: no safe position Output I_{max} = 20 mA	
Protective earth		

[2]) formerly DIN 43651

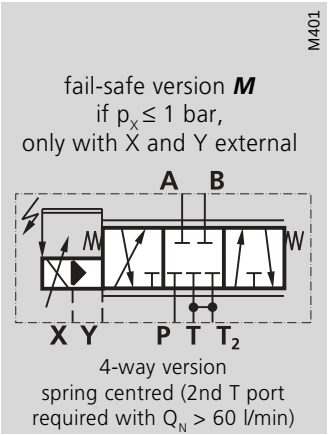
D661 Series
Technical data

Model . . . Type			***D661 - . . . . . P/B . . . . A***	***D661 - . . . . . P/B . . . . B***
Mounting pattern	ISO, with additional 2nd T port		ISO 4401-05-05-0-94	ISO 4401-05-05-0-94
Valve version			4-way, 2x2-way and 5-way 2-stage, standard spool	4-way, 2x2-way and 5-way 2-stage, standard spool
Pilot stage	ServoJet		Standard	Highflow
Pilot connection	optional, internal or external		X and Y	X and Y
Mass		[kg]	5,6	5,6
Rated flow	(±10%) at Δp_N = 5 bar per land	[l/min]	***30 / 60 / 80 / 2 x 80***	***30 / 60 / 80 / 2 x 80***
Operating pressure	max.			
Main stage:	ports P with X external, A, B	[bar]	350	350
	port T with Y internal	[bar]	210	210
	port T with Y external	[bar]	350	350
Pilot stage:	regular version	[bar]	280	280
	with dropping orifice (on request)	[bar]	350	350
Response time*	for 0 to 100 % stroke, typical	[ms]	***28***	***18***
Threshold*		[%]	< 0,05	< 0,05
Hysteresis*		[%]	< 0,3	< 0,3
Null shift*	with ΔT = 55 K	[%]	< 1	< 1
Null leakage flow*	total max. (~ critical lap)	[l/min]	3,5	4,4
Null leakage flow*	pilot stage only, typical	[l/min]	1,7	2,6
Pilot flow*	max., for 100% step input	[l/min]	***1,7***	***2,6***
Main spool stroke		[mm]	± 3	± 3
Spool drive area		[cm²]	2	2

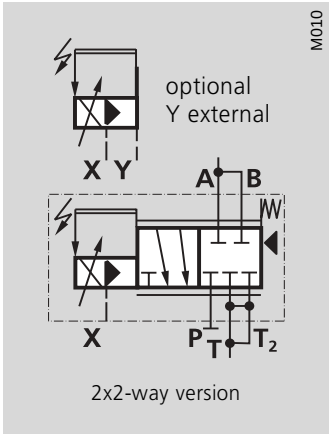
*) At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



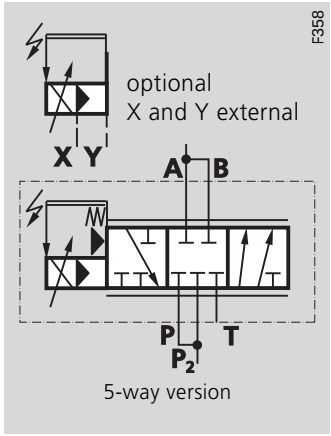
4-way version
(2nd T port required with Q_N > 60 l/min)



4-way version
spring centred (2nd T port required with Q_N > 60 l/min)



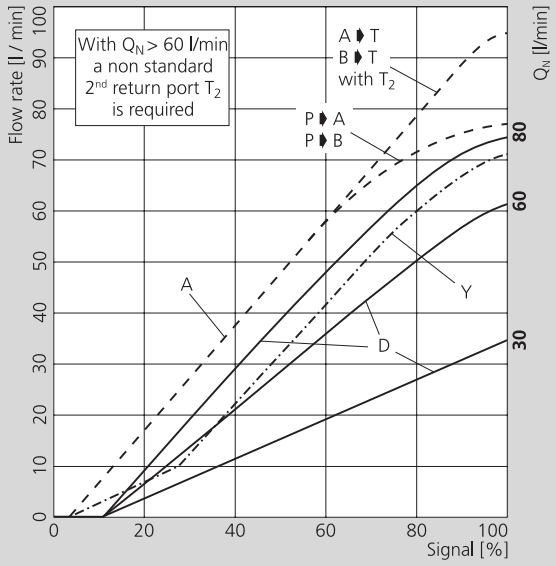
2x2-way version



5-way version

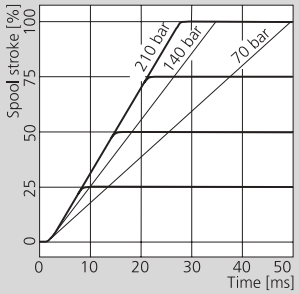
Typical characteristic curves at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow vs. signal curve
at Δp_N = 5 bar per land

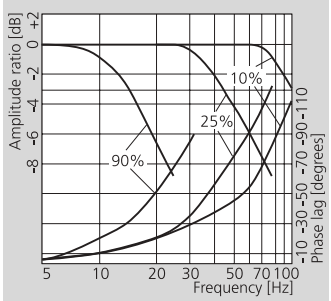


Spool version A: ~critical lap, linear characteristic (***80***)
Spool version D: 10 % overlap, linear characteristic
Spool version Y: ~critical lap,curvilinear characteristic (***80***)

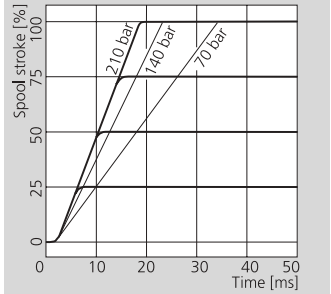
D661 - . . . . . P/B . . . . A
Step response

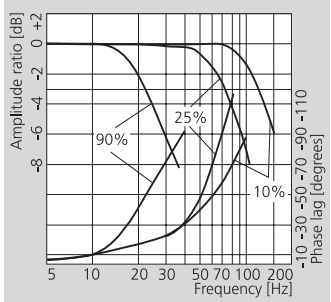


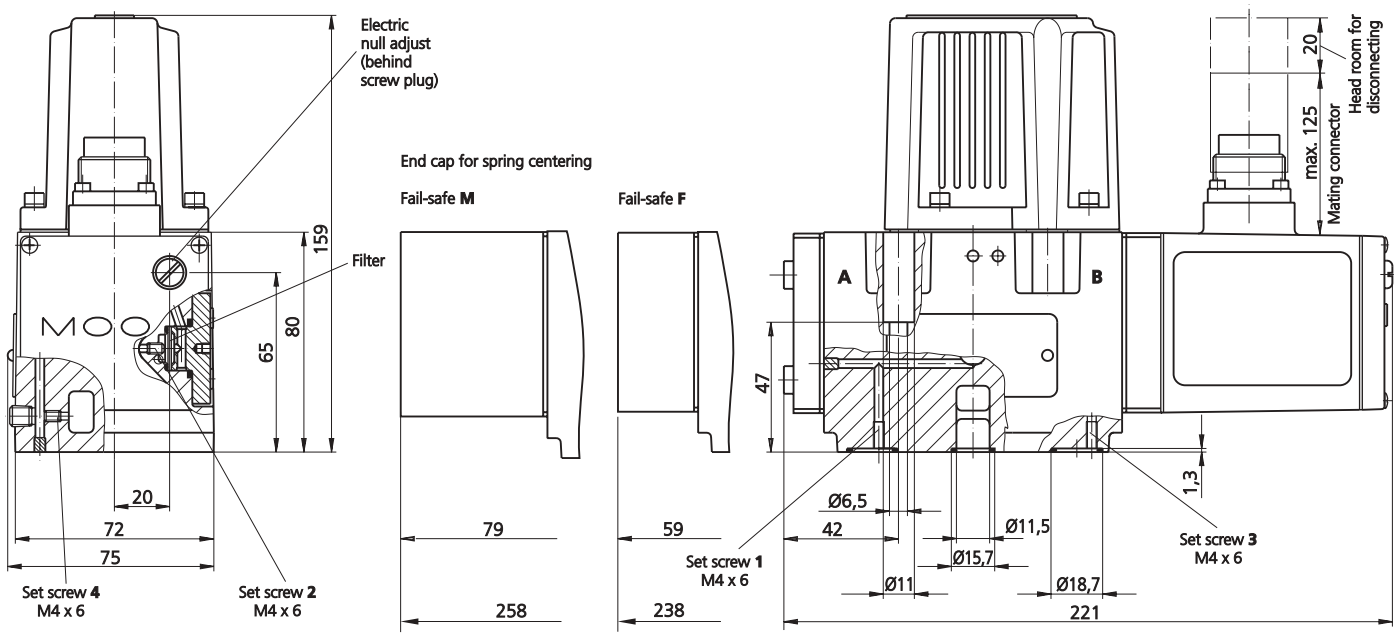
Frequency response



D661 - . . . . . P/B . . . . B

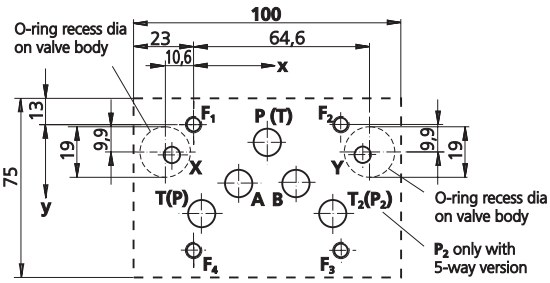






The mounting manifold must conform to ISO 4401-05-05-0-94.
Attention:
Mounting length min. 100 mm.
Notice O-ring recess dia of X and Y ports.
For valves in 4-way version with Q_N > 60 l / min and in 2x2-way version the non standard 2nd return port T_2 must be used.

For maximum flow the manifold ports P, T, A and B require to have ***11,5 mm dia*** (deviation from standard).
Mounting surface needs to be flat within 0,01 mm over a distance of 100 mm. Average surface finish value, Ra ≥ 0,8 µm.



	P	*A*	*B*	*T*	T_2	*X*	*Y*	F_1	F_2	F_3	F_4
	Ø11,5	***Ø11,5***	***Ø11,5***	***Ø11,5***	***Ø11,5***	Ø6,3	Ø6,3	M6	M6	M6	M6
x	27	16,7	37,3	3,2	50,8	-8	62	0	54	54	0
y	6,3	21,4	21,4	32,5	32,5	11	11	0	0	46	46

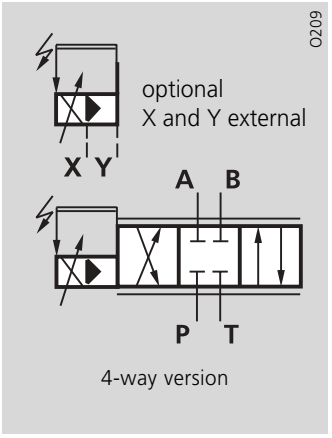
Spare parts and Accessories

O-rings (included in delivery)			NBR 85 Shore	FPM 85 Shore
for P, T, T_2, A, B	5 pieces ID 12,4 x Ø 1,8		45122 004	42082 004
for X, Y	2 pieces ID 15,6 x Ø 1,8		45122 011	42082 011
Mating connector, waterproof IP65	(not included in delivery)		for cable dia	
6+PE pole	B97007 061	EN 175201 Part 804	min. 10 mm, max. 12 mm	
11+PE pole	B97067 111	EN 175201 Part 804	min. 11 mm, max. 13 mm	
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	
M 6 x 60 DIN EN ISO 4762-10.9	A03665 060 060	13 Nm	4 pieces	
Replaceable filter	A67999 200	200 µm nominal		
O-rings for filter change		HNBR 85 Shore	NBR 85 Shore	FPM 85 Shore
filter	1 piece ID 12 x Ø 2,0	–––	66117 012 020	A25163 012 020
filter cover	1 piece ID 17,1 x Ø 2,6	B97009 080	–––	–––

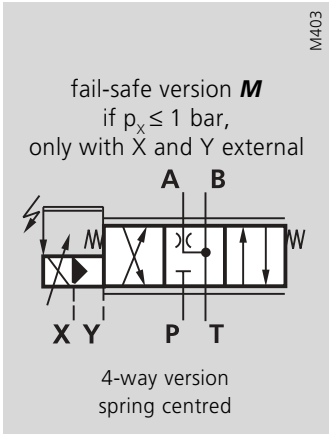
D662 Series
Technical data

Model . . . Type			***D662 - . . D . A***	***D662 - . . D . . B***	***D662 - . . P . M***
Mounting pattern			ISO 4401-07-06-0-94	ISO 4401-07-06-0-94	ISO 4401-07-06-0-94
Valve body version			4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 3-stage, standard spool
Pilot stage			D061 Series ServoJet, 1-stage	D061 Series ServoJet, 1-stage	D630 Series, 2-stage
Pilot connection	optional, internal or external		X and Y	X and Y	X and Y
Mass		[kg]	11	11	11,5
Rated flow	(±10%) at Δp_N = 5 bar per land	[l/min]	150 / ***250***	150 / ***250***	150 / ***250***
Operating pressure	max.				
Main stage:	ports P with X external, A, B	[bar]	350	350	350
	port T with Y internal	[bar]	140	140	210
	port T with Y external	[bar]	350	350	350
Pilot stage:	regular version, ports P, A und B	[bar]	280	280	280
	with dropping orifice (on request)	[bar]	350	350	---
	port T	[bar]	140	140	210
Response time*	for 0 to 100 % stroke, typical	[ms]	***44***	***28***	***9***
Threshold*		[%]	< 0,1	< 0,1	< 0,2
Hysteresis*		[%]	< 0,5	< 0,5	< 1,0
Null shift	with ΔT = 55 K	[%]	< 1,0	< 1,0	< 1,5
Null leakage flow*	total max. (~ critical lap)	[l/min]	4,2	5,1	4,5
Pilot leakage flow*	pilot stage only, typical	[l/min]	1,7	2,6	2,0
Pilot flow*	max., for100% step input	[l/min]	***1,7***	***2,6***	***20***
Main spool stroke		[mm]	± 5	± 5	± 5
Spool drive area		[cm²]	2	2	5

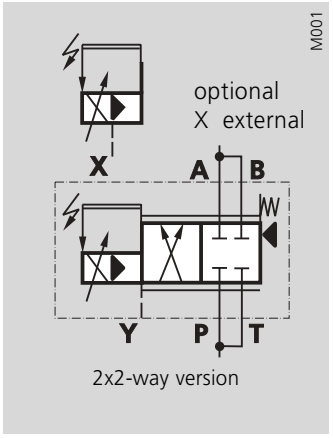
***** At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



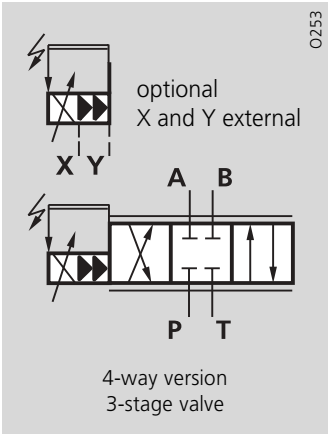
4-way version



4-way version
spring centred



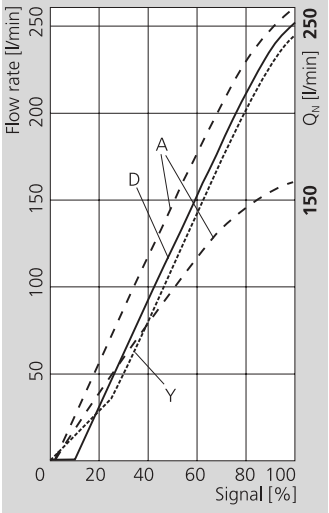
2x2-way version



4-way version
3-stage valve

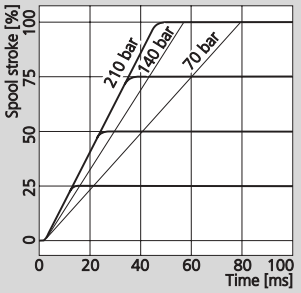
Typical characteristic curves at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow vs. signal curve
at Δp_N = 5 bar per land

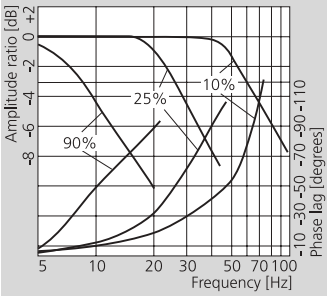


A: ~critical lap, linear
D: 10 % overlap, linear
Y: ~critical lap, curvilinear

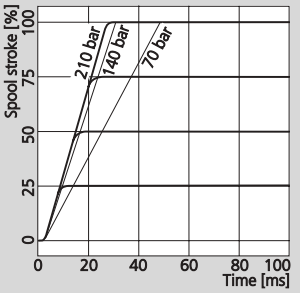
D662 - . . . . . D . . . . A
Step response

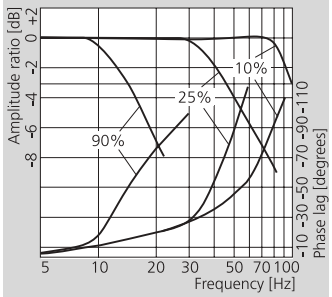


Frequency response

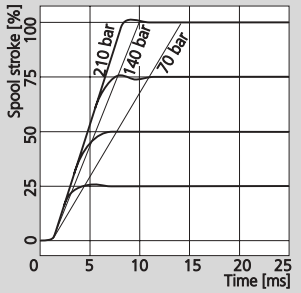


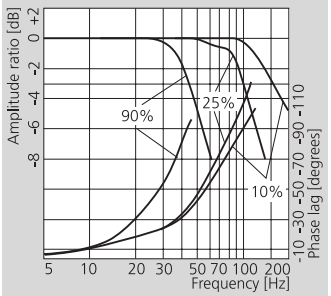
D662 - . . . . . D . . . . B



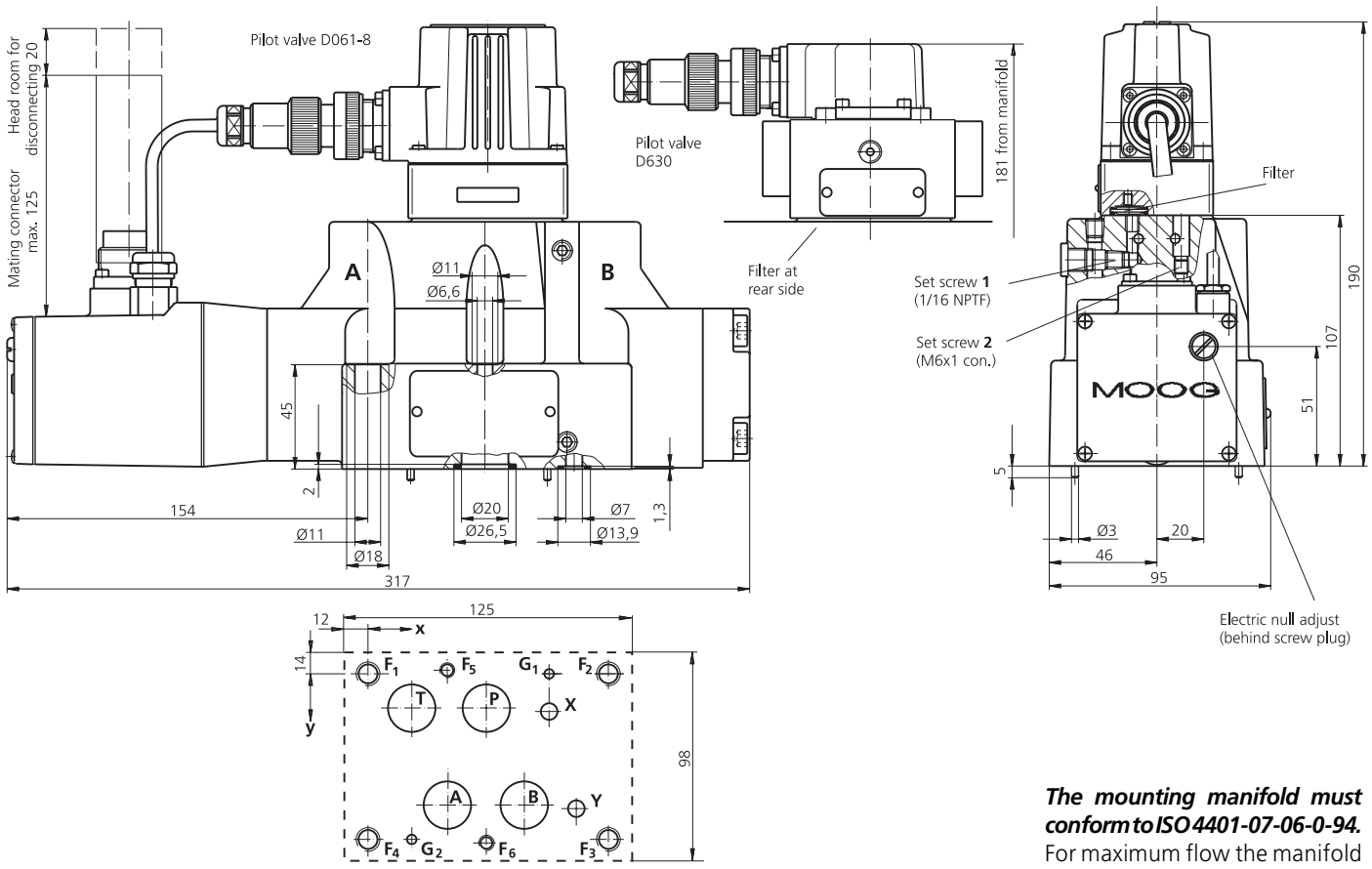


D662 - . . . . . P . . . . M





Installation drawing, Spare parts, Accessories



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 ***20 mm dia*** (deviation from standard).
Mounting surface needs to be flat within 0,01 mm over a distance of 100 mm. Average surface finish value, Ra, better than 0,8 µm.

	P	***A***	***T***	***B***	***X***	***Y***	***G_1***	***G_2***	***F_1***	***F_2***	***F_3***	***F_4***	***F_5***	***F_6***
	Ø20	***Ø20***	***Ø20***	***Ø20***	Ø6,3	Ø6,3	Ø4	Ø4	M10	M10	M10	M10	M6	M6
x	50	34,1	18,3	65,9	76,6	88,1	76,6	18,3	0	101,6	101,6	0	34,1	50
y	14,3	55,6	14,3	55,6	15,9	57,2	0	69,9	0	0	69,9	69,9	-1,6	71,5

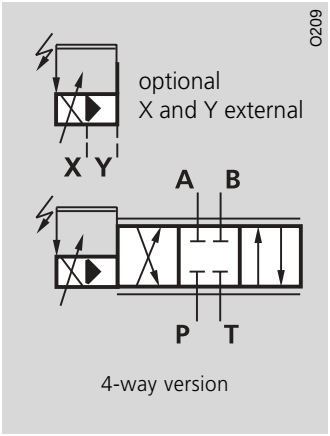
Spare parts and Accessories

O-rings (included in delivery)				NBR 85 Shore	FPM 85 Shore
for P, T, A, B		4 pieces ID 21,89 x Ø 2,6		45122 129	42082 129
for X, Y		2 pieces ID 10,82 x Ø 1,8		45122 022	42082 022
Mating connector, waterproof IP65 (not included in delivery)				for cable dia	
6+PE pole		B97007 061	EN 175201 Part 804	min. 10 mm, max. 12 mm	
11+PE pole		B97067 111	EN 175201 Part 804	min. 11 mm, max. 13 mm	
Flushing plate		76741			
Mounting manifold		B46891-001			
Mounting bolts (not included in delivery)			required torque	required	
M 10 x 60 DIN EN ISO 4762 -10.9		A03665 100 060	65 Nm	4 pieces	
M 6 x 55 DIN EN ISO 4762 -10.9		A03665 060 055	13 Nm	2 pieces	
Replaceable filter					
for pilot valve D061-8		A67999 200	200 µm nominal		
for pilot valve D630		A67999 065	65 µm nominal		
O-rings for filter change			HNBR 85 Shore	NBR 85 Shore	FPM 85 Shore
D061-8:	before filter	1 piece ID 14 x Ø 1,0	A67008 014 010	–––	–––
	behind filter	1 piece ID 13 x Ø 1,5	A67008 013 015	–––	–––
D630:	before and behind filter	2 pieces ID 13 x Ø 1,5	–––	66117 013 015	A25163 013 015

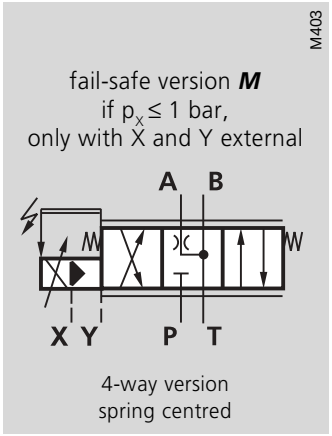
D663 Series
Technical data

Model . . . Type			***D663 - . . . . . L . . . . B***	***D663 - . . . . . P . . . . M***
Mounting pattern			ISO 4401-08-07-0-94	ISO 4401-08-07-0-94
Valve body version			4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 3-stage, stub shaft spool
Pilot stage			D061 Series ServoJet, 1-stage	D630 Series, 2-stage
Pilot connection	optional, internal or external		X and Y	X and Y
Mass		[kg]	19	19,5
Rated flow	(±10%) at Δp_N = 5 bar per land	[l/min]	***350***	***350***
Operating pressure	max.			
Main stage:	ports P with X external, A, B	[bar]	350	350
	port T with Y internal	[bar]	140	210
	port T with Y external	[bar]	350	350
Pilot stage:	regular version, ports P, A and B	[bar]	280	280
	with dropping orifice (on request)	[bar]	350	---
	port T	[bar]	140	210
Response time*	for 0 to 100 % stroke, typical	[ms]	***37***	***13***
Threshold*		[%]	< 0,1	< 0,2
Hysteresis*		[%]	< 0,5	< 1,0
Null shift	with ΔT = 55 K	[%]	< 1,0	< 1,5
Null leakage flow*	total max. (~ critical lap)	[l/min]	5,6	5,0
Pilot leakage flow*	pilot stage only, typical	[l/min]	2,6	2,0
Pilot flow*	max., for 100% step input	[l/min]	***2,6***	***30***
Main spool stroke		[mm]	± 4,5	± 4,5
Spool drive area		[cm²]	2,8	11,4

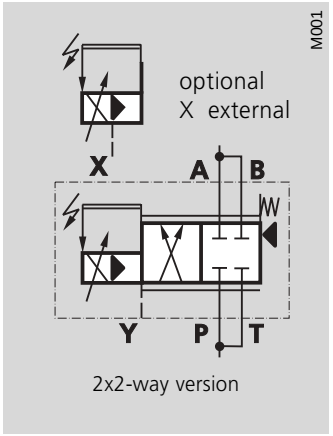
***** At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



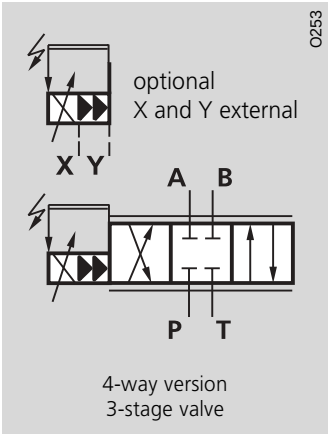
4-way version



4-way version
spring centred



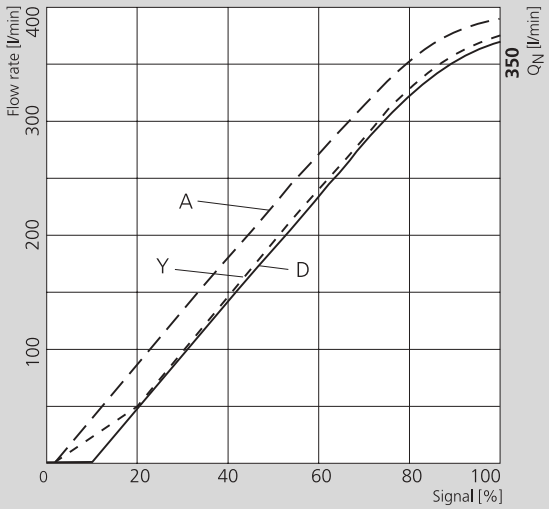
2x2-way version



4-way version
3-stage valve

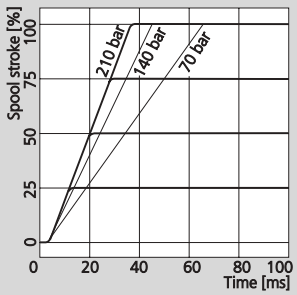
Typical characteristic curves at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow vs. signal curve
at Δp_N = 5 bar per land

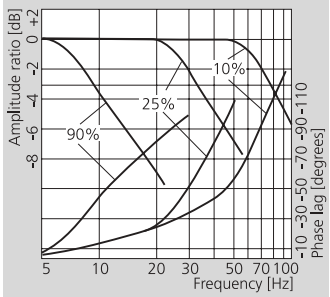


Spool version A: ~critical lap, linear characteristic
Spool version D: 10 % overlap, linear characteristic
Spool version Y: ~critical lap,curvilinear characteristic

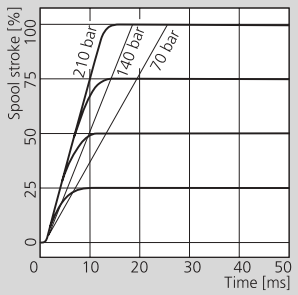
D663 - . . . . . L . . . . B
Step response

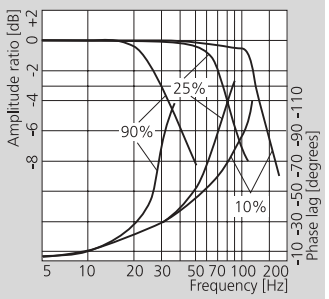


Frequency response

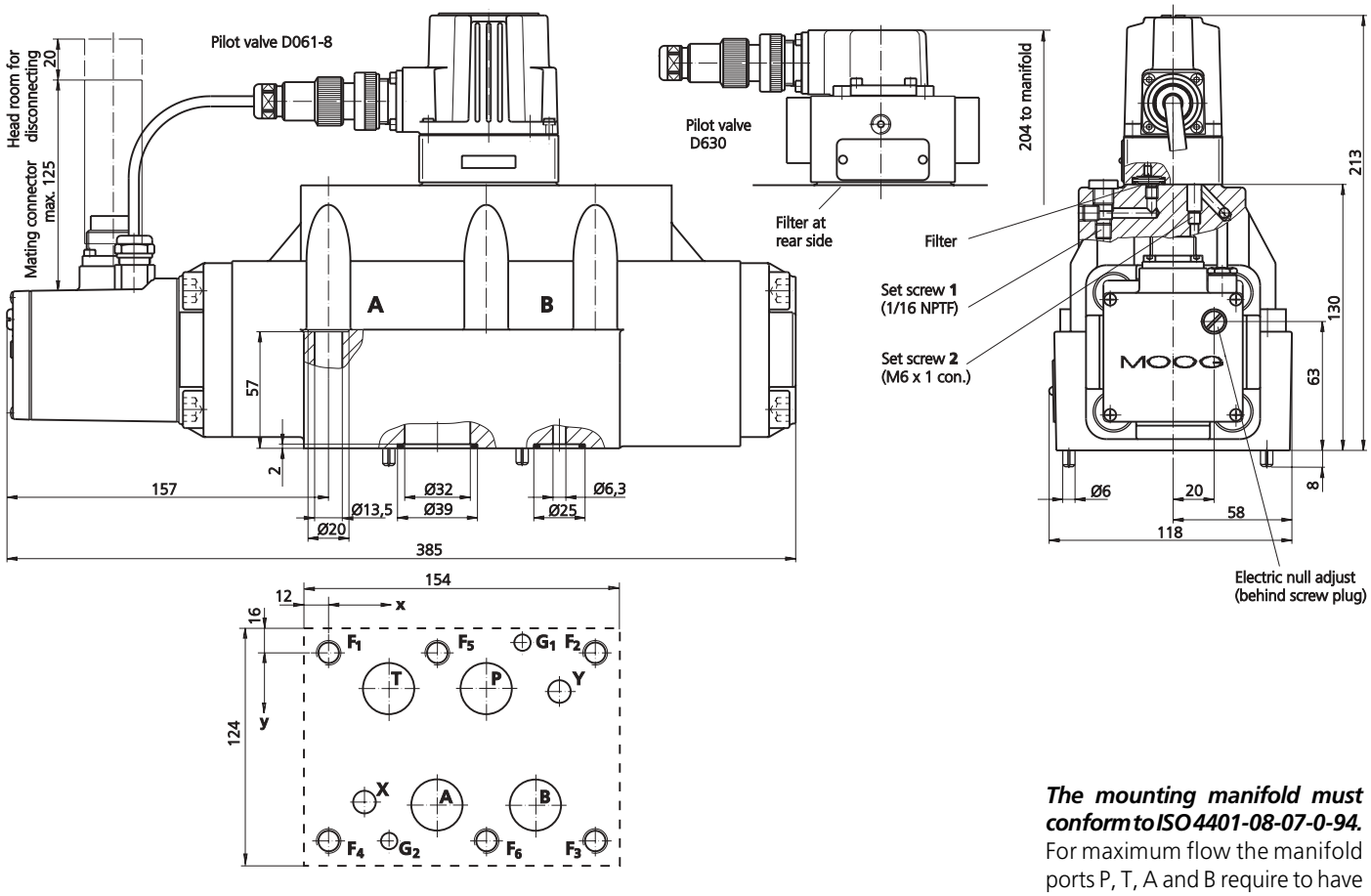


D663 - . . . . . P . . . . M





Installation drawing, Spare parts, Accessories



	P	A	T	B	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	Ø28	**Ø28**	**Ø28**	**Ø28**	Ø11,2	Ø11,2	Ø7,5	Ø7,5	M12	M12	M12	M12	M12	M12
x	77	53,2	29,4	100,8	17,5	112,7	94,5	29,4	0	130,2	130,2	0	53,2	77
y	17,5	74,6	17,5	74,6	73	19	-4,8	92,1	0	0	92,1	92,1	0	92,1

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 ***28 mm dia*** (deviation from standard).
Mounting surface needs to be flat within 0,01 mm over a distance of 100 mm. Average surface finish value, Ra, better than 0,8 µm.

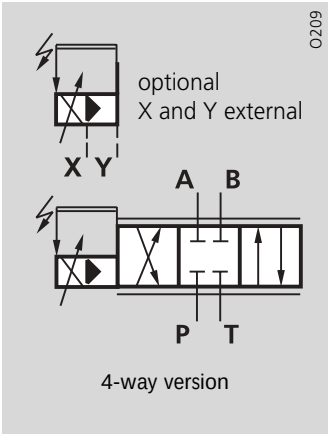
Spare parts and Accessories

O-rings (included in delivery)				NBR 85 Shore	FPM 85 Shore
for P, T, A, B		4 pieces ID 34,60 x Ø 2,6		45122 113	42082 113
for X, Y		2 pieces ID 20,29 x Ø 2,6		45122 195	42082 195
Mating connector, waterproof IP65 (not included in delivery)				for cable dia	
6+PE pole		B97007 061	EN 175201 Part 804	min. 10 mm, max. 12 mm	
11+PE pole		B97067 111	EN 175201 Part 804	min. 11 mm, max. 13 mm	
Flushing plate		76047			
Mounting manifold		A25855 009			
Mounting bolts (not included in delivery)			required torque	required	
M 12 x 75 DIN EN ISO 4762-10.9		A03665 120 075	110 Nm	6 pieces	
Replaceable filter					
for pilot valve D061-8		A67999 200	200 µm nominal		
for pilot valve D630		A67999 065	65 µm nominal		
O-rings for filter change			HNBR 85 Shore	NBR 85 Shore	FPM 85 Shore
D061-8:	before filter	1 piece ID 14 x Ø 1,0	A67008 014 010	–––	–––
	behind filter	1 piece ID 13 x Ø 1,5	A67008 013 015	–––	–––
D630:	before and behind filter	2 pieces ID 13 x Ø 1,5	–––	66117 013 015	A25163 013 015

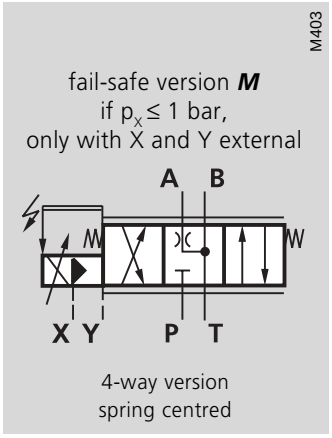
D664 Series
Technical data

Model . . . Type			***D664 - . . . . . L . . . . B***	***D664 - . . . . . P . . . . M***
Mounting pattern			ISO 4401-08-07-0-94	ISO 4401-08-07-0-94
Valve body version			4-way, 2x2-way 2-stage, stub shaft spool	4-way, 2x2-way 3-stage, stub shaft spool
Pilot stage			D061 Series ServoJet, 1-stage	D630 Series, 2-stage
Pilot connection	optional, internal or external		X and Y	X and Y
Mass		[kg]	19	19,5
Rated flow	(±10%) at Δp_N = 5 bar per land	[l/min]	***550***	***550***
Operating pressure	max.			
Main stage:	ports P with X external, A, B	[bar]	350	350
	port T with Y internal	[bar]	140	210
	port T with Y external	[bar]	350	350
Pilot stage:	regular version, ports P, A and B	[bar]	280	280
	with dropping orifice (on request)	[bar]	350	---
	port T	[bar]	140	210
Response time*	for 0 to 100 % stroke	[ms]	***48***	***17***
Threshold*		[%]	< 0,1	< 0,2
Hysteresis*		[%]	< 0,5	< 1,0
Null shift	with ΔT = 55 K	[%]	< 1,0	< 1,5
Null leakage flow*	total max. (~ critical lap)	[l/min]	5,6	5,0
Pilot leakage flow*	pilot stage only	[l/min]	2,6	2,0
Pilot flow*	max., for 100% step input	[l/min]	***2,6***	***30***
Main spool stroke		[mm]	± 6	± 6
Spool drive area		[cm²]	2,8	11,4

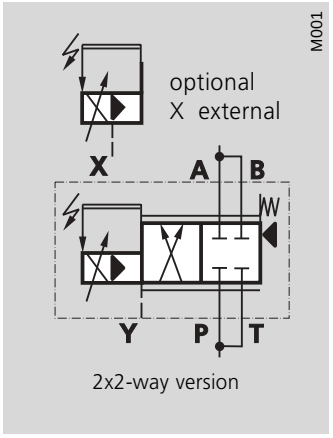
***** At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



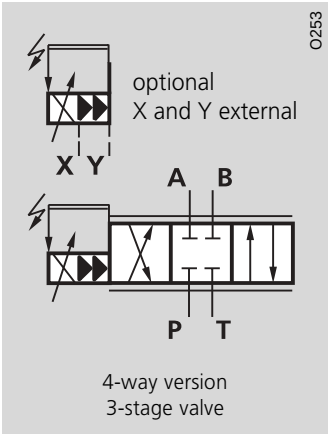
4-way version



4-way version
spring centred



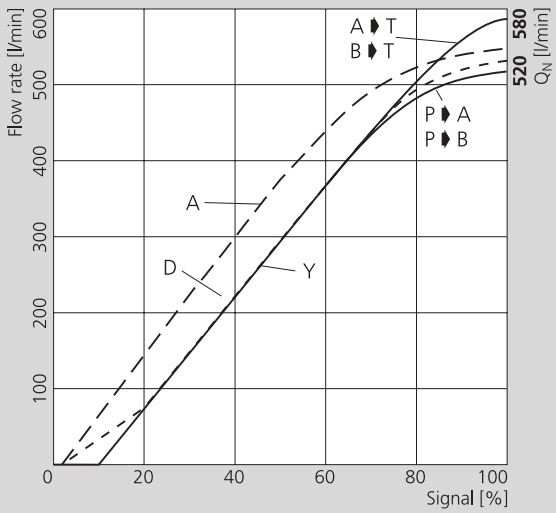
2x2-way version



4-way version
3-stage valve

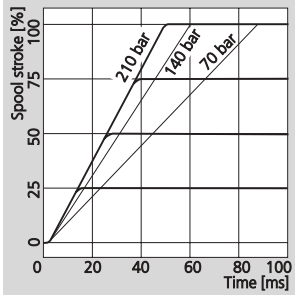
Typical characteristic curves at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow vs. signal curve
at Δp_N = 5 bar per land

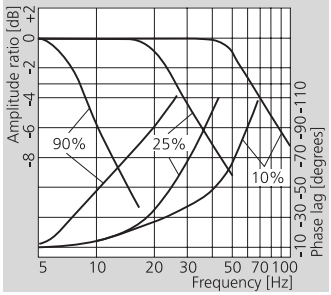


Spool version A: ~critical lap, linear characteristic
Spool version D: 10 % overlap, linear characteristic
Spool version Y: ~critical lap,curvilinear characteristic

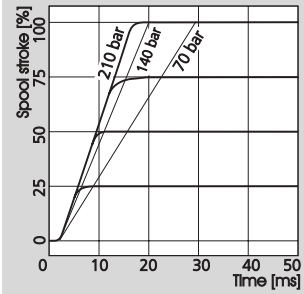
D664 - . . . . . L . . . . B
Step response

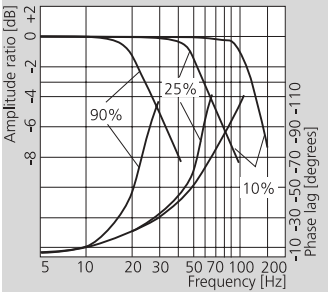


Frequency response

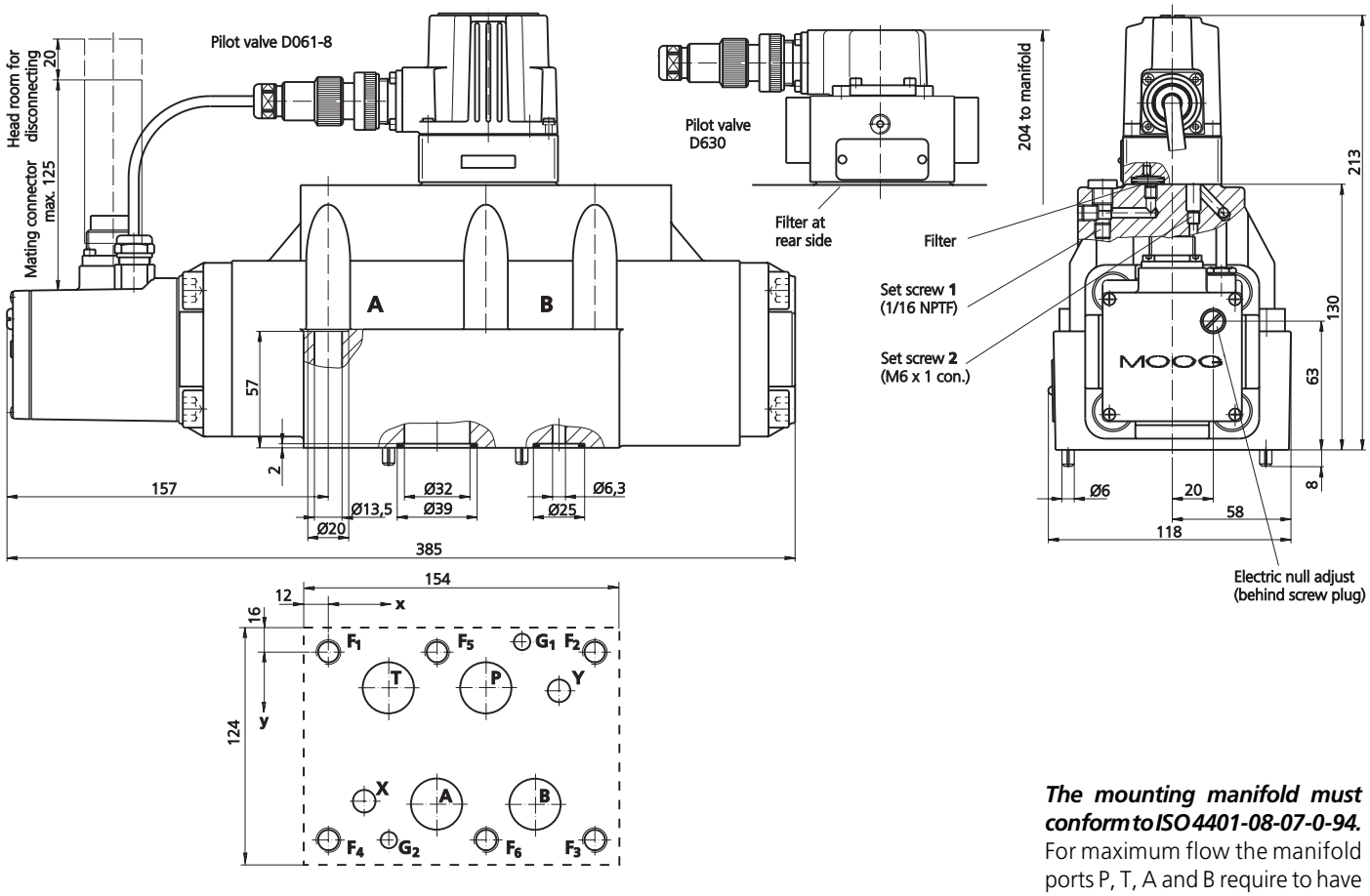


D664 - . . . . . P . . . . M





Installation drawing, Spare parts, Accessories



	P	A	T	B	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	Ø32	**Ø32**	**Ø32**	**Ø32**	Ø11,2	Ø11,2	Ø7,5	Ø7,5	M12	M12	M12	M12	M12	M12
x	77	53,2	29,4	100,8	17,5	112,7	94,5	29,4	0	130,2	130,2	0	53,2	77
y	17,5	74,6	17,5	74,6	73	19	-4,8	92,1	0	0	92,1	92,1	0	92,1

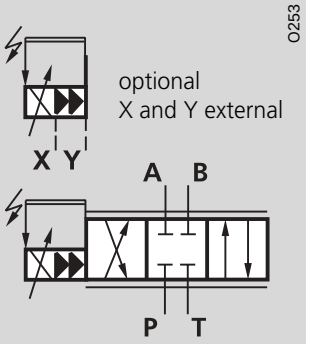
The mounting manifold must conform to ISO 4401-08-07-0-94.
For maximum flow the manifold ports P, T, A and B require to have ***32 mm dia*** (deviation from standard).
Mounting surface needs to be flat within 0,01 mm over a distance of 100 mm. Average surface finish value, Ra, better than 0,8 µm.

Spare parts and Accessories

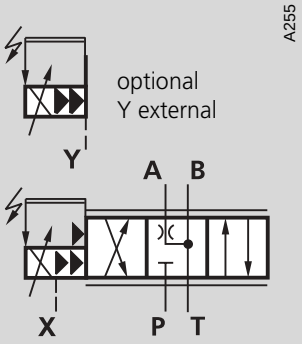
O-rings (included in delivery)				NBR 85 Shore	FPM 85 Shore
for P, T, A, B		4 pieces ID 34,60 x Ø 2,6		45122 113	42082 113
for X, Y		2 pieces ID 20,29 x Ø 2,6		45122 195	42082 195
Mating connector, waterproof IP65 (not included in delivery)				for cable dia	
6+PE pole		B97007 061	EN 175201 Part 804	min. 10 mm, max. 12 mm	
11+PE pole		B97067 111	EN 175201 Part 804	min. 11 mm, max. 13 mm	
Flushing plate		76047			
Mounting manifold		A25855 009			
Mounting bolts (not included in delivery)			required torque	required	
M 12 x 75 DIN EN ISO 4762-10.9		A03665 120 075	110 Nm	6 pieces	
Replaceable filter					
for pilot valve D061-8		A67999 200	200 µm nominal		
for pilot valve D630		A67999 065	65 µm nominal		
O-rings for filter change			HNBR 85 Shore	NBR 85 Shore	FPM 85 Shore
D061-8:	before filter	1 piece ID 14 x Ø 1,0	A67008 014 010	–––	–––
	behind filter	1 piece ID 13 x Ø 1,5	A67008 013 015	–––	–––
D630:	before and behind filter	2 pieces ID 13 x Ø 1,5	–––	66117 013 015	A25163 013 015

Model . . . Type			***D665 - . . . . . P . . . . H***		***D665 - . . . . . K . . . . J***	
Mounting pattern			ISO 4401-10-08-0-94		ISO 4401-10-08-0- 94	
Valve body version			4-way, 2x2-way 3-stage, standard spool		4-way, 2x2-way 3-stage, stub shaft spool	
Pilot stage			D631 Series, 2-stage		D661 Series ServoJet, 2-stage	
Pilot connection			optional X and Y external		always X and Y external	
Mass		[kg]	70		73,5	
Rated flow	(±10%) at Δp_N = 5 bar per land	[l/min]	1000	***1500***	1000	***1500***
Operating pressure	max.					
Main stage:	ports P with X external, A, B	[bar]	350		350	
	port T with Y internal	[bar]	100		100	
	port T with Y external	[bar]	350		350	
Pilot stage:	regular version, ports P, A and B	[bar]	210		210	
	with dropping orifice (on request)	[bar]	280		350	
	port T	[bar]	140		210	
Response time*	for 0 to 100 % stroke, typical	[ms]	***35***	***42***	***10***	***12***
Threshold*		[%]	< 0,3	< 0,2	< 0,3	< 0,2
Hysteresis*		[%]	< 1,0	< 0,7	< 1,0	< 0,7
Null shift	with ΔT = 55 K	[%]	< 2,0	< 1,5	< 2,5	< 2,0
Null leakage flow*	total max. (~ critical lap)	[l/min]	10,5		11	
Pilot leakage flow*	pilot stage only, typical	[l/min]	3,5		4	
Pilot flow*	max., for 100% step input	[l/min	***45***	***55***	***40***	***50***
Main spool stroke		[mm]	± 5,5	± 8	± 5,5	± 8
Spool drive area		[cm²]	33,2		9,6	

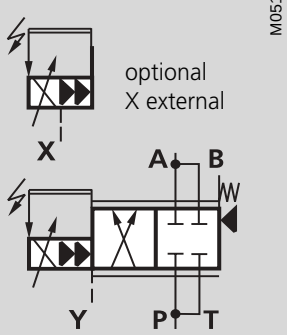
***** At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



4-way version
3-stage



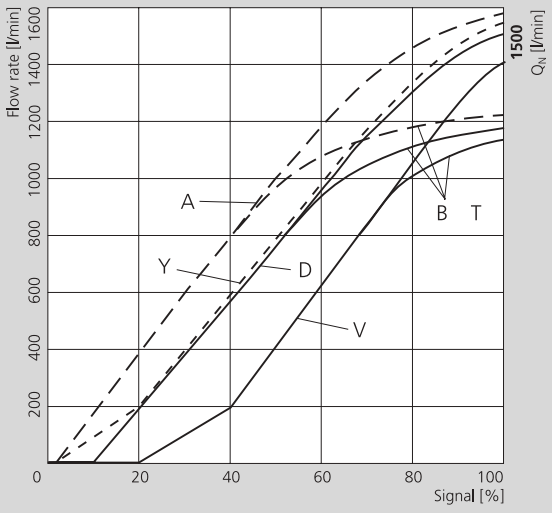
4-way version
3-stage



2x2-way version
3-stage

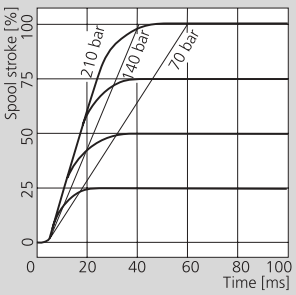
Typical characteristic curves at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow vs. signal curve
at Δp_N = 5 bar per land

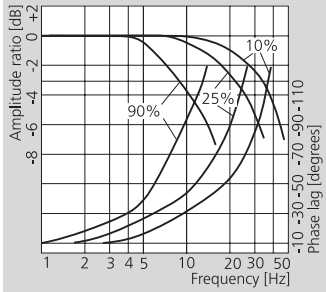


Spool version A: ~critical lap, linear characteristic
Spool version D: 10 % overlap, linear characteristic
Spool version Y: ~critical lap,curvilinear characteristic
Spool version V: 20 % overlap, curvilinear characteristic

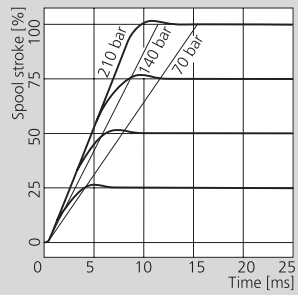
D665 - . . . . . P15 . . H
Step response

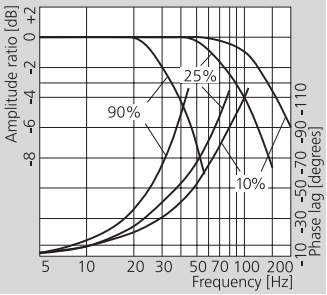


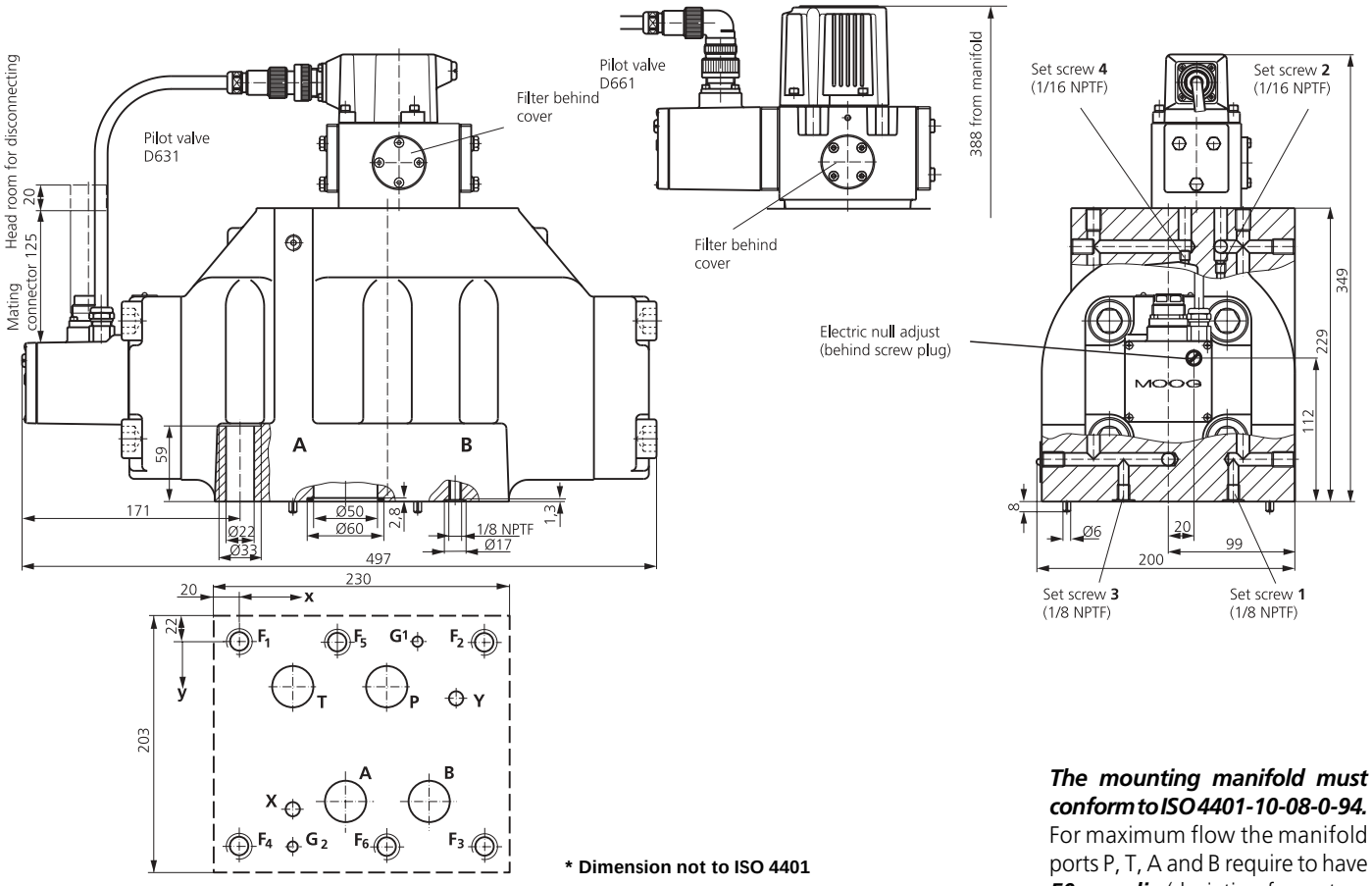
Frequency response



D665 - . . . . . K15 . . J







*** Dimension not to ISO 4401**

	P	A	T	B	X	Y	G_1	G_2	F_1	F_2	F_3	F_4	F_5	F_6
	Ø50	**Ø50**	**Ø50**	**Ø50**	Ø11,2	Ø11,2	Ø7,5	Ø7,5	M20	M20	M20	M20	M20	M20
x	114,3	82,5	41,3	147,6	41,3	168,3	147,6*	41,3	0	190,5	190,5	0	76,2	114,3
y	35	123,8	35	123,8	130,2	44,5	0	158,8	0	0	158,8	158,8	0	158,8

The mounting manifold must conform to ISO 4401-10-08-0-94.
For maximum flow the manifold ports P, T, A and B require to have ***50 mm dia*** (deviation from standard).
Mounting surface needs to be flat within 0,01 mm over a distance of 100 mm. Average surface finish value, Ra, better than 0,8 µm.

Spare parts and Accessories

O-rings (included in delivery)			NBR 85 Shore	FPM 85 Shore
for P, T, A, B	4 pieces ID 53,60 x Ø 3,5		45122 035	42082 035
for X, Y	2 pieces ID 14,0 x Ø 1,8		45122 008	42082 008
Mating connector, waterproof IP65 (not included in delivery)			for cable dia	
6+PE pole	B97007 061	EN 175201 Part 804	min. 10 mm, max. 12 mm	
11+PE pole	B97067 111	EN 175201 Part 804	min. 11 mm, max. 13 mm	
Flushing plate	not available			
Mounting manifold	A25856 001			
Mounting bolts (not included in delivery)		required torque	required	
M 20 x 90 DIN EN ISO 4762-10.9	A03665 200 090	520 Nm	6 pieces	
Replaceable filter				
for pilot valve D631	A67999 100	100 µm nominal		
for pilot valve D661	A67999 200	200 µm nominal		
O-rings for filter change for pilot valves D631 and D661		HNBR 85 Shore	NBR 85 Shore	FPM 85 Shore
filter	1 piece ID 12 x Ø 2,0	–––	66117 012 020	A25163 012 020
filter cover D631	1 piece ID 17 x Ø 2,0	–––	–––	A25163 017 020
filter cover D661	1 piece ID 17,1 x Ø 2,6	B97009 080	–––	–––

D661 to D665 Series
Valves for applications with safety requirements (fail-safe)

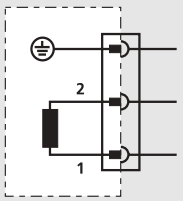
For applications with proportional control valves where certain safety regulations are applicable, a safe metering spool position is needed in order to avoid potential damage.
Therefore a fail-safe version is offered as an option for the multi-stage Moog proportional control valves.
After switching off the 24 V supply to the safety solenoid valve, this fail-safe function causes a safe metering spool position: overlapped centred position or fully opened.
In order to move the spool to the safe centred position with ***2-stage*** proportional valves, the two control chambers of the main stage are hydraulically short circuited by a 2/2-way poppet valve. The spring force then moves the spool to the overlapped position. The time required to reach the safe position equals the valve step response time, fail-safe version ***W***.
Fail-safe version ***P*** is based on pilot pressure cut off. Both control chambers are then depressurized by leakage through the receiver. The spring force subsequently moves the spool to the safe position A ◗ T. The time required to reach the safe position equals approximately 4 to 5 times the valve step response time.
With D665 Series ***3-stage*** proportional valves the fail-safe function is implemented with a 4/2-way solenoid valve. In addition to the hydraulic short circuit of the two control chambers the pilot stage pressure is switched off. The spring force moves the main spool to the safe position. The time required to reach the safe position equals approximately 2 times the valve step response time, fail-safe versions ***W, S***.

Electric characteristics
of the 2/2-way poppet valve (D661 to D664 Series, 2-stage) and 4/2-way solenoid valve (D665 Series) for the fail-safe version.

Hydraulically operated valves for the fail-safe version on request.

For more information on fail-safe versions see Moog Application Note TN 353.

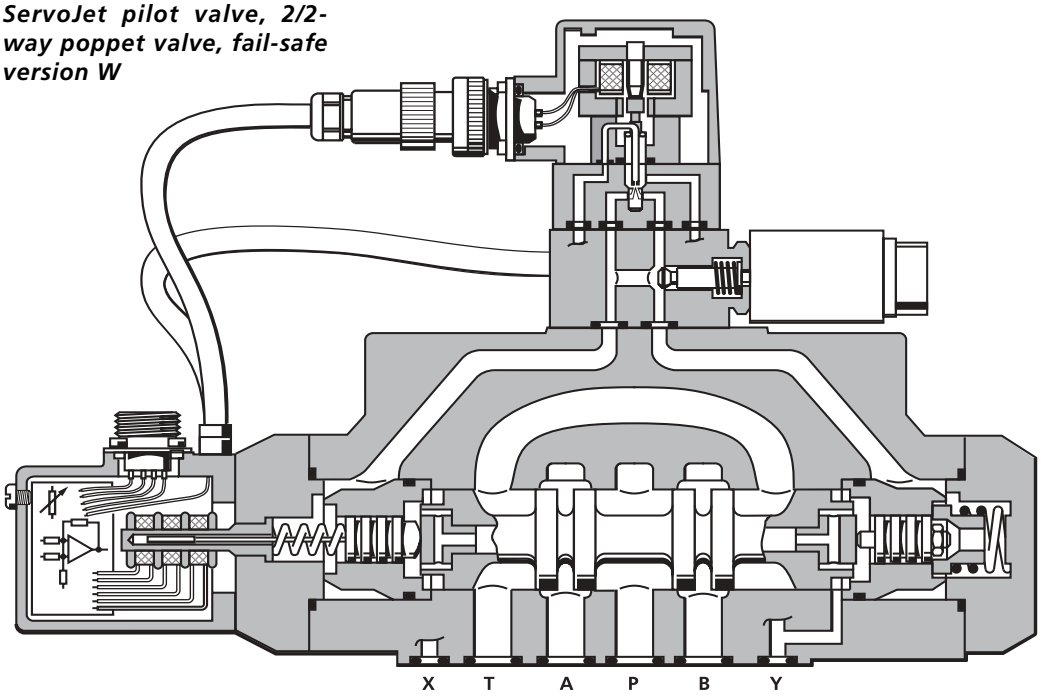
Connector wiring



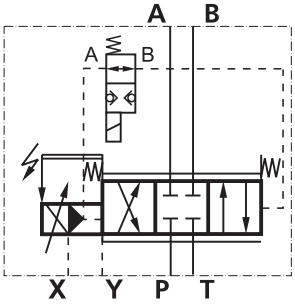
DIN 43650-1
Form A: 2+PE - PG9

Valve version	
for 2-stage valves	2/2-way poppet valve
for 3-stage valves	4/2-way solenoid valve
Function	electro magnetic
Nominal voltage U_N	24 VDC (min 22,8 VDC, max 26,4 VDC)
Nominal power P_N	
2/2-way poppet valve	26 W
4/2-way solenoid valve	36 W

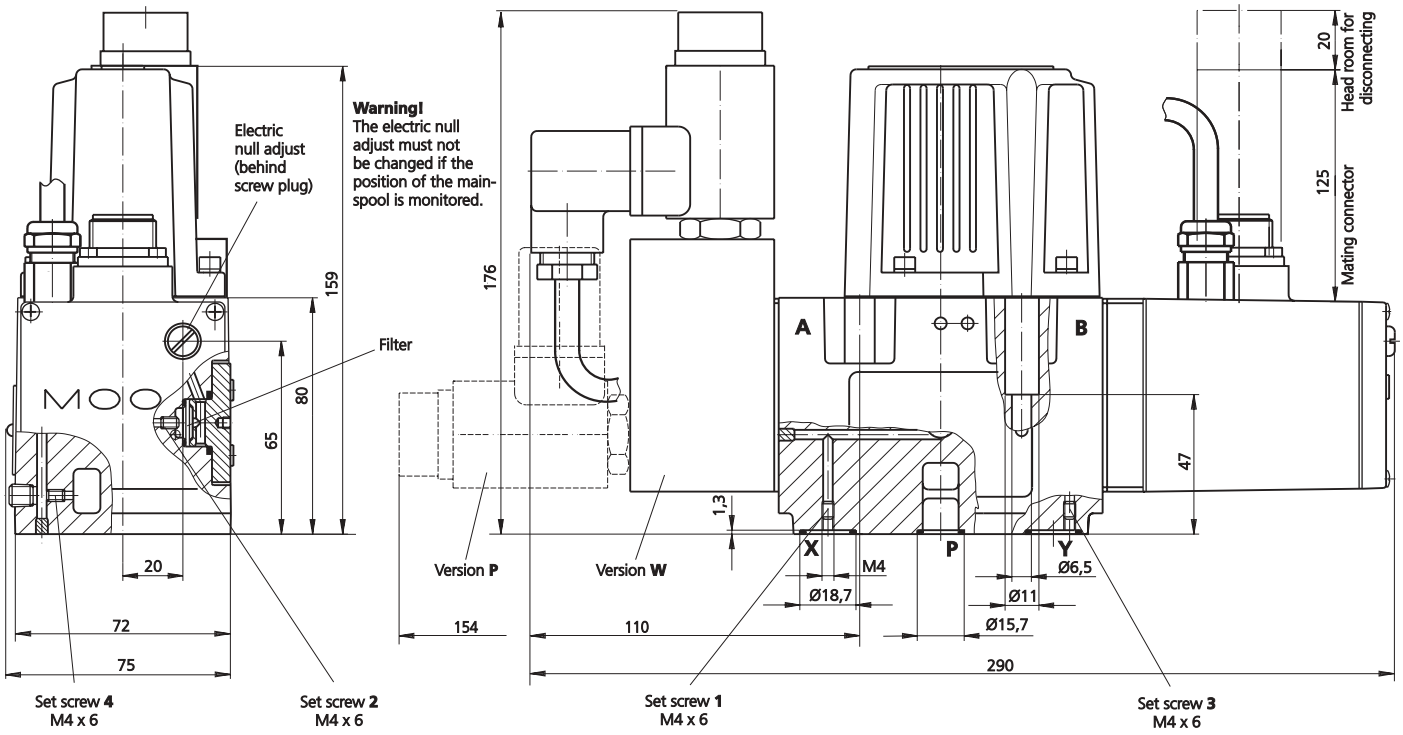
D663 Series 2-stage Proportional Control Valve with ServoJet pilot valve, 2/2-way poppet valve, fail-safe version W



Note:
For further information about safety requirements according to EN 954-1 see Moog Application Note AM 417 E, page 3/4. According to EN 954-1 a higher safety category can be achieved if a fail-safe valve is used.

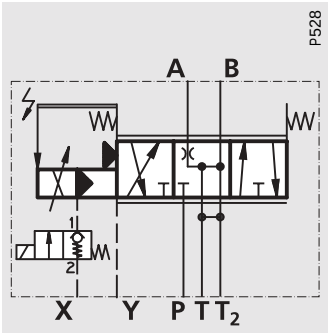


Hydraulic symbol:
Symbol shown with pilot pressure and electric supply on and zero command signal.

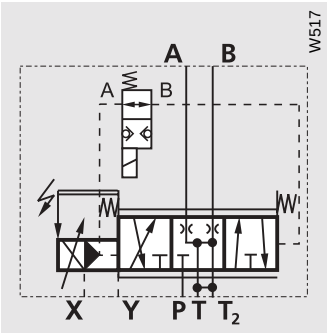


The mounting manifold must conform to ISO 4401-05-05-0-94 (see page 9)

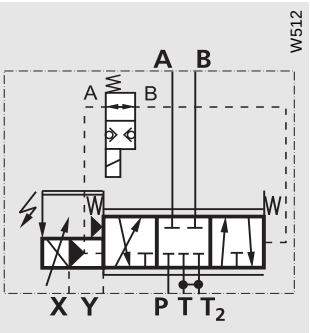
Version with mechanical spring centering (fail-safe version ***M***) see page 8 (symbol) and page 9 (installation drawing)



Fail-safe version ***P***
Centred position, underlapped



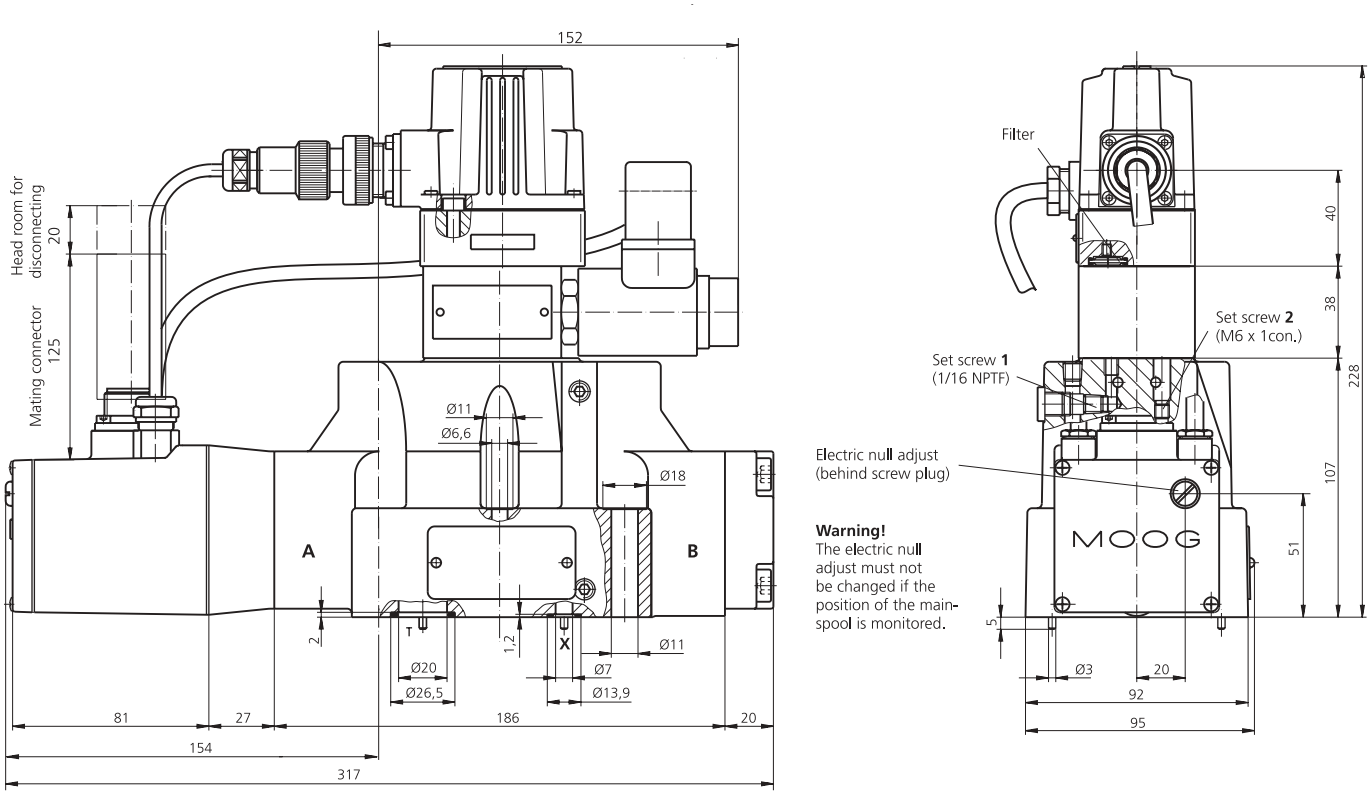
Fail-safe version ***W***
Centred position, underlapped



Fail-safe version ***W***
Centred position, overlapped

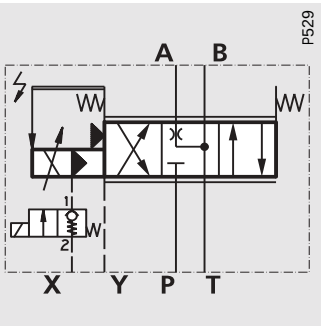
Spare parts and Accessories: see page 9

D662 Series
Fail-safe version

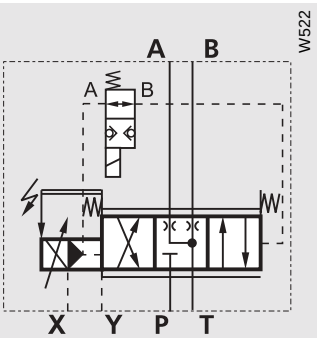


The mounting manifold must conform to ISO 4401-07-06-0-94 (see page 11)

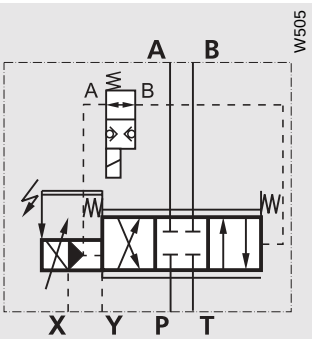
Version with mechanical spring centering (fail-safe version ***M***) see page 10 (symbol) and page 11 (installation drawing)



Fail-safe version ***P***
Centred position, underlapped

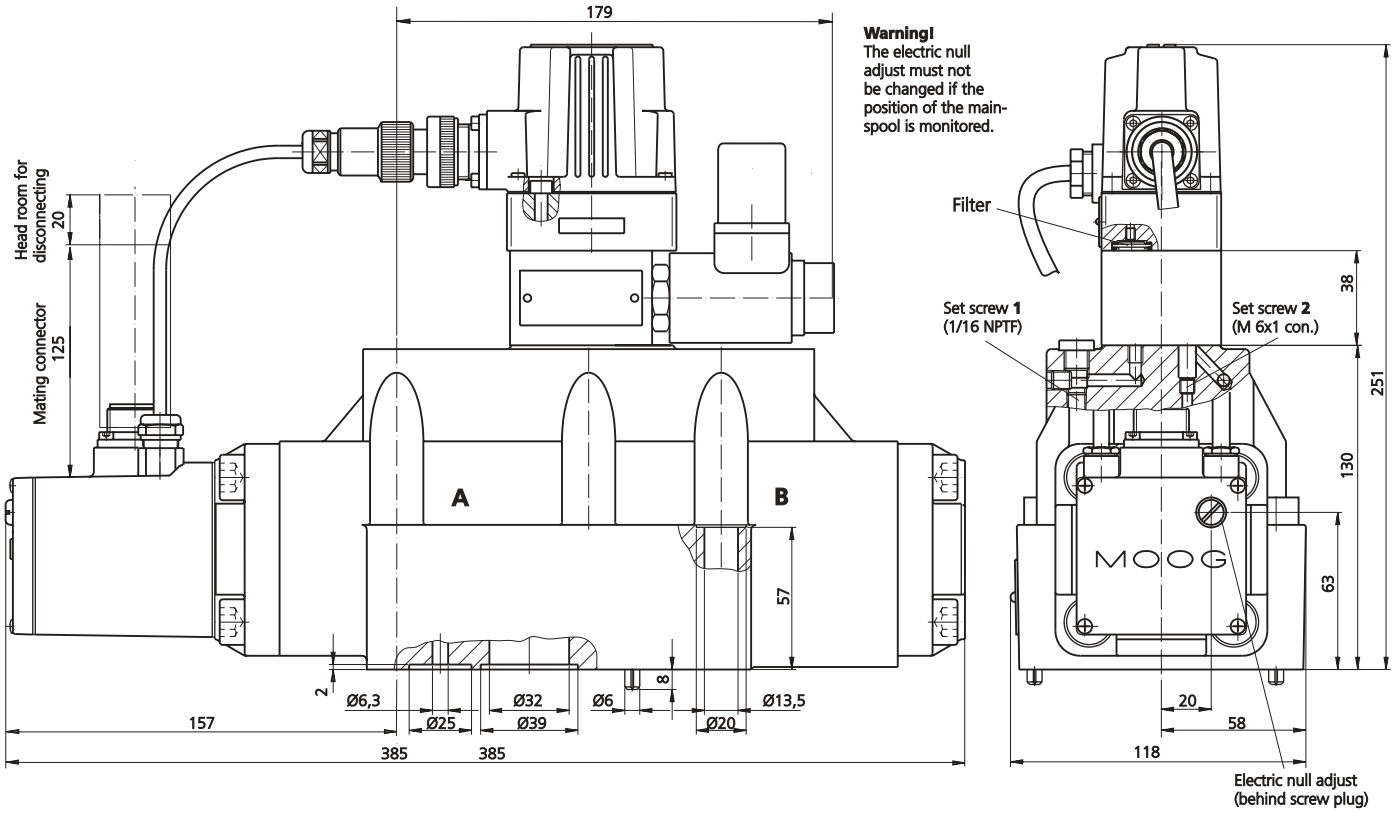


Fail-safe version ***W***
Centred position, underlapped



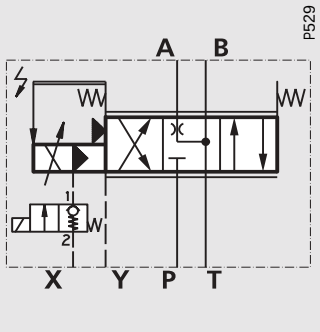
Fail-safe version ***W***
Centred position, overlapped

Spare parts and Accessories: see page 11

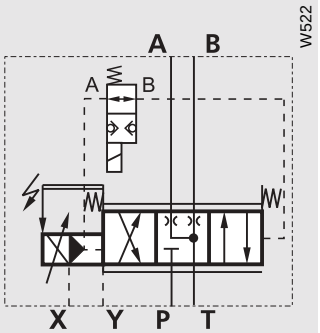


The mounting manifold must conform to ISO 4401-08-07-0-94 (see pages 13 and 15)

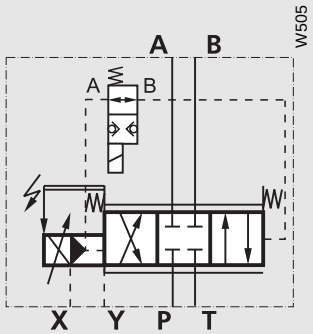
Version with mechanical spring centering (fail-safe version ***M***) see pages 12 and 14 (symbol) and pages 13 and 15 (installation drawing)



Fail-safe version ***P***
Centred position, underlapped

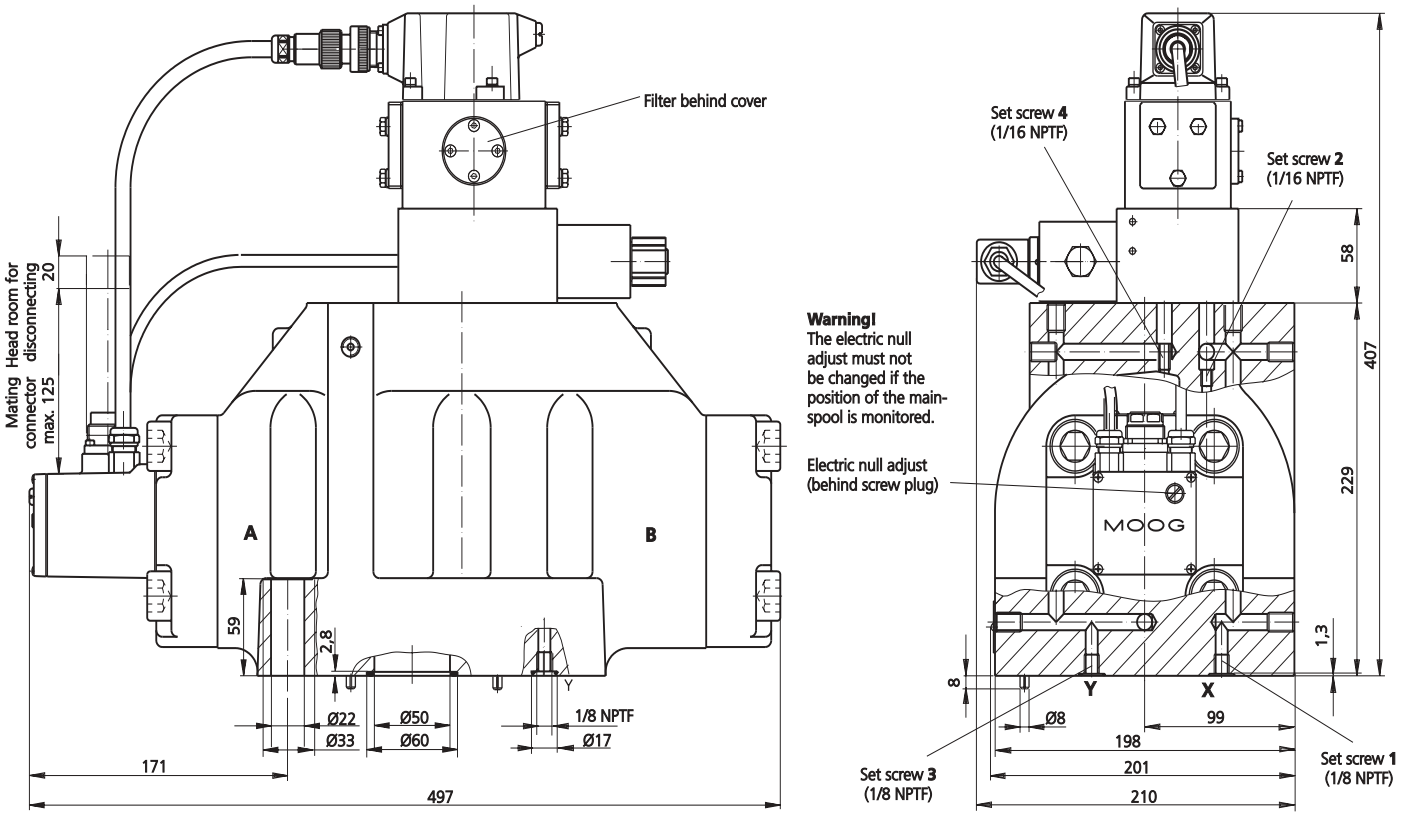


Fail-safe version ***W***
Centred position, underlapped



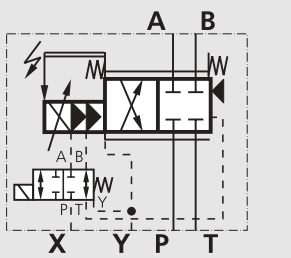
Fail-safe version ***W***
Centred position, overlapped

Spare parts and Accessories: see pages 13 and 15

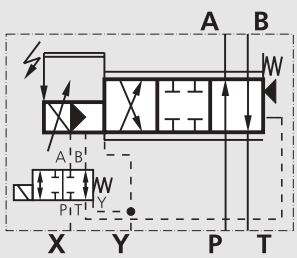


The mounting manifold must conform to ISO 4401-10-08-0-94 (see page 17)

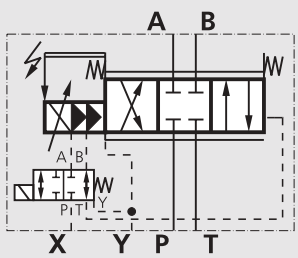
Version with mechanical spring centering (fail-safe version ***M***) see page 16 (symbol) and page 17 (installation drawing)



Fail-safe version ***W***
Centred position, overlapped



Fail-safe version ***S***
Centred position, critical lap



Fail-safe version ***W***
Centred position, overlapped

Spare parts and Accessories: see page 17

Ordering Information

MOOG

	Model-Number	Type designation
D661 to D665	. . . .	. . . . 2 – .

Specification status

–	Series specification
E	Preseries specification
K	Explosion proof version upon request
Z	Special specification

Model designation

	assigned at the factory

Factory identification

Valve version

			Series
P	Standard spool		D661 to D665
B	Standard spool		D661 (5-way)
D	Stub shaft spool	16 mm dia	D662
L	Stub shaft spool	19 mm dia	D663 and 664
K	Stub shaft spool	35 mm dia	D665

Rated flow

	Q_N [l/min] at Δp_N = 5 bar per land	Series
30	30	D661
60	60	D661
80	80	D661
01	150	D662
02	250	D662
03	350	D663
05	550	D664
10	1000	D665
15	1500	D665

Maximum operating pressure

			Pilot valve
F	210 bar	At $p_X \leq$ 210 bar (X and Y ext.) operating pressure in ports P, A, B and T up to 350 bar possible	H
H	280 bar	At $p_X \leq$ 280 bar (X and Y ext.) operating pressure in ports P, A, B and T up to 350 bar possible	A / B / J / M
K	350 bar	Not with pilot valves D630 and D631	A / B / J
X	Special version		

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 ç T: ~critical lap, curvilinear characteristic (D661 only)
Y	4-way:	~ critical lap, curvilinear characteristic
Z	2x2-way:	A ➧ T, B ➧ T_2: ~ critical lap, linear characteristic
X	Special spool on request	

Pilot stage or pilot valve

			for valve type
A	D061-8 ServoJet	Standard	D661...P
B	D061-8 ServoJet	High flow	D661...P D662...D D663/664...L
M	D630	2-stage, MFB	D662/D663/D664...P
H	D631	2-stage, MFB	D665...P
J	D661 ServoJet	2-stage , EFB	D665...K

Function code

		Connector
O	No enable input. Pin C not used.	S
A	Without enable signal applied the spool moves to adjustable centred position (see page 5).	S
B	Without enable signal applied the spool moves into defined end position A ➧ T or B ➧ T (page 5).	S
E	Without enable signal applied the spool moves to adjustable centred position. Position error monitored (see page 6).	E
F	Without enable signal applied the spool moves into defined end position A ➧ T or B ➧ T. Position error monitored (see page 6).	S
G	Without enable signal applied the spool moves to adjustable centred position. Spool position monitored (see page 7).	E
H	Without enable signal applied the spool moves into defined end position A ➧ T or B ➧ T. Spool position monitored (see page 7).	E

Supply voltage

2	24 VDC	(18 to 32 VDC)
0	Special version ± 15 V on request	

Signals for 100% spool stroke

	Command	Output	Connector
A	±10 V	±10 V (diff.)	E
D	±10 V	2 to 10 V (6 V centred position)	E / S
F	±10 V	2,5 to 13,5 V	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

			for supply voltage	
E	11+PE pole	EN 175201 Part 804	0	2
S	6+PE pole	EN 175201 Part 804	–	2

Seal material

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

Pilot connections and pilot pressure

	Supply X	Return Y
4	internal	internal
5	external	internal
6	external	external
7	internal	external

Parameters of the control electronics are adapted to the pilot pressure. See operating pressure on the nameplate and in this ordering information.

Spool position of main stage with/without electric or hydraulic supply

O	undefined (no fail-safe function)					for all valve versions
	Mechanical fail-safe version					
	Position	p_P or p_X external [bar]				for valves with pilot valve
F	P ➧ B and A ➧ T		≥25			A and B
			<1			A and B
D	P ➧ A and B ➧ T		≥25			A and B
			<1			A and B
M	centred position defined	≥1	<1			A and B
	centred position undefined	≥1	≥25			A and B
	centred position defined	≥1	≥15			H, J and M (2x2-way only)
	Electrically controlled fail-safe version					
	Position	p_P [bar]	p_X	WV*	VEL**	for valves with pilot valve
W	centred position defined	≥1	≥15	off	on	all types
	centred position undefined	≥1	<1	on	on	only A and B
S	centred position defined	≥1	≥15	on	off	all types
	P ➧ A and B ➧ T	≥1	≥15	off	on	all types
	P ➧ A and B ➧ T	≥1	≥15	on	off	all types
P	defined A ➧ T	≥1	≥15	off	on	only A and B (D661 only with p_X external)
	P ➧ B and A ➧ T	<1	<1	on	off	only A and B

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

*WV: Solenoid valve
**VEL: Valve electronics

MOOG

Argentina
Australia
Austria
Brazil
China
Finland
France
Germany
Great Britain

India
Ireland
Italy
Japan
Korea
Luxembourg
Philippines
Russia
Singapore
Spain
Sweden
USA

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