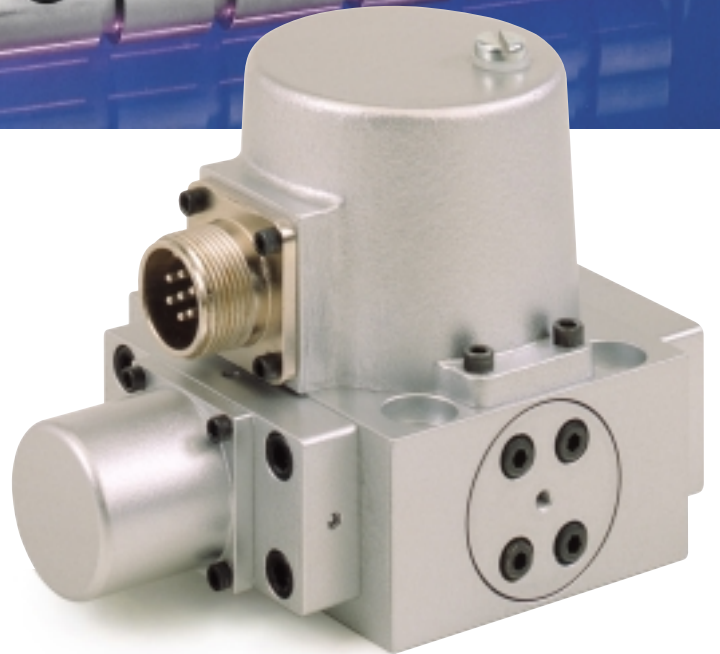


Servovalves
with integrated Electronics
D765 Series
ISO 10372 Size 04



D765 Series

Two stage Servovalves

The D765 Series flow control servovalves are throttle valves for 3- and preferably 4-way applications.

The design of these valves is based on the wellknown D761 Series. The mechanical feedback has been replaced by an electric feedback with a position transducer. An integrated electronics closes the position loop for the spool.

These valves are suitable for electrohydraulic position, velocity, pressure or force control systems


with extremely high dynamic response requirements.

Principle of operation

An electric command signal (flow rate set point) is applied to the integrated position controller which drives the pilot stage. The thereby deflected nozzle flapper system produces a pressure difference across the drive areas of the spool and effects its movement.

The position transducer (LVDT) which is excited via an oscillator

measures the position of the 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 stage until the error between command signal and feedback signal will be zero. Thus the position of the spool is proportional to the electric command signal.

 The D765 Series valve described in this catalogue has successfully passed EMC tests required by EC Directive. Please take notice of the respective references in the electronics section.

Operational features

- 2-stage design with dry torque motor
- Low friction double nozzle pilot stage
- High spool control forces
- Electric feedback with pressure isolated position transducer (LVDT), wear free
- Integrated electronics with built in false polarity protection
- High resolution, low hysteresis
- Completely adjusted at the factory
- Protection filter easy to replace

The actual 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:

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

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

$$p_x \geq 2,5 \cdot 10^{-2} \cdot \frac{Q}{A_k} \cdot \sqrt{\Delta p}$$

- 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 15 bar above the return pressure of the pilot stage.

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

This catalogue is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has to

check the suitability of the products described herein. In case of doubt please contact MOOG.

Operating pressure

Ports P, X, A and B up to 315 bar
Port T up to 210 bar

Temperature range

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

Seal material

FPM, others on request

Operating fluid

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

Viscosity recommended 15 to 100 mm²/s

System filtration: High pressure filter (without bypass, but with dirt alarm) mounted in the main flow and if possible directly upstream of the valve.

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 servovalve.

Recommended cleanliness class

For normal operation: ISO 4406 < 14/11
For longer life: ISO 4406 < 13/10

Filter rating recommended

For normal operation: $\beta_{10} \geq 75$ (10 μm absolute)
For longer life: $\beta_5 \geq 75$ (5 μm absolute)

Installation options

any position, fixed or movable

Vibration

30 g, 3 axes

Mass

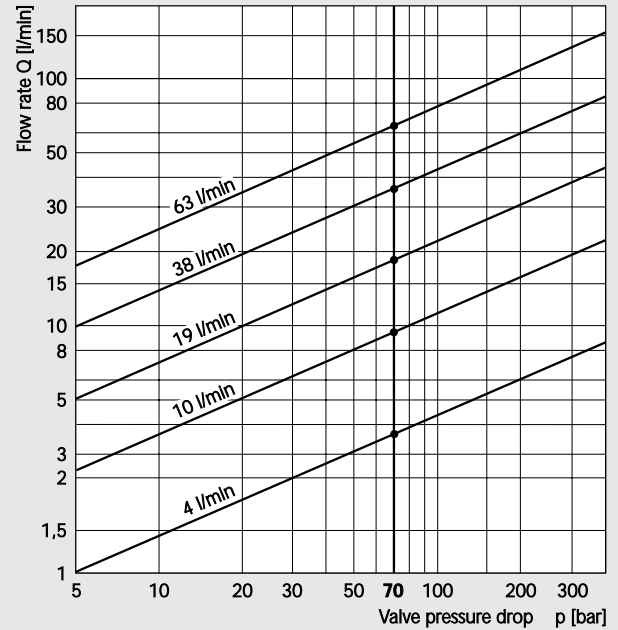
1,1 kg

Degree of protection

EN 60529: class IP 65, with mating connector mounted

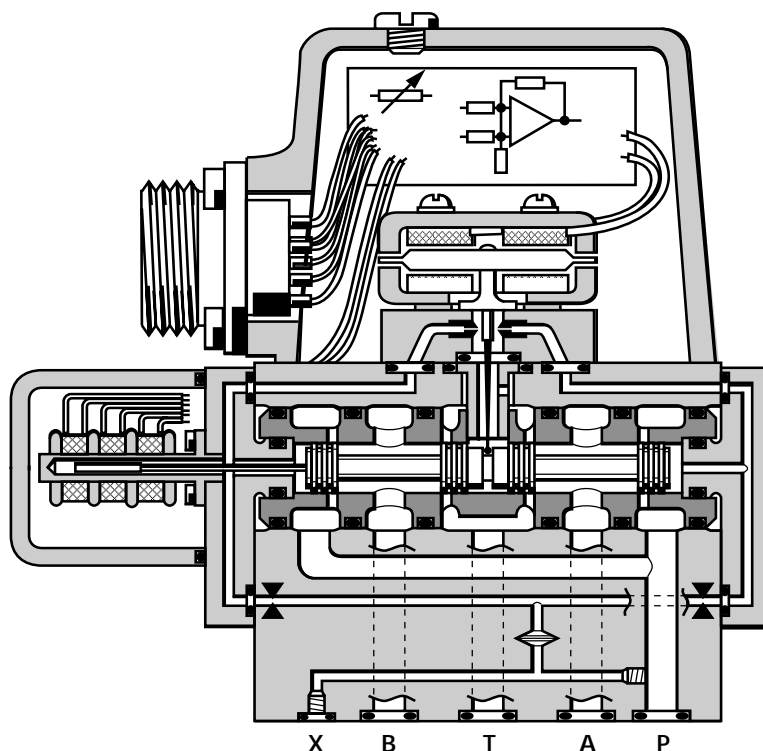
Shipping plate

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



D765 Series

Technical data

Model ... Type
Mounting pattern
Valve body version

D765-

ISO 10372-04-04-0-92

4-way

2-stage with spool-bushing assembly

Nozzle / Flapper, Highflow

X

Pilot stage			4	10	19	38	63
Pilot connection	optional, internal or external						
Rated flow	(± 10 %) at $\Delta p_N = 35$ bar per land						
	Standard	[l/min]	4	10	19	38	63
	High response	[l/min]	4	10	19	38	—
Response time*	Standard, typical	[ms]	4	4	4	4	8
	High response, typical	[ms]	2	2	2	3	—
Threshold*		[%]			< 0,1		
Hysteresis*		[%]			< 0,3		
Null shift	with $\Delta T = 55$ K	[%]			< 1		
Null leakage flow*	max.	[l/min]			1,5 to 2,3		
Pilot leakage flow*	typical	[l/min]			0,8		
Pilot flow*	for 100 % step input	[l/min]			0,4		
Spool drive area	Standard	[cm ²]			0,49		
	High response	[cm ²]			0,34		

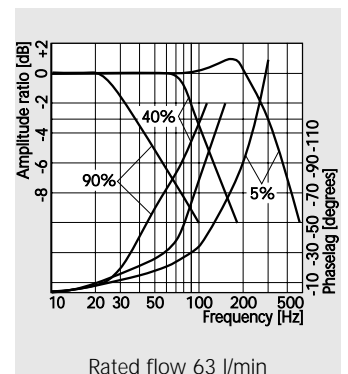
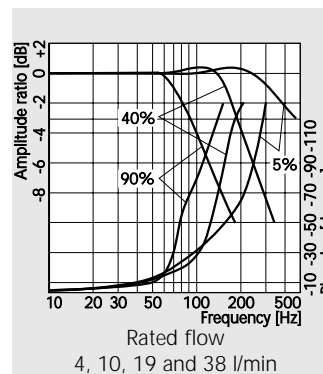
* At 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Flow gain in the null region (± 3 % signal) typically 50 to 200% nominal gain

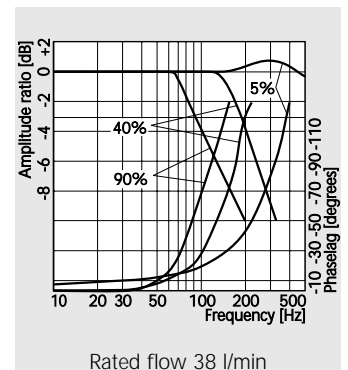
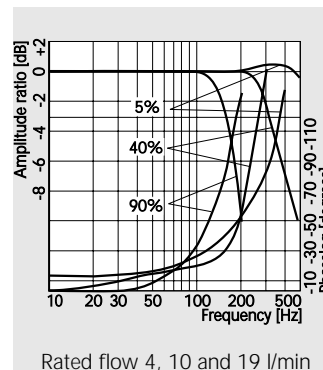
Typical characteristic curves

with ± 5 %, ± 40 % and ± 90 % input signal, at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C

Standard valves



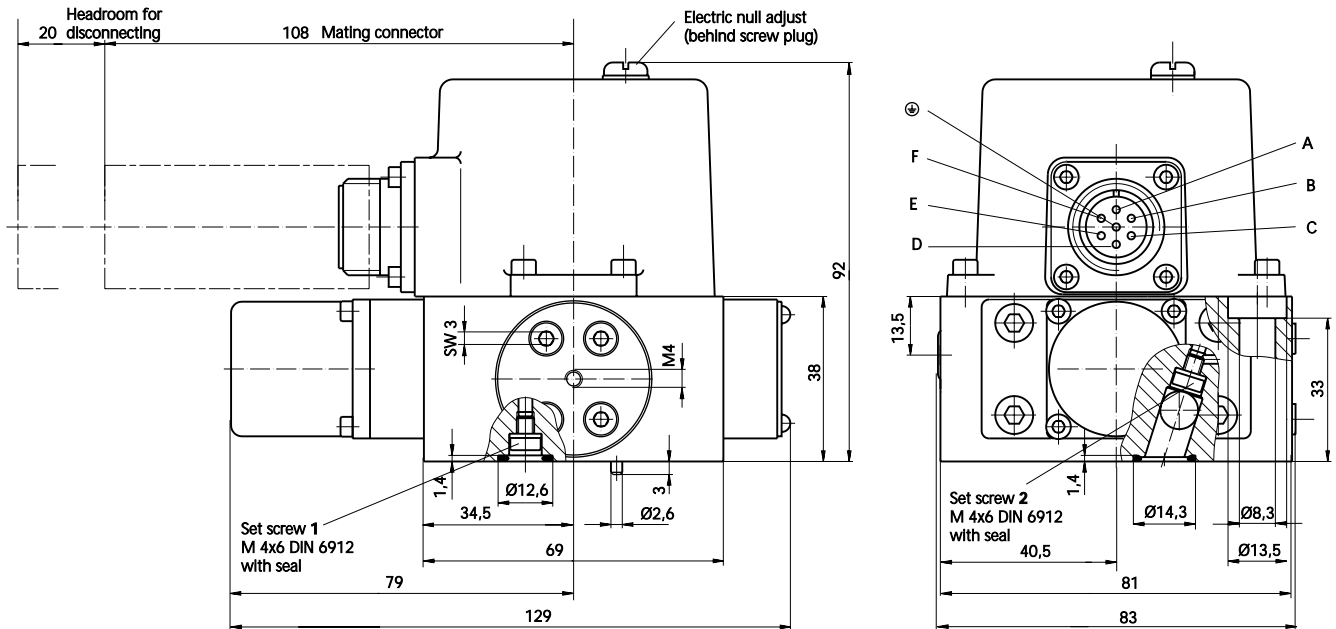
High response valves



D765 Series

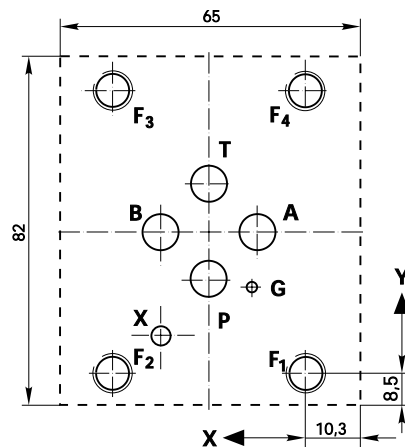
Installation drawing

Spare parts, Accessories



The mounting manifold must conform to ISO 10372-04-04-0-92.

Mounting surface needs to be flat within 0,01 mm. Average surface finish value, Ra, better than 0,8µm.



	P	A	T	B	G	X
	Ø8,2	Ø8,2	Ø8,2	Ø8,2	Ø3,5	Ø5
X	22,2	11,1	22,2	33,3	12,3	33,3
Y	21,4	32,5	43,6	32,5	19,8	8,7
	F1	F2	F3	F4		
	M8	M8	M8	M8		
X	0	44,4	44,4	0		
Y	0	0	65	65		

Conversion instruction

for operation with internal or external pilot connection	Pilot flow supply	Set screw (M 4 x 6 DIN 6912)	
	internal P	1 closed	2 open
	external X	1 open	2 closed

Spare parts and accessories

O-rings (included in delivery), for P, T, A and B	ID 10,82 x 1,78	FPM 85 Shore	42082 022
for X	ID 9,25 x 1,78		42082 013
Mating connector, waterproof IP 65 (not included in delivery)			
6+PE-pole	EN 175201 part 804*	B97007	061
Flushing plate, (int.)	55127 001	(ext.)	55127 002

* formerly DIN 43563

Mounting bolts (not included in delivery)	M 8 x 45 DIN EN ISO 4762-10.9 (4 pieces)	A03665 080 045
required torque		18 Nm
Replaceable filter		A67999 065
O-rings for filter change (2 pieces)		A25163 013 015
Screw internal/external M4 x 6 DIN 6912		76689 040 006
Seal for screw internal/external		A25528 040
Seal for null adjust screw plug		76425 050

D765 Series

Valve electronics with supply voltage ± 15 Volt

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

The spool stroke of the valve is proportional to $I_D = -I_E$. 100% valve opening P \blacktriangleright B and A \blacktriangleright 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 \perp (0 V) at cabinet side.

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

The spool stroke of the valve is proportional to differential input ($U_D - U_E$). 100% valve opening P \blacktriangleright B and A \blacktriangleright T is achieved at ($U_D - U_E$) = +10 V. At 0 V command the spool is in centred position.

If only one command signal is available, pin D or E is connected to signal ground according to the required operating direction (to be done at cabinet side).

Actual value 0 to ± 10 mA Valves with current command input

The actual spool position value can be measured at pin F. This signal can be used for monitoring and fault detection purposes.

The spool stroke range corresponds to ± 10 mA. +10 mA corresponds to 100% valve opening P \blacktriangleright B and A \blacktriangleright T.

Actual value 0 to ± 10 V Valves with voltage command input

The actual spool position value can be measured at pin F. This signal can be used for monitoring and fault detection purposes.

The spool stroke range corresponds to ± 10 V. +10 V corresponds to 100% valve opening P \blacktriangleright B and A \blacktriangleright T.

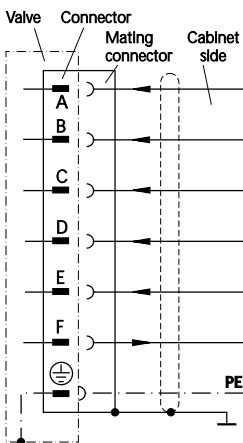
General requirements

- Supply ± 15 VDC $\pm 3\%$. Ripple < 50 mV_{pp}. Current consumption max. ± 100 mA
- All signal lines, also those of external transducers, shielded
- Shielding connected radially to \perp (0V), power supply side, and connected to the mating connector housing (EMC)
- **EMC:** Meets the requirements of EN 55011/03.91, class B, EN 50081-1/01.92, and EN 50082-2/03.95, performance criterion class A.
- Minimum cross section of all leads $\geq 0,75$ 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 AM 353 E.

Wiring for valves with 6+PE pole connector

to EN 175201 part 804¹⁾ and mating connector (type R and S, metal shell) with leading protective earth connection \oplus .



Function	Current command	Voltage command
Supply	+ 15 VDC $\pm 3\%$, ripple < 50 mV _{pp}	
Supply	- 15 VDC $\pm 3\%$, ripple < 50 mV _{pp}	
Supply / signal ground	\perp (0V)	
Input rated command Valve flow	0 to ± 10 mA Load resistance (diff.) 1 k Ω	0 to ± 10 V Input resistance 10 k Ω
Input inverted rated command Valve flow	0 to ± 10 mA Load resistance (diff.) 1 k Ω	0 to ± 10 V Input resistance 10 k Ω
Output actual value ²⁾ Spool position	0 to ± 10 mA Load resistance max. 1 k Ω	0 to ± 10 V Load resistance min. 1 k Ω
Protective grounding		

¹⁾ formerly DIN 43563 ²⁾ referenced to \perp (0V)

Model number		Type designation																																										
D765																																										
Specification status - Series specification E Preseries specification Z Special specification		Supply voltage 0 ± 15 VDC ± 3%, ripple < 50 mV _{pp}																																										
Model designation assigned at the factory		Signals for 100% spool stroke <table border="1"> <thead> <tr> <th></th> <th>Command</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>± 10 V</td> <td>± 10 V</td> </tr> <tr> <td>X</td> <td>± 10 mA, floating</td> <td>± 10 mA</td> </tr> </tbody> </table>			Command	Output	A	± 10 V	± 10 V	X	± 10 mA, floating	± 10 mA																																
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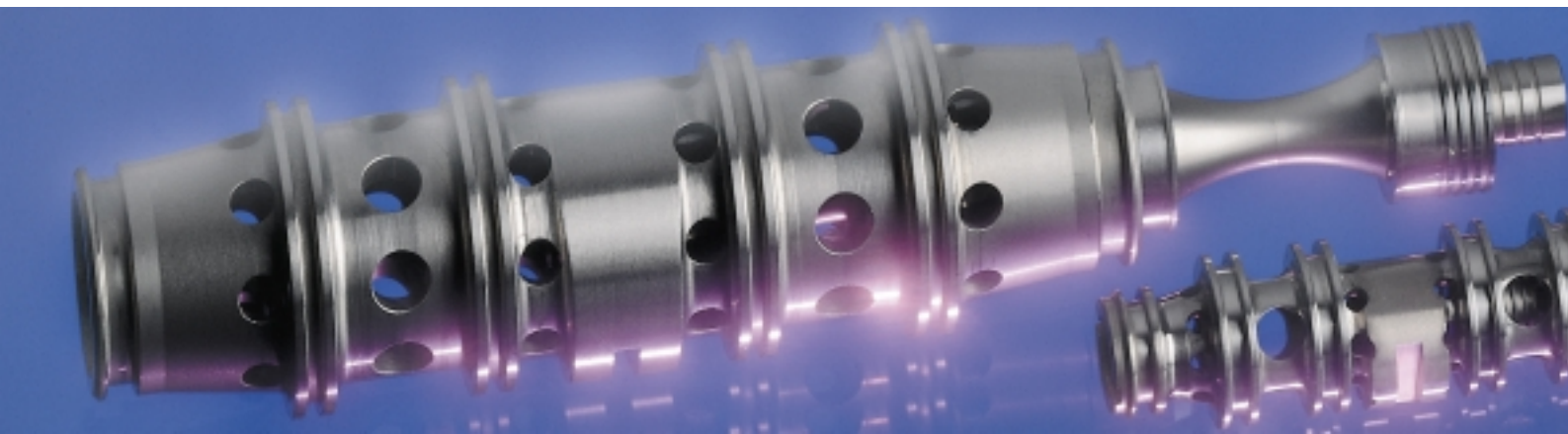
Preferred configurations are highlighted.
All combinations may not be available.
Please contact MOOG.

Options may increase price.
Technical changes are reserved.

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