Servovalves D761 Series
ISO 10372 Size 04

D761 Series
Two stage servovalves

The D761 Series servovalves are throttle valves for 3- and preferably 4-way applications. According to the requirements of the application, the user can select either the standard version (S) or the high response version (H). The main feature of the high response valves is improved dynamics.
These valves are suitable for electrohydraulic position, speed, pressure or force control systems with high dynamic response requirements.

Operational features

- ❒ 2-stage design with dry torque motor
- ❒ Low friction double nozzle pilot stage
- ❒ High spool control forces
- ❒ Mechanical feedback
- ❒ Internal or external pilot supply optional
- ❒ Protection filter easy to replace

Description
The servovalves D761 Series consist of an electromechanical transformer (torque motor), a hydraulic amplifier (nozzle/flapper principle), a spool in a bushing and a cantilever feedback spring.
The torque motor contains coils, pole pieces, permanent magnets and an armature. The armature is connected to a flexible tube which allows a limited rotation of the armature and at the same time seals the electromagnetic components against the hydraulic fluid.
The hydraulic amplifier is a full bridge arrangement with two upstream fixed orifices and two downstream variable orifices created by two nozzles and a flapper between them. The flapper is connected at its upper end to the centre of the armature and extends downward through the flexure tube to the nozzles. A deflection of the flapper between the nozzles changes the size of the variable orifices in opposite sense.
The 4-way spool controls fluid flow from pressure port to one of the load ports and also from the other load port to return.
Deflection of the feedback spring due to spool displacement produces a torque which is fed back to the torquemotor.

Operating principle
An electric current (command or input signal) is applied to the coils of the torquemotor and produces depending on the current polarity a clockwise or counter clockwise torque to the armature. The thereby deflected nozzle flapper system creates a pressure difference across the drive areas of the spool and effects its movement. The feedback spring connected to the armature engages with its lower end into a slot of the spool and is thus deflected by spool displacement. The motion of the spool stops when feedback torque and electromagnetic torque are in equilibrium. Then the flapper is again in hydraulic centre position (approximately). Thus the position of the spool is proportional to the electric command signal.

The actual flow depends on the electric command signal and the valve pressure drop, and may be calculated using the square root function for a sharp-edged orifice.

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

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 drops are required, an appropriate higher pilot pressure has to be chosen to overcome the flow forces. An approximate value can be calculated as follows:

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

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.

Valves available with intrinsical protection to EN 50.020 class EEx ia IIc T6. Special data sheet on request.

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

DIN ISO 9001 certified BVQi

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

Operating pressure range

Ports P, X, A and B	315 bar (350 bar on request)
port T	up to 210 bar
Temperature range	
Ambient	-20 to +60 °C
Fluid	-20 to +100 °C
Seal material	FPM (others on request)

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

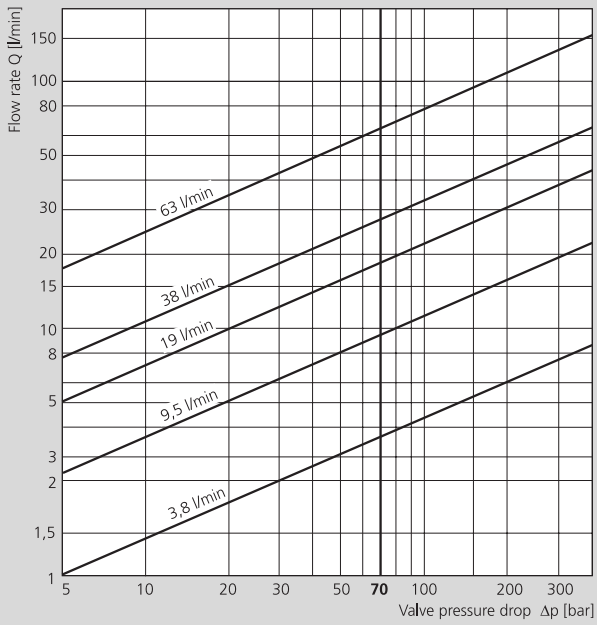
Viscosity	recommended	15 to 100 mm²/s
Protection filter for pilot stage		65 µm nominal

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

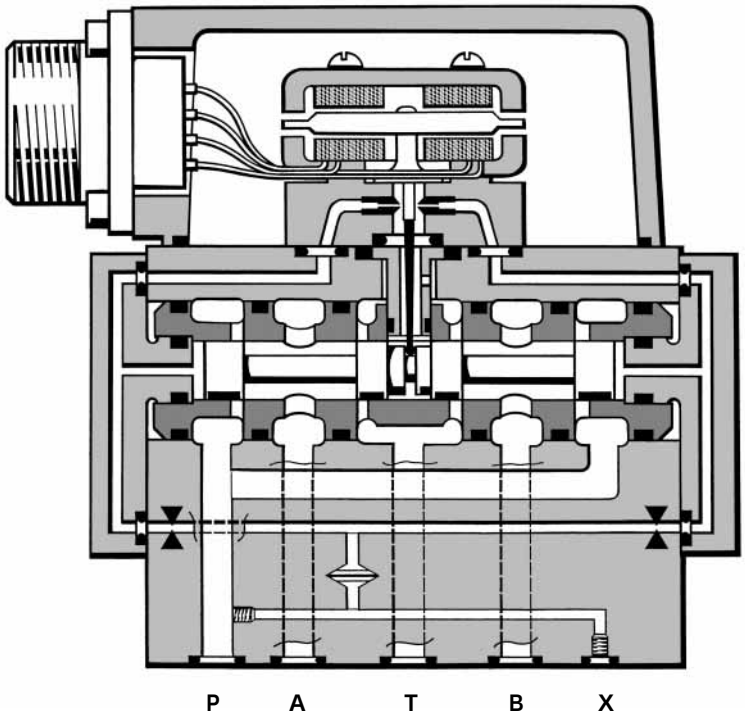
Class of cleanliness: The cleanliness of the hydraulic fluid greatly effects the performance (spool positioning, high resolution) and wear (metering edges, pressure gain, leakage) of the valve.

Recommended cleanliness class

For normal operation:	ISO 4406 < 14 / 11
For longer life:	ISO 4406 < 13 / 10
Filter rating recommended	
For normal operation:	$ß_{10} \geq 75$ (10 µm absolute)
For longer life:	$ß_5 \geq 75$ (5 µm absolute)
Installation options	any position, fixed or movable
Vibration	30 g, 3 axes
Mass	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 function of the valve pressure drop

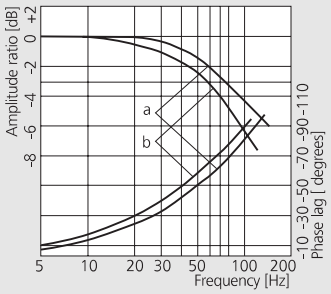


D761 Series
Technical data

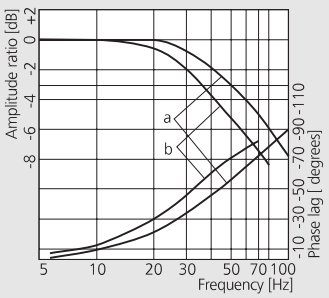
Model ... Type			**D761- .....S.....**					**D761- .....H.....**			
Mounting pattern			ISO 10372 - 04 - 04 - 0 - 92								
Valve body version			4-way, 2-stage with bushing-spool assembly								
Pilot stage			Nozzle / flapper					Nozzle / flapper			
Pilot connection	optional, internal or external		X					X			
Rated flow (± 10%)	at Δp_N = 35 bar per land	[l/min]	**3,8**	**9,5**	**19**	**38**	**63**	**3,8**	**9,5**	**19**	**38**
Response time*		[ms]	6	6	6	10	13	4	4	4	7
Threshold*		[%]	< 0,5					< 0,5			
Hysteresis*	without dither	[%]	< 3					< 3			
Null shift	with ΔT = 55 K	[%]	< 2					< 2			
Null shift	with variation of operating pressure between 70 and 100 %	[%]	< 2					< 2			
Null leakage flow*	max.	[l/min]	1,1 to 2,0					1,4 to 2,3			
Pilot leakage flow*		[l/min]	0,45					0,7			
Pilot flow* max.,	for 100% step input	[l/min]	0,2					0,3			
Spool drive area		[cm²]	0,49					0,34			

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

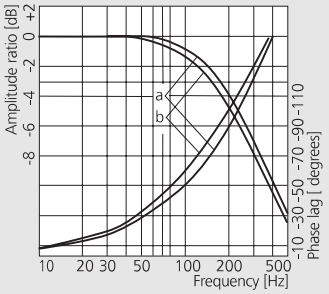
Frequency response curves measured at 210 bar pilot or operating pressure, fluid viscosity of 32 mm²/s and fluid temperature of 40 °C



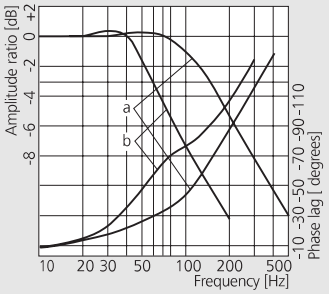
Standard valve
Signal ± 40 %



Standard valve
Signal ± 100 %



High response valve
Signal ± 40 %

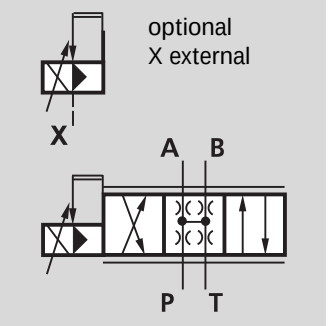


High response valve
Signal ± 100 %

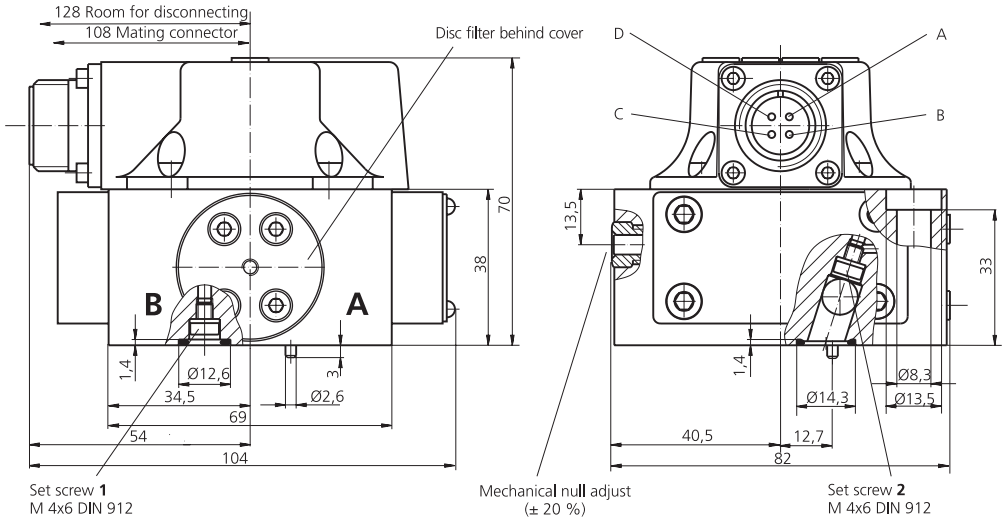
Standard valves: Curves a: Q_N 3,8; 9,5; 19 and 38 l/min
Curves b: Q_N 63 l/min

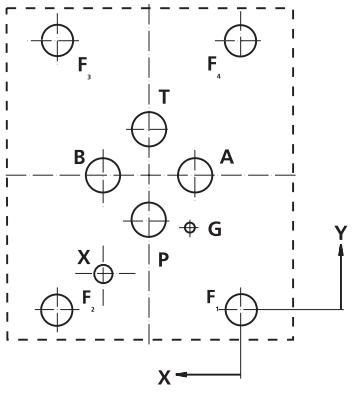
High response valves: Curves a: Q_N 3,8; 9,5 and 19 l/min
Curves b: Q_N 38 l/min

Hydraulic symbol



Installation drawing





The mounting manifold must conform to ISO 10372 size 04. Mounting surface needs to be flat within 0,02 mm. Average surface finish value, Ra, better than 1µm.

	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 **1** (M 4 x 6 DIN 912)	**2**
	internal P	closed	open
	external X	open	closed

Mechanical null adjust

The hydraulic null of the valve is preset at the factory with a tolerance of ± 2 % rated signal.

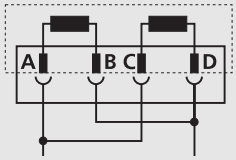
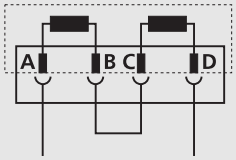
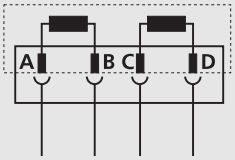
If necessary this null can be mechanically readjusted by the user. Turning the nulladjust pin clockwise results in flow increase at port B.

Electrical connection
Spare parts, Accessories

Electric connection with 4-pole connector to Mil C5015/14S-2

The torque motor has 2 coils. The leads of the coils are single connected to the pins. For operation in parallel, series or single coil mode the corresponding wiring must be done in the mating connector.

Note:
Before applying electric signals the pilot stage has to be pressurized.

		Parallel	Series	Single
				
Coil resistance (25 °C)	[Ω]	40	160	80
Rated current	[mA]	± 40	± 20	± 40
Inductance (at 60 Hz)	[H]	0,18	0,66	0,22
Electrical power	[W]	0,064	0,064	0,128
Connections for valve opening P ◗ B, A ◗ T		A an C (+) B and D (–)	A (+), D (–) B and C connected	A (+), B (–) or C (+), D (–)

Spare parts and accessories

O - rings (included in delivery),		FPM 85 Shore
for P, T, A and B	ID 10,82 x 1,78	42082 022
for X	ID 9,25 x 1,78	42082 013
Mating connector, waterproof IP 65 (not included in delivery)		
4-pole	MIL-C-5015/14S-2S	B46744 004
Replaceable filter		A67999 065
O - rings for filter change (2 pieces)		A25163 013 015

Flushing plate	(int.) 55127 001	(ext.) 55127 002
Mounting bolts (not included in delivery)		
M 8 x 45 DIN 912-10.9 (4 pieces)		A03665 080 045
required torque		18 Nm
Screw internal/external M4 x 6 DIN 912		66098 040 006
Seal for screw internal/external		A25528 040

Ordering Information

Model-Number

D761 . . . . . .

Type Designation

. . . . . .

Specification status

–	Series specification
E	Preseries specification
Z	Special specification
K	IS - Valve

Model designation

	assigned at the factory

Factory identification

Valve version

S	Standard
H	High response

Rated flow

	Q_N [l/min] at Δp_N = 35 bar per land	
	Standard	High response
04	3,8	3,8
10	9,5	9,5
19	19	19
38	38	38
63	63	---

Maximum operating pressure p_P and body material

F	210 bar. Aluminum
J	315 bar. Aluminum
K	350 bar. Steel

Bushing spool type

O	Critical lap, linear characteristic
X	Special spool on request

Signals for 100% spool stroke

	Rated command signal
H	± 7,5 mA Series
L	± 20 mA Series
N	± 30 mA Series

Valve connector

	Connerctor direction
A	over port A
B	over port B
P	over port P
T	over port T

Seal material

V	FPM (Viton)
	others on request

Pilot connections

	Former code	Supply
A	A, E, J	internal
C	C, G, J	external

Spool position without electric signal

A	P ◗ B, A ◗ T
B	P ◗ A, B ◗ T
M	Mid position

Pilot stage max. allowed pilot pressure p_X as operating pressure p_P

F	Standard response for valve version "S"
G	Valve version "H" and higher response for valve version "S"

Preferred configurations are highlighted.
All combinations may not be available.
Please contact MOOG.

Options may increase price.
Technical changes are reserved.

Australia	Melbourne
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Philippines	Baguio
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MOOG Controls Limited
Ashchurch
Tewkesbury
Gloucestershire
GL20 8NA
Telephone (01684) 29 66 00
Telefax (01684) 29 67 60

MOOG GmbH
Hanns-Klemm-Straße 28
D - 71034 Böblingen
Postfach 1670
D - 71006 Böblingen
Telefon (07031) 622-0
Telefax (07031) 622-191

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