

MOOG

72 Series
Servovalves

ISO 10372-06-05-0-92



72 SERIES TWO STAGE SERVOVALVES

72 SERIES SERVOVALVES

The 72 Series flow control servovalves are throttle valves for 3 and preferably 4-way applications. They are a high performance, two-stage design that covers the range of rated flows from 25 to 60 gpm at 1000 psi valve drop. The output stage is a closed center, four-way sliding spool. The pilot stage is a symmetrical double-nozzle and flapper, driven by a double air gap, dry torque motor. Mechanical feedback of spool position is provided by a

cantilever spring. The valve design is simple and rugged for dependable, long life operation.

These valves are suitable for electrohydraulic position, speed, pressure or force control systems with high dynamic response requirements.

Principle of operation

An electrical command signal (flow rate set point) is applied to the torque motor coils, and creates a magnetic force which acts on the ends of the pilot stage armature. This causes a

deflection of armature/flapper assembly within the flexure tube. Deflection of the flapper restricts fluid flow through one nozzle which is carried through to one spool end, displacing the spool.

Movement of the spool opens the supply pressure port (P) to one control port, while simultaneously opening the tank port (T) to the other control port. The spool motion also applies a force to the cantilever spring, creating a restoring torque on the armature/flapper

assembly. Once the restoring torque becomes equal to the torque from the magnetic forces, the armature/flapper assembly moves back to the neutral position, and the spool is held open in a state of equilibrium until the command signal changes to a new level.

In summary, the spool position is proportional to the input current and with constant pressure drop across the valve, flow to the load is proportional to the spool position.

VALVE FEATURES

- > 2-stage design with dry torque motor
- > Low friction double nozzle pilot stage
- > High spool control forces
- > High dynamics
- > Field replaceable pilot stage filter
- > Rugged, long-life design
- > High resolution, low hysteresis
- > Completely set-up at the factory
- > Optional fifth port for separate pilot supply

The actual flow is dependent upon electrical command signal and valve pressure drop. The flow for a given valve pressure drop can be calculated using the square root function for sharp edge orifices:

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

- Q [gpm] = calculated flow
- Q_N [gpm] = rated flow
- Δp [psi] = actual valve pressure drop
- Δp_N [psi] = rated valve pressure drop



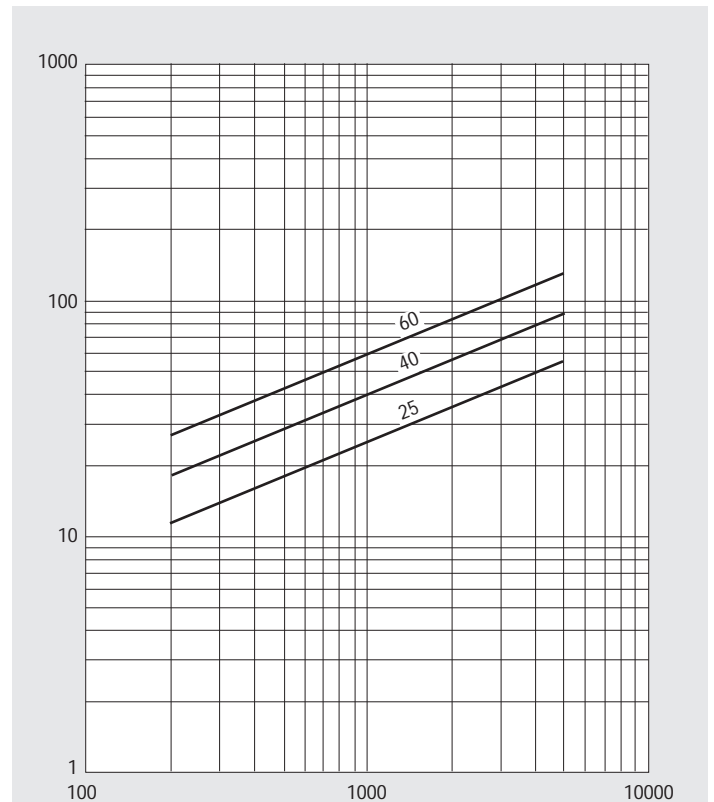
This catalog is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has

to check the suitability of the products described here. In case of doubt, please contact Moog Inc.

72 SERIES GENERAL TECHNICAL DATA

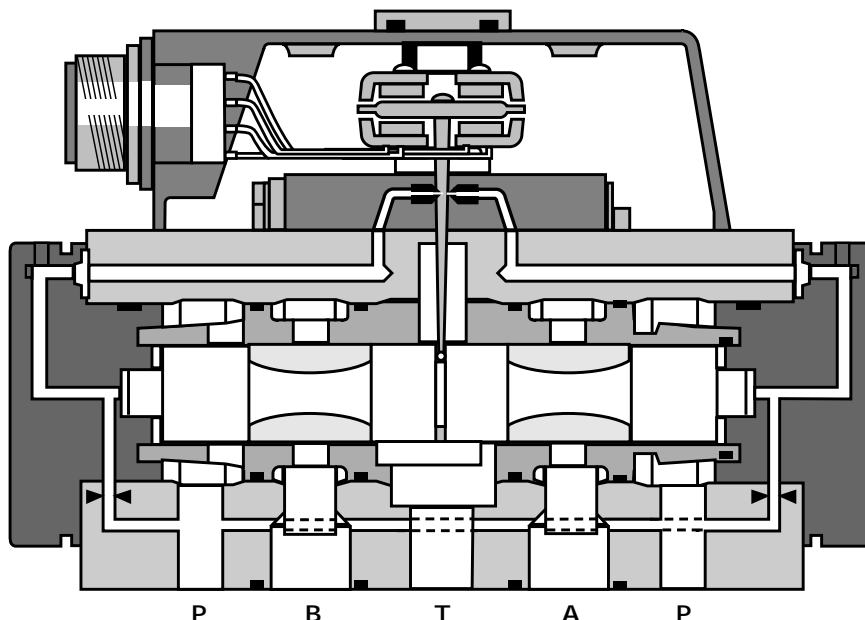
Operating Pressure	ports P, X, A and B	up to 3,000 psi*
	port T	up to 3,000 psi
Temperature Range	Fluid	-40°F to 275°F
	Ambient	-40°F to 275°F
Seal Material		Viton, others on request
Operating Fluid		Compatible with common hydraulic fluids, other fluids on request.
	Recommended viscosity	60-450 SUS @ 100°F
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 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 Operations	Any position, fixed or moveable.	
Vibration	30 g, 3 axes	
Weight	7.75 lb. (3.52 kg)	
Shipping Plate	Delivered with an oil sealed shipping plate.	

* Maximum special order is 5,000 psi



Valve Flow Diagram

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



72 SERIES TECHNICAL DATA

Model ... Type
Mounting Pattern
Valve Body Version

72

ISO 10372 - 05 - 05 - 0 -92

4-way

2-stage with spool-bushing assembly

Nozzle/Flapper, High flow

Pilot Stage

Pilot Connection Optional Internal or External

Rated Flow ($\pm 10\%$) at $\Delta p_N = 1,000$ psi [gpm]

25 40 60

Response Time* [ms]

16 26 40

Threshold* [%]

< 1.5%

Hysteresis* [%]

< 4.0%

Null Shift at $\Delta T = 100^\circ F$ [%]

< 4.0%

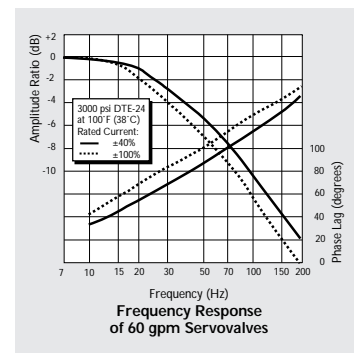
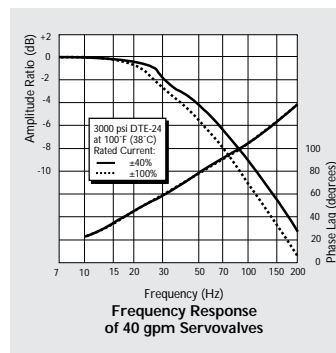
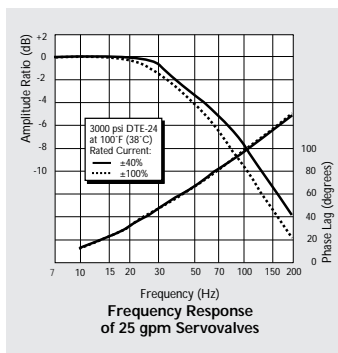
Null Leakage Flow* max. [gpm]

0.55 to 1.30

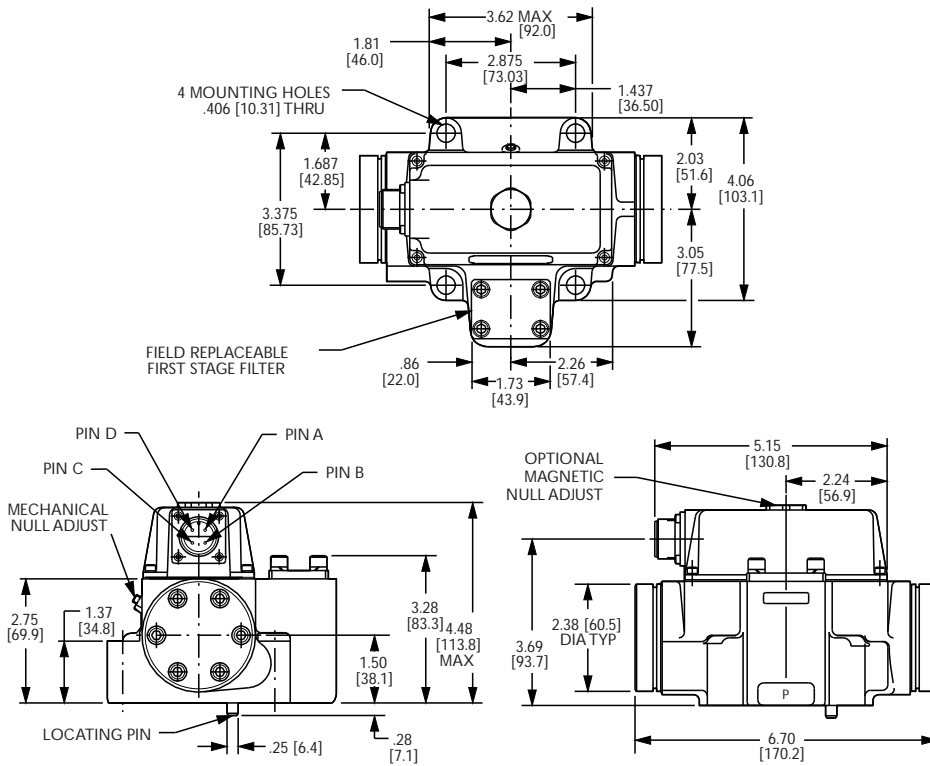
* Measured at 1,000 psi pilot or operating pressure

Typical characteristic curves with $\pm 40\%$ and $\pm 100\%$ input signal, measured at 3,000 pilot or operating pressure.

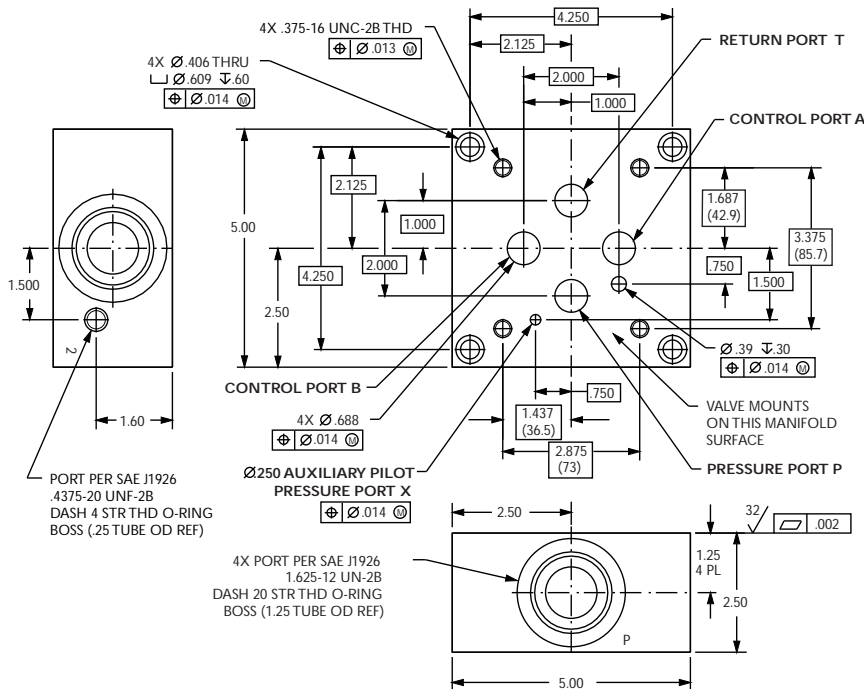
Standard Valves



72 SERIES INSTALLATION DRAWINGS



TYPICAL SUBPLATE MANIFOLD



Null Adjust: Flow out of Control Port B will increase with clockwise rotation of null adjust screw (3/32 hex key).

The mounting manifold must conform to ISO 10372-06-05-0-92. Surface to which valve is mounted requires a $\sqrt{32}$ [ΔΔ] finish, flat within 0.002[0.05] TIR.

72 SERIES ELECTRICAL CONNECTIONS

Rated current and coil resistance

A variety of coils are available for 72 Series Servovalves, which offer a wide choice of rated current. See Table I.

Coil connections

A four-pin electrical connector (that mates with an MS3106F14S-2S) is standard. All four torque motor leads are available at the connector so external connections can be made for series, parallel or differential operation.

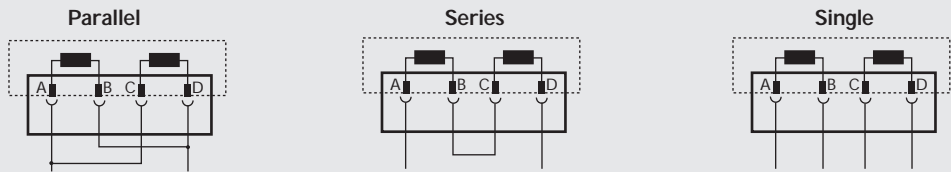
72 Series Servovalves can be supplied on special order with other connectors.

Servoamplifier

The servovalve responds to input current, therefore a servoamplifier that has high internal impedance (as obtained with current feedback) should be used. This will reduce the effects of coil inductance and will minimize changes due to coil resistance variations.

ELECTRICAL CONNECTIONS

(Examples with typical 72 series coils)



Coil Resistance	[Ω]	100	400	200
Rated Current	[mA]	± 15	± 7.5	± 15
Electrical Power	[W]	.023	.023	.045
Connections for Valve Opening		A and C (+) P \blacktriangleright B, A \blacktriangleright T	A (+), D (-) B and C connected	A (+), B (-) or C (+), D (-)

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

TABLE 1

Nominal Resistance Per Coil at 77°F (25°C) Ω	Recommended Rated Current—mA		Approximate Coil Inductance*—Henrys		
	Parallel, Differential or Single Coil Operation	Series Coils	Single Coils	Series Coils	Parallel Coils
80	± 40	± 20	0.12	0.36	0.10
200	± 15	± 7.5	0.72	2.20	0.59
1000	± 8	± 4	3.20	9.70	2.60

* Measured at 50 Hz

72 SERIES ORDERING INFORMATION SPARE PARTS AND ACCESSORIES

Model Number		Type Designation									
72		.									
Optional Feature											
	Series specification										
K	Intrinsically safe										
Model Designation											
	Assigned at the factory										
Factory Identification (Revision Level)											
Value Version											
S	Standard response										
Rated Flow											
	Q_N [gpm] at $\Delta p_N = 1,000$ psi										
095	25										
152	40										
228	60										
Maximum Operating Pressure Pp and Body Material											
F	3,000 psi aluminum										
K	5,000 psi steel body										
Main Spool Type											
O	4-way / axis cut / linear										
A	4-way / < =3% overlap - critical lap / linear										
D	4-way / +/-10% overlap / linear										
M	4-way / axis cut $p_c > 80\%$ of p_p / linear										
X	Special*										
		Signals for 100% Spool Stroke									
		4 ±4 mA series (±8 mA parallel)									
		H ±7.5 mA series (±15 mA parallel)									
		L ±20 mA series (±40 mA parallel)									
		Y Special signal (see spec sheet)*									
		Valve Connector									
		A Connector over Port A – side (RH)									
		B Connector over Port B – side (LH)									
		X Special connector*									
		Seal Material									
		V Viton									
		N NBR (Buna)									
		Others on request*									
		Pilot Connection and Pressure									
		Pressure [psi]									Supply
		A	250 to 3,000								internal
		C	250 to 3,000								external
		J	5,000								internal
		L	5,000								external
		Spool Position without Electrical Signal									
		M Mid position									
		Pilot Stage									
		F Standard Dynamics									

Preferred configurations highlighted.
All combinations may not be available.
Options may increase price and delivery.
Technical changes are reserved.

* Optional designs are available with intrinsically safe coils (FM approved), and/or special spool bushing lap configuration. Available seal materials: VITON (Std.), BUNA or EPR.

SPARE PARTS AND ACCESSORIES

O-Rings (included in delivery), for P,T,A and B for X	FPM 85 Shore ID 0.801 x 0.070 ID 0.364 x 0.070	Moog P/N 42082-40 42082-13
Mating Connector, waterproof IP 65 (not included in delivery)		49054F14S2S (MS3106F14S-2S)
Flushing Block		G4321AM1
Mounting Bolts (not included in delivery) 3/8 - 16 NC x 2 long (4 pieces)		A31324-332B
Replaceable Filter Cartridge		22050K2
Field Replaceable Filter Kit		B52555RK99K1



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England	Tewkesbury
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France	Rungis
Germany	Böblingen



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Japan	Hiratsuka
Korea	Seoul
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Singapore	Singapore
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