MOOG

G77X Series
Servovalves

G77X SERIES SERVOVALVES

The G77X 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 1 to 15 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 the 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 the 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. 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
- Rugged, long-life design
- High resolution, low hysteresis
- Completely set-up at the factory
- Small body size

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

ISO 9001 CERTIFIED

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.

Valves available with CENELEC approved intrinsically safe protection class EEx ia IIc T4 for Category 1G. and FM, CSA approved intrinsically safe protection in Class I, II and III, Division 1 hazardous locations. Special data sheet on request.

GENERAL TECHNICAL DATA

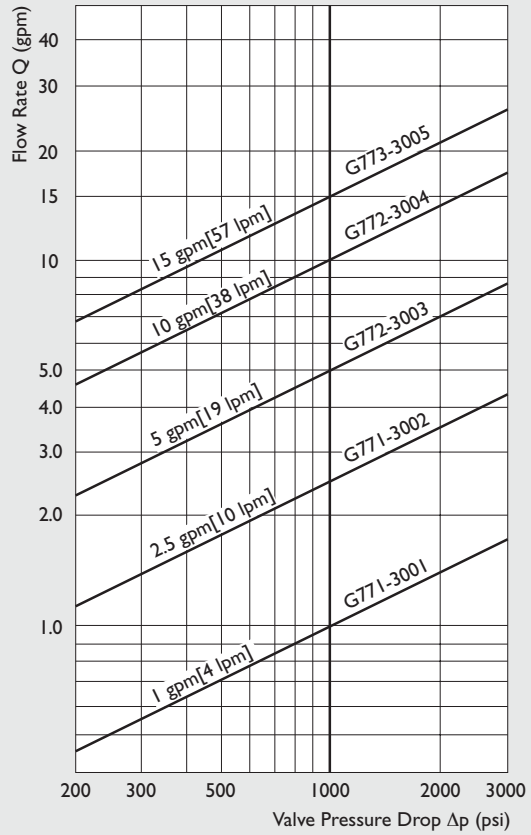
Operating Pressure	
ports P, T, A and B	up to 3,000 psi [210 bar]
Temperature Range	
Fluid	-20° to 275°F [-29° to 135°C]
Ambient	-20° to 275°F [-29° to 135°C]
Seal Material*	Fluorocarbon
Operating Fluid	Compatible with common hydraulic fluids, other fluids on request.
Recommended viscosity	60-450 SUS @ 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. Refer to Moog filtration catalog for recommended filtration scheme.

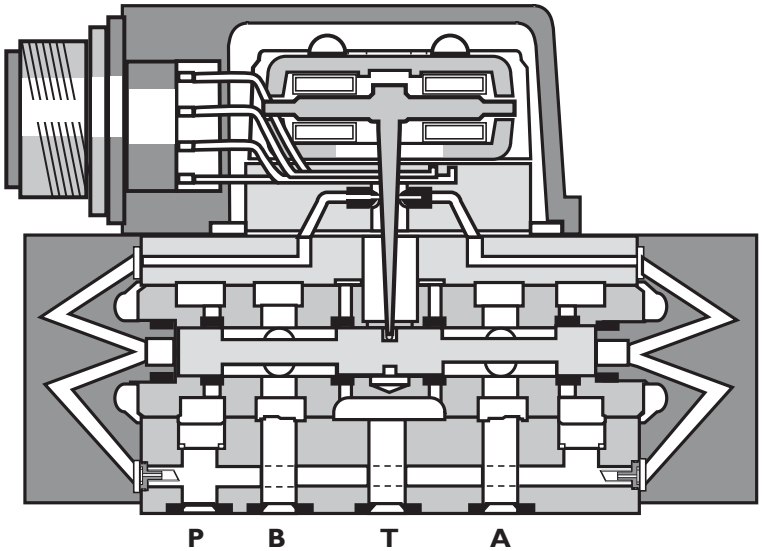
Class of Cleanliness: The cleanliness of the hydraulic fluid greatly effects the performance (spool positioning, high resolution) and wear (metering edges, pressure gain, leakage) of the servovalve.

Recommended Cleanliness Class	
For normal operation	ISO 4406 < 14/11
For longer life	ISO 4406 < 13/10
Filter Rating recommended	
For normal operation	$ß_{10} \geq 75$ (10 µm absolute)
For longer life	$ß_5 \geq 75$ (5 µm absolute)
Installation Operations	Any position, fixed or moveable.
Vibration	30 g, 3 axes
Weight	1.9 lb [.86 kg]
Degree of Protection	EN50529P: class IP65, with mating connector mounted.
Shipping Plate	Delivered with an oil sealed shipping plate.

* Other seal materials on request



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

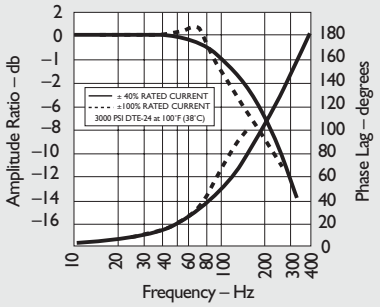


View from Pressure Side

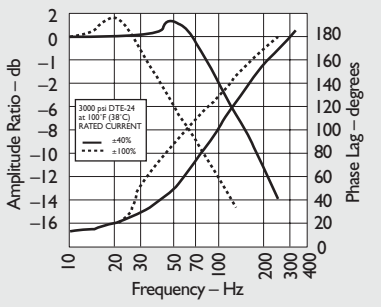
Model…Type			**G771**	**G772**	**G773**
Mounting Pattern			see installation drawings		
Valve Body Version			4-way 2-stage with spool–bushing assembly		
Pilot Stage			Nozzle/Flapper		
Pilot Connection			Internal		
Fluid Supply			G77X series servovalves are intended to operate with constant supply pressure		
Supply Pressure	minimum		200 psi [14 bar]		
	maximum		3,000 psi [210 bar]		
Rated Flow Tolerance	@ 1,000 psi ΔP_N	[%]	±10		
Symmetry		[%]	< 10		
Threshold		[%]	< 0.5		
Hysteresis		[%]	< 3.0		
Null Shift	with Temp., 100°F [55°K] variation	[%]	< 2.0		
	with acceleration to 10 g		< 2.0		
	for every 1,000 psi [70 bar] supply pressure change		< 2.0		
	with return pressure 0 to 500 psi [0 to 35 bar]		< 2.0		

Typical characteristic curves with ±40% and ±100% input signal, measured at 3,000 psi operating pressure.

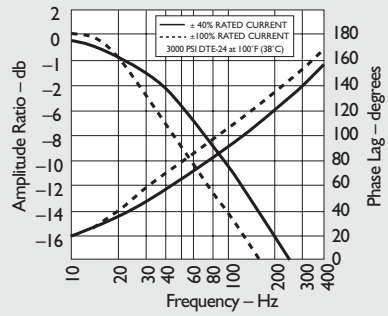
1, 2.5 & 5 gpm



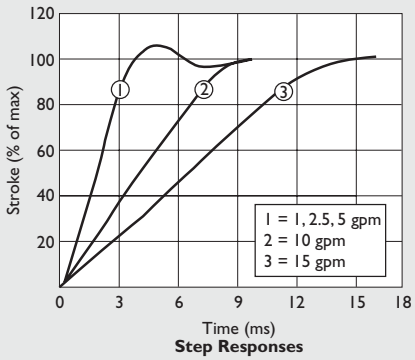
10 gpm



15 gpm

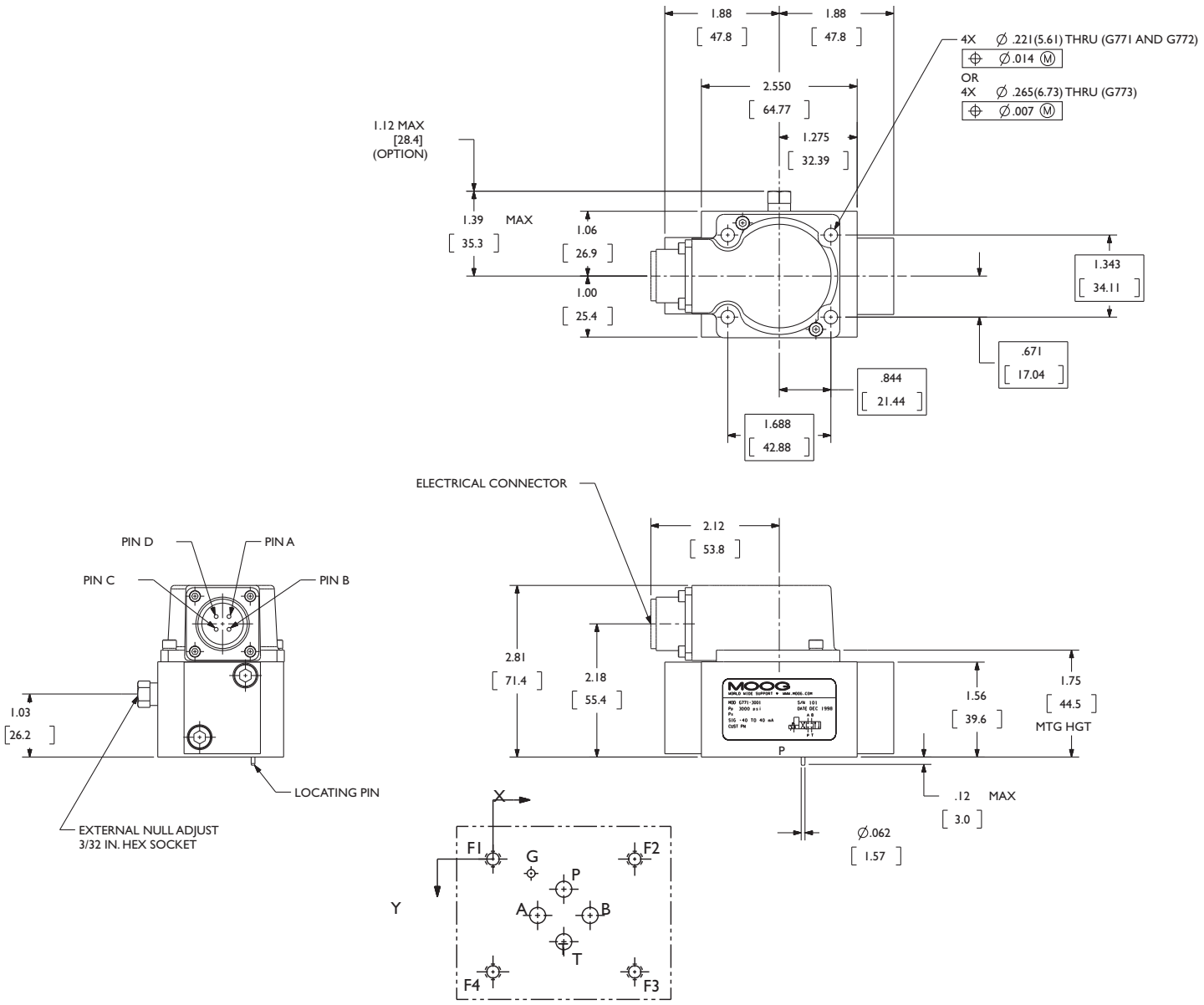


Step Response



Step Responses

INSTALLATION DRAWINGS



G771 U.S.

	P	A	B	T	G	F1	F2	F3	F4
	Ø .191	Ø .191	Ø .191	Ø .191	Ø .14	.190-32	.190-32	.190-32	.190-32
X	0.84	0.53	1.16	0.84	0.45	0	1.69	1.69	0
Y	0.36	0.67	0.67	0.98	0.17	0	0	1.34	1.34

METRIC

	P	A	B	T	G	F1	F2	F3	F4
	5.0	5.0	5.0	5.0	2.39	M5	M5	M5	M5
X	21.3	13.5	29.4	21.3	11.5	0	42.9	42.9	0
Y	9.1	17.1	17.1	25.0	4.4	0	0	34.1	34.1

G772 U.S.

	P	A	B	T	G	F1	F2	F3	F4
	Ø .260	Ø .260	Ø .260	Ø .260	Ø .14	.190-32	.190-32	.190-32	.190-32
X	0.84	0.45	1.23	0.84	0.45	0	1.69	1.69	0
Y	0.28	0.67	0.67	1.06	0.17	0	0	1.34	1.34

METRIC

	P	A	B	T	G	F1	F2	F3	F4
	6.6	6.6	6.6	6.6	3.5	M5	M5	M5	M5
X	21.4	11.5	31.3	21.4	11.5	0	42.9	42.9	0
Y	7.2	17.1	17.1	27	4.4	0	0	34.1	34.1

G773 U.S.

	P	A	B	T	G	F1	F2	F3	F4
	Ø .312	Ø .312	Ø .312	Ø .312	Ø .14	.250-20	.250-20	.250-20	.250-20
X	0.84	0.38	1.31	0.84	0.45	0	1.69	1.69	0
Y	0.20	0.67	0.67	1.14	0.17	0	0	1.34	1.34

METRIC

	P	A	B	T	G	F1	F2	F3	F4
	8.0	8.0	8.0	8.0	2.39	M6	M6	M6	M6
X	21.3	9.5	33.3	21.4	11.5	0	42.9	42.9	0
Y	5.1	17.1	17.1	29.0	4.4	0	0	34.1	34.1

Standard electrical connector mates with MS3106F14S-2S or equivalent.

The mounting manifold for G772 conforms to ISO 10372-03-03-0-92. Surface to which valve is mounted requires a $\sqrt{32}$ [ΔΔ] finish, flat within 0.002[0.05] TIR.

For external null adjust: Flow out of Port B will increase with clockwise rotation of null adjust screw ($^3/_{32}$ hex key). Flow bias is continually varied for a given port as the null adjust is rotated.

ELECTRICAL CONNECTIONS

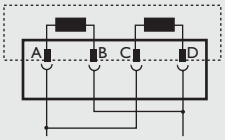
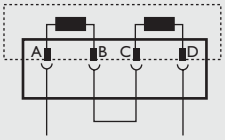
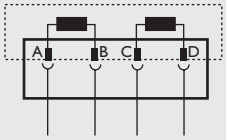
Rated current and coil resistance
A variety of coils are available for G771/2/3 Series Servovalves.

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 single operation.

Servoamplifier
The servovalve responds to input current, so 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 G771/2/3 series coils)

		Parallel	Series	Single
				
Coil Resistance	[Ω]	40	160	80
Rated Current	[mA]	±40	±20	±40
Coil Inductance @ 50 Hz	[H]	.18	.66	.22
Electrical Power	[W]	.064	.064	.128
Polarity for Valve Opening		A and C (+)	A (+), D (-)	A (+), B (-)
P ◗ B, A ◗ T		B and D (-)	B and C connected	or C (+), D (-)

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

ORDERING INFORMATION
SPARE PARTS AND ACCESSORIES

STANDARD MODELS

Model	Type Designation	Rated Flow (Δ 1,000 psi)		Internal Leakage (at 3,000 psi)		Rated Current (Single Coil)	Nominal Coil Resistance
		gpm	lpm	gpm	lpm	mA	Ohms
G771-3001	H04FOFM4VBL	1.0	4	< 0.31	< 1.2	40	80
G771-3002	H10FOFM4VBL	2.5	10	< 0.38	< 1.5	40	80
G772-3003	H19FOFM4VBL	5.0	19	< 0.49	< 1.9	40	80
G772-3004	S38FOFM4VBL	10.0	38	< 0.49	< 1.9	40	80
G773-3005	S57FOFM4VBL	15.0	57	< 0.49	< 1.9	40	80

Model Number

G77 • • • • • • •

Base Number	
1	.625 Port circle
2	.780 Port circle
3	.937 Port circle

Optional Feature	
	Series specification

Model Designation	
	Assigned at the factory

Factory Identification (Revision Level)

Type Designation

• • • **F** • **F** **M** **4** **V** • •

Valve Version	
H	High response .260 spool (04, 10, 19 lpm)
S	Standard response .312 spool (38, 57 lpm)

Rated Flow		
	Q_N gpm [lpm] at Δp_N = 500 psi [35 bar] per land	
04	1 [4]	G771 series only
10	2.5 [10]	G771 series only
19	5.0 [19]	G772 series only
38	10.0 [38]	G772 series only
57	15.0 [57]	G773 series only

Maximum Operating Pressure (P) and Body Material	
F	3,000 psi [210 bar] aluminum

Signals for 100% Spool Stroke	
H	±7.5 mA (series)
L	±20 mA (series)

Valve Connector	
A	Connector over A-side
B	Connector over B-side

Seal Material	
V	Fluorocarbon

Pilot Connections	
4	Internal only

Spool Position without Electrical Signal	
M	Mid-position

Pilot Stage	
F	Standard dynamics

Main Spool Type	
O	4-way / axis cut / linear
D	4-way / +/-10% overlap / linear

SPARE PARTS AND ACCESSORIES

Moog Part	Size	Moog Part Number
O-Rings (included in delivery), for P, T, A and B	FPM 85 Shore	
G771	ID 0.239 x 0.070	-42082-007
G772	ID 0.364 x 0.070	-42082-013
G773	ID 0.426 x 0.070	-42082-022
Mating Connector, waterproof IP 65 (not included in delivery)		-49054F014S002S (MS3106F14S-2S)
Flushing Block Kit (not included in delivery)		
G771 and G772		A01704-1K1
G773		A01704-2K1
Mounting Bolts (included in delivery)		
G771 and G772	.190-32 NF x 2.00 long (4 pcs.) [M5 x 0.8 x 50 mm]	B64929-6D50
G773	.250-20 NC x 2.25 long (4 pcs.) [M6 x 1.0 x 60 mm]	B64929-7D60
Field Replaceable Filter Kit (includes service manual)		B52555RK54K1

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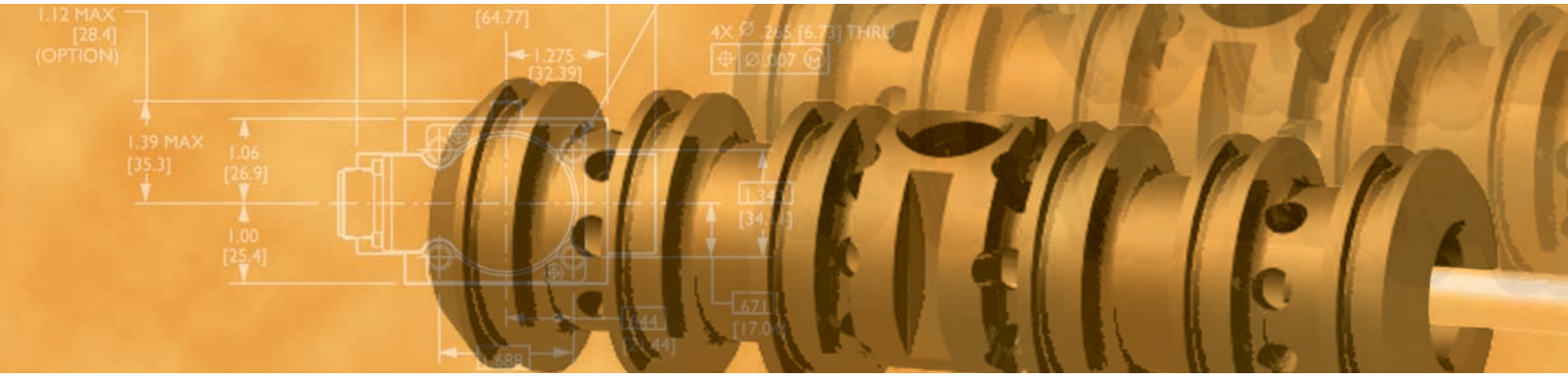
Germany



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