

MOOG

G76I Series Servovalves ISO 10372 Size 04



G76I SERIES TWO STAGE SERVOVALVES

G76I SERIES SERVOVALVES

The G76I 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 16.5 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 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
- Optional fifth port for separate pilot supply
- Field replaceable first stage disc filter

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



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.

G76I SERIES

GENERAL TECHNICAL DATA

Operating Pressure

ports P, X, A and B
port T

up to 4,500 psi [315 bar]
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

$\beta_{10} \geq 75$ (10 μ m absolute)

For longer life

$\beta_5 \geq 75$ (5 μ m absolute)

Installation Operations

Vibration

Any position, fixed or movable.

Weight

30 g, 3 axes

Degree of Protection

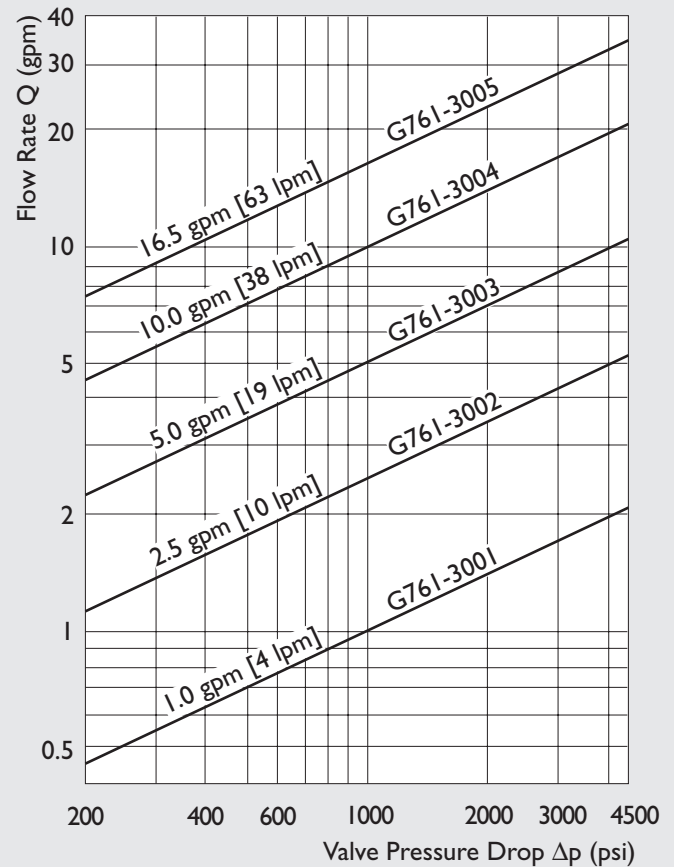
2.4 lb (4.0 lb for steel body)

EN50529P: class IP65, with
mating connector mounted.

Shipping Plate

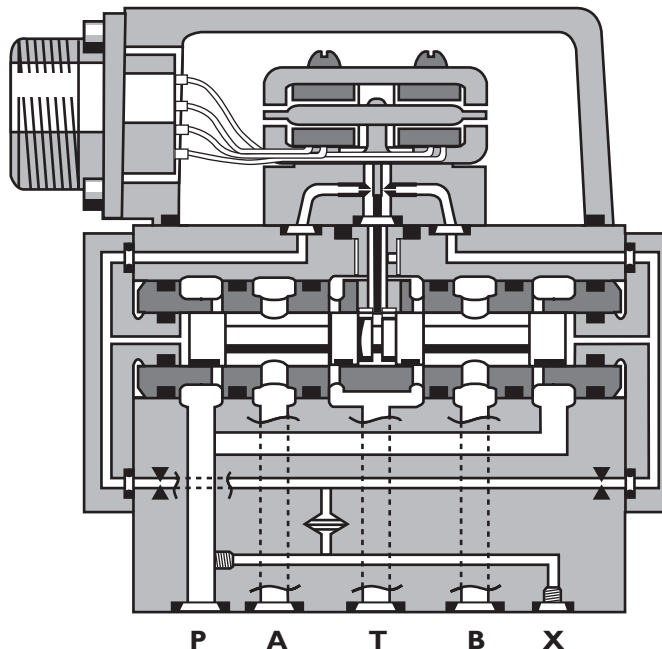
Delivered with an oil sealed
shipping plate.

* Other seal material upon request



Valve Flow Diagram

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

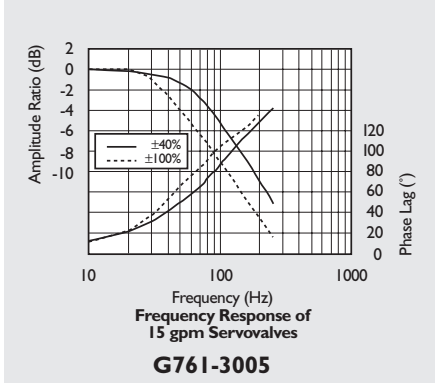
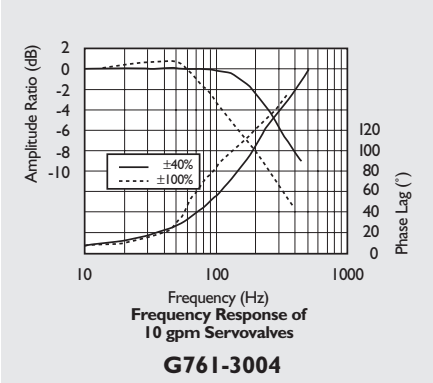
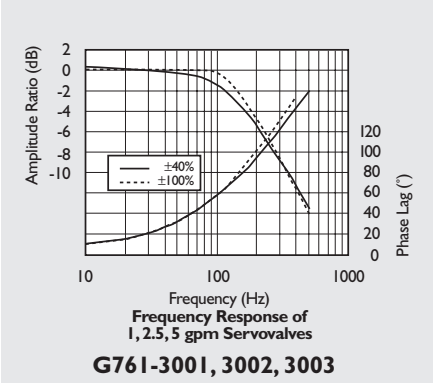


G76I SERIES
TECHNICAL DATA

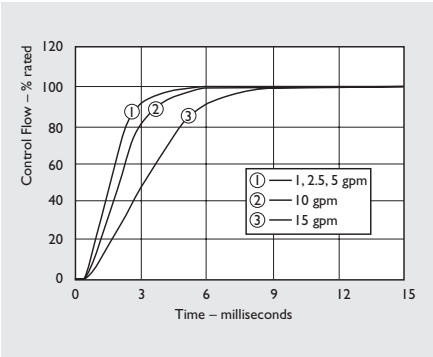
Model...Type		G76I-.....
Mounting Pattern		ISO 10372 - 04 - 04 - 0 - 92
Valve Body Version		4-way 2-stage with spool-bushing assembly
Pilot Stage		Nozzle/Flapper
Pilot Connection		Optional, Internal or External
Fluid Supply		G76I series servovalves are intended to operate with constant supply pressure
Supply Pressure	Minimum	200 psi [14 bar]
	Maximum Standard	4,500 psi [315 bar]
Proof Pressure	at "P" Port	6,750 psi [473 bar]
	at "T" Port	4,500 psi [315 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

* Measured at 3,000 psi pilot or operating pressure
NOTE: High response is available, consult factory

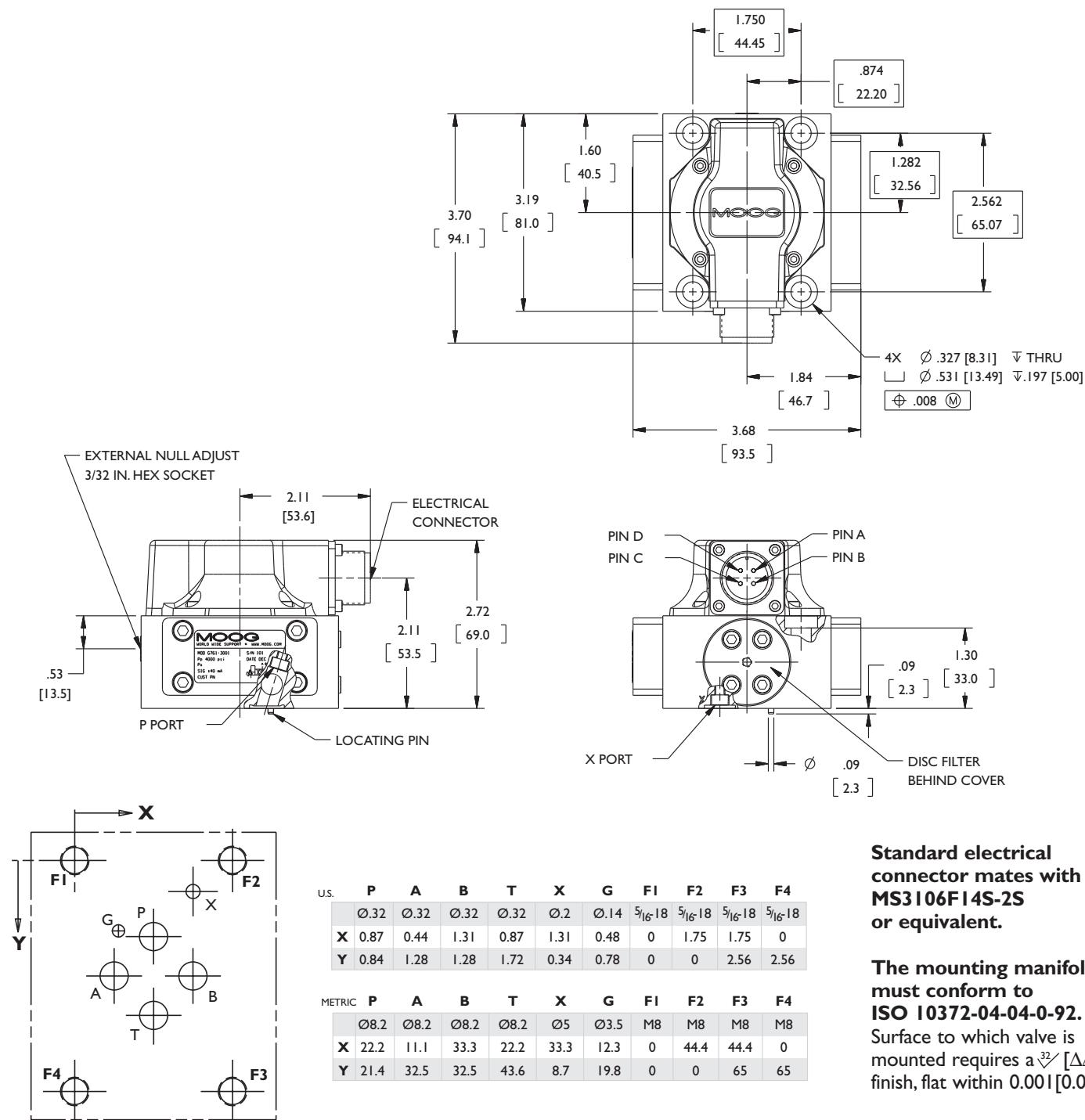
Frequency Response* Typical response characteristics for G76I series servovalves.



Step Response* Typical transient response of G76I series servovalves.



G76I SERIES
INSTALLATION DRAWINGS



CONVERSION INSTRUCTION

For operation with internal or external pilot connection.	Pilot flow supply	Screw & Seal Washer Location (M4 X 6 DIN EN ISO 4762)	
	Internal P*	X	
	External X	closed	open

*The standard version of these valves is configured as internal pilot supply. Changing pilot supply configuration requires model number change.

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

The mounting manifold must conform to ISO 10372-04-04-0-92. Surface to which valve is mounted requires a $\sqrt{R}$ [ΔΔ] finish, flat within 0.001 [0.03] TIR.

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

G76I SERIES
ELECTRICAL CONNECTIONS

Rated current and coil resistance

A variety of coils are available for G76I Series Servovalves.

Coil connections

A four-pin electrical box connector (that mates with an MS3106FI4S2S cable connector) is standard. All four torque motor leads are available at the connector so external connections can be made for series, parallel or single coil operation.

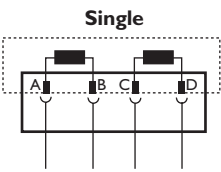
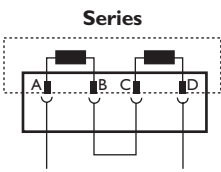
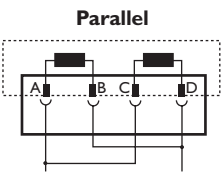
Servoamplifier

The servoamplifier 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 G76I series coils)

Coil Resistance	[Ω]	40
Rated Current	[mA]	±40
Coil Inductance @ 50 Hz	[H]	0.18
Electrical Power	[W]	.064
Polarity for Valve Opening		A and C (+) B and D (-)
P ⬆ B, A ⬆ T		



160	80
±20	±40
0.66	.22
.064	0.128
A (+), D (-)	A (+), B (-) or C (+), D (-)

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

G76I SERIES

ORDERING INFORMATION

SPARE PARTS AND ACCESSORIES

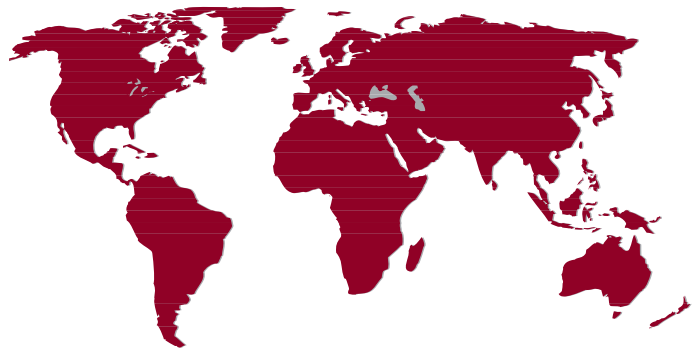
STANDARD MODELS

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
G76I-3001	H04JOFM4VPL	1	4	< 0.31	< 1.2	40	80
G76I-3002	H10JOFM4VPL	2.5	10	< 0.38	< 1.5	40	80
G76I-3003	H19JOGM4VPL	5	19	< 0.60	< 2.3	40	80
G76I-3004	H38JOGM4VPL	10	38	< 0.60	< 2.3	40	80
G76I-3005	S63JOGM4VPL	16.5	63	< 0.60	< 2.3	40	80

Model Number		Type Designation	
G76I • • • • •		• • • J • • M • V P •	
Optional Feature Series specification		Signals for 100% Spool Stroke H ± 7.5 mA (series) L ± 20 mA (series) Z ± 100 mA (series)	
Model Designation Assigned at the factory		Valve Connector P Connector over P-side B Connector over B-side	
Factory Identification (Revision Level)		Seal Material V Fluorocarbon	
Valve Version H High response 1 gpm/4 lpm - 10 gpm/38 lpm S Standard response 16.5 gpm/63 lpm		Pilot Connections 4 Internal 5 External	
Rated Flow Q _N gpm [lpm] at $\Delta P_N = 500$ psi [35 bar] per land 04 1.0 [4.0] 10 2.5 [10] 19 5.0 [19] 38 10.0 [38] 63 16.5 [63]		Spool Position without Electrical Signal M Mid-position	
Maximum Operating Pressure (P) and Body Material J 4,500 psi [310 bar] aluminum		Pilot Stage F Low Flow, Nozzle-Flapper, ≤ 10 lpm G High Flow, Nozzle-Flapper, > 10 lpm	
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	Moog Part	Size	Moog Part Number
FPM 85 Shore O-Rings (included in delivery), for P,T,A and B	ID 0.426 x 0.070 [10.8 x 1.8]	42082-022	Mounting Bolts (not included in delivery) (4 pieces)	5/16 - 18 NC x 1-3/4 long [M8-1.25 x 45 mm long]	A31324-228B [B64929-8B45]
for X	ID 0.364 x 0.070 [9.25 x 1.8]	42082-013	Field Replaceable Filter Kit (includes service manual)		B52555RK201K1
Mating Connector; waterproof IP 65 (not included in delivery)		49054F14S2S (MS3106F14S-2S)	Pilot Supply Screw	M4 x 6 DIN EN ISO 4762	66098-040-006
Flushing Block (not included in delivery)		55124	Seal for Set Screw		A25528-040



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