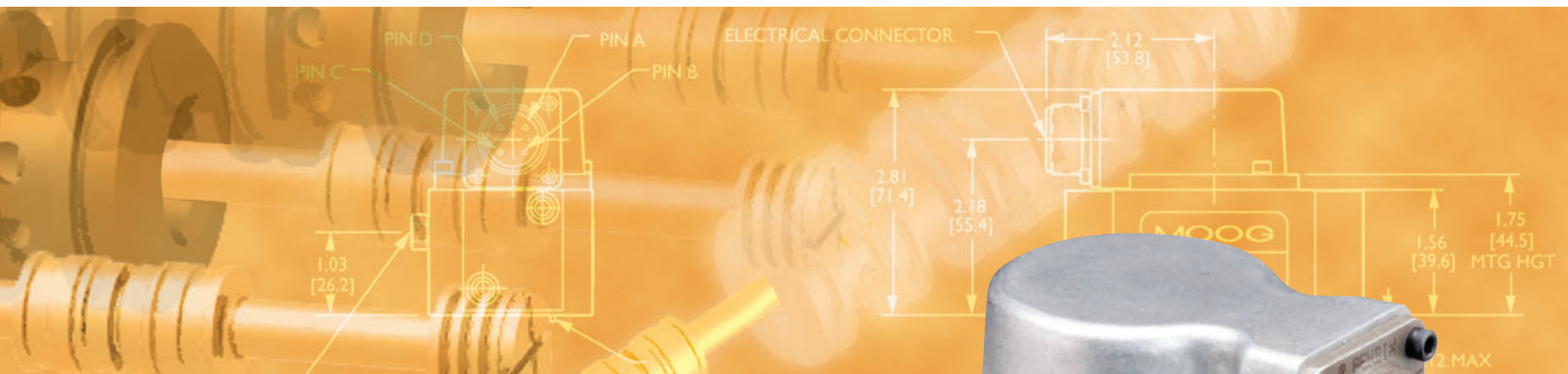


G77X Series Servovalves



G77X SERIES TWO STAGE 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



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.

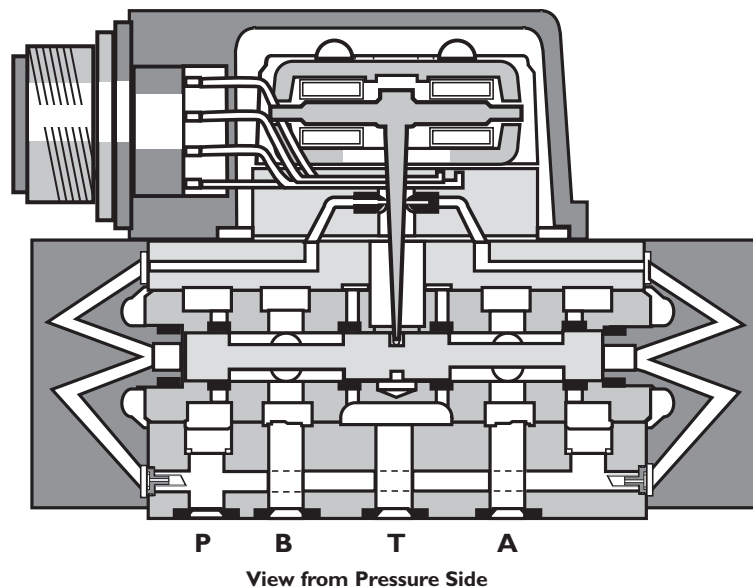
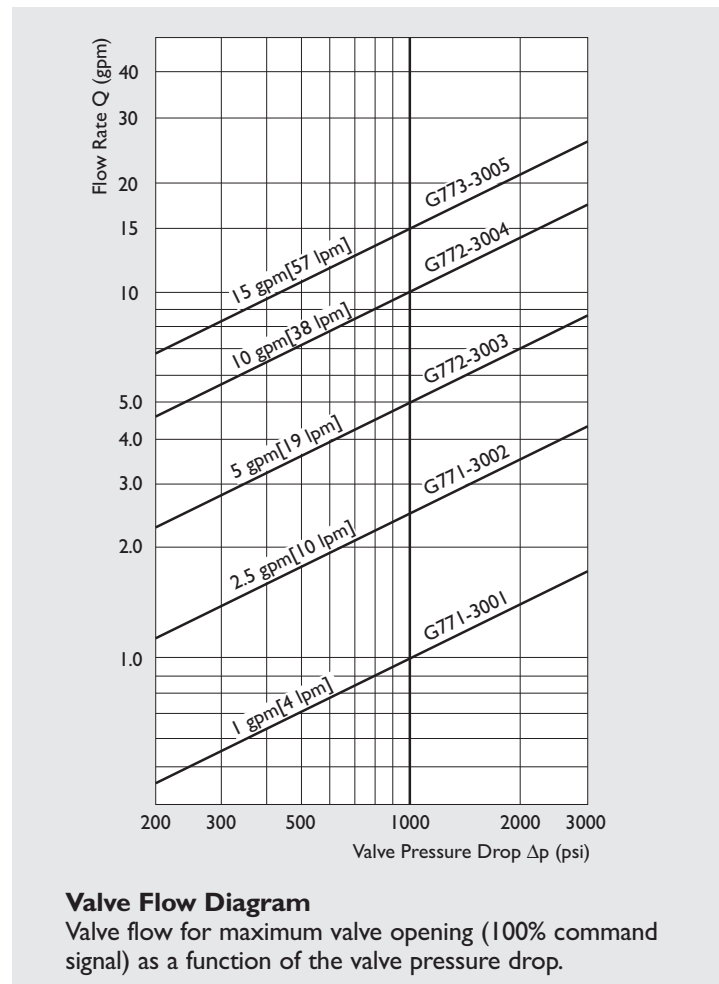


Intrinsically safe valve versions are available for use in hazardous locations. Specific models are certified to FM, ATEX, CSA, and TIIS standards. Contact the factory for details.

**G77X SERIES
GENERAL TECHNICAL DATA**

| | |
|--------------------------------------|--|
| Operating Pressure | up to 3,000 psi [210 bar] |
| ports P,T,A and B | |
| Temperature Range | |
| Fluid | -20° to 275°F [-29° to 135°C] |
| Ambient | -20° to 275°F [-29° to 135°C] |
| Seal Material* | Fluorocarbon (Viton) |
| 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 | 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. |

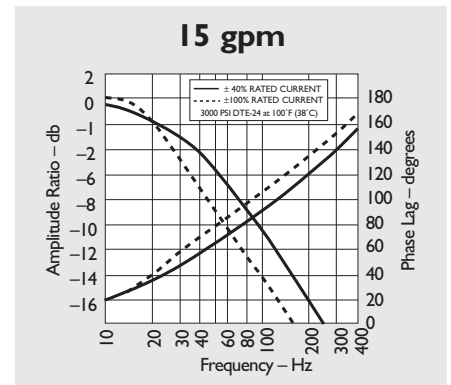
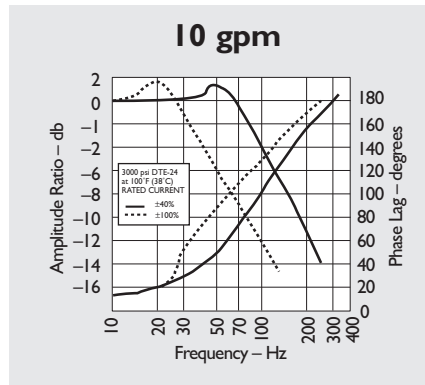
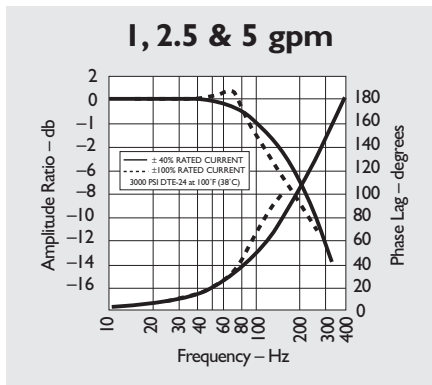
* Other seal materials on request



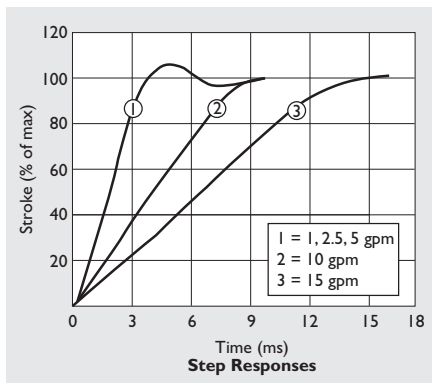
**G77X SERIES
TECHNICAL DATA**

| 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 | | |

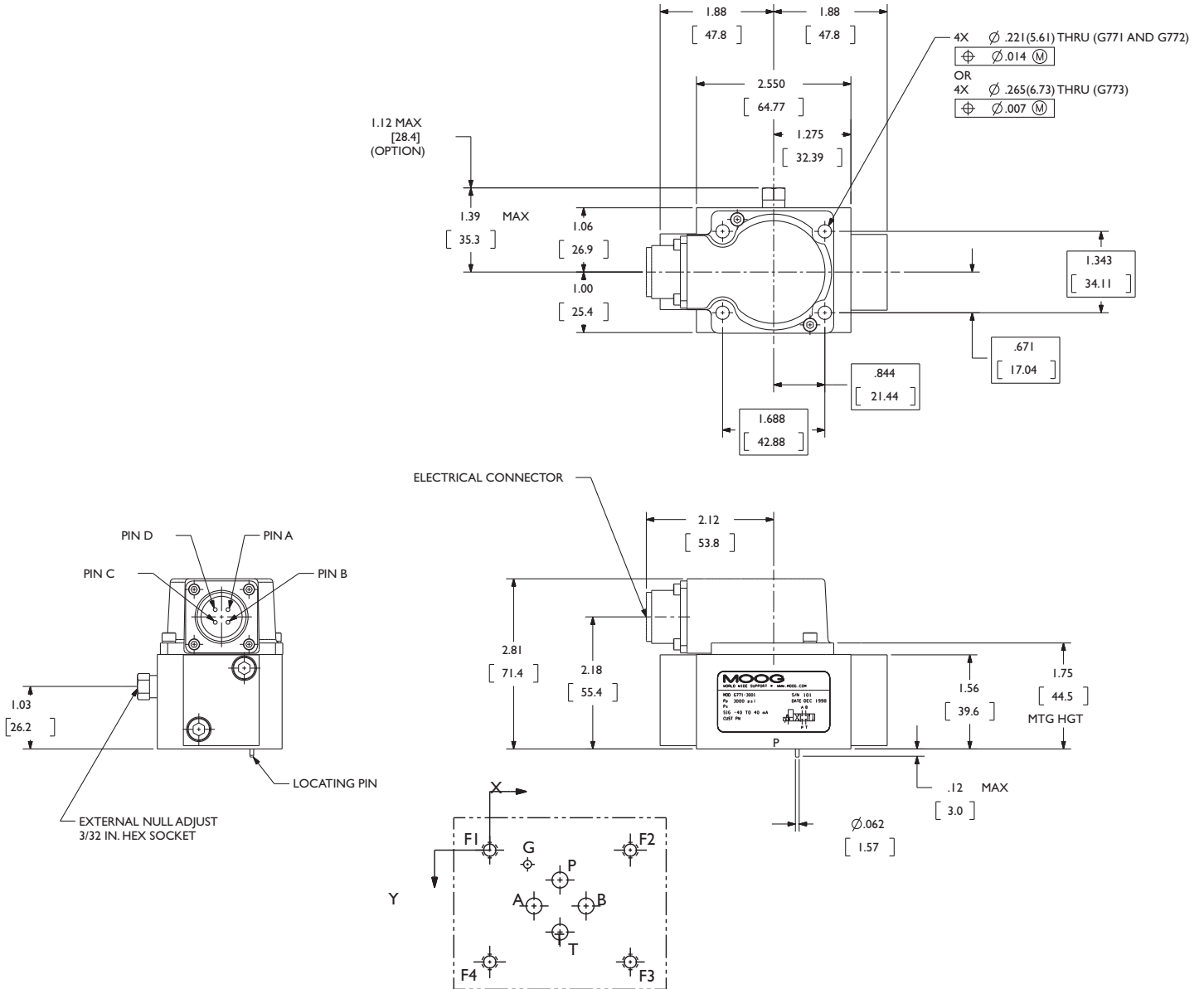
Typical characteristic curves with ±40% and ±100% input signal, measured at 3,000 psi operating pressure.



Step Response



G77X SERIES INSTALLATION DRAWINGS



G771 U.S.

| | P | A | B | T | G | FI | 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 | FI | 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 | FI | 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 | FI | 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 | FI | 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 | FI | 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 $\sqrt{3}$ [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 ($\frac{3}{32}$ hex key). Flow bias is continually varied for a given port as the null adjust is rotated.

G77X SERIES 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 (+) B and D (-) | A (+), D (-) B and C connected | A (+), B (-) or C (+), D (-) |

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

G77X 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 |
| 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) | |
|---|--|
| | |

| 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 $\Delta p_N = 500$ 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 |

Type Designation

. . . **F** . **F** **M** **4** **V** . .

| 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 |

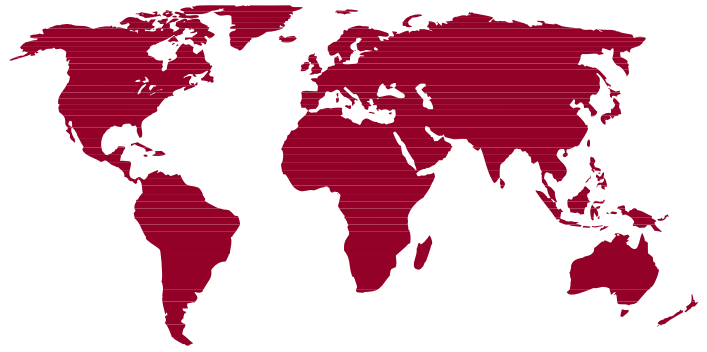
| Spool Position without Electrical Signal | |
|--|--------------|
| M | Mid-position |

| 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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