MOOG

# 771, 772, 773 Series
# Servovalves

## 771/2/3 SERIES SERVOVALVES

The 771/2/3 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 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 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
- 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] = calculated flow
$Q_N$ [gpm] = rated flow
$\Delta p$ [psi] = actual valve pressure drop
$\Delta p_N$ [psi] = 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.

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.

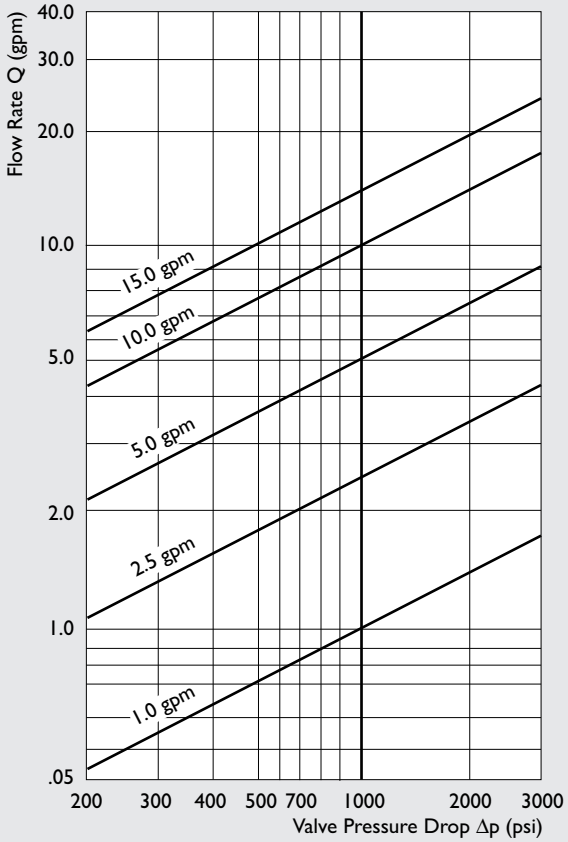
# GENERAL TECHNICAL DATA

| | |
|---|---|
| **Operating Pressure** | |
| ports P, T, A and B | up to 3,000 psi |
| **Temperature Range** | |
| Fluid | -40° to 275°F |
| Ambient | -40° 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 |

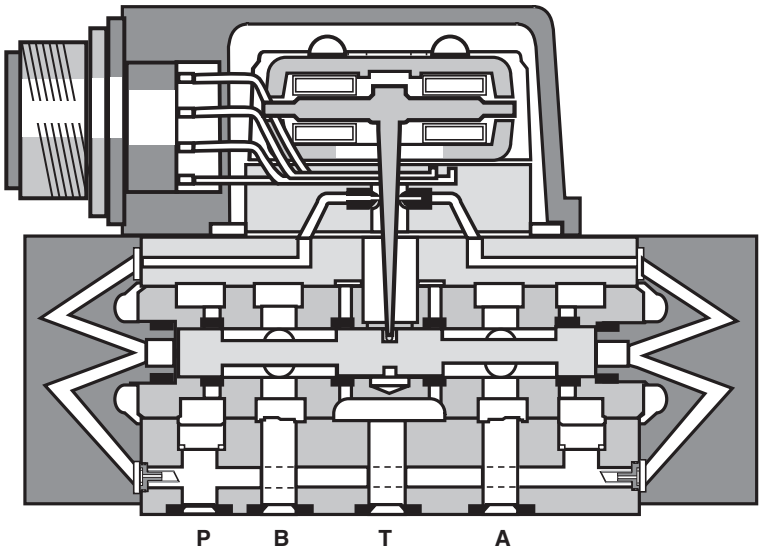
**System Filtration:** High pressure filter (without bypass, but with dirt alarm) mounted in the main flow and if possible, directly upstream of the valve.

**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 | $ß_{10} \geq 75$ (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** | 2.0 lb [.09 kg] |
| **Degree of Protection** | EN50529P: class IP65, 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 a function of the valve pressure drop.

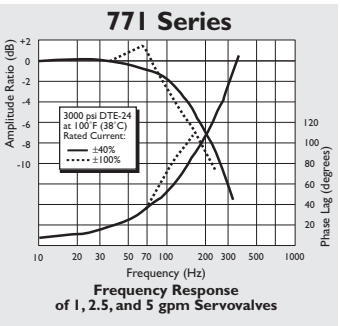


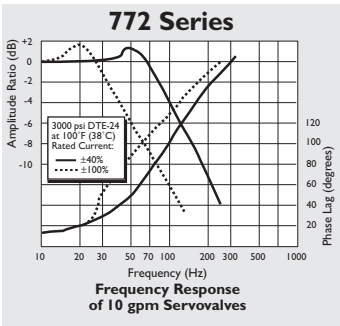

**View from Pressure Side**

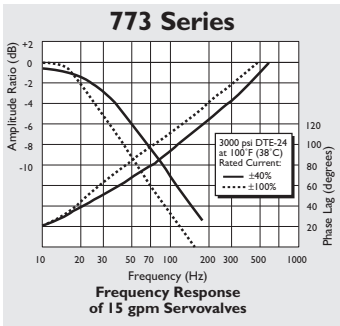
| **Model…Type** | | | **771** | **771** | **773** | | |
|---|---|---|---|---|---|---|---|
| **Mounting Pattern** | | | ISO 10372 - 02 - 02 - 0 - 92 | | | | |
| **Valve Body Version** | | | 4-way | | | | |
| | | | 2-stage with spool–bushing assembly | | | | |
| **Pilot Stage** | | | Nozzle/Flapper, Highflow | | | | |
| **Pilot Connection** | Optional, Internal or External | | Internal only | | | | |
| **Rated Flow** | ($\pm$10%) at $\Delta p_N$ = 1,000 psi | | | | | | |
| | Standard | [gpm] | 1.0 | 2.5 | 5.0 | 10.0 | 15.0 |
| **Response Time*** | Standard | [ms] | 6 | 6 | 6 | 10 | 16 |
| **Threshold*** | | [%] | | | < 0.5 | | |
| **Hysteresis*** | | [%] | | | < 3.0 | | |
| **Null Shift** | at $\Delta$T = 100˚F | [%] | | | < 2.0 | | |
| **Null Leakage Flow*** | max. | [gpm] | | | 0.35 | | |

* Measured at 1,000 psi pilot or operating pressure

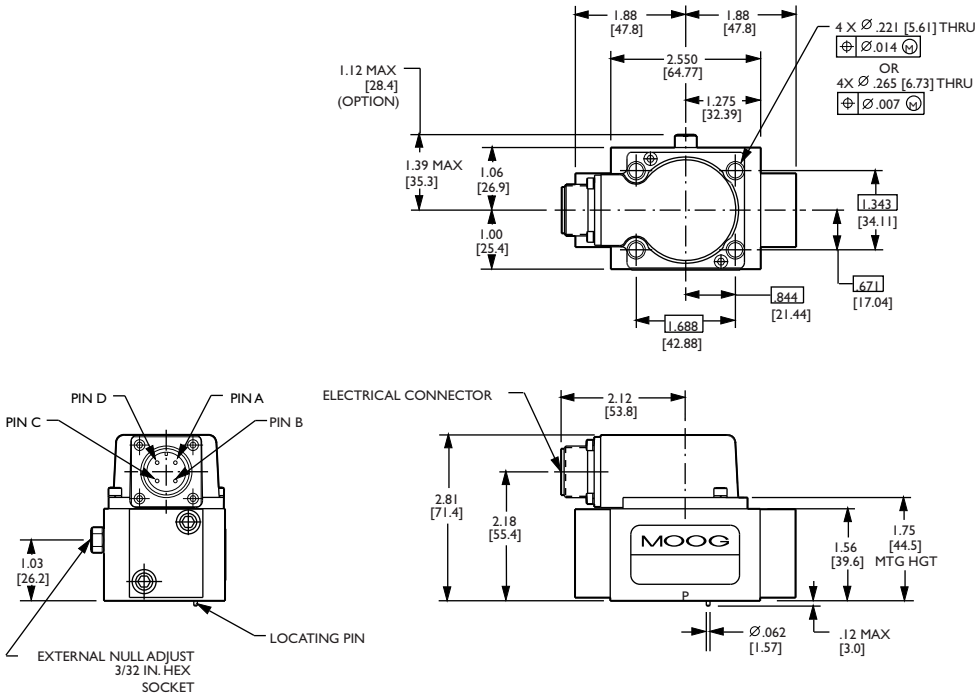
**Typical characteristic curves** with ±40% and ±100% input signal, measured at 3,000 psi operating pressure.



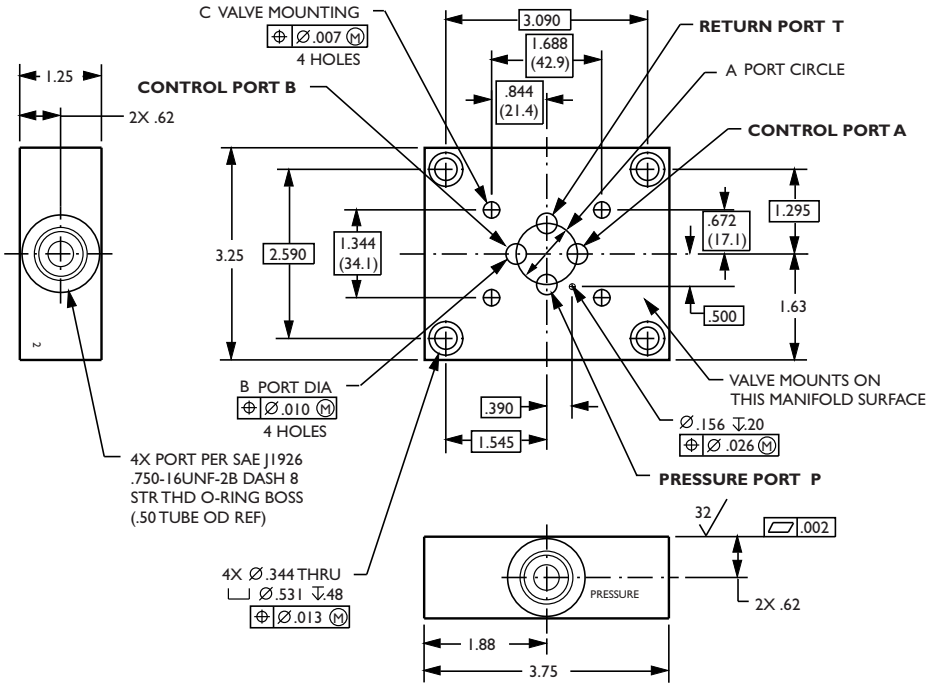



# INSTALLATION DRAWINGS




## TYPICAL SUBPLATE MANIFOLD




**The mounting manifold must conform 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).

**For External Null Adjust:** Flow bias is continually varied for a given port as the null adjust is rotated.

## TYPICAL SUBPLATE MANIFOLD

| Model Number | A Port Circle Dia | B Port Dia | C Mtg Holes |
|---|---|---|---|
| 771-XXX | .625 | .191 | .190-32 NF |
| 772-XXX | .780 | .261 | .190-32 NF |
| 773-XXX | .937 | .312 | .250-20 NC |

# ELECTRICAL CONNECTIONS

**Rated current and coil resistance**
A variety of coils are available for 771/2/3 Series Servovalves, which offer a wide choice of rated current. See Table 1.

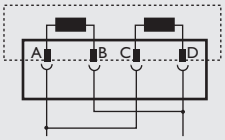
**Coil connections**
A four-pin electrical connector (that mates with an MS3106F14S-2S) is standard. All four torque motor leads are available at the connector so external connections can be made for series, parallel or differential operation.

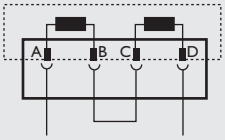
771/2/3 Series Servovalves can be supplied on special order with other connectors or a pigtail.

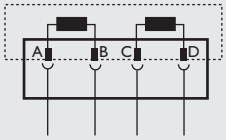
**Servoamplifier**
The servovalve responds to input current, therefore, a servoamplifier that has high internal impedance (as obtained with current feedback) should be used. This will reduce the effects of coil inductance and will minimize changes due to coil resistance variations.

## ELECTRICAL CONNECTIONS

(Examples with typical 771/2/3 series coils)




| | | Parallel | Series | Single |
|---|---|---|---|---|
| Coil Resistance | [Ω] | 100 | 400 | 200 |
| Rated Current | [mA] | ±15 | ±7.5 | ±15 |
| Electrical Power | [W] | .023 | .023 | .045 |
| Connections for Valve Opening P ◗ B, A ◗ T | | 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.

## 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 | 0.22 | 0.66 | 0.18 |
| 200 | ±15 | ±7.5 | 0.72 | 2.20 | 0.59 |
| 1000 | ±8 | ±4 | 3.20 | 9.70 | 2.60 |

* Measured at 50 Hz

# ORDERING INFORMATION
# SPARE PARTS AND ACCESSORIES

## Model Number

**771, 772, 773** • • • • • •

## Type Designation

• • • • • • • • • • • •

| Optional Feature | |
|---|---|
| | Series specification |
| **K** | Intrinsically safe |

| Model Designation | |
|---|---|
| | Assigned at the factory |

| Factory Identification (Revision Level) |
|---|

| Valve Version | |
|---|---|
| **S** | Standard response |

| Rated Flow | | |
|---|---|---|
| | $Q_N$[gpm] at $\Delta p_N$ = 1,000 psi | |
| | Standard | High Response |
| **04** | 1 | 771 series only |
| **10** | 2.5 | 771 series only |
| **19** | 5.0 | 772 series only |
| **38** | 10.0 | 772 series only |
| **57** | 15.0 | 773 series only |

| Maximum Operating Pressure $p_p$ and Body Material | |
|---|---|
| **F** | 3,000 psi aluminum |

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

| Signals for 100% Spool Stroke | |
|---|---|
| **4** | ±4 mA series |
| **H** | ±7.5 mA series |
| **L** | ±20 mA series |
| **N** | ±30 mA series |
| **Z** | ±100 mA series |
| **Y** | Special signal (see spec. sheet) |

| Valve Connector | |
|---|---|
| **A** | Connector C1 (A) – side (RH) |
| **B** | Connector C2 (B) – side (LH) |
| **X** | Special connector |

| Seal Material | |
|---|---|
| **V** | Fluorocarbon |
| **N** | NBR (Buna) |
| | Others on request |

| Pilot Connections and Pressure | | |
|---|---|---|
| | Pressure [psi] | Supply |
| **A** | 250 to 3,000 | internal |

| 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.**

## SPARE PARTS AND ACCESSORIES

| | | | |
|---|---|---|---|
| O-Rings (included in delivery), | | | |
| for P, T, A and B | | FPM 85 Shore | Moog P/N |
| 771 | | ID 0.239 x 0.070 | 42082-007 |
| 772 | | ID 0.364 x 0.070 | 42082-013 |
| 773 | | ID 0.426 x 0.070 | 42082-022 |
| Mating Connector, waterproof IP 65 (not included in delivery) | | | 49054F14S2S (MS3106F14S-2S) |
| Flushing Block | | | |
| 771 and 772 | | A01704-1K1 | |
| 773 | | A01704-2K1 | |
| Mounting Bolts (included in delivery) | | | |
| 771 and 772 | .190-32 NF x 2.0 long (4 pcs.) | | C39674-132 |
| 773 | .250-20 NC x 2.25 long (4 pcs.) | | A31324-136Z |
| Field Replaceable Filter Kit | | B52555RK54K1 | |

| | |
|---|---|
| Australia | Mulgrave |
| Brazil | São Paulo |
| China | Hong Kong |
| | Shanghai |
| Denmark | Cöpenhagen |
| England | Tewkesbury |
| Finland | Espoo |
| France | Rungis |

| | |
|---|---|
| Germany | Böblingen |
| India | Bangalore |
| Ireland | Ringaskiddy |
| Italy | Brescia |
| | Malnate |
| Japan | Hiratsuka |
| Korea | Seoul |
| Luxembourg | Luxembourg City |
| Philippines | Baguio |
| Singapore | Singapore |
| Spain | Orio |
| Sweden | Askim |
| USA | East Aurora |

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