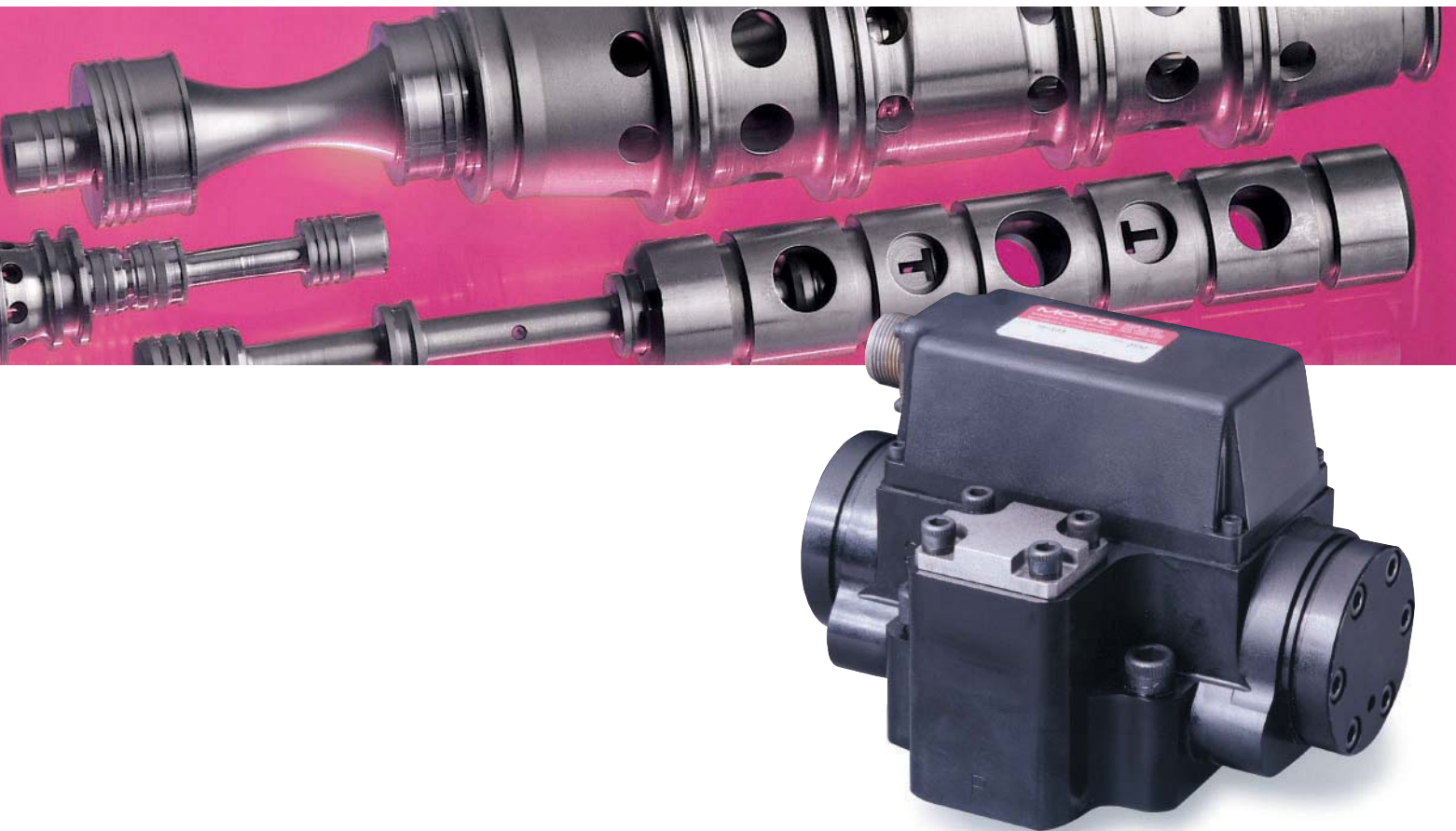


# MOOG

72 Series  
Servovalves



## 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<sub>N</sub> [gpm] = rated flow
- Δp [psi] = actual valve pressure drop
- Δp<sub>N</sub> [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.



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.

# 72 SERIES GENERAL TECHNICAL DATA

**Operating Pressure**  
ports P, X, A and B  
port T

up to 3,000 psi\*  
up to 3,000 psi

**Temperature Range**  
Fluid  
Ambient

-40°F to 275°F  
-40°F to 275°F

**Seal Material**  
**Operating Fluid**

Viton \*\*  
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  $\mu\text{m}$  absolute)  
For longer life  $\beta_5 \geq 75$  (5  $\mu\text{m}$  absolute)

**Installation Operations**

Any position, fixed or moveable.

**Vibration**

30 g, 3 axes

**Weight**

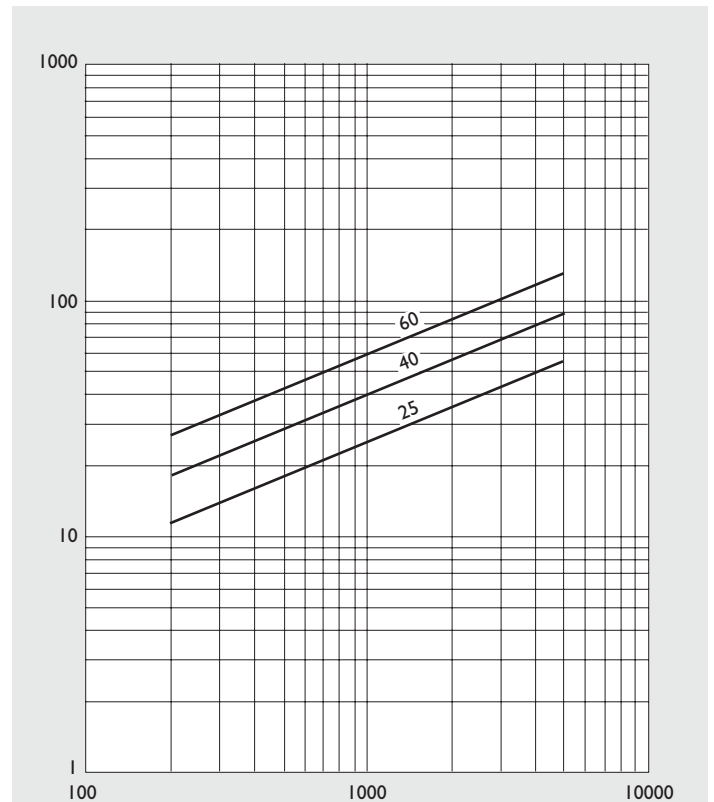
7.75 lb. (3.52 kg)

**Shipping Plate**

Delivered with an oil sealed shipping plate.

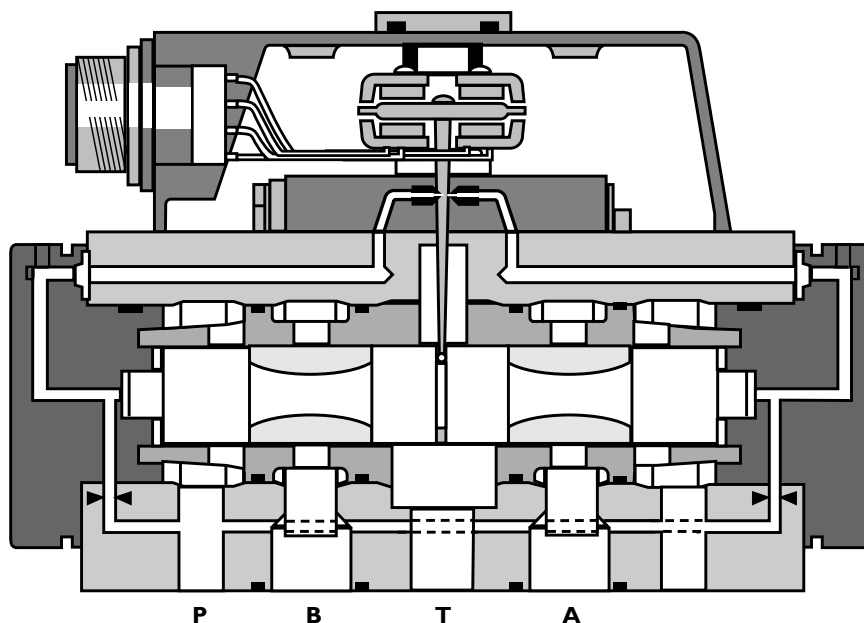
\* Maximum special order is 5,000 psi

\*\* 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.



# 72 SERIES TECHNICAL DATA

**Model ... Type**  
**Mounting Pattern**  
**Valve Body Version**

**72 .....**

ISO 10372 - 06 - 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%

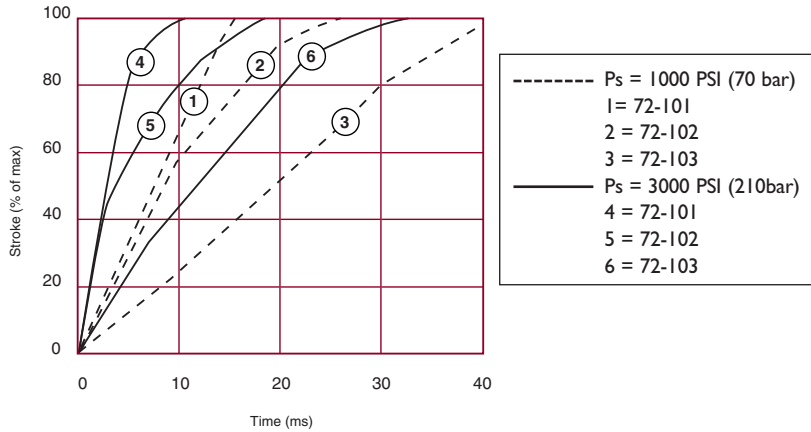
**Hysteresis\*** [%] < 4.0%

**Null Shift** at  $\Delta T = 100^\circ F$  [%] < 4.0%

**Null Leakage Flow\*** max. [gpm] 0.55 to 1.30

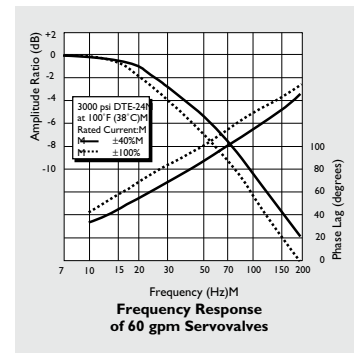
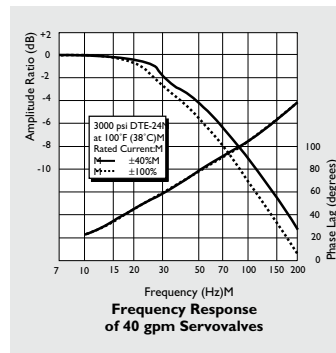
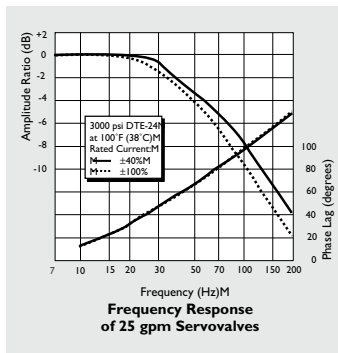
\* Measured at 1,000 psi pilot or operating pressure

## Step Response

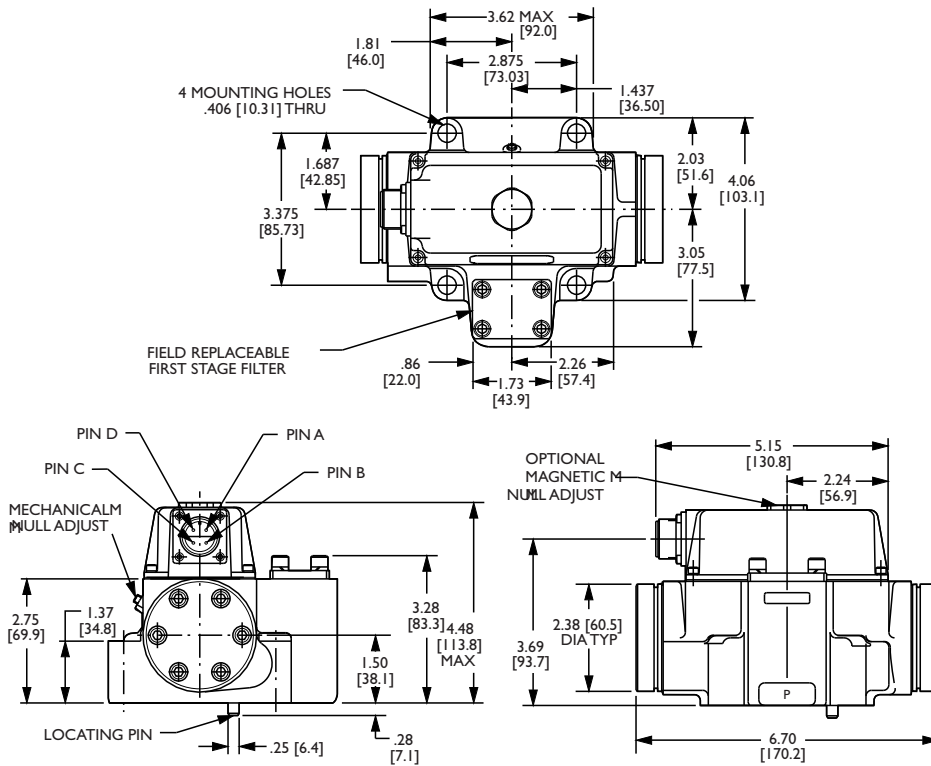


**Typical characteristic curves** with  $\pm 40\%$  and  $\pm 100\%$  input signal, measured at 3,000 pilot or operating pressure.

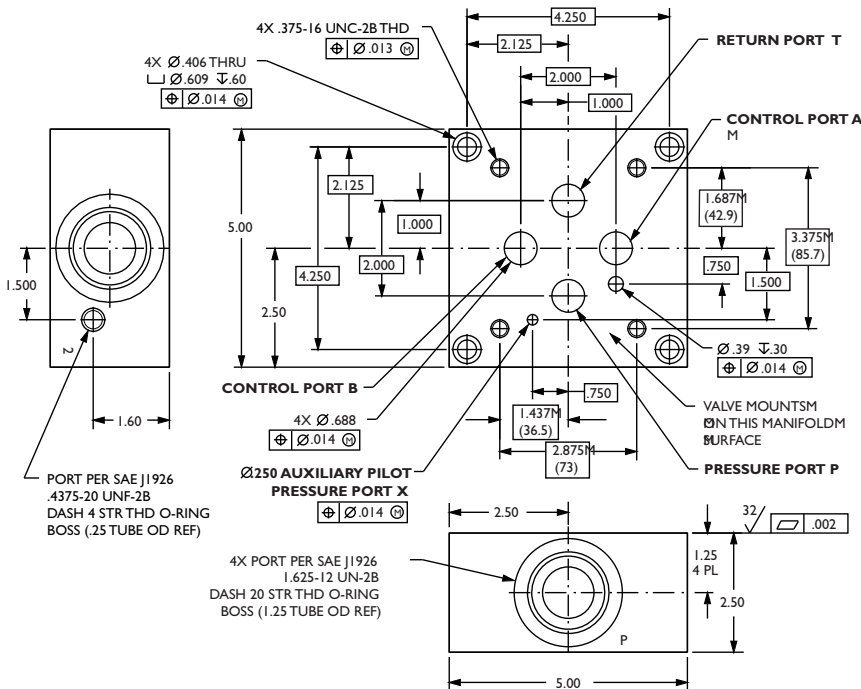
## Standard Valves



# 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  $\sqrt[3]{\Delta\Delta}$  finish, flat within 0.002[0.05] TIR.

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

# 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.

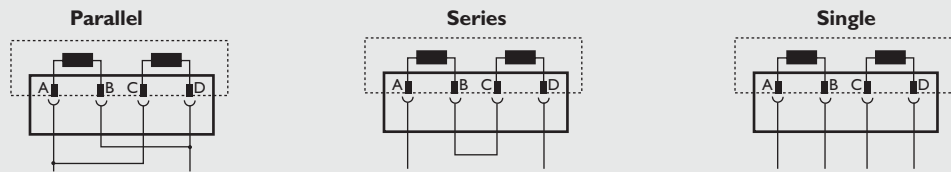
TABLE I

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

## ELECTRICAL CONNECTIONS

(Examples with typical 72 series coils)



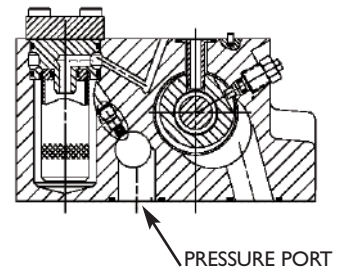
Coil Resistance [Ω]	Rated Current [mA]	Electrical Power [W]	Connections for Valve Opening P ▽ B, A ▽ T
100	±15	.023	A and C (+) B and D (-)
400	±7.5	.023	A (+), D (-) B and C connected
200	±15	.045	A (+), B (-) or C (+), D (-)

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

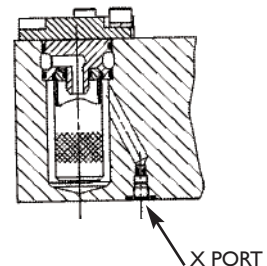
## Procedure to Configure a 72 Series Servovalve for External Pilot Operation

1. Remove the set screw from the "X" port on the base of the valve using a 1/8" Allen wrench.
2. Thread a #2-56 screw into the o-ring plug that is now visible and remove it from the "X" port.
3. Remove the four (4) socket head cap screws and lockwashers that retain the cover plate for the field replaceable filter, using a 3/16" Allen wrench.
4. Use one of the screws to pull the filter and filter housing out of the filter cavity of the body. The filter housing has two (2) o-rings on its O.D. The housing will come part way out, then stop after the second o-ring passes the internal relief in the body. At this time it may be easier to remove the visible o-ring and carefully pry the housing and filter out with two opposing flat blade screw drivers, than to continue pulling on the screw. Be careful not to damage the o-ring groove.
5. A bore will be visible inside the body cavity where the o-ring plug must be inserted.
6. Retain the o-ring plug with the set screw.
7. Re-install the filter and filter housing in the cavity.
8. Re-install the filter cover, retaining screws and lockwashers. Torque the screws to 85 in-lbs.

## External



## Internal



# 72 SERIES ORDERING INFORMATION SPARE PARTS AND ACCESSORIES

## Model Number

72 • • • • •

Optional Feature	
	Series specification
<b>K</b>	Intrinsically safe

Model Designation	
	Assigned at the factory

Factory Identification (Revision Level)	

Valve Version	
<b>S</b>	Standard response

Rated Flow	
	$Q_N$ [gpm] at $p_N = 1,000$ psi
<b>09</b>	25
<b>15</b>	40
<b>22</b>	60

Maximum Operating Pressure $p_p$ and Body Material	
<b>F</b>	3,000 psi aluminum
<b>K</b>	5,000 psi steel body

Main Spool Type	
<b>O</b>	4-way / axis cut / linear
<b>A</b>	4-way / $< = 3\%$ overlap / linear
<b>D</b>	4-way / $\pm 10\%$ overlap / linear
<b>M</b>	4-way / axis cut $p_c > 80\%$ of $p_p$ / linear (servodrive)
<b>X</b>	Special

## Type Designation

• • • • • • • • • • •

Signals for 100% Spool Stroke	
<b>4</b>	-4 mA series (-8 mA parallel)
<b>H</b>	-7.5 mA series (-15 mA parallel)
<b>L</b>	-20 mA series (-40 mA parallel)
<b>Y</b>	Special signal (see spec. sheet)

Valve Connector	
<b>A</b>	Connector over Port A – side (RH)
<b>B</b>	Connector over Port B – side (LH)
<b>X</b>	Special connector

Seal Material	
<b>V</b>	Fluorocarbon
<b>N</b>	NBR (Buna)
	Others on request

Pilot Connection	
<b>4</b>	Internal
<b>5</b>	External

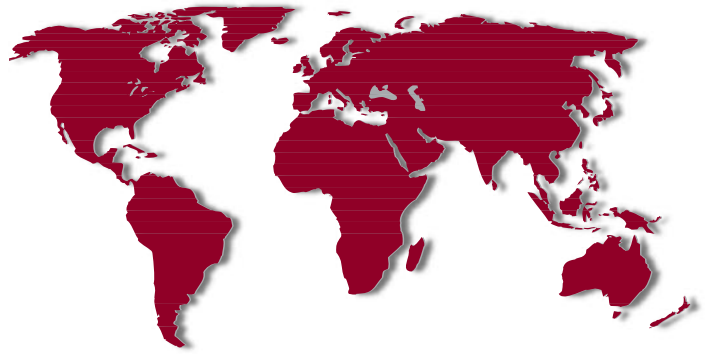
Spool Position without Electrical Signal	
<b>M</b>	Mid position

Pilot Stage	
<b>F</b>	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 for X	FPM 85 Shore ID 0.801 x 0.070 ID 0.364 x 0.070	Moog P/N -42082-040 -42082-013
Mating Connector, waterproof IP 65 (not included in delivery)		-49054F014S002S (MS3106F14S-2S)
Flushing Block		G4321AM001
Mounting Bolts (not included in delivery) 3/8 - 16 UNC x 2 long (4 pieces)		C66391-332B
Replaceable Filter Cartridge		-22050K002
Field Replaceable Filter Kit		B52555RK099K001



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CDL6266 Rev P 500-226 1009