

31 SERIES MICRO SERVO VALVES

A high response, high efficiency valve in a compact package



The 31 Series is a two-stage, flow control, double-nozzle, mechanical feedback servo valve that has a stainless steel body and integrated torque motor in an environmentally sealed compartment. Its nozzle-flapper design is a proven technology for applications where high response, stability and accuracy are required in a compact package. As the higher flow counterpart to the 30 series it has an impressive power density of nearly 0.75 horsepower per oz. equivalent, or 9.3 horsepower overall. Many options are available for this series, including vented and non-vented motor caps, pigtail versions for convenient installation, tie wire options and special connectors.

The 31 Series Servo Valve is designed to perform reliably over a long service life even in potentially extreme environments where temperatures might drop to -40 °F (-40°C) or be as high as 400 °F (204.4°C). The stainless steel body and a self contained envelope provide a rugged construction that allows the valve to be used in environments with potentially high acceleration, and / or be where they are exposed to high shock and vibration. This product is part of our micro-hydraulic offering which delivers high power to weight ratio and high efficiency. It achieves this all while providing high dynamics and precise flow control for better overall system control.

ADVANTAGES

- High response improves control capability
- Compact light weight package for mobile applications
- Can be used in extreme temperature environments
- Stainless steel body suitable for use in aggressive operational settings
- Magnetically adjusted null flow independent of other system parameters allows for adjustment in the field

APPLICATIONS

- Remotely operated vehicle
- Automated guided vehicle
- Animatronics
- Manipulators
- Downhole tools
- Entertainment



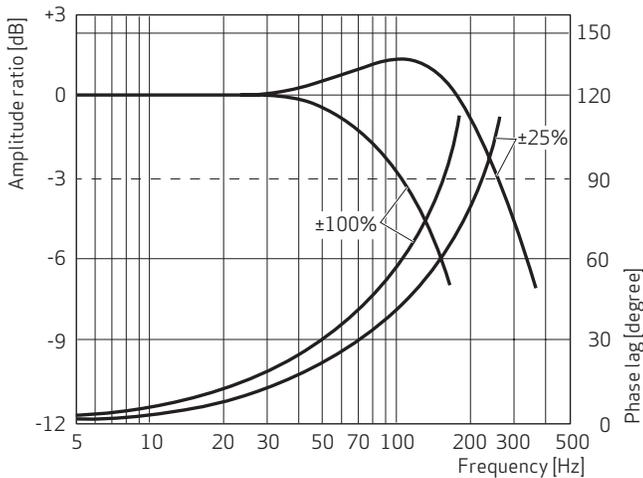
Wire direct version for convenient installation and space saving

Many specialized versions available including tie wire options and special connectors

Micro-hydraulics are ideal for applications requiring high power density

SPECIFICATIONS

RESPONSE PLOT

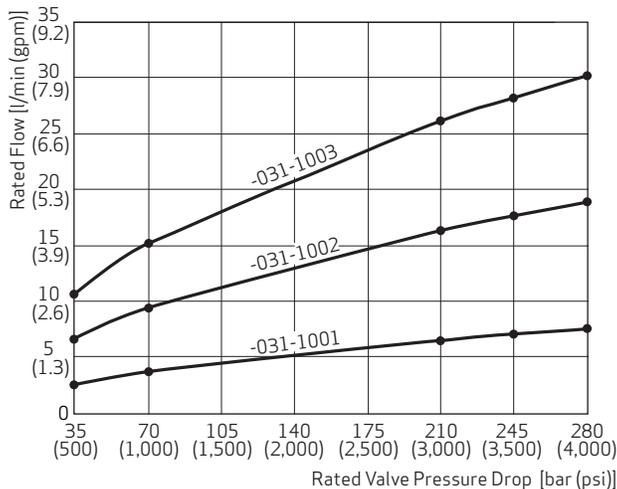


Typical responses for peak sinusoidal inputs of $\pm 25\%$ and $\pm 100\%$ rated current

Supply 210 bar (3,000 psi)

Oil temp 38°C (100°F)

PERFORMANCE CURVE



DYNAMIC TECHNICAL SPECIFICATIONS

Response limits at $\pm 25\%$ input and 3,000 psi supply per table:

Frequency of 90 degree phase	200 Hz
Step response (90 % output)	2.5 ms
Amplitude ratio	< 2 dB
First order time constant	1.5 ms
2nd order natural frequency	200 Hz
Damping ratio	0.50

GENERAL TECHNICAL SPECIFICATIONS

Weight	370 g (13 oz)
Maximum operating pressure	275 bar (4,000 psi)
Rated flow	3.8 to 15.0 l/min (1.0 to 4.0 gpm) @ Δp 70 bar (1,000 psi)
Mounting pattern	0.625 in. port circle [ISO 10372-02-02-0-92]
Static performance	
Rated flow tolerance	$\pm 10\%$
Linearity	< $\pm 7\%$
Null region	< $\pm 3\%$
Null bias	< $\pm 3\%$ initial; < $\pm 5\%$ long term
Hysteresis	< $\pm 3\%$
Threshold	< $\pm 1\%$
Operating temperature	
Standard model with FKM seals (option 8, V)	-20°F to +300°F (-29°C to +149°C)
Standard model with BUNA seal (option 8, N)	-40°F to +275°F (-40°C to +135°C)
High temperature model with FKM seals and high temperature components (contact Moog for ordering information)	-20°F to +400°F (-29°C to +204°C)
Internal leakage @ 3,000 psi (cis)	< $\pm 3\%$ rated flow plus < 0.50 cis tare
Proof pressure	415 bar (6,000 psi) max (supply), 275 bar (4,000 psi) (return)
Burst pressure	690 bar (10,000 psi) max (supply), 345 bar (5,000 psi) (return)

HYDRAULIC DATA

Seal Material: FKM

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 affects the performance (e.g., spool positioning, high resolution) and wear (e.g., metering edges, pressure gain, leakage) of the servo valves.

Recommended Cleanliness Class

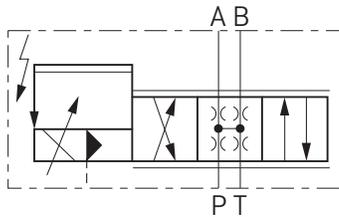
For functional safety ISO 4406 <17/14/11
For longer service life ISO 4406 <16/13/10

Filter Rating recommended

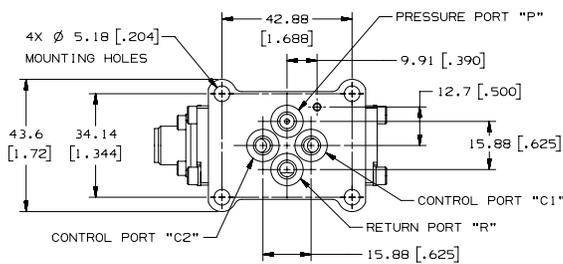
For normal operation $\beta_{10} \geq 75$ (10 μm absolute)
For longer life $\beta_5 \geq 75$ (5 μm absolute)

Compatible Fluids: Petroleum base or selected phosphate ester fluid, 10 to 97 centistokes at 38°C (60 to 450 SSU at 100°F)

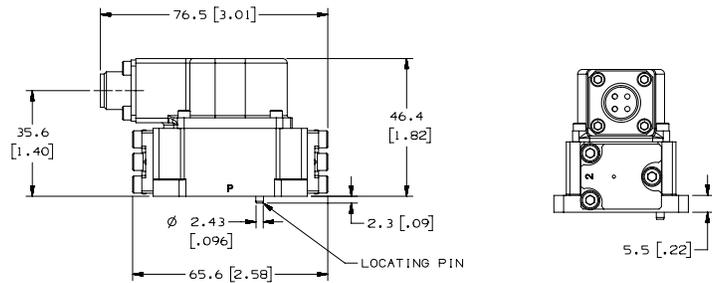
HYDRAULIC VALVE SYMBOL



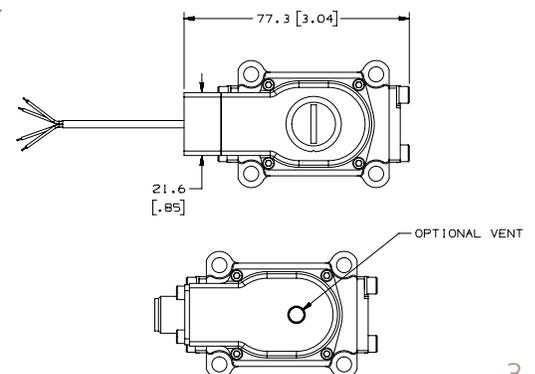
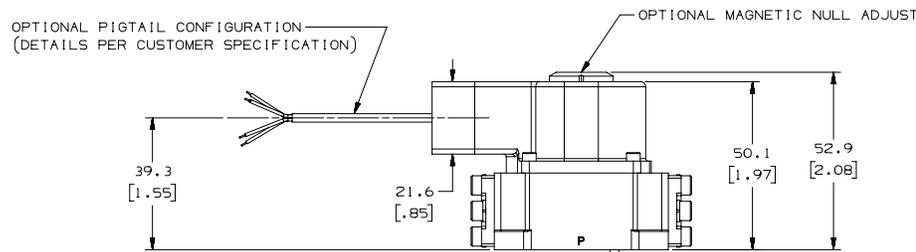
STANDARD COMPONENTS AND DIMENSIONS



REFERENCE MOUNTING PATTERN SPECIFICATION
ISO 10372-02-02-0-92



OPTIONAL COMPONENTS AND DIMENSIONS



COIL RESISTANCE

The effects of coil resistance changes can be essentially eliminated through the use of a current feedback servoamplifier having a high output resistance, such as the Moog IN123-825 buffer amplifier.

Parallel Coils			Series Coils			Single Coils		
R [Ω]	L [H]	i_R [mA]	R [Ω]	L [H]	i_R [mA]	R [Ω]	L [H]	i_R [mA]
40	0.18	40	160	0.56	20	80	0.22	40
103	0.59	20	412	2.2	10	206	0.72	20
500	2.6	10	2,000	9.7	5	1,000	3.2	10

Note:

- Resistance values at 20°C (68°F) 10% tolerance
- Inductance values are typical to 50 Hz, servo valve pressurized. Inductance is not normally measured on individual servo valves.

MAGNETIC NULL ADJUST

The null flow of a servo valve can be adjusted independently of other system parameters. The magnetic null adjustment permits an approximately 8% adjustment of the null flow. The null adjuster is located at the top of the motor cap which, when rotated, biases the first stage torque motor magnetically. This does not permit the vented motor cap option.

ORDERING INFORMATION

ORDERING CODE

Model number (assigned at the factory)

-031						
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Optional Features

-	Standard
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Model designation

Assigned at the factory

Factory Identification (Revision Level)

1 Valve version

S	Standard response
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2 Rated flow in l/min (gpm)

	For $\Delta p_N = 35$ bar (500 psi) per spool land	
04	3.8	(1.0)
10	9.4	(2.5)
15	15.1	(4.0)

3 Maximum operating pressure in bar (psi) and body material

H	275	(4,000)	Stainless steel
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4 Bushing/spool design

*O	4-way/axis cut/linear
C	4-way/ $\pm 3\%$ overlap/linear
D	4-way/ $\pm 10\%$ overlap/linear
N	4-way/ $\pm 3\%$ underlap/linear

5 Pilot stage design

F	Low flow, nozzle-flapper
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Type designation

1 2 3 4 5 6 7 8 9 10 11

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11 Motor Cap Options

	*Standard Motor Cap
V	Vented Motor Cap
N	Magnetic Null Adjust

10 Signals for 100 % spool stroke

G	± 10 mA single coil, 1,000 ohms
J	± 20 mA single coil, 206 ohms
L	± 40 mA single coil, 80 ohms

9 Valve connector

A	4-Pin MS Threaded Connector over Port A
B	4-Pin MS Threaded Connector over Port B
1	4-Lead (18") Pigtail over Port B
2	4-Lead (18") Pigtail over Port A

8 Seal material

V	Fluorocarbon (FKM)
N	Nitrile Butadiene (NBR)

7 Pilot connections

4	Internal
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6 Spool position without electrical signal

M	Mid position
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*Preferred Models

31 SERIES SERVO VALVE SPARE PARTS

Part name	Material	Remark	Part number
O-rings for ports P, R, C1 and C2	FKM	Quantity 4 required	-42082-007
	NBR		-45122-007
Mounting Screws	Steel	Quantity 4 required, Torque to 45 in-lbs	NAS1351N3-10

This technical data is based on current available information and is subject to change at any time by Moog. Specifications for specific systems or applications may vary.

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31 Series Servo Valves
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SERVO VALVE ACCESSORIES

Moog provides a wide variety of accessories that our customers may need for hydraulic valve commissioning. A common accessory is the Moog IN123-825 buffer amplifier, a DIN rail mount module that solves an issue of the input signal being incompatible with the valve drive requirements. For more information, contact your sales administrator or visit us online.

www.moog.com/industrial

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