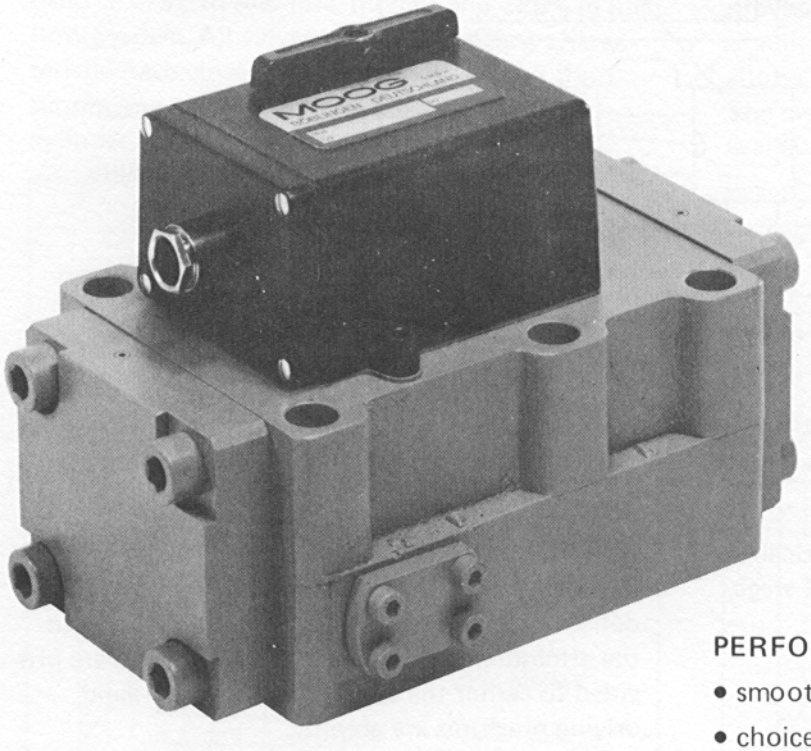
MOOG®

Series D064B
Electrohydraulic Proportional Valves



The D064B is an electrically controlled, four-way proportional metering valve suitable for many industrial applications. This valve is normally used for open loop, proportional control (i.e., control without electrical feedback). In some feedback systems having low dynamic response requirements, the D064B may provide satisfactory performance. Manifold mounting of the D064B offers direct interchangeability with standard 3/4" sub-plate mounted directional control valves.

This valve operates with a "closed-center", or constant pressure, hydraulic system. Electrical inputs control flow to load ports A or B in a proportional manner throughout the range from zero to full-flow in either direction. A variety of electrical controllers are available, including manual lever controllers, settable knob controllers, joy-stick controllers (for controlling two valves simultaneously), hand-held multifunction controllers, and radio controllers.

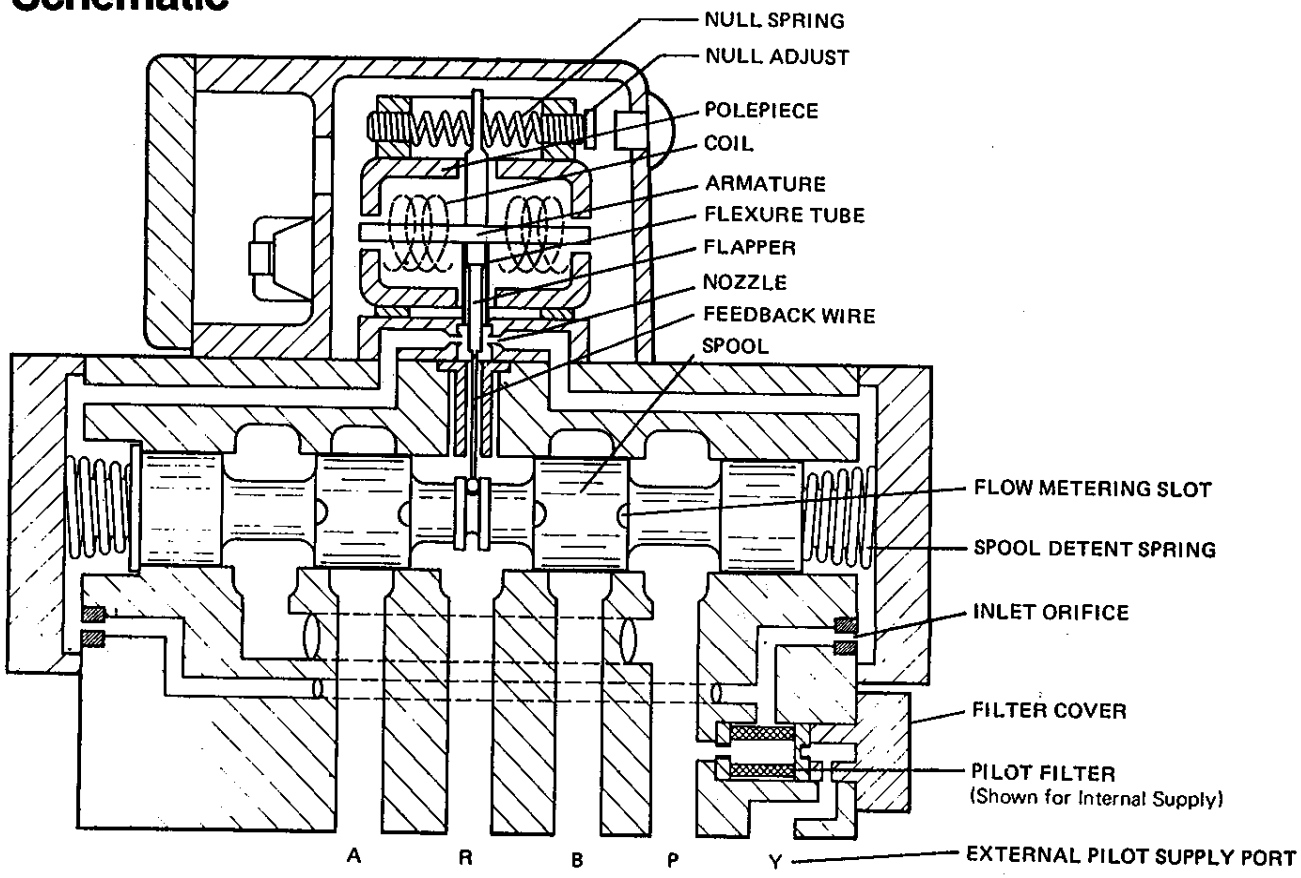
PERFORMANCE FEATURES

- smooth and repeatable flow control
- choice of flow capacity
- choice of flow metering characteristic
- 3000 psi rated supply pressure
- low valve pressure drop
- very small electrical control power (0.135 watts max.)
- OSHA compatibility
- intrinsically safe for mining and petrochemical applications (special order)

DESIGN FEATURES

- rugged cast iron body
- completely dry electrical torque motor
- easily changeable for internal or external pilot
- pilot has 150 micron dirt passing capability
- spool detent springs for safe pressure-off condition
- convenient null adjustment
- optional manual input lever

Schematic



The D064B proportional valve has an electrical torque motor section, a double-nozzle pilot stage, and a sliding-spool main stage.*

TORQUE MOTOR

The torque motor includes coils, polepieces, magnets and an armature. The armature is supported for limited movement by a flexure tube. The flexure tube also provides a fluid seal between the hydraulic and electromagnetic portions of the valve.

PILOT STAGE

The flapper attaches to the center of the armature and extends down, inside the flexure tube. A nozzle is located on each side of the flapper so that flapper motion varies the nozzle openings. Filtered pilot flow is supplied to each nozzle through a fixed inlet orifice. Differential pressure between the ends of the spool is varied by flapper motion between the nozzles.

VALVE SPOOL

The four-way valve spool directs flow from supply to either control port A or B in an amount proportional to spool displacement. The spool contains flow metering slots in the control lands that are uncovered by spool motion. Spool movement deflects a feedback wire that applies a torque to the armature/flapper. Spool detent springs are provided to center the spool whenever hydraulic driving pressures are absent.

OPERATION

Electrical current in the torque motor coils causes either clockwise or counter-clockwise torque on the armature. This torque displaces the flapper between the two nozzles. The differential nozzle flow moves the spool to either the right or left. The spool continues to move until the feedback torque counteracts the electromagnetic torque. At this point the armature/flapper is returned to center, so the spool stops and remains displaced until the electrical input changes to a new level. Therefore, valve spool position is proportional to the electrical signal. The actual flow from the valve to the load will depend upon the load pressure as described under Rated Flow.

*U.S. Patent Nos. 3,023,782 and 3,228,423

Flow Metering Characteristics

The flow capacity and control characteristic are determined by the size and shape of the flow metering slots in the valve spool. Two basic flow metering characteristics are available: linear and curvilinear.

LINEAR FLOW

This flow characteristic provides linear flow control outside the null deadband region. The deadband is ±15% in low flow models and ±25% in high flow models. All valves with a linear flow characteristic have closed cylinder ports. At null the supply and return ports are closed-off and the cylinder ports are blocked.

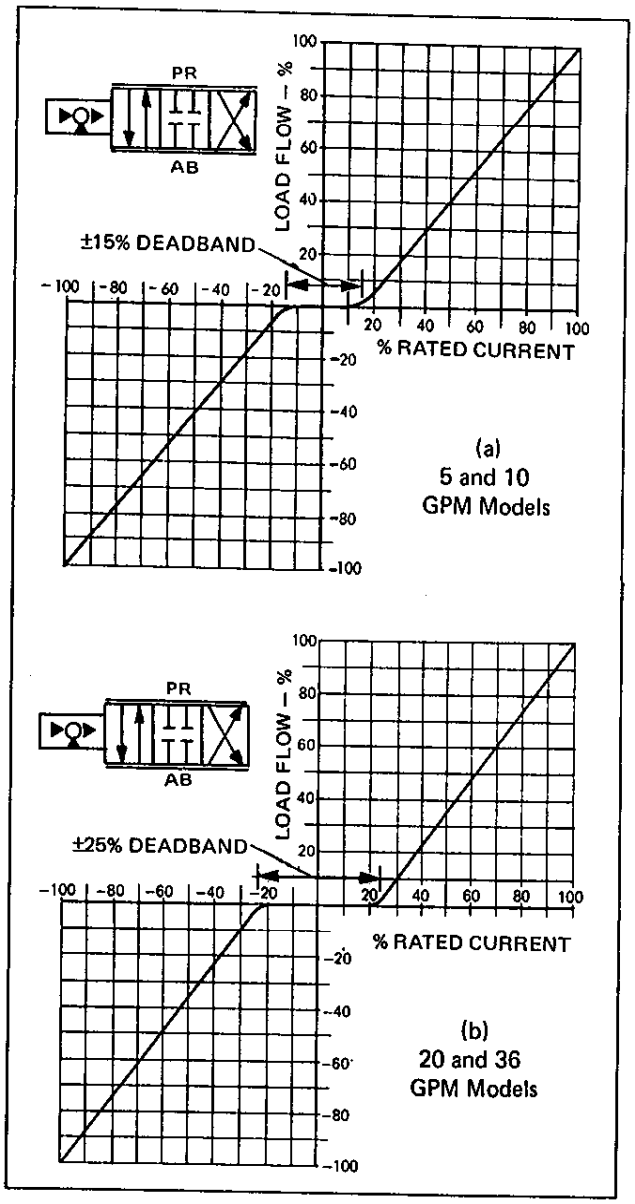


Figure 1 Linear Flow Characteristic

CURVILINEAR FLOW

This flow characteristic gives a lower flow gain region to ±40% of rated current. The reduced flow provides vernier control at slow speeds for improved load feathering. Curvilinear flow models are usually provided with open-cylinder ports. This allows use of pilot operated load holding valves. The closed cylinder port configuration is also available for curvilinear flow models.

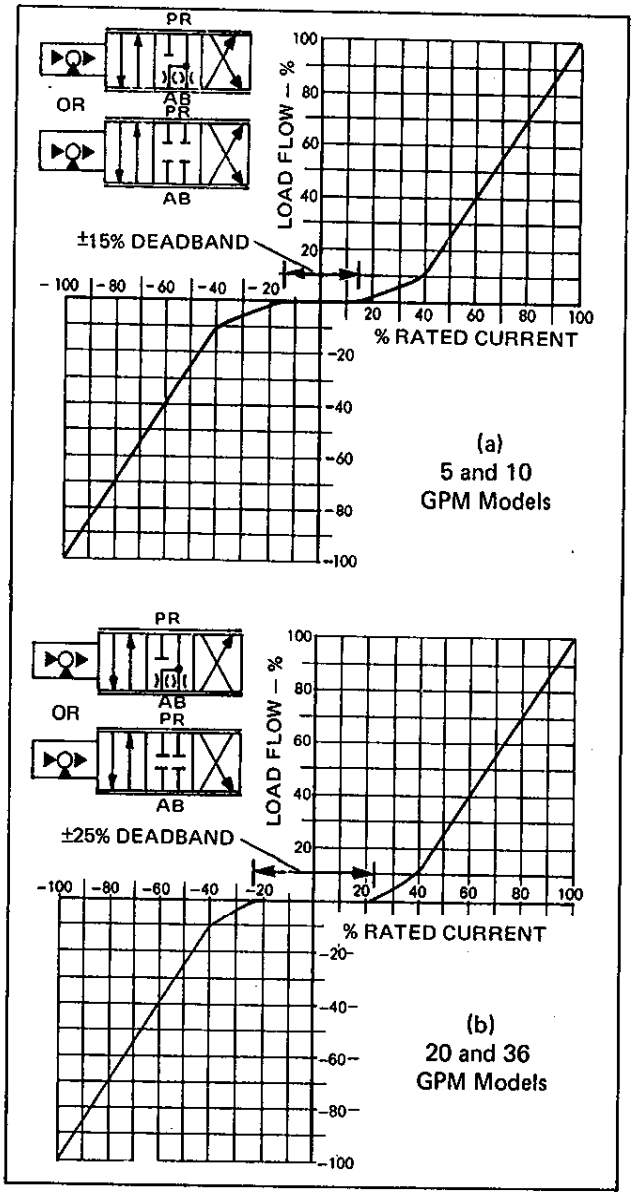


Figure 2 Curvilinear Flow Characteristic

Performance

RATED FLOW

Four flow sizes are available (see Fig. 3). Rated flow is achieved with either plus or minus 100% electrical signal and will depend upon valve pressure drop as shown.

Valve pressure drop is the difference between supply pressure, return pressure and load pressure.

$P_V = P_s - P_r - P_l$

where P_V = valve pressure drop psi

P_s = system supply pressure psi

P_r = system return pressure psi

P_l = load pressure drop psi

(total drop across cylinder and piston, lines, accessory valves, etc.)

Flow through the valve increases with valve pressure drop by the following relationship:

$$Q_V = Q_{150}\sqrt{\frac{P_V}{150}}$$

where Q_V = maximum control flow at P_V valve pressure drop gpm

Q_{150} = rated flow at 150 psi gpm

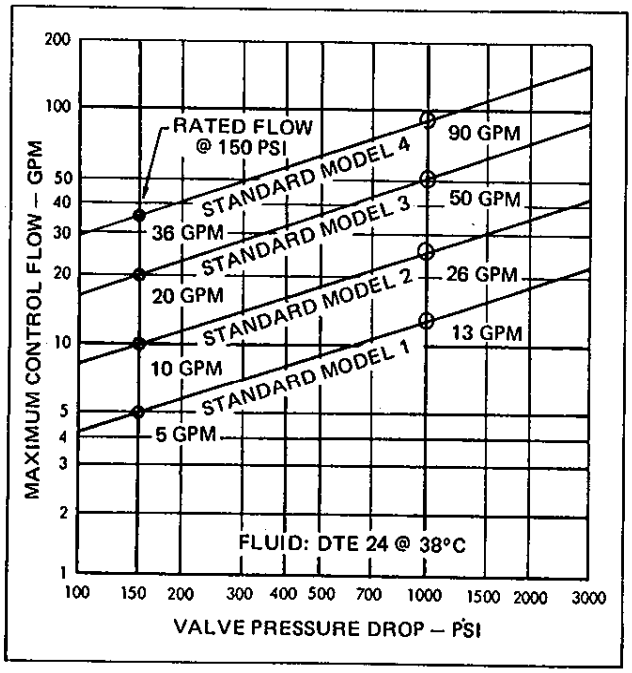


Figure 3 Rated Flow Capacity

STATIC PERFORMANCE

All performance parameters are for valve operation at 2000 psi with DTE24 fluid at 38°C. Operation with pilot pressure below 1000 psi may have degrated performance.

rated flow tolerance ..... ±15%

threshold ..... <3%

hysteresis ..... <5%

internal leakage ..... <0.8 gpm

external leakage ..... none

null shift:
with 35°C temperature change ... <5%

null shift:
with 500 psi supply change ..... <3%

null shift:
with return pressure 0 to 500 psi . <3%

burst pressures
supply ..... >12,000 psi
return ..... > 5,000 psi

APPLICATION REQUIREMENTS

Supply pressure ..... 3000 psi maximum

Pilot stage supply ..... 3000 psi maximum
300 psi minimum

Maximum return pressure ..... 300 psi below pilot supply but not above 1250 psi

Operating temperature . –35°C to +95°C unless limited by fluid

Fluid ..... Petroleum base hydraulic fluids 60 to 450 SSU at 38°C

Supply filtration ..... 10μm nominal, 25μm absolute, Moog Type HP non-bypass filter Recommended

Rated electrical power . 0.135 watts

Mounting position .... Any position, fixed or movable

DYNAMIC PERFORMANCE

Frequency response and step response will vary with supply pressure and with the magnitude of the electrical input. Typical dynamic characteristics are shown:

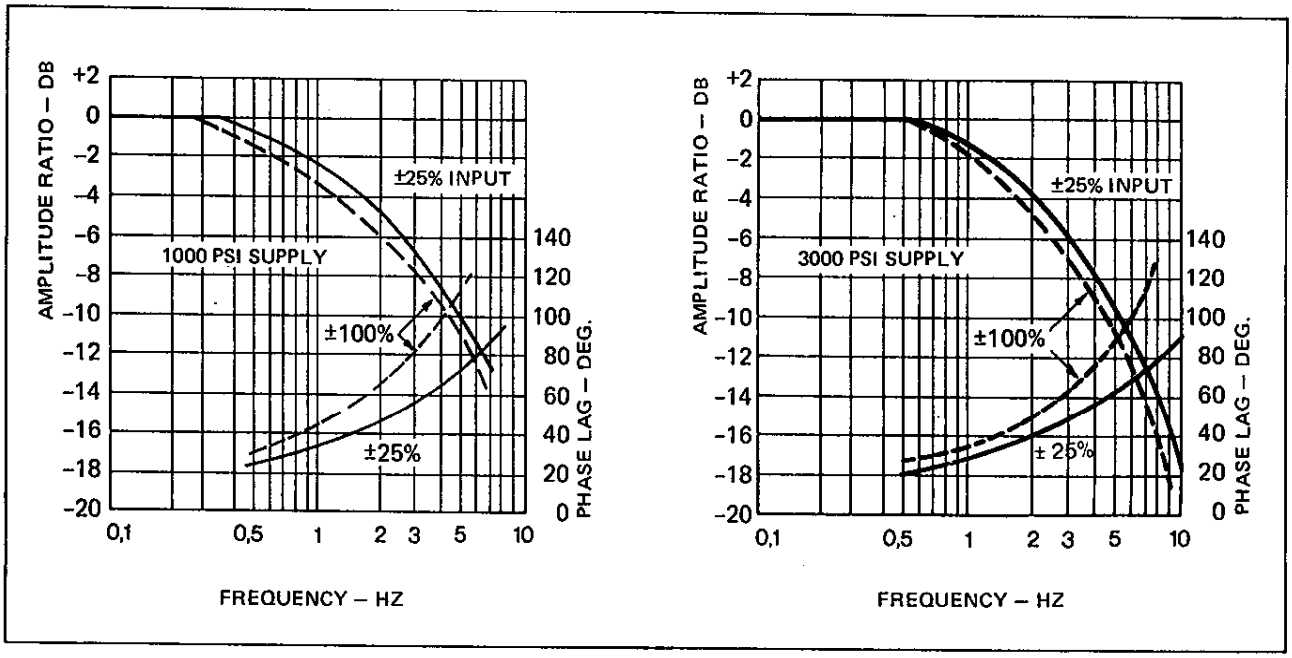


Figure 4 Frequency Response

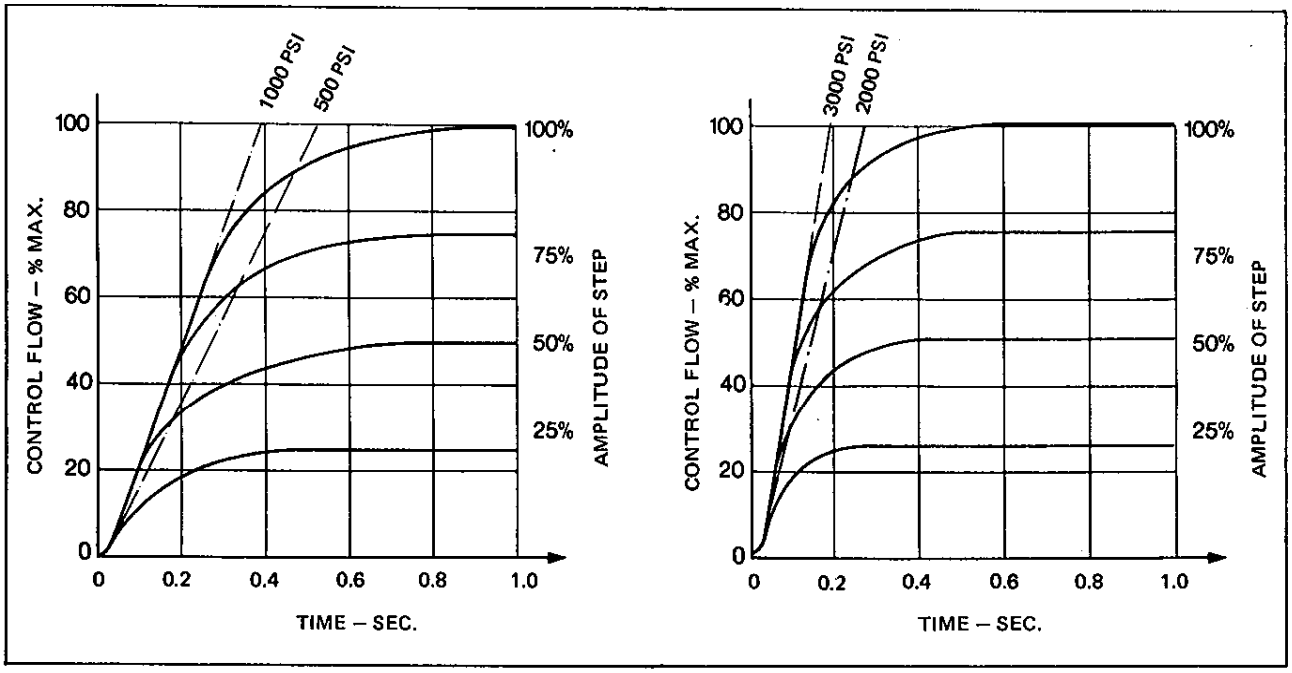
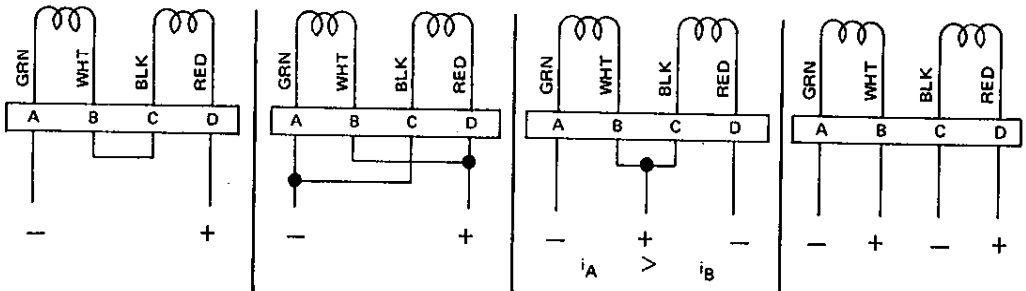


Figure 5 Step Response

Electrical Characteristics

The two torque motor coils can be connected several different ways as shown in the Table below. The valve can be supplied with screw terminal connections or with an MS electrical connector.



	SERIES	PARALLEL	DIFFERENTIAL	SINGLE COILS
TORQUE MOTOR COILS				
CONNECTOR PINS				
POLARITY FOR FLOW OUT PORT A				
COIL CONNECTIONS	SERIES	PARALLEL	DIFFERENTIAL	SINGLE COILS
NOMINAL COIL RESISTANCE @ 25°C (±10%)	54Ω	13.5Ω	27Ω (EACH COIL)	27Ω (EACH COIL)
RATED CURRENT	±50 MA	±100 MA	±100 MA (Differential Current)	±100 MA (Either Coil)
NOMINAL VOLTAGE	±2.70 VDC	±1.35 VDC	±2.70 VDC (Differential Voltage)	±2.70 VDC (Either Coil)

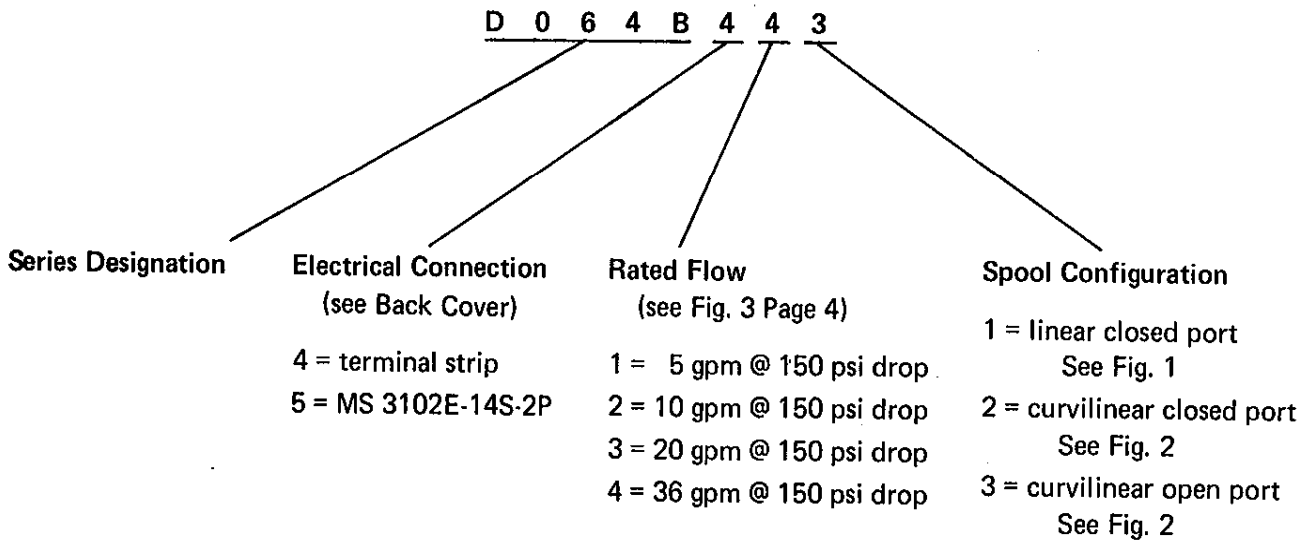
Accessories

	Moog Part No.
Mounting manifolds (including mounting bolts, washers and 1/4" NPTF pilot port)	
with 3/4" NPTF bottom ports	100-98530-1
with 3/4" NPTF side ports	100-98530-2
Valve port O-rings (Buna-N) – one set supplied with each valve	
P,R,A,B ports	080-66177-026-20
pilot port	080-45122-4
Flushing block	010-76047-2

A new hydraulic system must be flushed for clean-up before installing the D064B valve. Recommended procedure is to use a low pressure, low micron, clean-up filter and run the pump until the fluid is clean (usually several hours). If possible, cylinders should be externally cycled several times during flushing. It may be necessary to replace the clean-up filter during flushing. When complete, install high pressure system filter and flush for another 10 minutes. Then remove flushing block and install valve.

Replacement pilot filter	010-76240-1
Replacement nozzle block filter screens	071-67106-1
Mating MS electrical connector	
for general use	061-49054A14S-2S
for environmental use	061-49054E14S-2S

Standard Models



Special Valve Configurations

Manual control lever — valves can be supplied with a lever on the cover cap that can be rotated ±10° to give emergency manual control in case of an electrical failure.

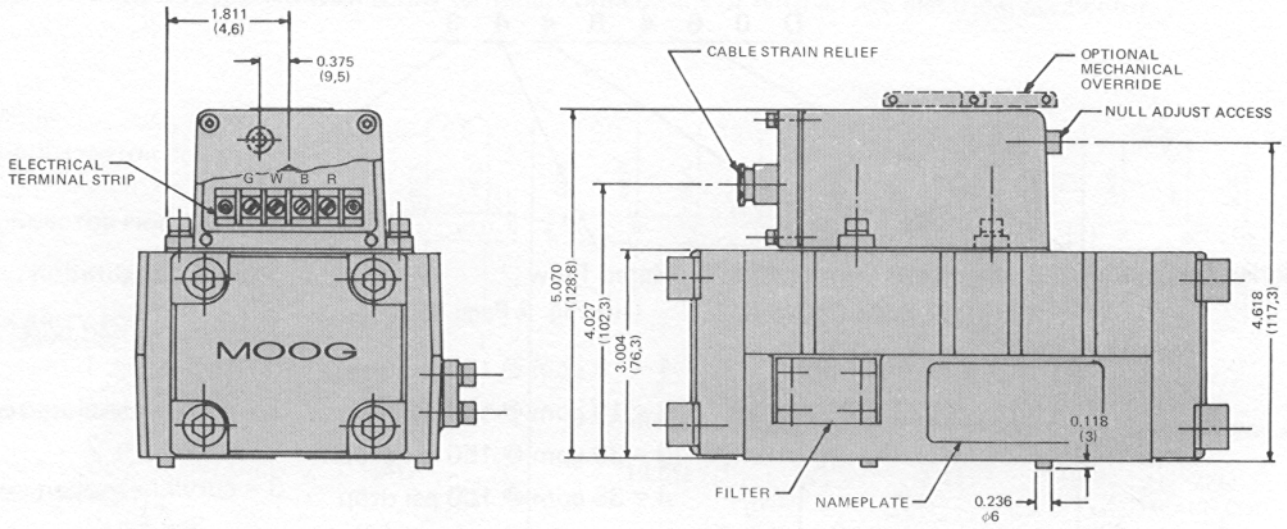
Intrinsically safe — valves can be supplied with a low voltage coil and protecting diodes as necessary for intrinsically safe rating for mining and petro-chemical applications.

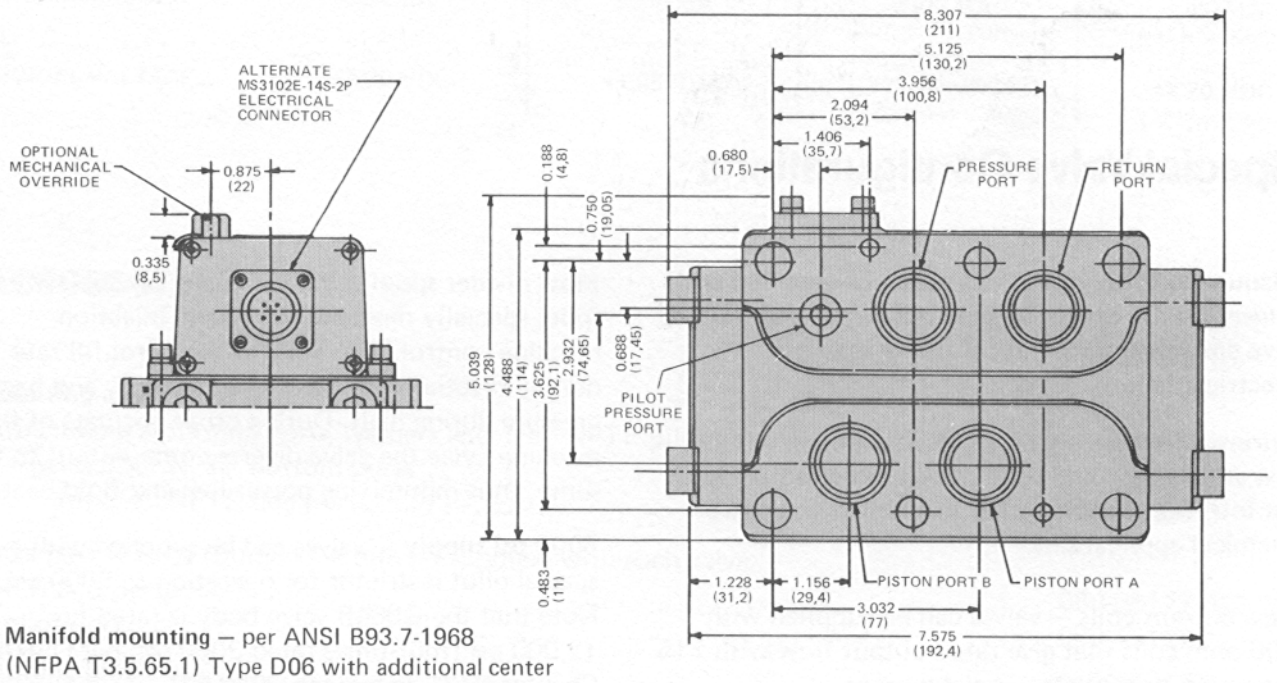
Low current coils — valves can be supplied with 300 ohm coils that give rated output flow with ±15 ma series, or ±30 ma parallel current.

Flow divider spool — valves can be supplied with a spool specially designed for plastic injection machine control. This valve will control fill rate during injection, mold packing pressure, and back pressure during melt. During other portions of the machine cycle the valve diverts pump output to the sump, thus minimizing power loss and fluid heating.

5000 psi supply — valves can be supplied with a special pilot restrictor for operation to 5000 psi. Note that the D064B valve body is rated for 12,000 psi (four-times rated 3000 psi, per OSHA Chapter XVII, Paragraph 1910.67).

Installation Details





Manifold mounting – per ANSI B93.7-1968 (NFPA T3.5.65.1) Type D06 with additional center mounting holes. Also per DIN 24340 Form A25.

Valve weight –22 pounds

Internal seals – Buna N

Mechanical null adjust – remove access hole plug; use 5/64" Allen wrench; clockwise rotation increases flow out port B.

Pilot supply – valves shipped with pilot connected internally to pressure port P; to change to external pilot supply (through auxiliary port), remove filter cover, rotate filter assembly end-for-end, and reinstall.

NOTE: Dimensions in parenthesis are in millimeters.
Pilot pressure port size 0.30 (ϕ8) dia.
All other ports 0.875 (ϕ22) dia.