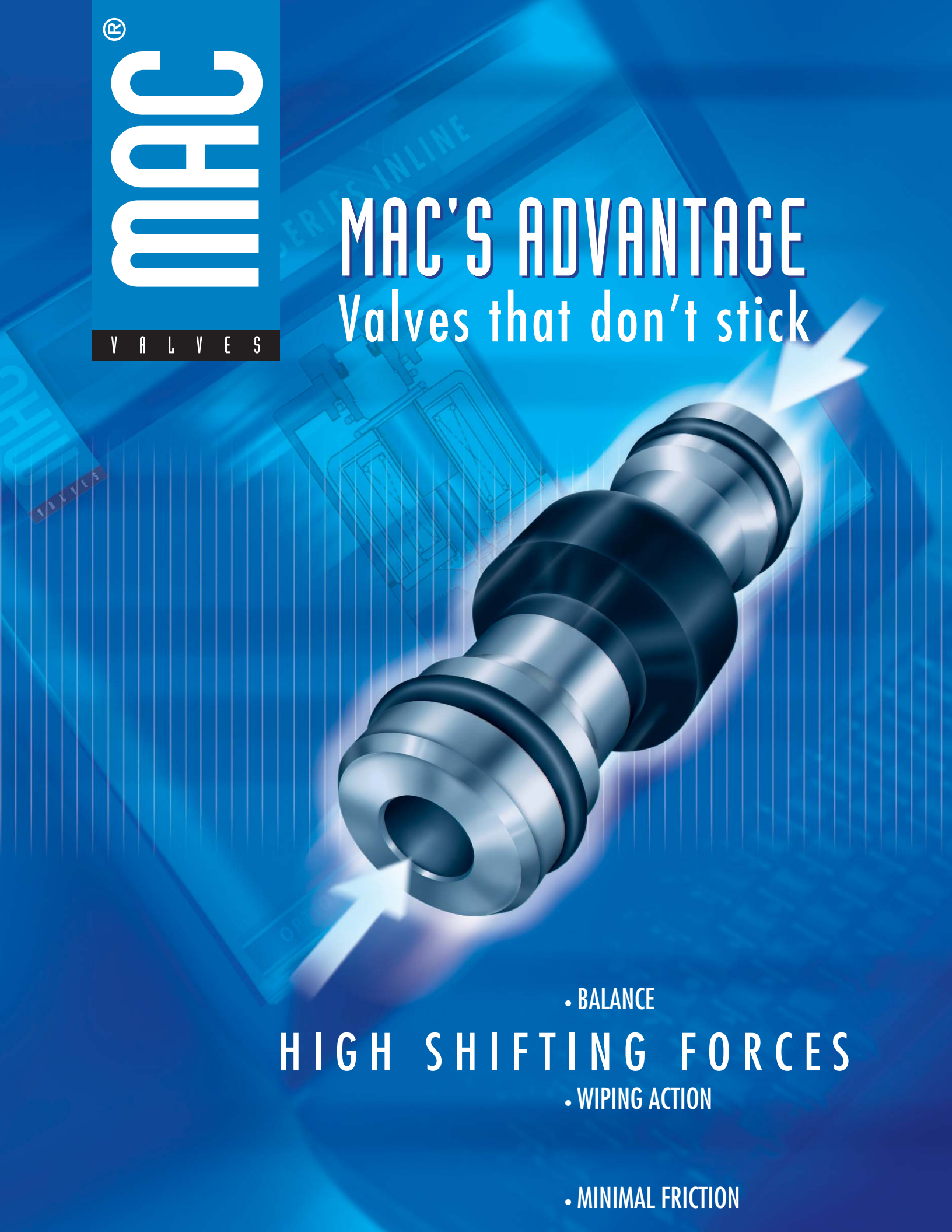
MAC®

VALVES

MAC'S ADVANTAGE

Valves that don't stick



- BALANCE

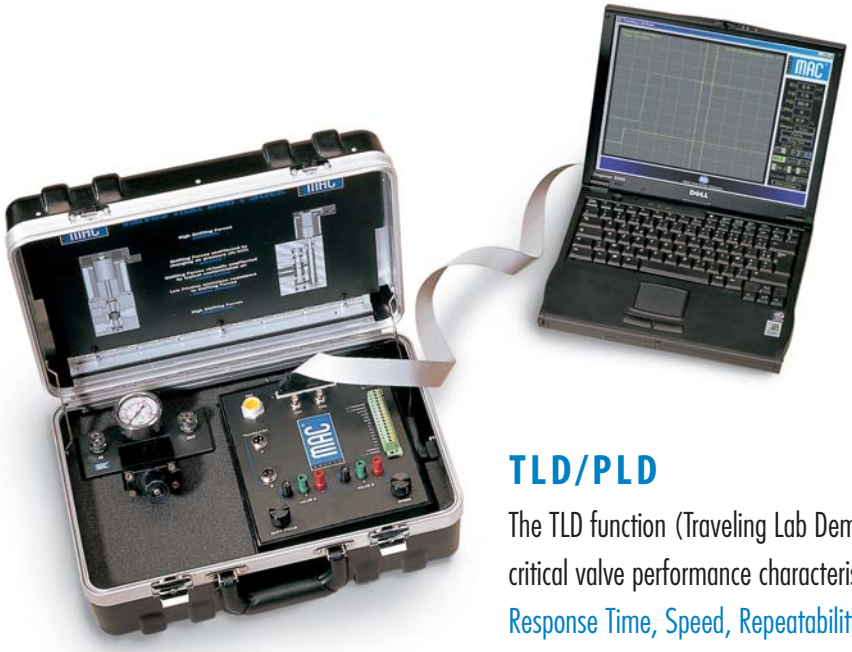
HIGH SHIFTING FORCES

- WIPING ACTION

- MINIMAL FRICTION

Let us show you via high performance demonstration kits and animated software,

HOW MAC'S PERFORMANCE ADVANTAGES HELP MAKE YOUR EQUIPMENT MORE RELIABLE - FASTER - MORE REPEATABLE.



TLD/PLD

The TLD function (Traveling Lab Demonstration) measures critical valve performance characteristics - Shifting forces, Response Time, Speed, Repeatability and Flow.

The PLD function (Proportional Lab Demonstration) measures critical proportional regulation characteristics - Response Time, Accuracy, Hysterisis, Repeatability and Flow.

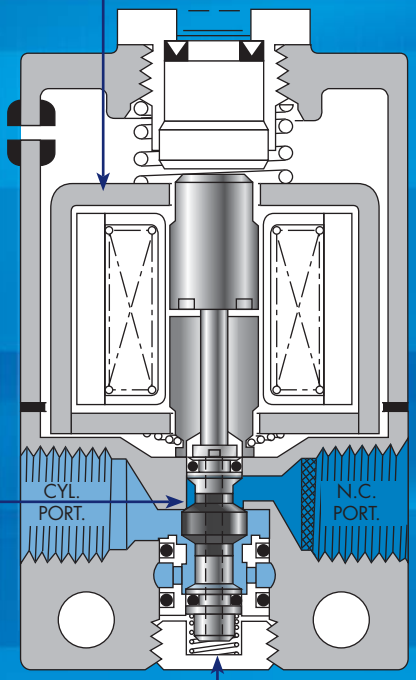
Animation

Animated Software shows inner workings of various Air Valve Designs - Powerful educational tool for learning about how air valves function.

BUILDING BLOCKS

High SHIFTING FORCE
(Energized)
- SHORT STROKE -

SOLENOID



SHIFTING FORCES unaffected by changing air pressure (IN/EXH)
- BALANCE -

SHIFTING FORCES virtually unaffected by typically contaminated air
- WIPING ACTION -

Low friction minimizes resistance to **SHIFTING FORCES**
- MINIMAL FRICTION -

VALVE

SPRING

High SHIFTING FORCE
(De-energized)
- STRONG RETURN SPRING -

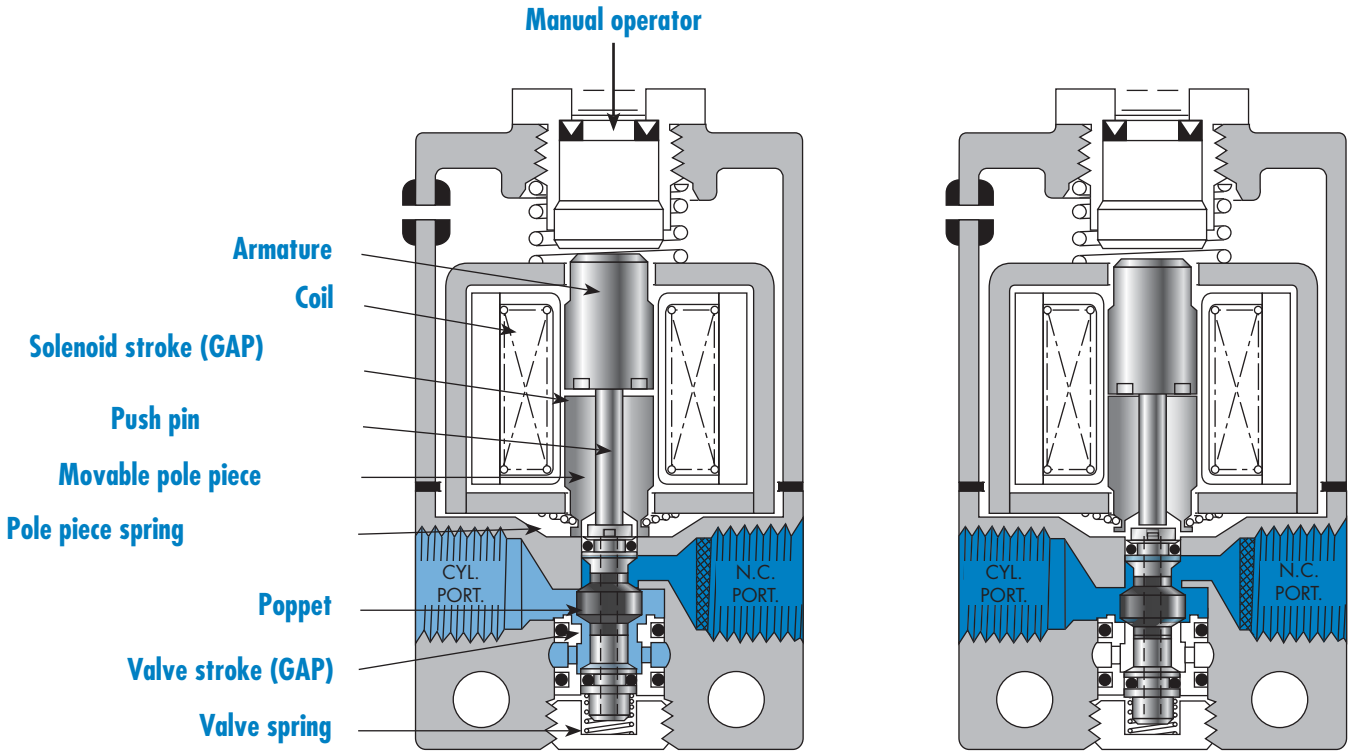
100% OF PRODUCTION TESTED 100%

WARRANTY 18 MONTHS

Valves that don't stick

Consult our manual for the use, installation and maintenance of our Mac Valves (see general catalog).

MACSOLENOID®



(A) SOLENOID DE-ENERGIZED **(B) SOLENOID ENERGIZED**

Sequence of events

(A) - Solenoid is de-energized

(B) - Solenoid is energized

- Armature is attracted magnetically downwards, extending push pin which shifts poppet from upper to lower seat.
- Movable pole piece is attracted magnetically upwards to meet the armature which compensates for difference between solenoid stroke and shorter valve stroke. Armature and pole piece therefore close regardless of valve position.

ADVANTAGES

- Short stroke solenoid produces high energization shifting force.
- High force return spring due to high force solenoid, maximizes both energization and de-energization shifting forces.
- Built-in wear compensation - valve stroke is shorter than solenoid stroke.
- Solenoid closes regardless of position of valve, virtually eliminating coil burnout on AC service.

Short stroke = High force = Valves that don't stick

SHORT STROKE - OVAL SHAPED ARMATURE

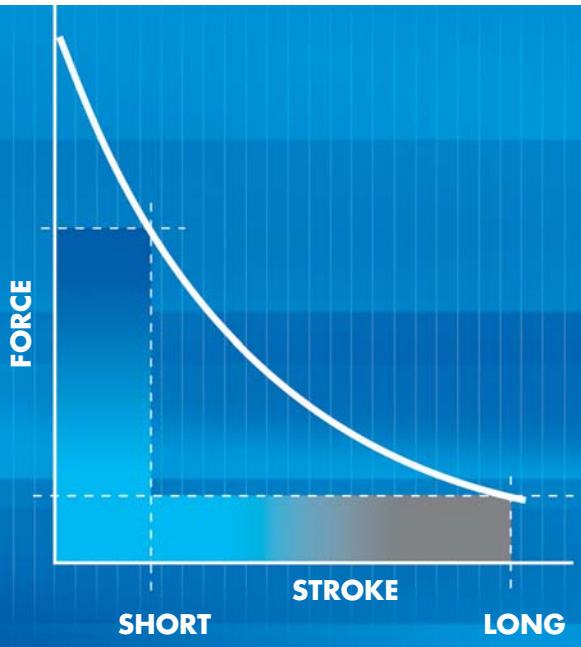
Typical solenoid force curve

SHORT STROKE

Short Stroke = High solenoid force
Short Stroke = High return spring force
Short Stroke = Low current to shift solenoid

OTHERS: LONG STROKE

Long Stroke = Low solenoid force (off seat)
Long Stroke = Low return spring force
Long Stroke = High current to shift solenoid

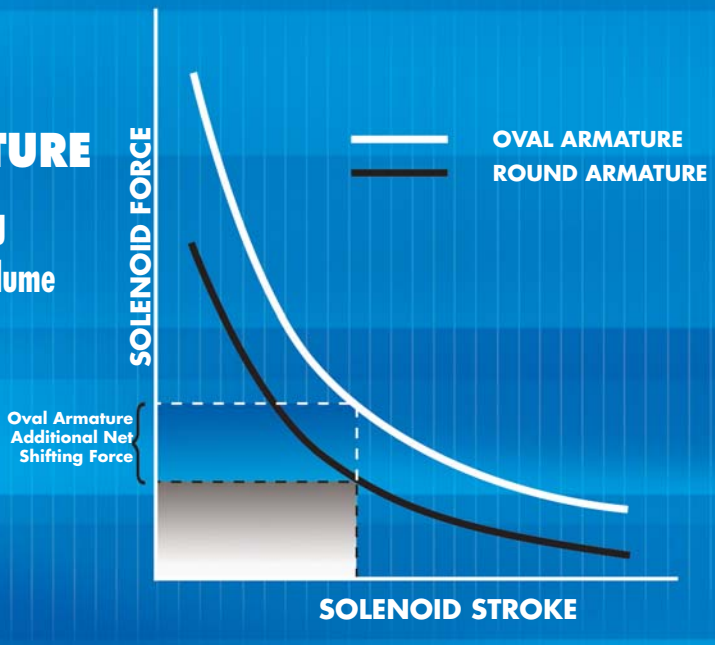


OVAL SHAPE ARMATURE

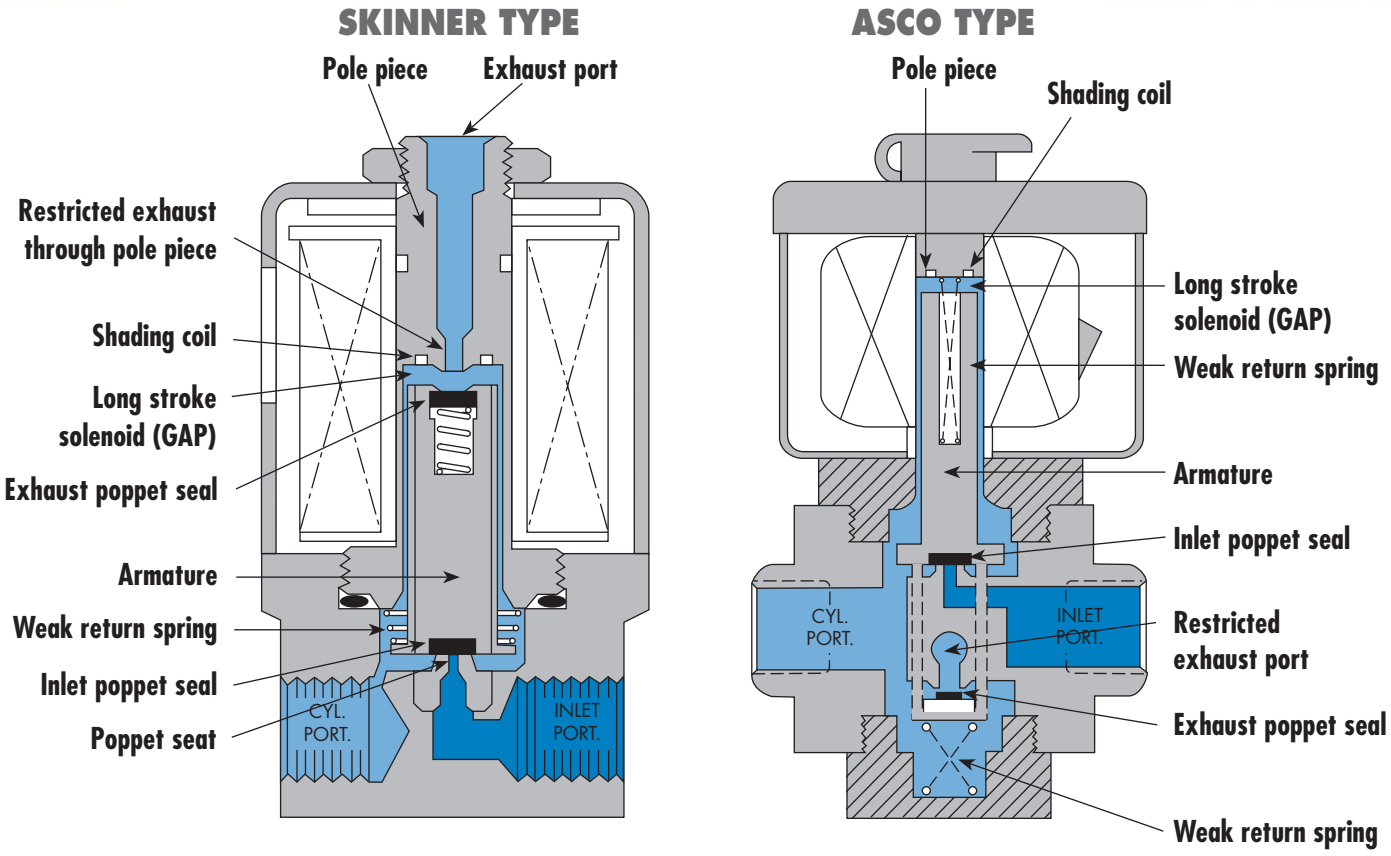
Oval shape armature = Increased coil winding
Oval shape armature = Increased coil iron volume
Oval shape armature = Higher shifting forces

OTHERS: ROUND ARMATURE

Round armature = Less coil winding
Round armature = Less coil iron volume
Round armature = Lower shifting forces



TYPICAL **UNBALANCED** POPPET 3-WAY AIR VALVE



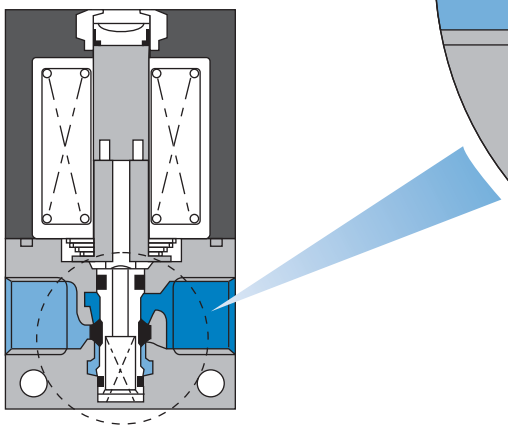
UNBALANCED POPPET = INCONSISTENT LOW SHIFTING FORCES

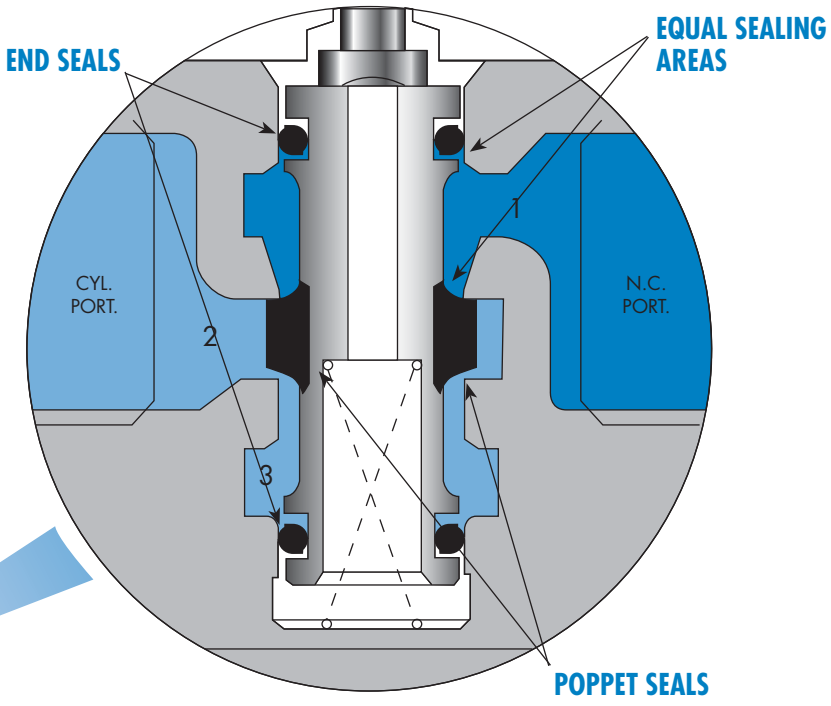
- Spring force (holding poppet on seat) is constant.
- Inlet air pressure acts upon a single sealing area.
- Inlet pressure X sealing area creates a force that opposes return spring shifting force.
- Force created by inlet air pressure on inlet poppet seal varies as inlet air pressure varies.
- Changing inlet pressures therefore affect energizing and de-energizing shifting forces.

DISADVANTAGES

- Normal pressure fluctuations cause inconsistent shifting forces
- Air pressure fights return spring, reducing shifting forces
- Weak return spring force
- Exhaust contaminants pass through operating solenoid parts causing sticking and coil burnout (SKINNER type)
- When air pressure rating is increased, the inlet and exhaust orifice must be reduced thereby decreasing flow through the valve
- Multiple models to cover range of vacuum to 10 Bar, 150 PSI, each with separate flow rating
- Pilot valves rated for 10 Bar, 150 PSI have very low flow
- Exhaust, located in pole piece, is restricted due to core iron requirements (SKINNER type)

BALANCED POPPET 3-WAY AIR VALVE





BALANCED POPPET = CONSISTENT HIGH SHIFTING FORCES

Exhaust Contaminants Isolated From Solenoid Parts = Clean Solenoid

- Sealing areas are equal
- End seals balance poppet seals
- Forces created by air pressure are equal in both directions
- Changing pressure therefore has no effect on shifting forces

ADVANTAGES

- Valve shifting forces are consistent and independent of pressure fluctuations
- High solenoid and return spring forces ensure high speed and precise repeatability
- Exhaust contaminants are isolated from the solenoid
- Manual override - standard
- Constant high flow maintained throughout the pressure range - including pilot valves
- Full flow exhaust
- Universal porting - 6 functions in one valve

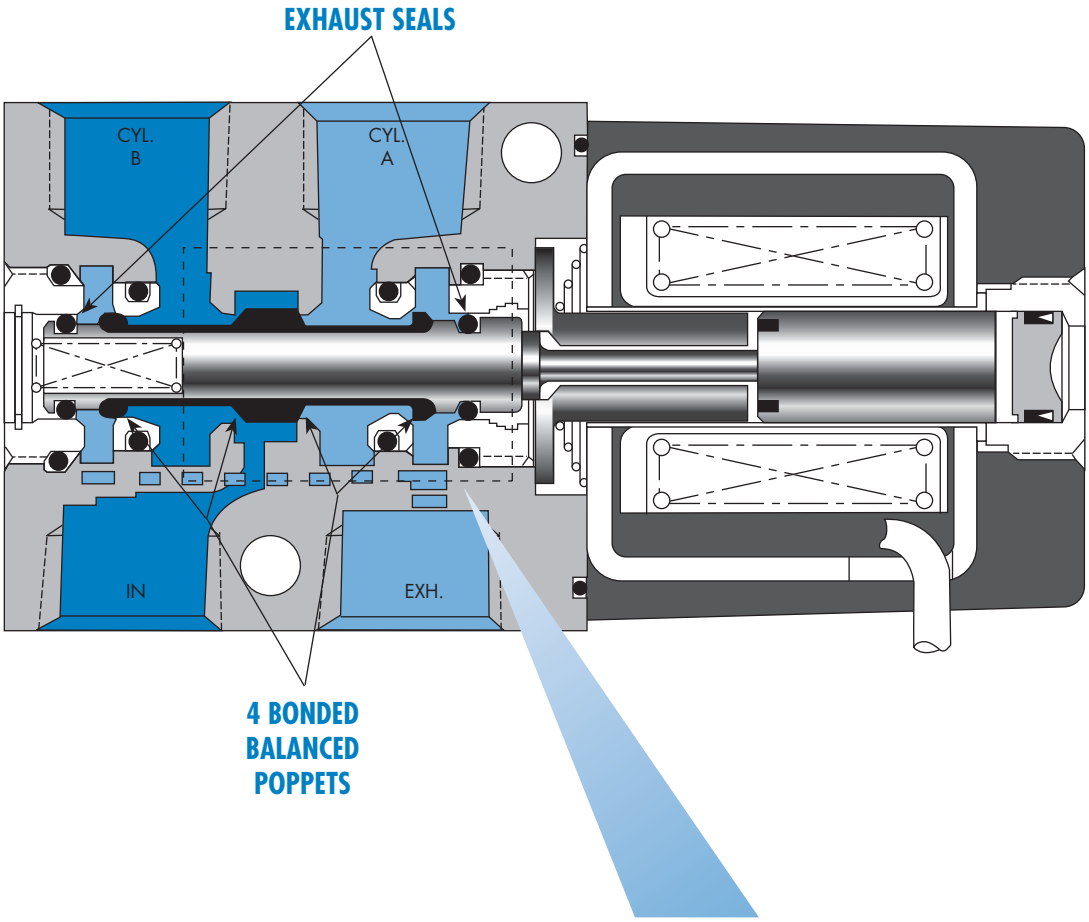
100% OF PRODUCTION TESTED 100%

WARRANTY 18 MONTHS

Valves that don't stick

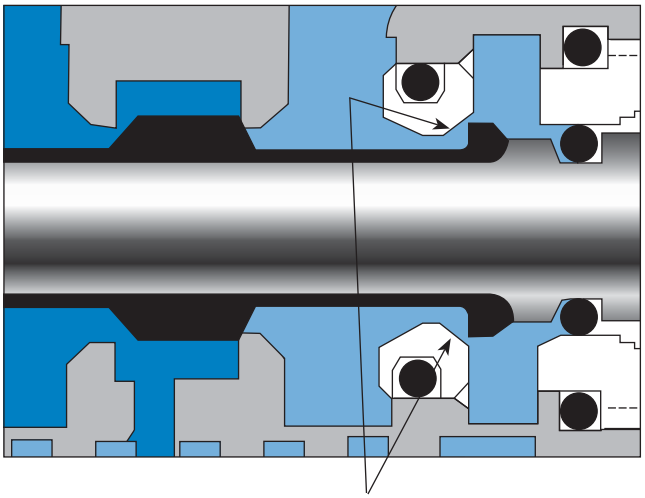
Consult our manual for the use, installation and maintenance of our Mac Valves (see general catalog).

SMALL DIRECT SOLENOID POPPET VALVE



ADVANTAGES

- 4 balanced poppets on a one-piece valve stem
- End poppets seal first on conical seats and cushion inlet poppet, eliminating cutting
- Exhaust seals are not under inlet pressure thus reducing friction
- Integral non-rising flow controls available
- Short stroking balanced poppet allows for direct solenoid operation with high shifting forces, minimized friction, fast response and high flow in a small package



Valves that don't stick

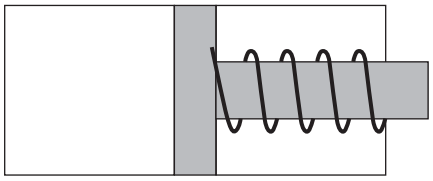
4-WAY PILOT OPERATION

DIRECT OPERATED

ADVANTAGE:
No minimum operating pressure.

DISADVANTAGE:
Sticking due to low **shifting forces** in both directions on long stroke valves.

Net Energized Force **F**



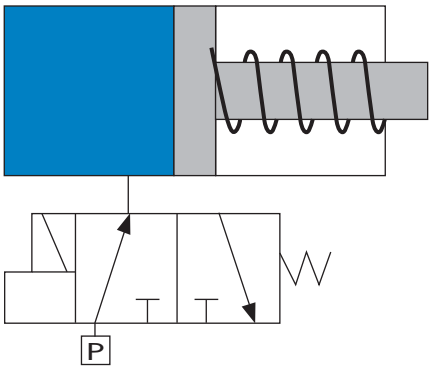
Net De-Energized Force **F**

3-WAY PILOT OPERATED (Spring Only Return)

ADVANTAGE:
High **shifting force** in one direction.

DISADVANTAGE:
Sticking due to low return **shifting force**. Must be able to operate at low pressure. Therefore, return spring force is low.

Net Energized Force **F**



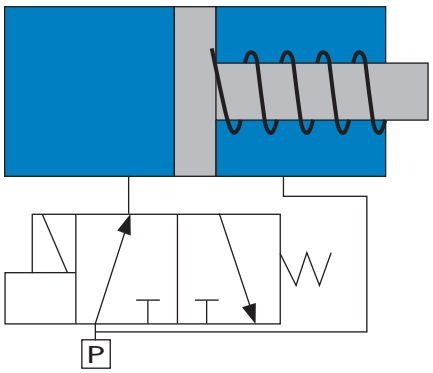
Net De-Energized Force **F**

3-WAY PILOT OPERATED (Air and Spring Return)

ADVANTAGE:
High **shifting forces** in both directions.

DISADVANTAGE:
Resistance to energizing **shifting forces** from air/spring return.

Net Energized Force **F**

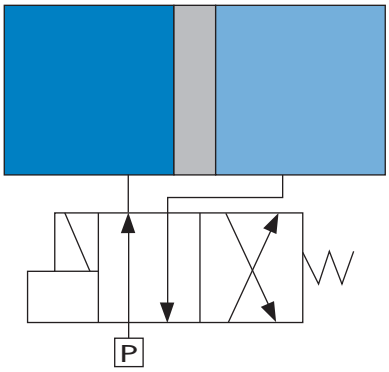


Net De-Energized Force **F**

4-WAY PILOT OPERATED (Air Return)

ADVANTAGE:
Highest **shifting forces** in both directions.
No resistance to **shifting force** in either direction. Full return piston area is utilized.

Net Energized Force **F**



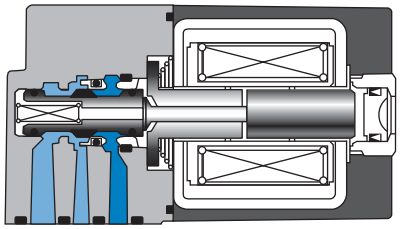
Net De-Energized Force **F**

100% OF PRODUCTION TESTED 100%

WARRANTY 18 MONTHS

MAC VALVES

3-WAY
SOLENOID PILOT OPERATED LARGE VALVE



Small direct 3-way solenoid operated valve

SPRING | **VALVE** | **SOLENOID**

SHIFTING FORCES unaffected by changing air pressure (IN/EXH)
- BALANCE -

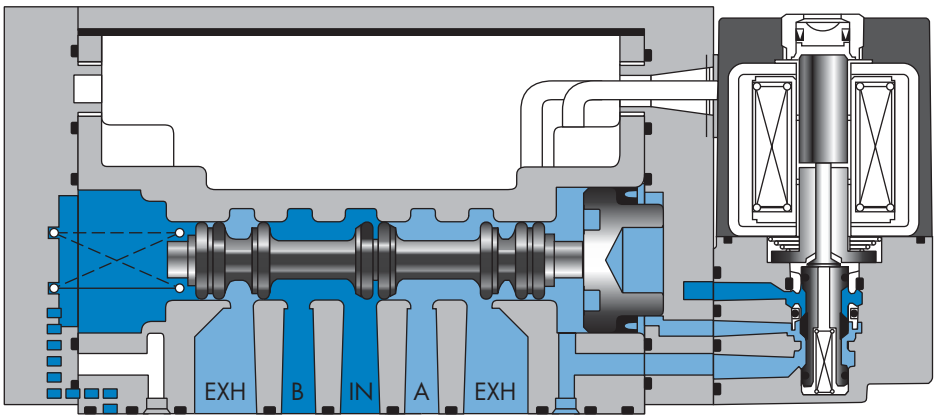
HIGH SHIFTING FORCE (De-energized)

SHIFTING FORCES virtually unaffected by typically contaminated air
- WIPING ACTION -

HIGH SHIFTING FORCE (Energized)

Low friction minimizes resistance to **SHIFTING FORCES**
- MINIMAL FRICTION -

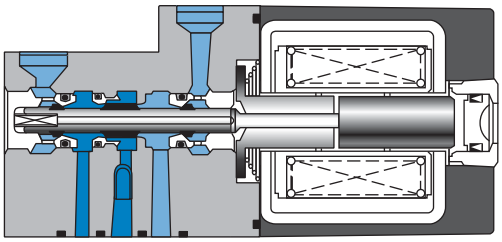
AIR/SPRING | **VALVE** | **SOLENOID PILOT OPERATOR**



Solenoid pilot operated large valve

Valves that don't stick

4-WAY
SOLENOID PILOT OPERATED LARGE VALVE



Small direct 4-way solenoid operated valve

SPRING | **VALVE** | **SOLENOID**

SHIFTING FORCES unaffected by changing air pressure (IN/EXH)
- BALANCE -

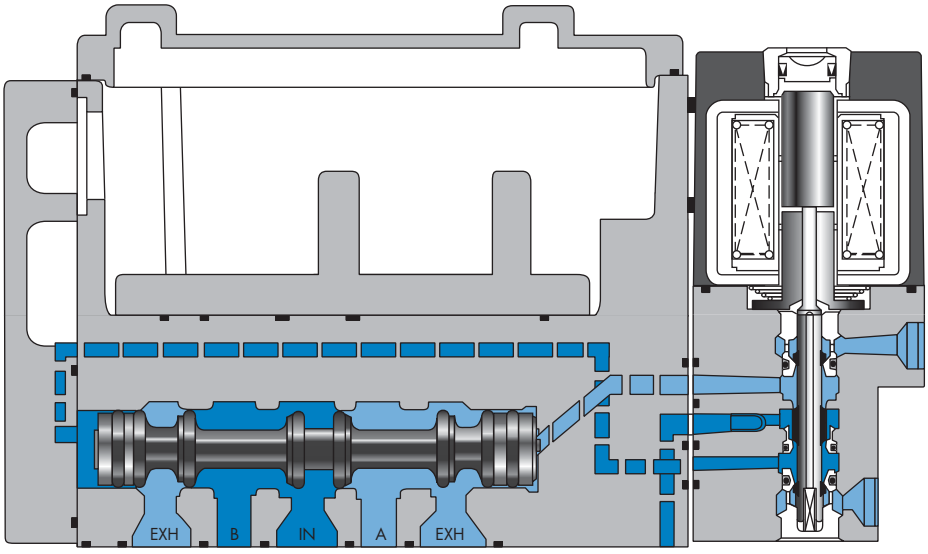
HIGH SHIFTING FORCE (De-energized)

SHIFTING FORCES virtually unaffected by typically contaminated air
- WIPING ACTION -

HIGH SHIFTING FORCE (Energized)

Low friction minimizes resistance to **SHIFTING FORCES**
- MINIMAL FRICTION -

DE-ENERGIZED 4-WAY PILOT | **VALVE** | **ENERGIZED 4-WAY PILOT**



Solenoid pilot operated large valve

100% OF PRODUCTION TESTED 100%

WARRANTY 18 MONTHS

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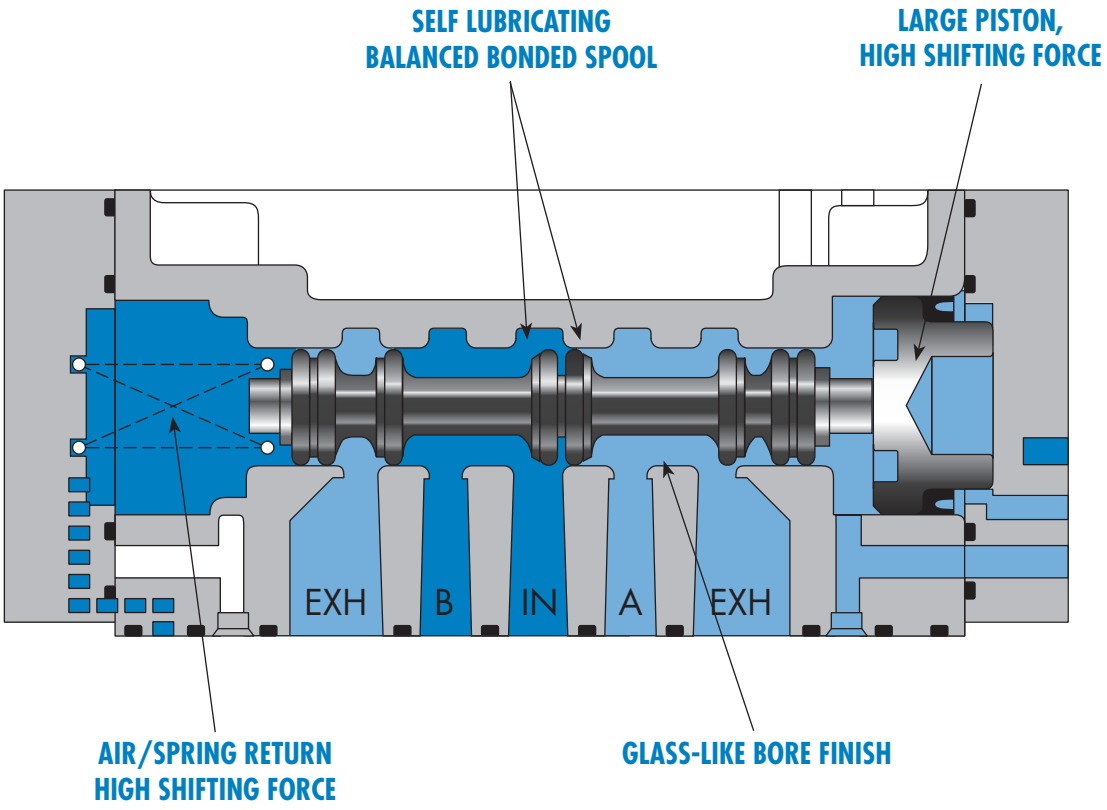
SPOOL & BORE



ADVANTAGES

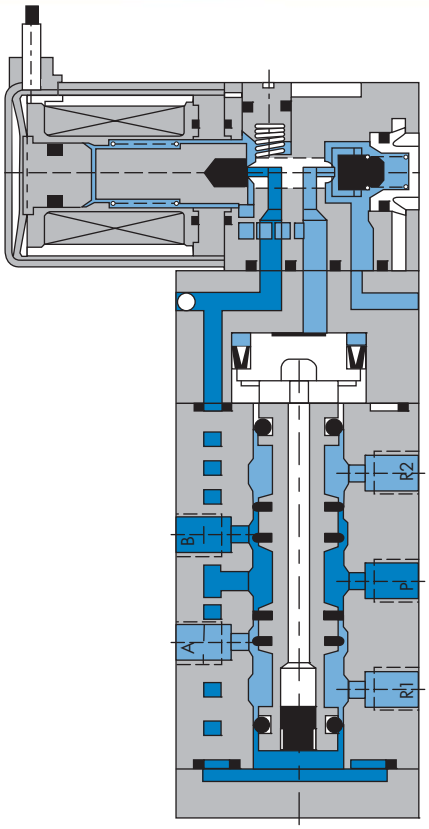
SPOOL PLUS BORE = WIPING ACTION = VALVES THAT DON'T STICK

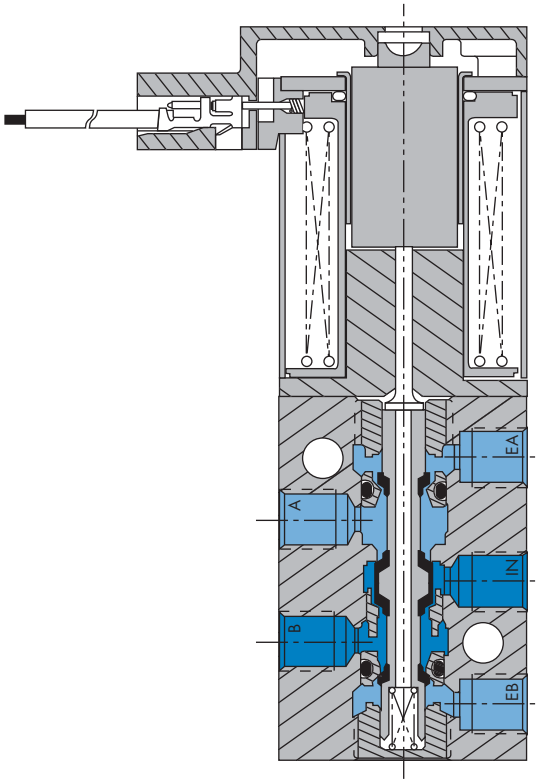
MAXIMIZES ABILITY TO OPERATE UNDER CONTAMINATED CONDITIONS, WHILE MINIMIZING FRICTION

- Large minimum piston area (3 cm^2) provides high shifting force even at minimum operating pressure
- Air/Spring assures maximum return shifting force
- Precision ground bonded spool controls compression - wipes contaminants away with minimum friction
- Chemically hardened seals eliminate creep, reduce friction and increase life
- Lubricant in rubber reduces friction - enhances nonlube service
- Two seals each controlling a single orifice provide a short stroke, less wear, minimum friction and high flow in a small package
- Patented centering seals ensure spool alignment for minimum wear
- Bore is machined, roller burnished and polished for hard smooth surface and glasslike finish - minimum friction, minimum wear and long life
- Lightweight aluminium spool allows for fast response
- One piece spool - simple construction and easy maintenance

Valves that don't stick

10 MM DIRECT SOLENOID POPPET VALVE





TYPICAL PILOT OPERATED 10 MM DESIGN

- "U cup" plus 4 "O-rings" in the bore at any one time - high friction
- 0.5 watt limited volume magnet wire plus small core iron size - low shifting force
- Unbalanced 3 way pilot - low shifting forces compromised by fluctuations in air pressure
- Small piston area - low shifting force
- Small orifice "0.0004 in²" (0,26 mm²) - prone to cloging
- Air return only - insufficient shifting force at low pressure to permit mechanical spring
- Many parts - complicated design
- Long stroke spool, unbonded seals can extrude and cut - short life
- 5 micron filtertration typically required

MAC 44 SERIES DIRECT OPERATED 10 MM DESIGN

- Balanced poppet, with no seals of any kind in a bore - no friction
- New MACsolenoid® patent pending with "oval" shaped armature - provides high shifting force through more core iron and magnet wire
- Balanced poppet - high shifting forces - unaffected by fluctuations in air pressure
- Short stroke direct operated poppet valve (patented adjustable inlet seat controls stroke) - high shifting force - without small piston and no minimum operating pressure
- Large orifice "0.0024 in²" (1,55 mm²) minimum - resists cloging
- Strong return spring - high shifting force - even at low pressure
- Few parts - simple design
- Patented conical shaped exhaust seats act as cushions - eliminates cutting - long life
- Every valve calibrated for flow for a given coil wattage - consistent flow

100% OF PRODUCTION TESTED 100%

WARRANTY 18 MONTHS

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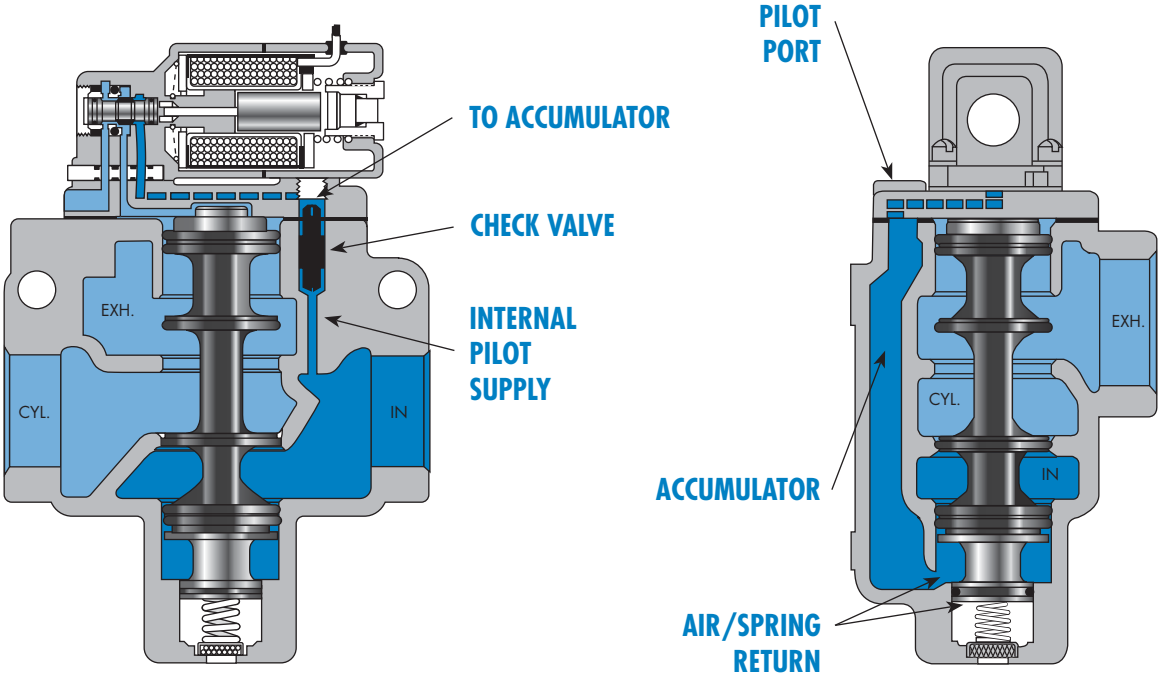
PILOT SYSTEM



ADVANTAGES

HIGH, CONSISTENT SHIFTING FORCES IN BOTH DIRECTIONS

CHECKED ACCUMULATOR

- Accumulator stores several times volume of air required to shift valve
- Accumulator (not direct inlet) feeds air spring and pilot
- Check valve protects accumulator from inlet pressure fluctuations
- Accumulator bleeds to atmosphere when inlet pressure is removed

AIR & SPRING RETURN

- Spring provides consistent shifting force at low pressure
- Air provides maximum shifting forces at both higher and lower pressures
- Air spring counterbalances air pilot pressure for consistent operation
- Spring provides memory

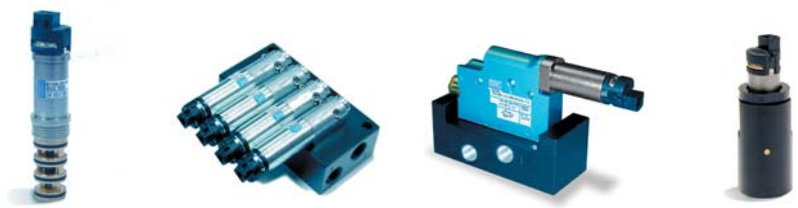
Valves that don't stick

PRODUCT RANGE

NEW

Bullet Valve® & P.O.P. Series

Balanced/Lifting solenoid (Patented)
Fastener free - cartridge mount available
P.O.P. = Pilot Operated Poppet series

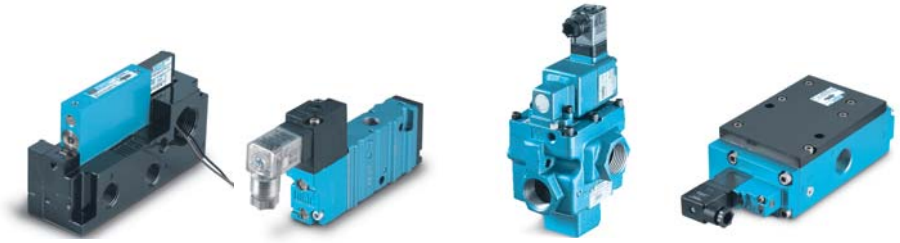


Small 3-way solenoid operated valves

#10-32 (M5) to 1/4" port size
Cv .10 to .50 (100 to 500 Nl/min)

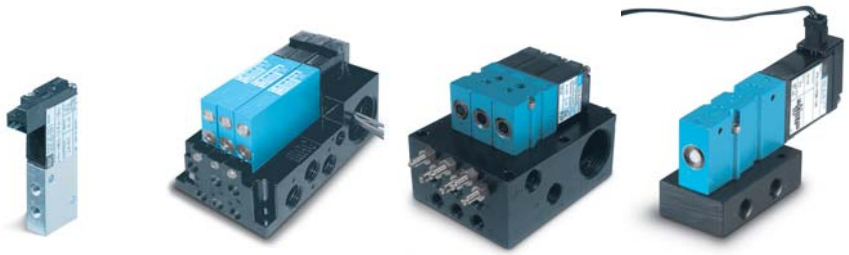
Large 3-way solenoid operated valves

#10-32 (M5) to 2 1/2" port size
Cv .40 to 60 (400 to 60000 Nl/min)



Small 4-way solenoid operated valves

#10-32 (M5) to 1/4" port size
Cv .10 to 1.4 (100 to 1400 Nl/min)



Large 4-way solenoid operated valves

#10-32 (M5) to 1 1/2" port size
Cv .40 to 15.9 (400 to 15900 Nl/min)

Proportional Valves & Field bus products

I/P, E/P & Digital Commands
±.5% to ±2.5% accuracy fullscale
Serial Communication capabilities with a variety of protocols

MAC VALVES

THINK GLOBAL ACT LOCAL

Our global distribution network is keeping your machines running around the clock around the world

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