

Humphrey Manual/Mechanical Air Valves

TECHNICAL SECTION

GENERAL INFORMATION DESCRIPTION

Description

125 Series	Full .125 inch (3.17mm) orifice diaphragm-poppet valves with various manual, ball, plunger and three different types of cam operators.
250 Series	Full .250 inch (6.35mm) orifice diaphragm-poppet valves with various manual, foot, and cam operators.
501 Series	Full .500 inch (12.7mm) orifice piston-poppet valves with manual operators.

Port Identification (Varies by model. See individual model drawing)

IN	Pressure supply port.
CYL	Delivery port.
CYL N/O	Delivery port, normally open (passing).
CYL N/C	Delivery port, normally closed (not passing).
EXH	Exhaust port. Vent to atmosphere.

Installation

Humphrey manual and mechanical valves can be mounted in any position in most environments within the parameters stated in the specifications.

Mounting

Valves can be mounted directly in the supply line, or with body mounting threads, holes, or lugs, depending on model. Many models can be panel mounted. Most Humphrey manual and mechanical valves have optional mounting bases (Code 21) which can be used for either base mounting or panel mounting. Mounting bases are standard on some models. 125 Series valves are available with optional panel mounting nuts (Code 22).

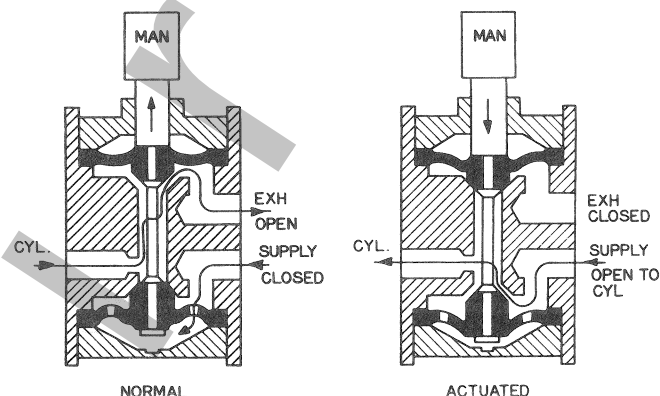
Use as 2-Way Valves

Most 3-way valves can be ordered as 2-way valves by specifying *Code 2* after the basic model number. Example: 125P-2-10-20. Most 3-way valves can be field converted to 2-way function simply by plugging the exhaust port.

These valves can be used as 2-ways venting to atmosphere; however, if actuated position is maintained for extended periods of time the bottom diaphragm may extrude into the flow path, causing a restriction.

These valves can be used as 2-ways to trap pressure between valve and downstream device; however, pressure under the top diaphragm may cause extrusion of the valve's stem through the bottom diaphragm if: 1) pressure exceeds 60 PSIG, or if 2) supply pressure is removed. If the conditions exist, consult factory for possible alternate port connections.

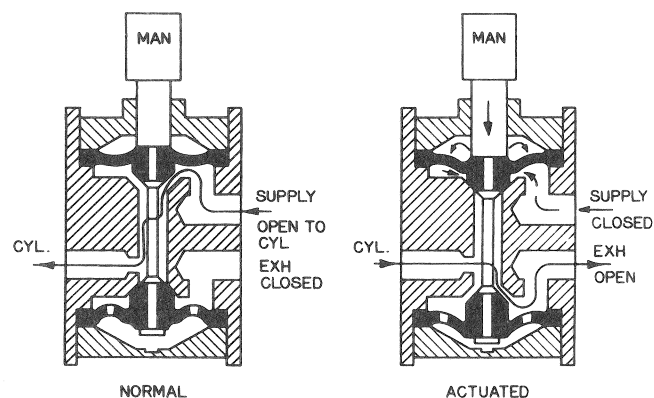
Basic Normally Closed Valve



NORMAL Design employs principle of imbalance wherein the supply pressure is applied to the greater effective area on the bottom side of the lower diaphragm.

ACTUATED When actuation is initiated, perforations in the bottom diaphragm begin to neutralize pressure to minimize the required actuation force. Supply pressure assists the spring in returning valve to normal position.

Basic Normally Open Valve



NORMAL Design employs principle of imbalance wherein the supply pressure is applied to the greater effective area on the bottom side of the top diaphragm.

ACTUATED When actuation is initiated, perforations in the bottom diaphragm begin to neutralize pressure to minimize the required actuation force.

Use as 3-Way Valves

2-way valves can be used as 3-ways by removing the exhaust port plug.

4-way valves can be used as 3-ways by plugging the CYL NO or CYL NC delivery port.

Use as Normally Open (passing)

Most models can be ordered as normally open by specifying *Code 11*. Example 250P-3-11-21.

Normally closed valves with detent actuators can be used as normally open by maintaining actuated position.

Most normally closed 3-way valves can be used as normally open by plumbing the supply pressure to the exhaust port (60 PSIG maximum). Excludes internally piloted 125PLG and 250HO models.

In this mode, the CYL port remains the delivery port; however, the IN port becomes the exhaust port.

Use as a Selector Valve

Most 3-way normally open (Codes -3-11) can be used as selector valves. Connect higher pressure to EXH port (normally closed, not passing to CYL port). Connect lower pressure to IN port (normally open, passing to CYL port). Combined pressure must not exceed 125 PSIG total.

Use as a Diverter Valve

Most 3-way normally open models (Codes -3-11) can be used as diverter valves. Connect supply pressure to CYL port (normally open, passing to IN port). EXH is normally closed, not passing to CYL port.

Media/Pressure

Humphrey manual and mechanical valves are designed for use with compressed air or inert gases from 0 to 125 PSIG (8.5 bar) with some exceptions. Humphrey also manufactures a number of valves designed especially for vacuum service, from 0 to 29.5" Hg. See Vacuum section of Humphrey Air Valves General Catalog.

Temperature

The normal temperature range of these valves with Buna N seals (nitrile, supplied as standard) is -20° to +225°F (-29° to 107°C). For higher temperatures (to 400°F/204°C), or for mild chemical resistance, consider optional fluoroelastomer seals. Specify *w/VAI*.

Some models are capable of controlling liquids and may be ordered with optional brass body. Specify *w/BRB*. Or consult factory and provide desired model number and application details.

Lubrication

Whereas no lubrication of any kind is necessary with Humphrey manual and mechanical diaphragm-poppet valves, if lubricating oil is used it must be compatible with Buna N. Lubrication compatibility problems can sometimes be satisfied with Viton seals option. Specify *w/VAI*.

Plumbing

Humphrey manual and mechanical diaphragm-poppet valves will function with low pressure or restricted volume media supplies, except Model 125PLG and 250HO which have minimum pressure requirements.

Most 125 Series Normally Closed valves are available with optional bottom inlet for plumbing convenience. Specify *w/BIN*.

Before connecting fittings and tubing, blow all foreign material from these components. If using a sealant, take extra care the sealant does not enter valve causing malfunction and/or leaks.

Recommended torque for 1/8 NPT and 1/4 NPT fitting installation is 60 and 130 inch-pounds (6.8 and 14.7 Newton-meters) respectively.

CAUTION: Compressed air is powerful and may be dangerous. Before attempting to remove a component from an air line or system, always disconnect the supply air and thoroughly exhaust the line or system. Never attempt to construct, operate, or service anything using compressed air unless you have been properly trained to do so. Failure to heed this warning could result in SERIOUS, EVEN FATAL, PERSONAL INJURY.

Metric Ports

Although these valves are produced using the inch system, all drawings show the metric equivalent in millimeters (indicated by slanted numbers).

All port connections are available in metric as follows:

125 Series Available with 1/8 BSP instead of 1/8 NPT.
250 Series Available with 1/4 BSP instead of 1/4 NPT.

Specify metric port threads by using letter *E* as a model number prefix. Example: *E125P* (with 1/8 BSP ports rather than Model 125P with 1/8 inch NPT ports).

Humphrey does not offer metric size fittings. Contact your local Humphrey distributor for metric size fittings sources.

Force to Actuate

Force To Actuate (pounds) @ 30 PSIG and 100 PSIG
Actuator Type

Valve Series	B	C	F	H	HO	MC	MP	MOC	P	PL	PLG	T	V
125	3.25 8	1 2	• •	• •	3.5 7	2.5 5	4 8	3.25 6.5	4.75 8	• •	2 3	2.5 3.5	.5 1.5
250	• •	5.5 11	3.75 5	• •	8.5 14	• •	• •	• •	10.5 23	7.5 21	• •	3.25 5	1.25 3
250-4	• •	• •	7.5 13	3 4	• •	• •	• •	• •	• •	• •	• •	• •	• •
501	• •	• •	• •	• •	• •	• •	• •	• •	• •	• •	• •	• •	3 3.5

• Not available

Flow Rates/ C_v

Humphrey recommends "fill/exhaust times", which are related to various chamber sizes, as the best method for calculating total valve and device (specifically, cylinder) response time. Humphrey recognizes the industry's use of flow coefficient C_v as a comparison standard.

Consequently, Humphrey offers three types of flow data. The National Fluid Power Association's standards for C_v , the scfm flow rate determined by flowing to atmosphere, and Humphrey's preferred "fill/exhaust times."

Model	C_v	SCFM @100 PSIG	Fill Time (Sec) (0 to 90 PSIG) Chamber (cu. in.)		Exhaust Time (Sec) (100 to 10 PSIG) Chamber (cu. in.)	
			10	100	10	100
125	0.2	20	.150	1.50	.200	2.00
250	0.8	50	.045	0.45	.080	0.80
250-4	0.8	50	.045	0.45	.080	0.80
501	2.4	220	.012	0.12	.019	0.19

Note: Normally Closed and Normally Open flow rates, C_v , etc. vary slightly and can cause slight deviations from these specifications.

Example of how to calculate fill/exhaust times:

Model 125P-3-10-20

One Air Line (0.125 I.D. x 36-inch long)

100 PSIG supply

Air Cylinder (2-inch bore x 4-inch stroke)

Volume =

$0.785 \times \text{Diameter squared} \times \text{stroke or length}$

Cylinder Volume = 12.56 cubic inches

Air Line Volume = 0.43 cubic inches

Total Circuit Volume = 12.99 or 13 cubic inches

Time to Fill 13 cubic inches =

130% of .150 sec. for 10 cubic inches = 0.195 sec.

Time to Exhaust 13 cubic inches =

130% of .200 sec. for 10 cubic inches = 0.260 sec.

Total Cycle Time

0.455*

*Although this result is not exact, it is sufficient for most application needs and provides a simple, straight-forward system.

Flow Controls

Flow controls should be placed between valve and device being actuated. **Installation of flow controls in valve exhaust ports is not recommended as back pressure may cause valve to malfunction.**

A muffler may be installed in valve exhaust port/s to muffle the sound of exhausting media. Mufflers should not impede exhaust function. A canister-type muffler is recommended. Sintered bronze mufflers are not recommended because they easily become plugged. If sintered bronze mufflers are used, routine cleaning or replacement is recommended.

Packaging

Individual components are packaged in corrugated boxes for protection. Boxes show the valve model number for easy product identification.

Customers purchasing large quantities may prefer to reduce unpacking cost by ordering in bulk. Bulk packs contain multiple units. Consult factory.

Troubleshooting

Valve malfunction problems are normally caused by circuit design errors, improper valve application, or improper plumbing.

Past experience indicates that the following are frequent causes of problems and should be investigated:

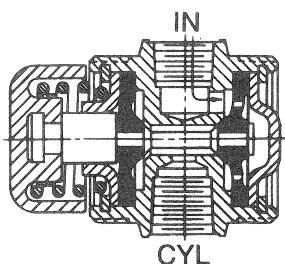
- Ensure presence of pressure; blocked or defective fittings are frequent causes of circuit start-up problems.
- Ensure that rated pressure is not exceeded. Higher than rated pressure may cause premature valve failure.
- Ensure proper stroke of cam or ball valves. Too little stroke will not allow valve to operate or cause air to leak at exhaust. Too much stroke may damage valve or equipment.
- Ensure integrity of cylinder seals. A valve leaking from the exhaust port may not actually be a valve malfunction, but may result from air leaking around worn out cylinder piston seals.

Warranty

All valves have a one year warranty from date of manufacture. This warranty includes repair and/or replacement at no charge should the product be deemed defective due to workmanship and/or material.

Valves outside one year warranty may be returned for factory repair. Valves may also be repaired using a Humphrey Seal Repair Kit. Each kit includes replacement parts and instructions for easy completion. Please see following page for kit numbers.

Sample SRK Instruction Sheet



LETTERED PARTS (A) (B) (C) ETC. IN KIT

NUMBERED PARTS (1) (2) (3) ETC. NOT IN KIT

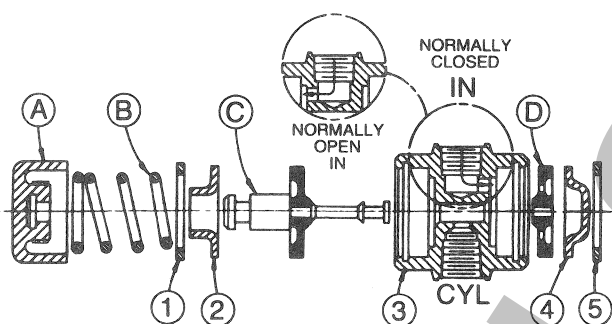
Kit Number

SRK 125A
SRK 125MC
SRK 125P
SRK 125PLG
SRK 125V
SRK 250
SRK 250V

Repairs Model/s

125A, 125B or HO
125MC, MP, MOC, or T(NO)
125C or P
125PLG
125V or T(NC)
250C, F, P & 250-4F** or H**
250B or V

**Order 2 kits to repair both sides of these valves. Seals Repair Kits can be ordered with fluoroelastomer at extra charge. Specify w/VAI.



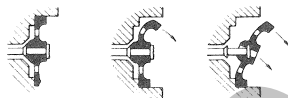
DISASSEMBLY PROCEDURE

1. Remove nylon Button A as SHOWN — If *steel button, remove two set screws.



2. Remove Retaining Ring 5 and End Cap 4.

3. Remove Diaphragm D as SHOWN.



4. Remove Retaining Ring 1 and End Cap 2.

5. Remove Main Stem and Diaphragm Assembly C NOTING relationship to "IN" port to insure correct reassembly.

*Valve with Steel Button has internal spring located between parts 4 and D. (This spring is not included in kit).

REASSEMBLY PROCEDURE

1. Insert New Main Stem and Diaphragm Assembly C into Valve Body 3 in correct relationship to "IN" port.

2. Assemble New Diaphragm D to Main Stem as SHOWN.



3. Install End Cap 4 and Retaining Ring 5.

4. Install End Cap 2 and Retaining Ring 1.

5. Assemble New Spring B and Button A with LARGE END of SPRING in BUTTON. Push down until Button "Snaps" into place.

