

# ARO

## *Pneumatic Valves and Motion Control*

*2, 3, and 4-Way Valves, available with electric, manual, mechanical, and pneumatic actuators. Miniature to full size valves.*



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### Descriptions

#### Sierra Series

Compact 2-position, 4-way valves that are lightweight, yet durable. 10mm, 15mm or 18mm wide. Body ported or sub-base mounted. Single and double solenoids available. M5 (10-32) and 1/8" ports.



(Page 4, 26)

#### MaxAir Series

2, 3 and 4-way air solenoid, pilot and hand lever valves feature excellent flow in a compact, lightweight package.



(Page 16, 38, 46, 50, 69)

#### Alpha Series

High flow, 2-and-3-position, 4-way valves that are compact in size with many features. The family includes: Body Threaded, Stacking, Bar Manifold and Assembled Manifold. Single and double solenoids, or pilot actuators are available. 1/8", 1/4" and 3/8" ports.



(Page 20)

#### Cat Series

Small, 3-way solenoid valves. Perfect for small bore, single acting cylinders and electric to air interfacing applications. Body ported for stand alone applications, stacking or base manifold. Available as normally open or normally closed. 1/8" and 1/4" ports.



(Page 32)

#### 50 Series

3-way and 4-way body ported valves. Six manual, mechanical and pilot actuator styles available. 1/8" ports.



(Page 42)

#### E-Series

3-way and 4-way body ported valves. Nine manual, mechanical, pilot and solenoid actuator styles available. 1/4" ports.



(Page 52)

#### K-Series

Manual, Pilot and Solenoid, heavy duty 4-way valves. Available as body ported. Seven actuator styles available. Manual: 3/8" and 1/2" ports. Solenoid and Pilots: 3/8", 1/2", 3/4" and 1" ports.



(Page 58)

#### H-Series

High flow 3-and-4-way function Poppet valves. Available in solenoid, pilot and bleed actuators. 1/4", 3/8" and 1/2" ports.



(Page 62)

#### Premair™

3-and-4-way direct acting solenoid valve. Rugged construction and lightweight, stand alone and stacking. Available in 1/8" ports.



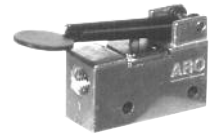
(Page 36)



## Accessories

### Accessory Valves

- 100 Series - 3-way N.C., miniature limit valves.
- 200 Series - 3-way limit valve-ideal for sensing devices such as cylinders, slides and gates.
- 400 Series - Heavy duty 3-way limit valves, 4 actuator arms available.
- 460 Series - 3-way palm button valves.
- The 200, 400 and 460 are multipurpose valves, plumb N.O., N.C., diverter, and selector.
- In line and right angle flow controls, in line needle and check valves.



200 Series Valve



460 Series Valve

### Valve Accessories and Special Valves

- Bleed valves: manual button and pilot operated.
- Quick exhaust valves for enhancing cylinder speed.
- One shot pulse valve to convert continuous air supply to a momentary output.
- Shuttle valves operate as a check when two inlets are required.
- Micro switch converts pneumatic signal into an electric signal.
- Exhaust mufflers, exhaust speed controls, breather vents.



Quick Exhaust Valve



Exhaust Muffler

### Pneumatic Logic Controls

- Two-hand anti-tie-down unit for monitoring operators hands during work cycle.
- Pneumatic pulse and delay timers for use in simple valve circuitry.
- Pneumatic counters.



2-Hand Anti-Tie Down

## Features

### Sierra TN Series Miniature Manifold Valves are excellent choices for:

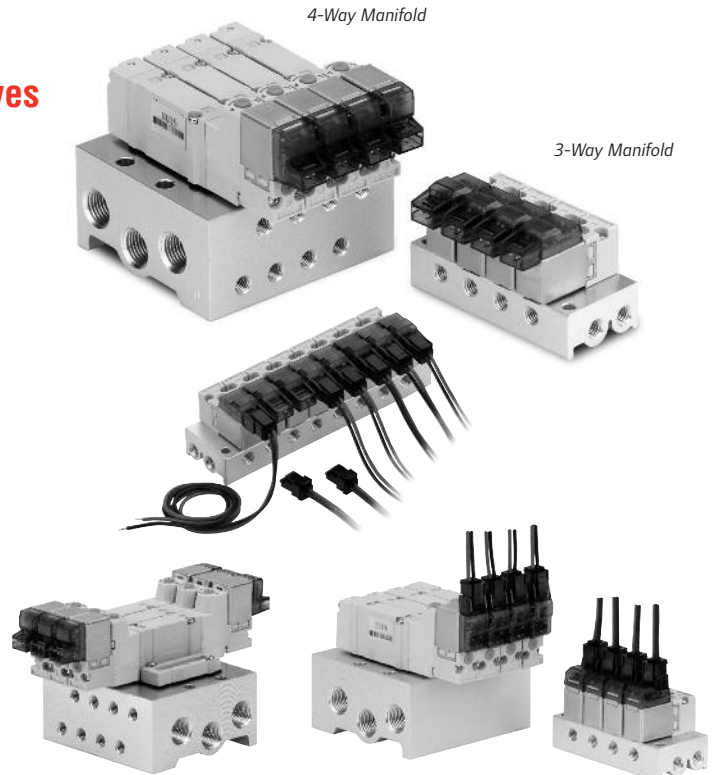
- |                         |                 |
|-------------------------|-----------------|
| Dispensing Applications | Control Systems |
| Converting Applications | Food Processing |
| Packaging Applications  | Animation       |

#### 3-Way Valves

- Single Solenoid
- Normally Closed, Direct Acting
- Low Power Consumption
- Compact Space Saving Design
- Large Flow Capacity Cv 0.01

#### 4-Way Valves

- Quick Response and Large Flow capacity
- High Reliability
- Compact size
- Single Solenoid, Double Solenoid,
- 2-Position, 3-Position Spring Centered
- Low Power Consumption



4-Way Manifold, Double Solenoid

Vertical Electrical Entry available: Consult Factory

## Ordering

| Number | Description | Model Voltage | Watts/VA |
|--------|-------------|---------------|----------|
|--------|-------------|---------------|----------|

### Valves

#### 3-Way

|               |                              |         |     |
|---------------|------------------------------|---------|-----|
| TN15M5S-012-H | 3-Way Solenoid/Spring Return | 12 VDC  | 1.0 |
| TN15M5S-024-H | 3-Way Solenoid/Spring Return | 24 VDC  | 0.6 |
| TN15M5S-120-H | 3-Way Solenoid/Spring Return | 110 VAC | 1.4 |

#### 4-Way

|               |                                    |         |     |
|---------------|------------------------------------|---------|-----|
| TN1210S-012-H | 4-Way Solenoid/Spring Return       | 12 VDC  | 1.0 |
| TN1210S-024-H | 4-Way Solenoid/Spring Return       | 24 VDC  | 0.6 |
| TN1210S-120-H | 4-Way Solenoid/Spring Return       | 110 VAC | 1.6 |
| TN1210D-012-H | 4-Way 2 Position Solenoid/Solenoid | 12 VDC  | 1.0 |
| TN1210D-024-H | 4-Way 2 Position Solenoid/Solenoid | 24 VDC  | 0.6 |
| TN1210D-120-H | 4-Way 2 Position Solenoid/Solenoid | 110 VAC | 1.6 |

#### All Ports Blocked

|               |                                  |         |     |
|---------------|----------------------------------|---------|-----|
| TN1310D-012-H | 4-Way 3 Position Spring Centered | 12 VDC  | 1.0 |
| TN1310D-024-H | 4-Way 3 Position Spring Centered | 24 VDC  | 0.6 |
| TN1310D-120-H | 4-Way 3 Position Spring Centered | 110 VAC | 1.6 |

Vertical Electrical Entry available: Consult Factory

| Model Number | M5 Ports | Model Number | 10-32 NPT Ports |
|--------------|----------|--------------|-----------------|
|--------------|----------|--------------|-----------------|

### Manifold\*

#### 3-Way

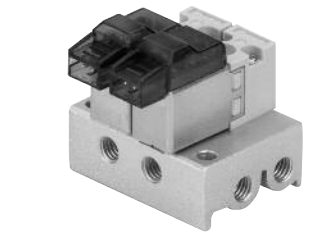
|          |                |
|----------|----------------|
| TNM15-01 | Single Station |
| TNM15-02 | 2 Stations     |
| TNM15-03 | 3 Stations     |
| TNM15-04 | 4 Stations     |
| TNM15-05 | 5 Stations     |
| TNM15-06 | 6 Stations     |
| TNM15-07 | 7 Stations     |
| TNM15-08 | 8 Stations     |
| TNM15-09 | 9 Stations     |
| TNM15-10 | 10 Stations    |

#### 4-Way

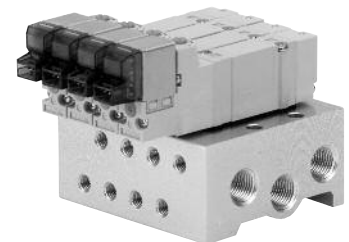
|          |             |
|----------|-------------|
| TNM14-02 | 2 Stations  |
| TNM14-04 | 4 Stations  |
| TNM14-06 | 6 Stations  |
| TNM14-08 | 8 Stations  |
| TNM14-10 | 10 Stations |

### Blanking Kit

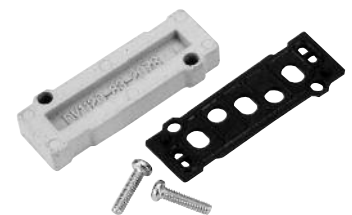
TNB14



3-Way 2 station manifold



4-Way 4 station manifold



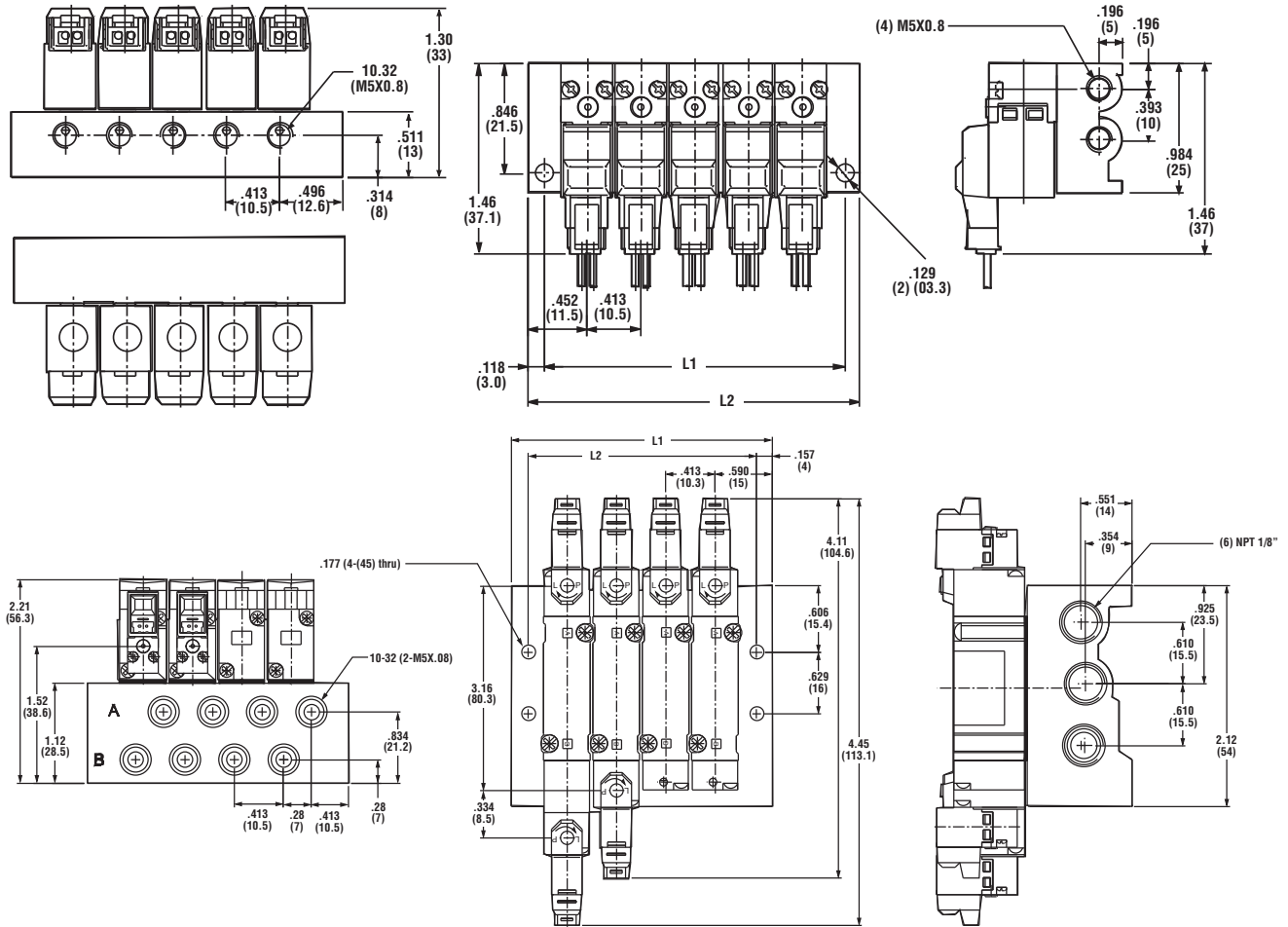
Blanking Kit TNB14 (4-way only)

\* Other manifolds available up to 16 stations. Consult factory.

# Performance Specifications

|                           | 3-Way                                   | 4-Way                                  |
|---------------------------|---|--|
| <b>Body Style</b>         | Manifold Mount                          | Manifold Mount                         |
| <b>Media</b>              | Air                                     | Air                                    |
| <b>Temperature Range</b>  | 44-122 F (5-50 C)                       | 44-122 F (5-50 C)                      |
| <b>Operating Pressure</b> |   |  |
| 2-Position Single         | 0-100 PSIG (0-7 Bar)                    | 20-100 PSIG (1.5-7 bar)                |
| 2-Position Double         | N/A                                     | 15-100 PSIG (1-7 bar)                  |
| 3-Position                | N/A                                     | 30-100 PSIG (2-7 bar)                  |
| <b>Cv Factor</b>          | 0.01                                    | 0.2                                    |
| <b>Response Time</b>      | 10ms                                    | 12ms                                   |
| <b>Power Consumption</b>  | DC 1.0 W 12 VDC, .6W 24 VDC<br>AC 1.4 W | DC 1.0 W 12VDC, .6W 24 VDC<br>AC 1.6 W |
| <b>Lead Entry</b>         | Horizontal                              | Horizontal                             |
| <b>Manual Override</b>    | Non-Lock Push                           | Push & Lock                            |
| <b>Lubrication</b>        | None Required                           | None Required                          |
| <b>Connection</b>         | IP65 Rating                             | IP65 Rating                            |

# Dimensional Data



### 3-Way Manifold

| Stations | 2           | 3         | 4           | 5         | 6           | 7         | 8           | 9          | 10           |
|----------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|------------|--------------|
| L1       | 1.31 (33.5) | 1.73 (44) | 2.14 (54.5) | 2.56 (65) | 2.97 (75.5) | 3.38 (86) | 3.80 (96.5) | 4.21 (107) | 4.62 (117.5) |
| L2       | 1.08 (27.5) | 1.50 (38) | 1.91 (48.5) | 2.32 (59) | 2.74 (69.5) | 3.15 (80) | 3.56 (90.5) | 3.98 (101) | 4.39 (111.5) |

### 4-Way Manifold

| Stations | 2           | 4           | 6           | 8            | 10           |
|----------|-------------|-------------|-------------|--------------|--------------|
| L1       | 1.51 (38.5) | 2.34 (59.5) | 3.17 (80.5) | 4.00 (101.5) | 4.82 (122.5) |
| L2       | 1.20 (30.5) | 2.03 (51.5) | 2.85 (72.5) | 3.68 (93.5)  | 4.50 (114.5) |

## Features

At Last. A Miniature Valve with Maximum Range.

### Body-Ported:

- 2-position single and double solenoid models.
- Two wiring options: Lead Wire and Plug-In.
- Available in 120V AC, 24V DC or 12V DC.
- Body-Ported valves can be mounted on low profile manifold to simplify installation when using multiple valves.

### Base Mounted:

- 2-position single and double solenoid models.
- Standard 2-, 4-, 6-, 8-, 10-, 12- and 16 stations.
- Stand-alone subbase (for 1-station) with M5 (10-32) or 1/8" NPT(F) ports.
- Two wiring options: Lead Wire and Plug-In and three voltage options 120V AC, 24V DC or 12V DC.

### One-Touch Manual Valve Override (Standard)

Mechanical valve override is nonlocking spring return push with tool.

### Wiring and Voltage Options

Lead-Wire Style: Valve lead wires come stripped and preattached to the coil (NEMA 4). All models are available in either 120V AC, 24V DC. 12V DC Available on plug in only.

### Manifold Options

Manifolds are available in 2, 4, 6, 8, 10, 12 and 16-station configurations. Sierra manifolds are available with 1/8" NPT(F) ports. Sierra Valves and Manifolds are sold separately.

Stand-alone sub-bases available in M5 (10-32) or 1/8" NPT, for use with manifold mount valves only.

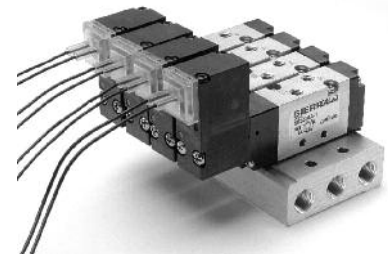
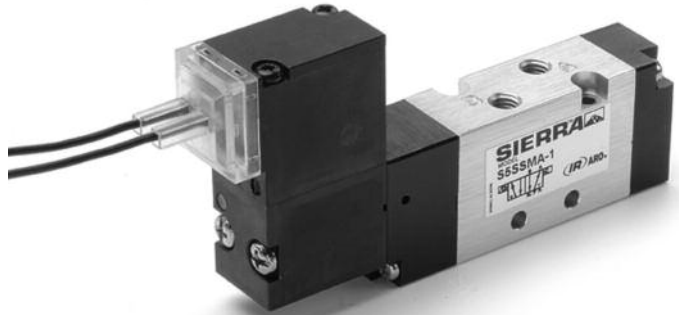
Superior flow capacity, an unrivaled array of “real-world” design features and options, a valve body that is both ultra-compact and lightweight—yet exceptionally durable—this is Sierra 15, the miniature valve with the maximum range.

### Ultra-Compact Valve Design

At only 15 mm wide, Sierra 15 is the one compact valve that’s going to fit your valve location requirements – with room to spare.

### Durable Body Construction

Sierra’s body features bar stock aluminum construction, producing a light weight, yet durable valve.

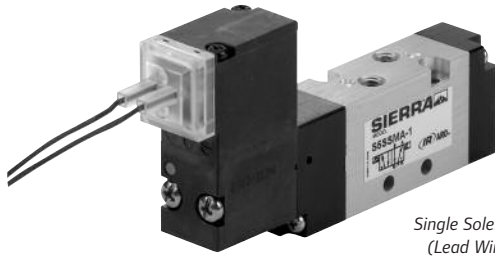


Sierra Valves on SML51N-02 Low Profile Manifold

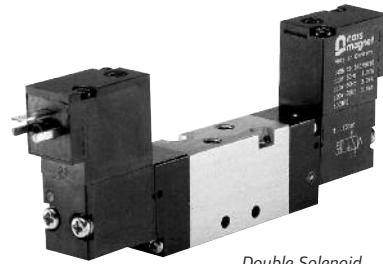
## Performance Specifications

|                             |  |
|-----------------------------|--|
| <b>Pressure Range:</b>      | 22 to 115 PSI (0.8 M pa)                                       |
| <b>Shift Pressures:</b>     | 22 PSI Single or Double-Solenoid                               |
| <b>Flow:</b>                | 9 SCFM, .25 Cv   |
| <b>Operating Medium:</b>    | Compressed Air   |
| <b>Lubrication:</b>         | None Required  |
| <b>Cycle Rate:</b>          | 120 Cycles Per Minute  |
| <b>Temperature Rating:</b>  | 0° to 122°F (-17° to 50°C)                                     |
| <b>Signal Response Time</b> | 14 ms  |
| <b>Rated Voltage:</b>       | 120V AC, 24V DC and 12V DC                                     |
| <b>Current Ratings:</b>     | 120V AC = 16 mA in-rush; 11 mA holding 12V DC & 24V DC = 67 mA |
| <b>Power Consumption:</b>   | 2.1/1.8 VA      1.9 W  |





Single Solenoid  
(Lead Wire)

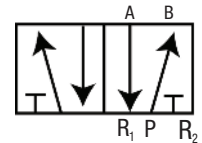


Double Solenoid  
(Plug-In Model)

## Ordering

|                          |                                |           |
|--------------------------|--------------------------------|-----------|
| <b>Sierra Valve Size</b> |                                | <b>S5</b> |
| <b>Code</b>              | <b>Description</b>             |           |
| S5                       | 15 mm                          |           |
| <b>Number of Coils</b>   |                                | <b>X</b>  |
| <b>Code</b>              | <b>Description</b>             |           |
| S                        | Single Solenoid, Spring Return |           |
| D                        | Double Solenoid                |           |
| <b>Valve Style</b>       |                                | <b>S</b>  |
| <b>Code</b>              | <b>Description</b>             |           |
| S                        | Standard Solenoid Operator     |           |

|                            |                    |              |
|----------------------------|--------------------|--------------|
| <b>Coil Style/ Voltage</b> |                    | <b>X - 1</b> |
| <b>Code</b>                | <b>Description</b> |              |
| A                          | Lead Wire, 120V AC |              |
| B                          | Lead Wire, 24V DC  |              |
| C                          | Plug-In, 120V AC   |              |
| D                          | Plug-In, 24V DC    |              |
| F                          | Plug-In, 12V DC    |              |
| A, B                       | NEMA 4 Rating      |              |
| C, D & F                   | NEMA 2 Rating      |              |



|                   |                    |          |
|-------------------|--------------------|----------|
| <b>Body Style</b> |                    | <b>M</b> |
| <b>Code</b>       | <b>Description</b> |          |
| M                 | M5 (10-32)         |          |

### Low Profile Manifold

|                         |               |
|-------------------------|---------------|
| <b>Sierra Manifold:</b> | <b>SML51N</b> |
|-------------------------|---------------|

15mm valve low profile manifold with 1/8" Supply and Exhaust Ports

|                           |           |
|---------------------------|-----------|
| <b>Number of Stations</b> | <b>XX</b> |
|---------------------------|-----------|

|             |                    |
|-------------|--------------------|
| <b>Code</b> | <b>Description</b> |
| 02          | 2 Stations         |
| 04          | 4 Stations         |
| 06          | 6 Stations         |
| 08          | 8 Stations         |

**NOTE:** Low Profile Manifolds are for use with Body Ported Valves only. One gasket and two screws are provided per station.

### Replacement Coils

| Part Number | Description     | Part Number | Description       |
|-------------|-----------------|-------------|-------------------|
| 119892-33   | 120 VAC Plug-In | 119893-33   | 120 VAC Lead Wire |
| 119892-39   | 24 VDC Plug-In  | 119893-39   | 24 VDC Lead Wire  |
| 119892-38   | 12 VDC Plug-In  |             |                   |



Single Solenoid  
(Plug-In Model)

## Ordering

### Base-Mounted Valves

**S5 X X 9 X - 1**

| Sierra Valve Size |             |
|-------------------|-------------|
| Code              | Description |
| 5                 | 15 mm       |

| Number of Coils |                                |
|-----------------|--------------------------------|
| Code            | Description                    |
| S               | Single Solenoid, Spring Return |
| D               | Double Solenoid                |

| Valve Style |                            |
|-------------|----------------------------|
| Code        | Description                |
| S           | Standard Solenoid Operator |

| Body Style |              |
|------------|--------------|
| Code       | Description  |
| 9          | Base Mounted |

| Coil Style/ Voltage |                    |
|---------------------|--------------------|
| Code                | Description        |
| A                   | Lead Wire, 120V AC |
| B                   | Lead Wire, 24V DC  |
| C                   | Plug-In, 120V AC   |
| D                   | Plug-In, 24V DC    |
| F                   | Plug-In, 12V DC    |

A, B NEMA 4 Rating  
C, D & F NEMA 2 Rating

When raceway option is used, requires a 119354 Single Solenoid or 119355 Double

### Subbase

**11936 X**

| Port Size |                             |
|-----------|-----------------------------|
| Code      | Description                 |
| 7         | M5 Subbase (10/32" threads) |
| 8         | 1/8" Subbase                |



Sierra Valve on M5  
Stand-alone Subbase

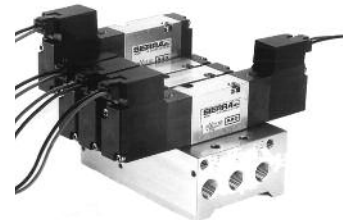
### Manifold

**SMH51 X - XX**

Sierra Manifold:  
15mm valve with 1/8" Ports

| Wiring Configuration |                 |
|----------------------|-----------------|
| Code                 | Description     |
| N                    | Normal Manifold |

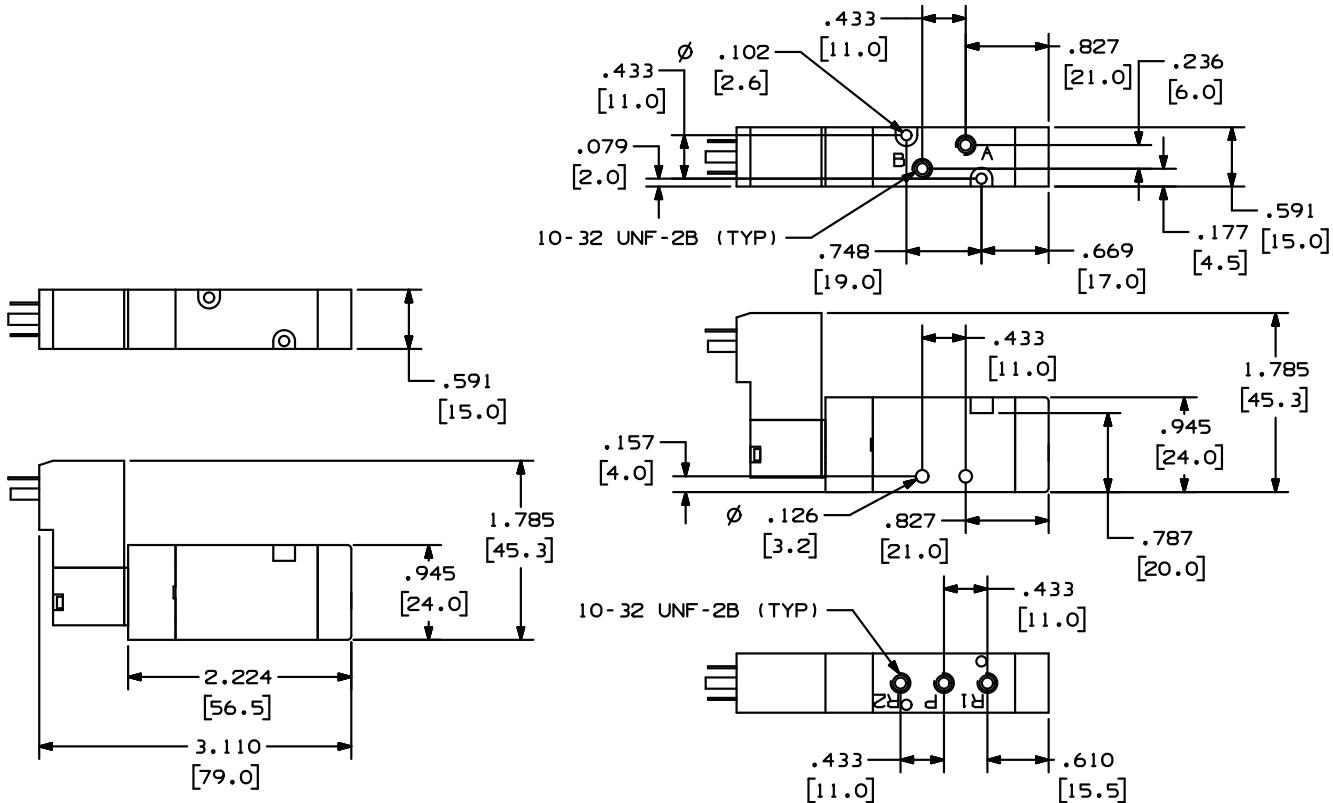
| Number of Stations |             |      |             |
|--------------------|-------------|------|-------------|
| Code               | Description | Code | Description |
| 02                 | 2 Stations  | 10   | 10 Stations |
| 04                 | 4 Stations  | 12   | 12 Stations |
| 06                 | 6 Stations  | 16   | 16 Stations |
| 08                 | 8 Stations  |      |             |



Manifold Close-Up

### Replacement Coils

| Part Number | Description     | Part Number | Description       |
|-------------|-----------------|-------------|-------------------|
| 119892-33   | 120 VAC Plug-In | 119893-33   | 120 VAC Lead Wire |
| 119892-39   | 24 VDC Plug-In  | 119893-39   | 24 VDC Lead Wire  |
| 119892-38   | 12 VDC Plug-In  |             |                   |

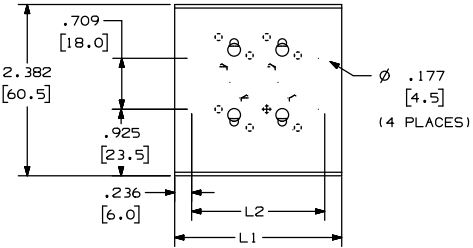


S5SS9X-1

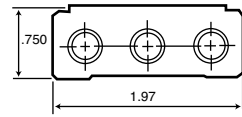
S5SSMX-1



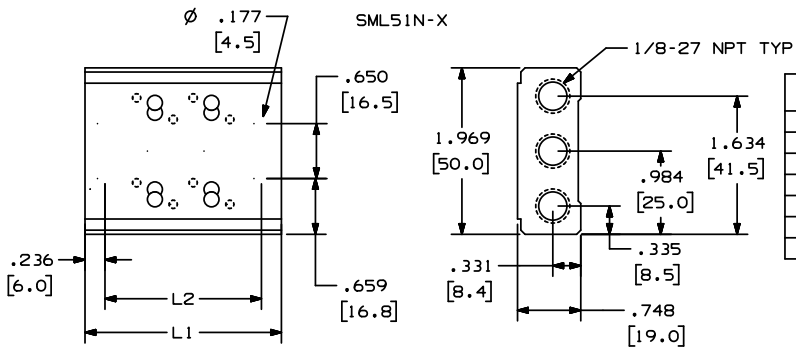
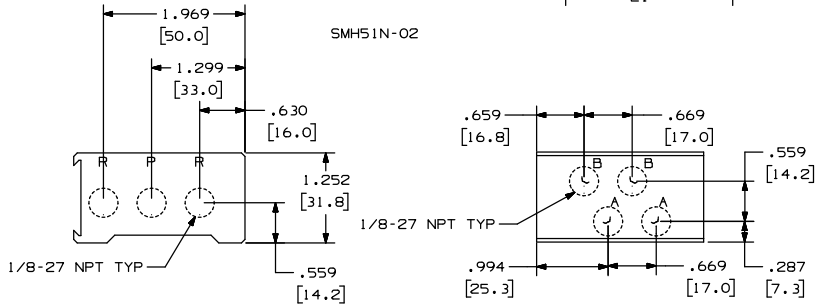
| NUMBER OF STATIONS | L1             | L2             |
|--------------------|----------------|----------------|
| 2                  | 2.323 (59.0)   | 1.850 (47.0)   |
| 4                  | 3.661 (93.0)   | 3.189 (81.0)   |
| 6                  | 5.000 (127.0)  | 4.528 (115.0)  |
| 8                  | 6.339 (161.0)  | 5.866 (149.0)  |
| 10                 | 7.677 (195.0)  | 7.205 (183.0)  |
| 12                 | 9.016 (229.0)  | 8.543 (217.0)  |
| 16                 | 11.693 (297.0) | 11.220 (285.0) |



**Standard Manifold Dimensions**



| No. of Stations | "A"          |
|-----------------|--------------|
| 2               | 2.323 (59)   |
| 4               | 3.661 (91)   |
| 6               | 5.000 (127)  |
| 8               | 6.339 (161)  |
| 10              | 7.678 (195)  |
| 12              | 9.017 (229)  |
| 14              | 10.356 (263) |
| 16              | 11.695 (297) |



| NUMBER OF STATIONS | L1             | L2             |
|--------------------|----------------|----------------|
| 2                  | 2.323 (59.0)   | 1.850 (47.0)   |
| 4                  | 3.661 (93.0)   | 3.189 (81.0)   |
| 6                  | 5.000 (127.0)  | 4.528 (115.0)  |
| 8                  | 6.339 (161.0)  | 5.866 (149.0)  |
| 10                 | 7.677 (195.0)  | 7.205 (183.0)  |
| 12                 | 9.016 (229.0)  | 8.543 (217.0)  |
| 16                 | 11.693 (297.0) | 11.220 (285.0) |

**Additional Valve Accessories**

**119351 Blanking Plate**

Gasketed metallic plate installs in minutes and caps off unused manifold ports. Order one plate per valve station.

**119375 Replacement Gasket/Fastener**

Kit contains Valve Gasket, Block Gasket, Valve-to-Manifold Screw, Replacement Shut-Off Block to Manifold Screw, Replacement Raceway Screw and Replacement Manifold Blanking Plate.

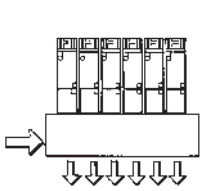
**119376 Pipe Plug Kit**

Contains 3 (ea.) 1/8" pipe plugs.

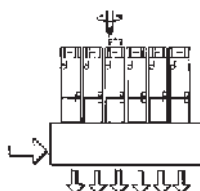
**Ordering**

**119350 "Sandwich" Shut Off Block**

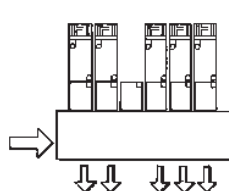
Allows a specific manifold valve to be removed without shutting down pressure to rest of the manifold.



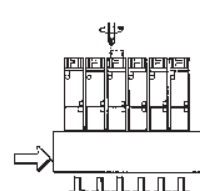
One Solenoid Valve needs to be replaced during set-up.



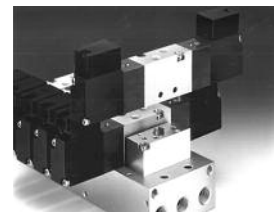
Loosen the valve's retaining screws and lift off valve.



Removing the valve automatically causes the Shut-Off Block to close the valve ports leading to the manifold.



Replacing the valve automatically reopens the ports and reenergizes the new valve.



119350 "Sandwich" Shut-off Block for Manifold Valves

**IMPORTANT:** The Shut-off Block option is intended for machine setup convenience only. When performing routine maintenance on machinery, always observe proper lock-out/ tag-out procedures.



## Features

### Sierra® 18 (1/8" Ports) 4-Way, Compact Air Valves

### 18mm Wide Body and 1/8" Ports Fill The Bill Between Mini and Medium Flow Valves

Larger than its 15mm Sierra® counterpart yet smaller than the Alpha® valve, the Sierra 18 is the perfect fit for valve applications that require a compact, 4-way valve with plenty of options and features. The new Sierra 18 valves are equally ideal where fast signal response (18ms avg.) with moderate flow (.5 Cv,

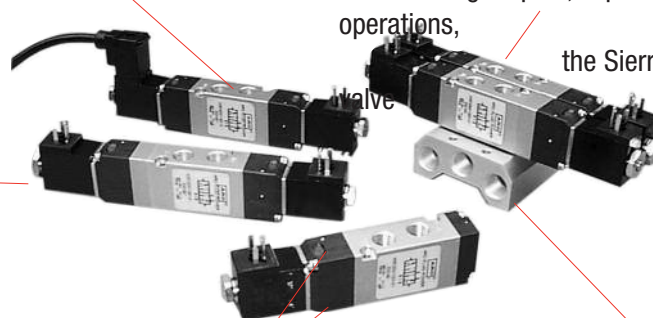
#### 3-Position Spool Function Provides Wider Application Flexibility:

Sierra 18 offers three distinct, 3-position spool configurations for a wide variety of applications:

- All ports blocked in center
- Cylinder ports open to exhaust in center, supply blocked
- Cylinder ports pressurized in center, exhaust ports blocked

#### Solenoid Coils and Connectors Provide Quick, Clean Connections:

Coils are Class F rated for 100% duty cycle applications at 122° F ( 50° C) . AC or DC coils can be interchanged on the same solenoid stem. Each Solenoid connector acts as its own junction box, with molded connectors and gaskets to protect electrical connections. Design meets NEMA-4 classifications.



#### 2 Styles Available: Choose Between Body-Threaded or Manifold - Mounted:

The Sierra 18 is a body - threaded valve that can be directly plumbed or mounted to a low profile manifold. The Sierra 18 is also available as a true manifold valve. Where there's a need for multiple valves in tight spots, especially in machine design operations,

the Sierra 18 is the compact

#### One - Touch Manual Override (Standard):

Sierra 18 contains a mechanical valve non-locking override.

#### Manifolds Available in 2, 4, 6, 8, 10, and 16-Station Configurations.

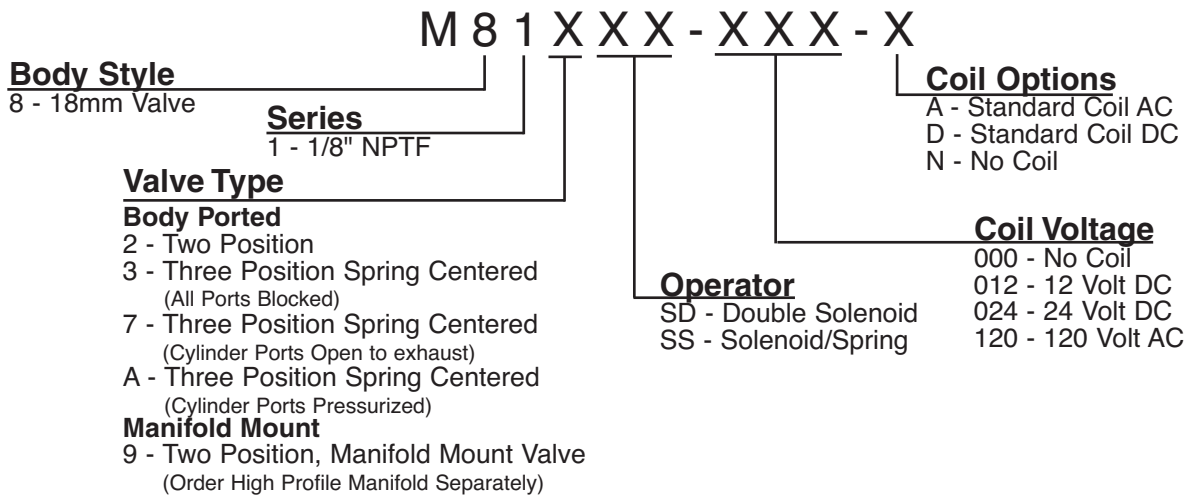


## Performance Specifications

|                              |  |
|------------------------------|--|
| <b>Pressure Range:</b>       | 115 PSI (7.8 bar)  |
| <b>Shift Pressure:</b>       | 22 PSI   |
| <b>Flow:</b>                 | 30 SCFM .7 Cv (2-Position Valves)<br>21 SCFM .5 Cv (3-Position Valves) |
| <b>Operating Medium:</b>     | Compressed Air   |
| <b>Cycle Rate:</b>           | 120 Cycles Per Minute  |
| <b>Temp. Rating:</b>         | 0° to 122° F ( -17° to 50° C)  |
| <b>Lubrication:</b>          | None Required  |
| <b>Signal Response Time:</b> | 17ms (AC), 22s (DC)  |

| <b>Rated Voltage</b> | <b>Power Consumption</b> |                | <b>Current Draw</b> |                |
|----------------------|--------------------------|----------------|---------------------|----------------|
|                      | <b>In-rush</b>           | <b>Holding</b> | <b>In-rush</b>      | <b>Holding</b> |
| 120 VAC              | 3.1 VA                   | 2.2 VA         | 26 mA               | 18 mA          |
| 12 VDC               | 1.9 W                    | 1.9 W          | 154 mA              | 154 mA         |
| 24 VDC               | 2.0 W                    | 2.0 W          | 85 mA               | 85 mA          |

## Ordering



### Low Profile Manifold & Blanking Plate

| <u>Model</u>     | <u>Description</u>                   |
|------------------|--------------------------------------|
| <b>SML81N-02</b> | 2-Station Manifold                   |
| <b>SML81N-04</b> | 4-Station Manifold                   |
| <b>SML81N-06</b> | 6-Station Manifold                   |
| <b>SML81N-08</b> | 8-Station Manifold                   |
| <b>SML81N-10</b> | 10-Station Manifold                  |
| <b>SML81N-16</b> | 16-Station Manifold                  |
| <b>114155</b>    | Blanking Plate                       |
| <b>114803</b>    | Replacement Gasket/Screw Kit         |
|                  | <i>(One Gasket &amp; Two Screws)</i> |



### Connector & Coil

| <u>Model</u>     | <u>Description</u>   |
|------------------|--|
| <b>CHL6-012</b>  | 12 VDC molded cable connector w/indicator light, 39" leads   |
| <b>CHL6-024</b>  | 24 VDC molded cable connector w/ indicator light, 39" leads  |
| <b>CHL6-120</b>  | 120 VAC molded cable connector w/ indicator light, 39" leads |
| <b>CHW6</b>      | 16 mm molded cable connector, 39" leads                      |
| <b>CSL6-012</b>  | 12 VDC strain relief connector w/ indicator light            |
| <b>CSL6-024</b>  | 24 VDC strain relief connector, w/ indicator light           |
| <b>CSL6-120</b>  | 120 VAC strain relief connector, w/ indicator light          |
| <b>CSN6</b>      | 16 mm, strain relief connector                               |
| <b>114153-33</b> | 120 VAC, lead wire coil                                      |
| <b>114153-38</b> | 12 VDC, lead wire coil                                       |
| <b>114153-39</b> | 24 VDC, lead wire coil                                       |
| <b>114138-33</b> | 120 VAC, standard coil                                       |
| <b>114138-38</b> | 12 VDC, standard coil  |
| <b>114138-39</b> | 24 VDC, standard coil  |

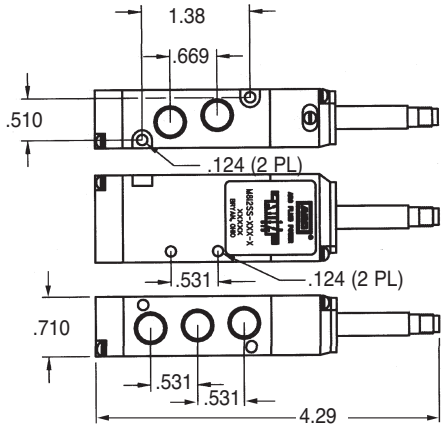


### High Profile Manifold & Blanking Plate

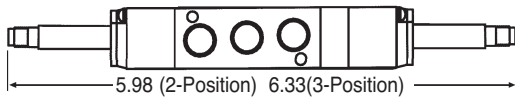
| <u>Model</u>     | <u>Description</u>  |
|------------------|---------------------|
| <b>SMH81N-02</b> | 2-Station Manifold  |
| <b>SMH81N-04</b> | 4-Station Manifold  |
| <b>SMH81N-06</b> | 6-Station Manifold  |
| <b>SMH81N-08</b> | 8-Station Manifold  |
| <b>SMH81N-10</b> | 10-Station Manifold |
| <b>114808</b>    | Blanking Plate      |



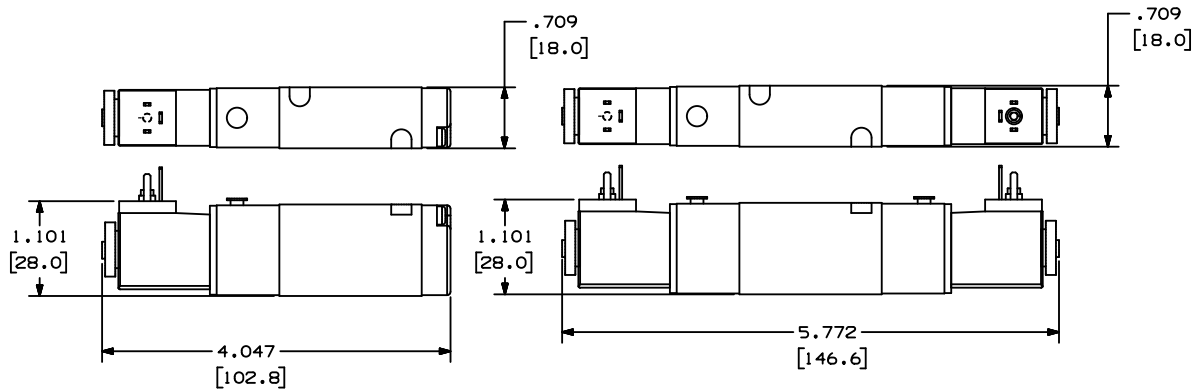
## Dimensional Data



M812SS-XXX-X

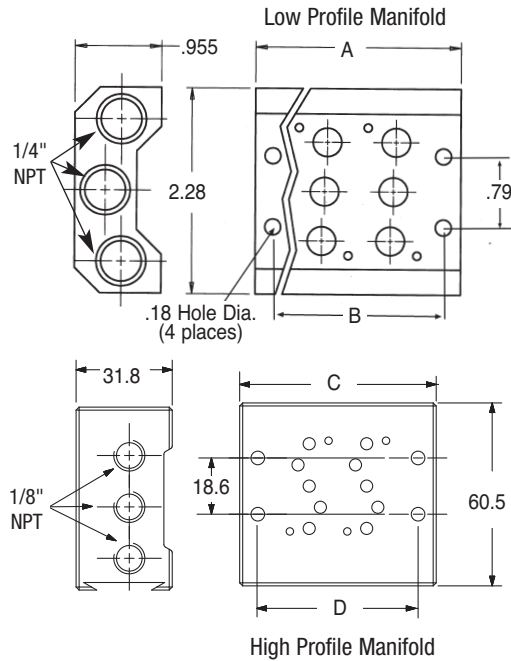


M812SD-XXX-X  
M813SD-XXX-X




M819SS-XXX-X

M819SD-XXX-X








|                   | A    | B    |
|-------------------|------|------|
| <b>2-Station</b>  | 2.24 | 1.85 |
| <b>4-Station</b>  | 3.74 | 3.35 |
| <b>6-Station</b>  | 5.24 | 4.84 |
| <b>8-Station</b>  | 6.73 | 6.34 |
| <b>10-Station</b> | 8.23 | 7.84 |

|                   | C    | D    |
|-------------------|------|------|
| <b>2-Station</b>  | 2.56 | 2.09 |
| <b>4-Station</b>  | 4.06 | 3.59 |
| <b>6-Station</b>  | 5.56 | 5.08 |
| <b>8-Station</b>  | 7.05 | 6.58 |
| <b>10-Station</b> | 8.55 | 8.08 |


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# ARO

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**FLUID TECHNOLOGIES**

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## Features

### 3-Way and 4-Way Air Solenoid & Pilot Valves 1/4", 3/8" & 1/2" NPT Ports

- Ideal for packaging, material handling and air motor applications
- Ideal for double acting pneumatic cylinders
- Compact size with excellent flow capacity
- Single and double solenoid or pilot models
- Three voltages available 120 VAC, 12 and 24 VDC
- Lightweight aluminum bodies and Buna-N seals are standard
- Manifold mounting available, blanking plates provided for future expansion
- Max/Air valves use Alpha style 22mm coil
- 1/4" = 26 mm Body Size
- 3/8" = 30 mm Body Size
- 1/2" = 34 mm Body Size

### 3-Position Spool Function Provides Wider Application Flexibility:

MaxAir offers 3-position spool configuration with all ports blocked in center.



### Solenoid Coils and Connectors Provide Quick, Clean Connections:

Coils are Class F rated for 100% duty cycle applications at 122° F ( 50° C). AC or DC coils can be interchanged on the same solenoid stem. Each Solenoid connector acts as its own junction box, with molded connectors and gaskets to protect electrical connections. Design meets NEMA-4 specifications.



### One - Touch Manual Override (Standard):

MaxAir contains a mechanical valve override that can be adjusted to a locking (push 'n twist) position or non-locking function.

### Valves are Body-Threaded and can be Manifold - Mounted:

MaxAir is a body - threaded valve that can be directly plumbed or manifold - mounted. Where there's a need for multiple valves in tight spots, especially in machine design operations. Manifolds Available in 2, 4, 6, 8, 10, and 12 Station Configurations.

## Ordering

|   |          |                     |                  |          |                           |            |          |                     |          |                     |
|---|----------|---------------------|------------------|----------|---------------------------|------------|----------|---------------------|----------|---------------------|
| <b>M</b>  | <b>-</b> | <b>2</b>            | <b>1</b>         | <b>2</b> | <b>-</b>                  | <b>SS*</b> | <b>-</b> | <b>120</b>          | <b>-</b> | <b>A</b>            |
| <b>Valve Type*</b>                                  |          | <b>Body Style</b>   | <b>Port Size</b> |          | <b>Actuator/Return</b>    |            |          | <b>Coil Voltage</b> |          | <b>Coil Options</b> |
| 2=2 Position  |          | 1=4 Way Side Ported | 2=1/4" NPT       |          | SS=Single Solenoid/Spring |            |          | 000=No Coil         |          | N=No Coil           |
| 3=3 Position  |          | 5=3 Way Side Ported | 3=3/8" NPT       |          | SD=Double Solenoid        |            |          | 012=12 VDC          |          | A=AC                |
| All Ports Blocked                                   |          |                     | 4=1/2" NPT       |          | PS=Pilot / Spring*        |            |          | 024=24VDC           |          | D=DC                |
| Spring Centered (Sol. & Pilot Only)                 |          |                     |                  |          | PD=Pilot / Double*        |            |          | 120=120VAC          |          |                     |
| * Model number ends here on pilot activated valves. |          |                     |                  |          |                           |            |          |                     |          |                     |

## Performance Specifications

|   |                                   |                            |  |
|---|-----------------------------------|----------------------------|--|
| <b>C<sub>v</sub> (Solenoid) (Pilot)</b> | 1/4 = .70, 3/8 = 1.65, 1/2 = 4.32 | <b>Temp. Range</b>         | 15° to 122° F (-10° to 50° C)                                      |
| <b>SCFM</b>                             | 1/4"= 26, 3/8"=61, 1/2"=150       | <b>Minimum Shift Pres.</b> | 2 position single pilot, single solenoid, spring return - 45 PSI   |
| <b>Port Size NPT</b>                    | 1/4", 3/8", 1/2"                  |                            | 2 position double pilot - 45 PSI                                   |
| <b>Operating Medium</b>                 | Non-Lubricated or Lubricated Air  |                            | 2 position double solenoid-20 PSI                                  |
| <b>Pres. Range (Solenoid)</b>           | 45 - 115 PSI                      |                            | 3 position double solenoid, double pilot, spring centered - 45 PSI |
| <b>Pres. Range (Pilot)</b>              | 45 - 140 PSI                      |                            |  |
| <b>Duty Cycle</b>                       | 100%                              |                            |  |



# Ordering

## Manifold






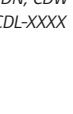


| No. of Stations | 1/4" NPT Ports | 3/8" NPT Ports | 1/2" NPT Ports |
|-----------------|----------------|----------------|----------------|
| 2               | M26M02-02      | M30M03-02      | M34M04-02      |
| 4               | M26M02-04      | M30M03-04      | M34M04-04      |
| 6               | M26M02-06      | M30M03-06      | M34M04-06      |
| 8               | M26M02-08      | M30M03-08      | M34M04-08      |
| 10              | M26M02-10      | M30M03-10      | M34M04-10      |



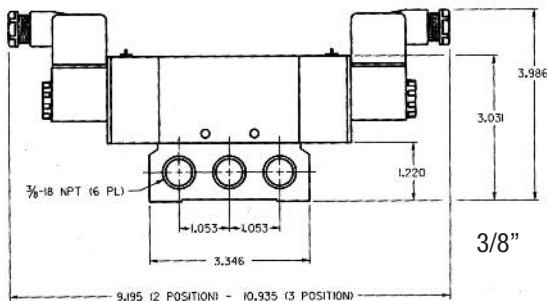
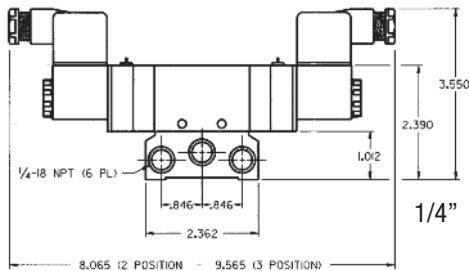
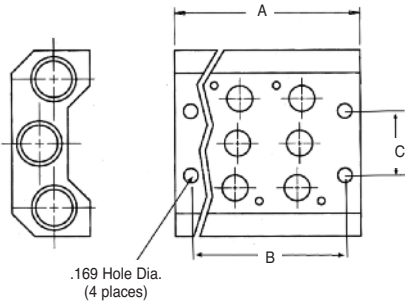
### Manifold Kits

Kits include: manifold, seals and valve attaching hardware

## 22mm Connector

| Model          | Description  |   |
|----------------|--|---|
| <b>CHW</b>     | Straight connector with cable (36") located on top             |    |
| <b>CBW</b>     | Straight connector with cable (36") located on back            |    |
| <b>CHL-XXX</b> | Straight connector (36") with indicator light located on back. |    |
| <b>CSN</b>     | Strain relief, without indicator light or cable.               |    |
| <b>CSL-XXX</b> | Strain relief, with indicator light located on the back.       |   |
| <b>CDN</b>     | 1/2" conduit without light or lead wire                        |  |
| <b>CDW</b>     | 1/2" conduit without light, 18" lead wire                      |  |
| <b>CDL-XXX</b> | 1/2" conduit with light, 18" lead wire                         |  |

## Dimensional Data



### Voltage (-XXX)

012 = 12 VDC/VAC    024 = 24 VDC/VAC    120 = 120 VDC/VAC

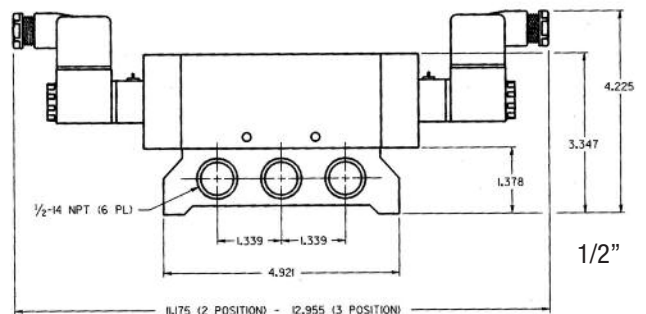
### Blanking Plate Kit

**M26MB** Fits 1/4" (26 mm) manifolds

**M30MB** Fits 3/8" (30 mm) manifolds

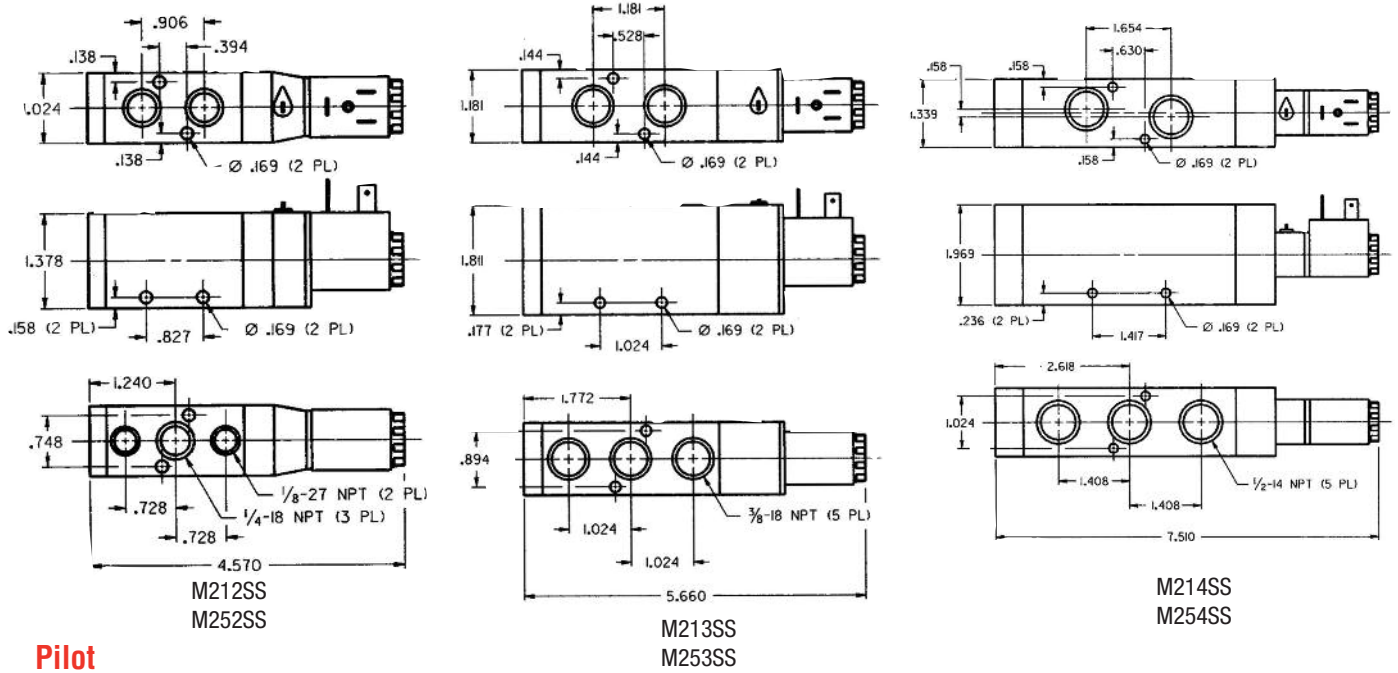
**M34MB** Fits 1/2" (34 mm) manifolds

| Stations | 1/4"   |        |       | 3/8"   |        |       | 1/2"   |        |       |
|----------|--------|--------|-------|--------|--------|-------|--------|--------|-------|
|          | A      | B      | C     | A      | B      | C     | A      | B      | C     |
| 2        | 3.189  | 2.638  | 0.866 | 3.661  | 3.031  | 1.063 | 4.134  | 3.346  | 1.181 |
| 4        | 5.315  | 4.764  | 0.866 | 6.101  | 5.471  | 1.063 | 6.890  | 6.102  | 1.181 |
| 6        | 7.441  | 6.890  | 0.866 | 8.541  | 7.911  | 1.063 | 9.646  | 8.858  | 1.181 |
| 8        | 9.567  | 9.016  | 0.866 | 10.981 | 10.351 | 1.063 | 12.402 | 11.614 | 1.181 |
| 10       | 11.693 | 11.142 | 0.866 | 13.421 | 12.791 | 1.063 | 15.158 | 14.370 | 1.181 |

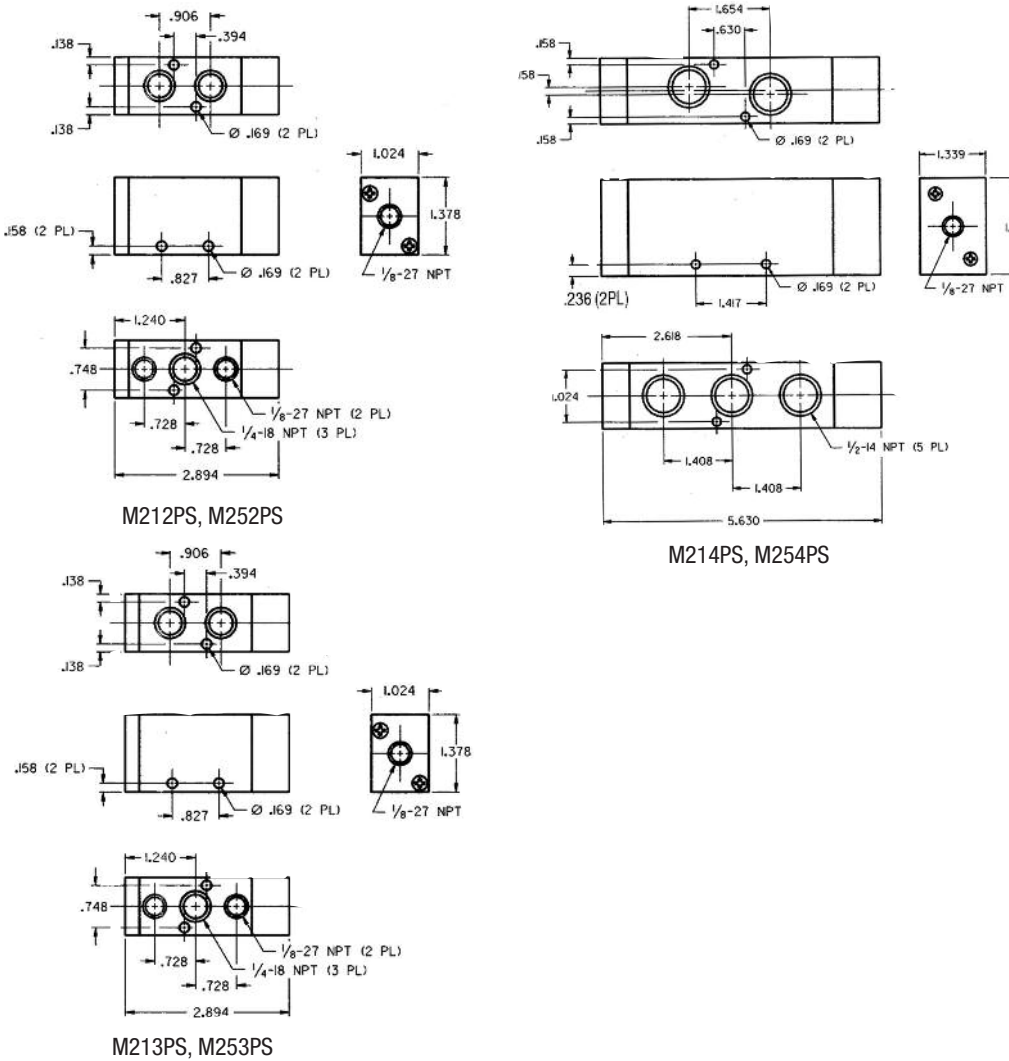


# Dimensional Data

## Solenoid

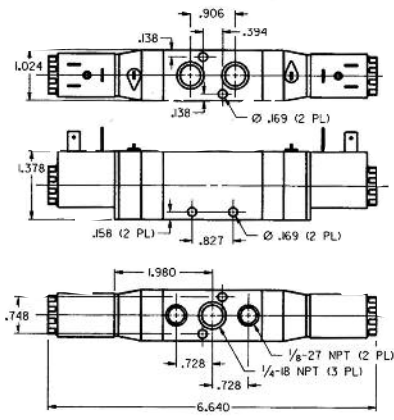


## Pilot

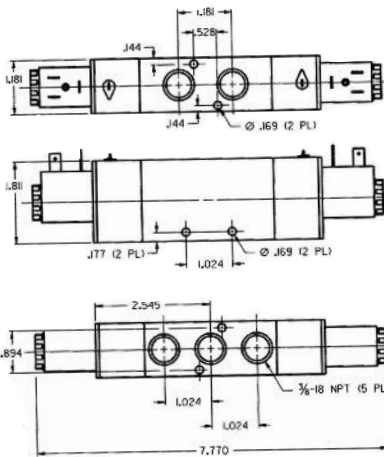


# Dimensional Data

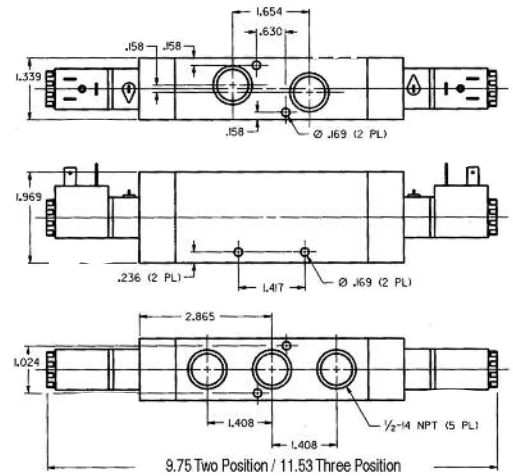
## Solenoid



M212SD  
M312SD

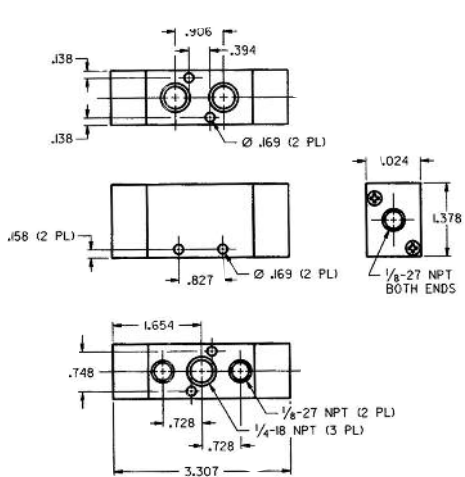


M213SD  
M313SD

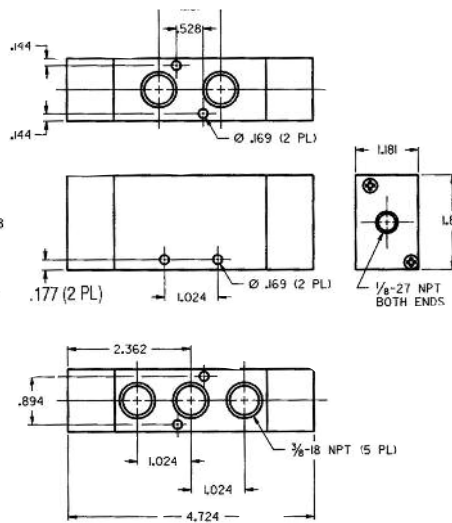


M214SD  
M314SD

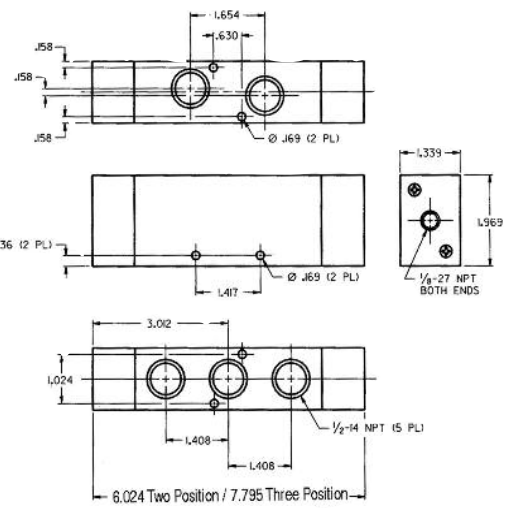
## Pilot



M212PD  
M312PD



M213PD  
M313PD

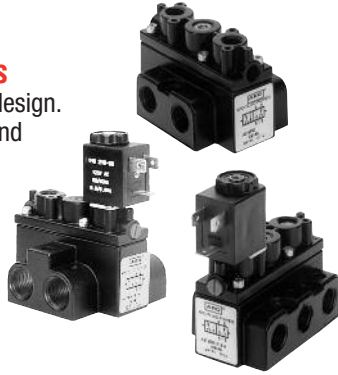


M214PD  
M314PD

## Features

### Body Ported Valves

Compact, space saving design. Perfect for stand alone and remote valve applications. Ports have ISO identification. Sizes include 1/8", 1/4" and 3/8" NPT.



### Subbase Valves

Replace valves easily! Simply remove three screws, lift off valve and replace. Math made simple! Add or subtract manifolds by removing an end plate and changing the valve stack as needed. No tie rods to make changing manifold lengths difficult. Port sizes of 1/8", 1/4", 3/8" and 1/2" with ISO port identifications. Subbase Valves use the same electrical coils and connectors as the ALPHA Body Ported Valve. Both End Plates can be used for common supplies and exhaust in high flow applications.



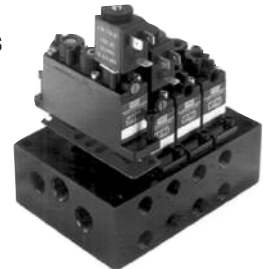
### Stacking Valves

The lowest cost method of ganging valves, because it eliminates the manifold. Flip out design. Loosen the end plate cap screws to swing the valve up and out. No need to disassemble entire stack to replace one valve. Bodies stack on 1" centers. Circuits can be designed and mounted in a compact area. When stacked, ALPHA becomes a 4-way, 4-ported valve. 3/8" common end plate ports with 1/8" or 1/4" working ports in the valve body.



### "Thin" Manifold Valves

Thin, 1" width means more valves in less space. Faster assembly than stacking style valves. 2, 4, 6, 8, and 10 station manifolds are available. Use optional blanking plates for odd-numbered stations. 1/4" (NPT) models, with 3/8" supply or exhaust ports. Speed controls install directly into manifold, cutting set-up time.



### Versatile Design

- Available in Body Ported, Subbase, Stacking and "Thin" configurations.
- Alpha can be ordered as a two-position or three-position valve.
- 5-Year Warranty.
- Valve Body, End Plate and- Manifold material is zinc.

### Superb Performance

- ALPHA's bonded, precision ground spool resists wear & provides excellent shift response.
- Large air passages result in high flow characteristics. Listings detail Cv factor and maximum flow rates.

### Numerous Control Options

- Control the valve one of five ways: Solenoid/Spring, Solenoid/Solenoid, Solenoid/Pilot, Pilot/Spring or Pilot/Pilot.
- External solenoid supply allows operation for vacuum service and low pressure applications. (Use kit No. 119306)
- Coils are UL and CSA Listed (Files: UL #MH13513; CSA #LR51090).

## Performance Specifications

|                              |  |
|------------------------------|--|
| <b>Pressure Range:</b>       | Vacuum to 150 psi (10.2 bar)   |
| <b>Operating Medium:</b>     | Compressed Air or inert gas  |
| <b>Lubrication:</b>          | None Required  |
| <b>Filtration:</b>           | 40 Micron recommended  |
| <b>Cycle Rate:</b>           | 600 Cycles Per Minute  |
| <b>Temperature Rating:</b>   | 0° to 180°F (-17° to 82°C)   |
| <b>Shift Pressures:</b>      | 50 psi (3.4 bar) 2-Position Single Solenoid or Single Pilot, Spring Return.<br>20 psi (1.4 bar) 2-position double pilot or double solenoid.<br>60 psi (4.0 bar) 3-Position Double Solenoid or Double Pilot, Spring Centered. |
| <b>Signal Response Time:</b> | Double Pilot Actuator: 14 ms<br>Double Solenoid: 20 ms<br>Single Pilot (Pilot On) 19 ms<br>Single Pilot (Pilot Off) 26 ms<br>Single Solenoid (Energized) 22 ms<br>Single Solenoid (De-energized) 27 ms                       |

|                         |  |
|-------------------------|--|
| <b>Flow:</b>            |  |
| <b>Body Ported</b>      | 2-position 1/8" Ports = .9 Cv, 30 SCFM<br>2-position 1/4" Ports = 1.5 Cv, 50 SCFM<br>2-position 3/8" Ports = 1.7 Cv, 61 SCFM<br>3-position 1/8" Ports = .8 Cv, 27 SCFM<br>3-position 1/4" Ports = 1.4 Cv, 45 SCFM<br>3-position 3/8" Ports = 1.7 Cv, 61 SCFM |
| <b>Subbase Valves:</b>  | 1/8" Ports = 1.3Cv, 43 SCFM<br>1/4" Ports = 1.6 Cv, 54 SCFM<br>3/8" Ports = 1.6 Cv, 54 SCFM<br>1/2" Ports = 1.75 Cv, 57 SCFM   |
| <b>Stacking Valves:</b> | 2-position 1/8" Ports = 1.32 Cv, 43 SCFM<br>2-position 1/4" Ports = 1.9 Cv, 63 SCFM<br>3-position 1/8" Ports = 1.2 Cv, 39 SCFM<br>3-position 1/4" Ports = 1.7 Cv, 57 SCFM  |
| <b>"Thin" Valves:</b>   | 1/4" Ports = 1.2 Cv, 39 SCFM   |

# Ordering

**A X X X XX - XXX - X**

**Alpha Series**

**Valve, Spool Type**

| Code | Description  |
|------|--|
| 2    | 2-Position, Urethane   |
| 3    | 3-Position, Urethane   |
| 8    | 3-Position, Viton<br>(3 & 8 are Spring Centered, all ports blocked in neutral. Available only with PD or SD Actuators)                         |
| 4    | 2-Position, Viton  |
| 7    | 3-Position, Urethane   |
| 9    | 3-Position, Viton<br>(7 & 9 are Spring Centered, inlet ports blocked (cylinder ports open) in neutral. Available only with PD or SD Actuators) |

**Valve Body Styles**

| Code | Description   |
|------|---|
| 1    | 4-Way, Body Ported Valves   |
| 2    | 4-Way, Stacking Valves<br>Order <i>End Plates</i> from menu on Page 22.<br>Order <i>Mounting Brackets</i> from Page 22. |
| 3    | 4-Way, Subbase Mounted Valves<br>Order <i>Subbase Manifolds</i> from menu on Page 23.                                   |
| 4    | 4-Way, Alpha Thin Valves<br>Order <i>Alpha Thin Manifolds &amp; Speed Control Kits</i> from menus on Page 23.           |

**Current Type**

| Code | Description   |
|------|---|
| A    | AC  |
| D    | DC  |
| N    | No Coil   |
| *L   | Low Watt<br><small>*(DC Only, 115 PSI Max.)</small> |

**Coil Voltage**

Leave Blank if ordering Pilot Valves

| Code | Description | Code | Description |
|------|-------------|------|-------------|
| 000  | No coil     | 024  | 24V AC/DC   |
| 005  | 5V DC       | 120  | 120V AC     |
| 012  | 12V AC/DC   | 240  | 240V AC     |

**Actuator/Return \***

| Code | Description       |
|------|-------------------|
| *PS  | Pilot/Spring      |
| *PD  | Pilot/Pilot       |
| SS   | Solenoid/Spring   |
| SD   | Solenoid/Solenoid |
| SP   | Solenoid/Pilot    |

\*Numbering ends here if a non-solenoid (PS or PD) valve is being selected.

**Port Size**

| Code | Description   |
|------|---|
| 1    | 1/8" NPTF (#1 & #2 available on <i>Body Ported</i> )          |
| 2    | 1/4" NPTF or on <i>Stacking Valves</i> )                      |
| 3    | 3/8" NPTF (#3 available on <i>Body Ported Valves</i> only)    |
| 9    | NONE (#9 used on <i>Subbase</i> or <i>Alpha Thin Valves</i> ) |

If coil option A, D or L is selected, a coil connector must be ordered. See Pg. 79 for coil & connector information. (Low Watt coils work only on valves with low watt option)

## Ordering Examples

### Body Ported Valve: A212SS-120-A

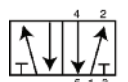
- "2" 2-Position Valve, Urethane Spool
- "1" 4-Way Body Ported Valve
- "2" 1/4" NPTF Ports
- "SS" Actuator-Solenoid, Return-Spring
- "120-A" 120 Volt Coil, AC Current

### "Thin" Valve & Manifold: A449PS

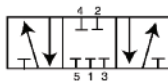
- "4" 2-Position Valve, Viton Spool
- "4" 4-Way Alpha "Thin" Valve
- "9" 9 No NPTF Ports
- "PS" Actuator-Pilot, Return-Spring
- "Thin" Manifold: 118605-4
- "11860X-X" Basic Manifold
- "5" 1/4" NPT Ports
- "-4" 4-Stations

**119306** External Supply Conversion Kit, Page 22. Use when supply pressure is under 50 PSI or vacuum is used.

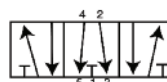
Manifold information on Page 23.



4-Way, 2-Position



4-Way, 3-Position, all ports blocked in neutral



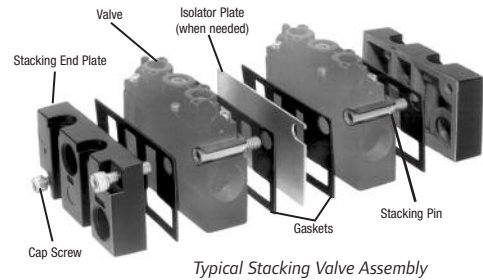
4-Way, 3-Position, cylinder ports open, inlet port blocked



## Accessories for Alpha Stacking Valves

### End Plates and Isolator Plates

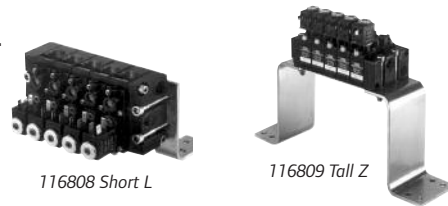
- MKN** One MKN Kit is required to stack 1-to-6 Valves without Isolator Plates. Each contains 2 End Plates, 2 Cap Screws and 1 Gasket.
- MKP** One MKP Kit is required to stack 7-to-12 Valves without Isolator Plates, or 1-to-12 Valves *with* an Isolator Plate. Each contains 2 End Plates, 2 Cap Screws and 1 Gasket.
- PTN** Isolator Plate. Blocks Supply *and* Exhaust Ports. Gasket Included.
- PEN** Isolator Plate. Blocks Exhaust Ports. Gasket Included.
- PPN** Isolator Plate. Blocks Supply Ports. Gasket Included.



### Mounting Brackets

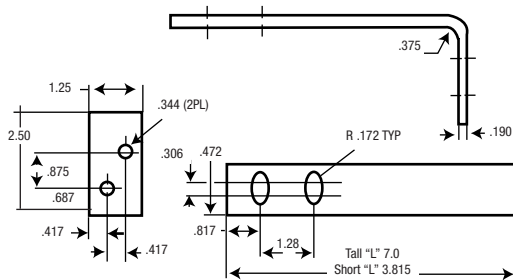
Kits include both Brackets and hardware to mount valve stacks to the brackets.

- 116710** Tie Bold Kit
- 116807** Long L - 7" long
- 116808** Short L - 3.75" long
- 116809** Tall Z - 6" high
- 117987** Short Z - 3" high

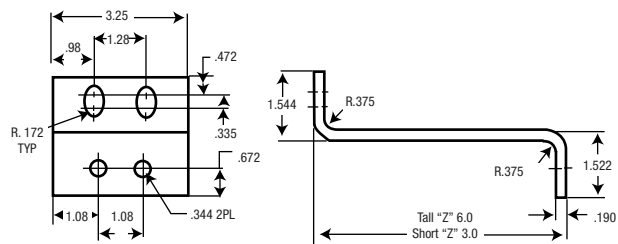


## Dimensional Data

### Mounting Brackets



"L" Brackets #116807 and 116808



"Z" Brackets #116809 and 117987

## Accessories

### Breather Vent, External Supply Plug Kit

**116464 Solenoid Breather Vent** 10-32 Thread Size.

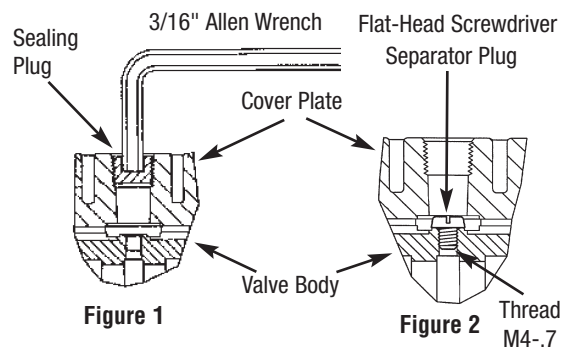
**119306 External Solenoid Supply Plug Kit**

Changes ALPHA valves from internal to external solenoid air source.

Step #1: Remove all air supply sources, remove sealing plug. Figure 1.

Step #2: Install separator plug by threading plug into valve body with a flat-head screwdriver. See Figure 2.

Step #3: Connect the external pilot air supply to the valve with an 1/8" NPT connector.



## Alpha “Thin” Valves

### Alpha Thin Manifolds

#### 11860X - X

##### Port Size

| Code | Description |
|------|-------------|
| 5    | 1/4" NPT    |

##### Number of Stations

| Code | Description |
|------|-------------|
| 2    | 2 Station   |
| 4    | 4 Station   |
| 6    | 6 Station   |
| 8    | 8 Station   |
| 10   | 10 Station  |



11860X-X ALPHA Thin Manifold Stack



118618 Speed Control Kit

### Alpha Thin Speed Controls

Control speed directly from the manifold. Kits allow you to control only the cylinder direction needed.

**119230** Kit controls Port 2 exhausting to Port 3.

**119231** Kit controls Port 4 exhausting to Port 5.

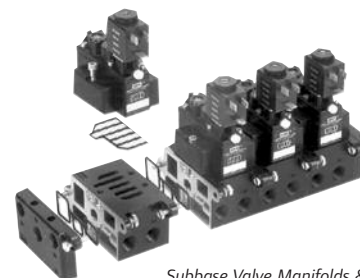
**118618** Includes both 119230 and 119231 control kits.

**118612** Station blanking kit.

## Subbase Valves

### Manifold & End Plate Kits

- Manifold Kits are required when ordering Sub-base valves.
- One End Plate Kit is needed for each valve stack.
- Manifold Kits include the Manifold, one Gasket and two Screws.
- End Plate Kits include two End Plates, one Gasket and two Screws.



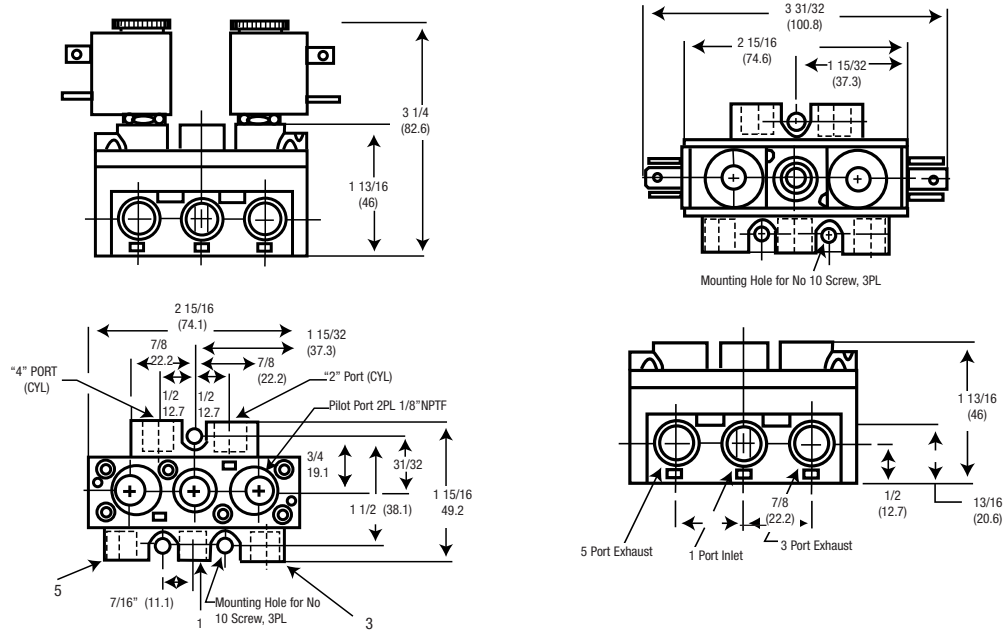
Subbase Valve Manifolds & End Plates

| Port Size | Manifold Kit    | End Plate Kit   |
|-----------|-----------------|-----------------|
| 1/8"      | <b>115422-1</b> | <b>116904-1</b> |
| 1/4"      | <b>115455-1</b> | <b>116916-1</b> |
| 3/8"      | <b>116862-1</b> | <b>116917-1</b> |
| 1/2"      | <b>116899-1</b> | <b>116926-1</b> |

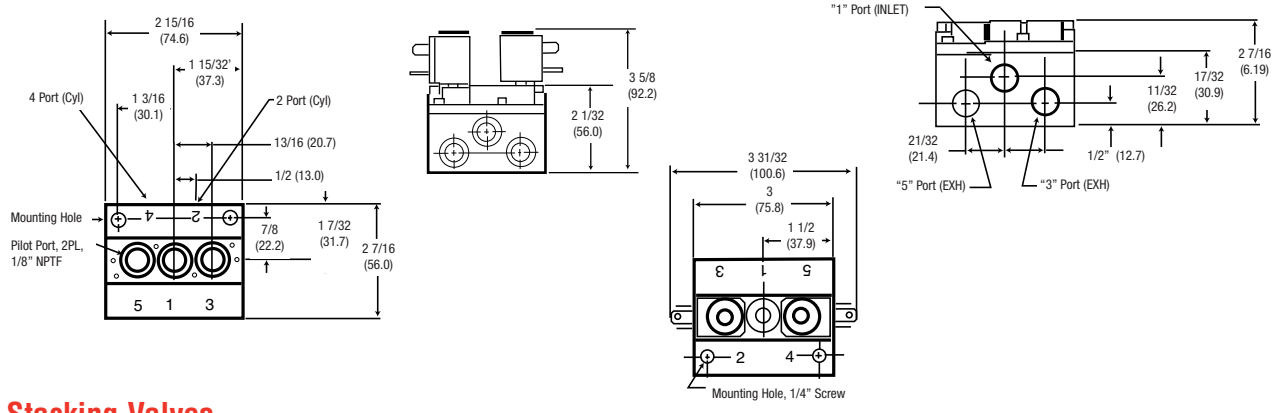
# Dimensional Data

Dimensions given in Inches and (Millimeters)

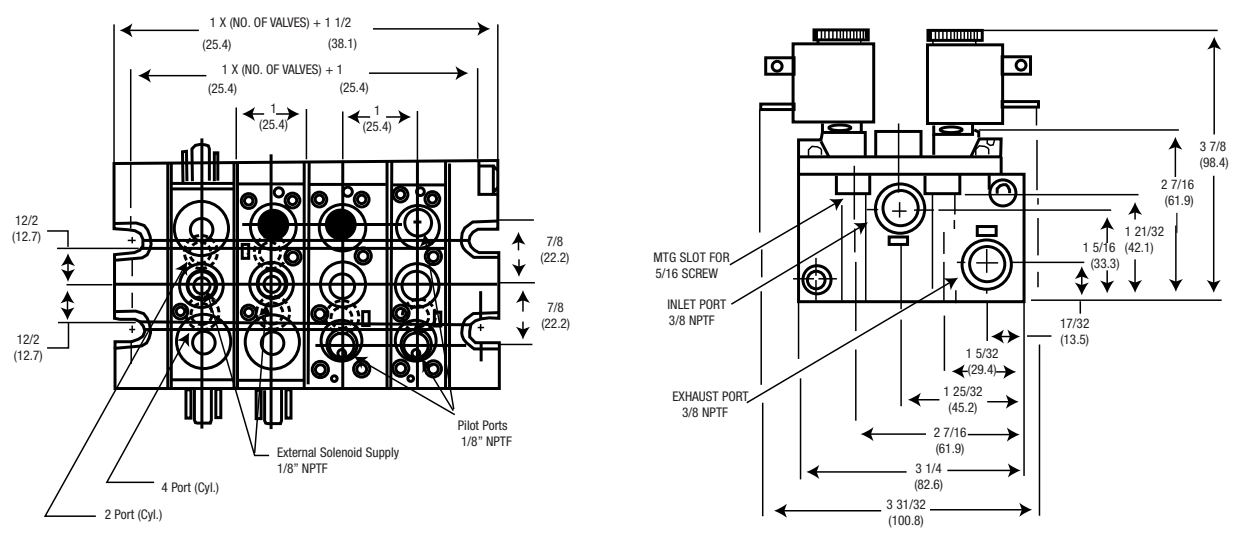
## 1/8" and 1/4" Body Ported Valves



## 3/8" Body Ported Valves



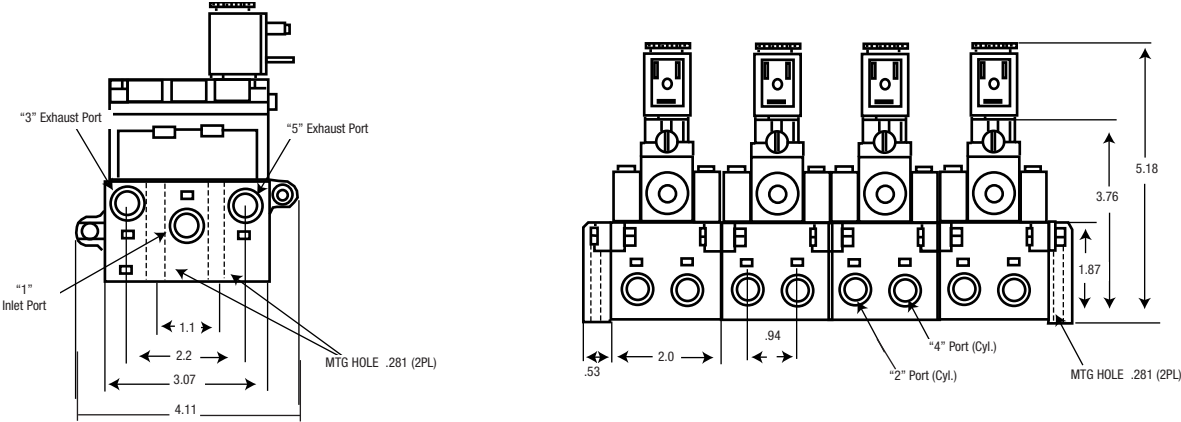
## Stacking Valves



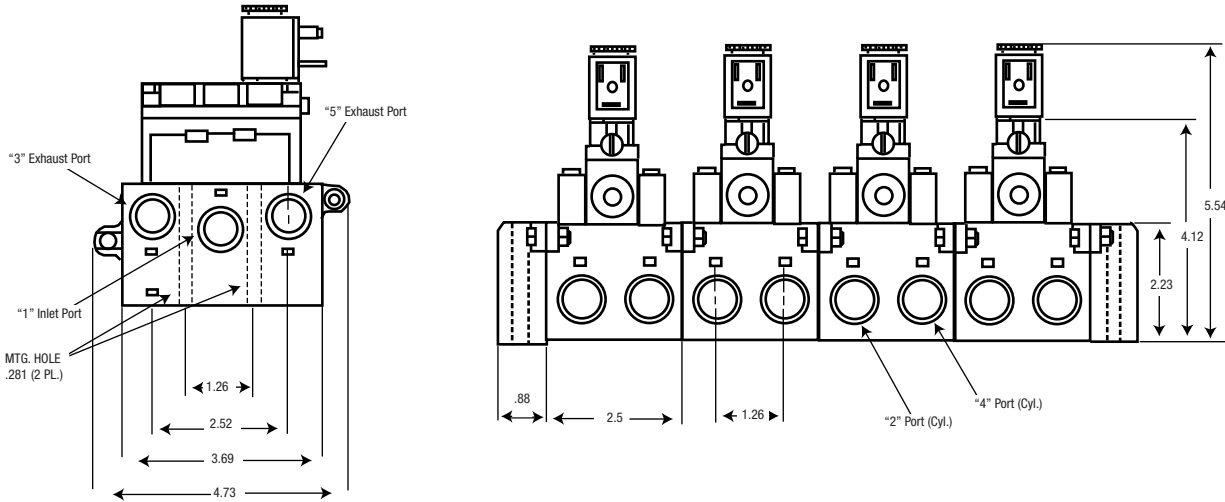
# Dimensional Data

## Subbase Valves with 1/8" or 1/4" Cylinder Ports

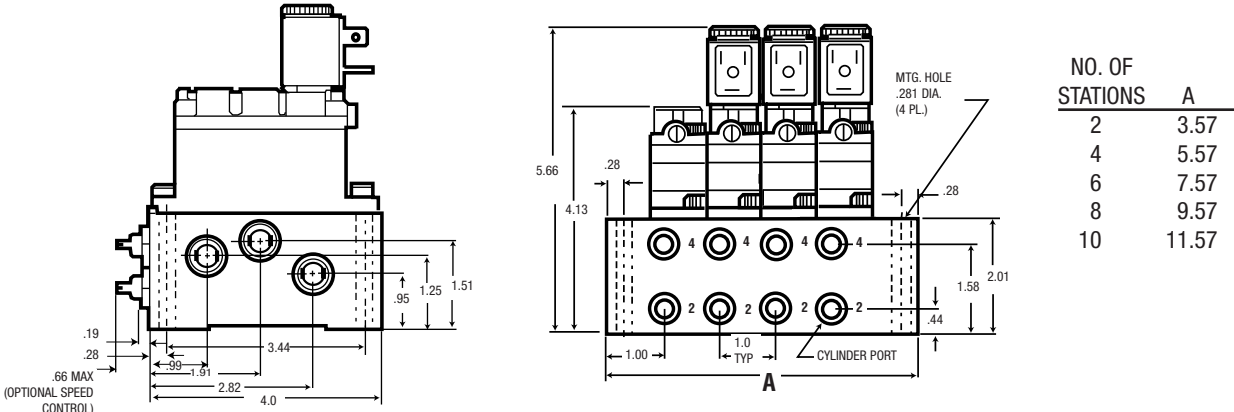
Dimensions given in Inches and (Millimeters)



## Subbase Valves with 3/8" or 1/2" Cylinder Ports

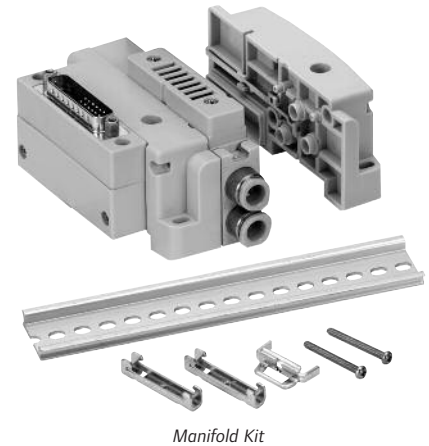
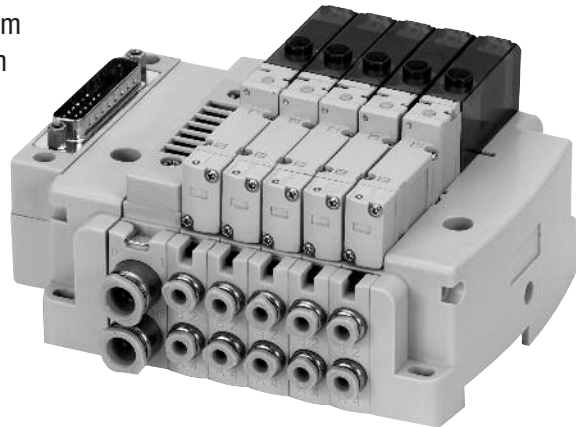


## Thin Manifolds with 3/8" or 1/4" Cylinder Ports



## Features

- Push-In Fitting Standard 5/32" outlet, 1/4" inlet on 10mm
- Push-In Fitting Standard 1/4" outlet, 3/8" inlet on 15mm
- High speed responsiveness and flow
- Less than 12ms response time
- Low power consumption
- Compact and High Flow Rate
- Plug In Valve
  - No wiring needed for installation
- Modular Type Manifold
- Each base is installed individually, so adding or removing another base is simple.
- Wiring Method
  - Usage of D-Sub connector, or Flat Cable connector,
  - Substitute the D-Sub connector and Flat Cable connector with ease
- Safety
  - RoHS, UL, (In process of receiving CE mark.)
- Easy to add SUP/EXH Blocks
  - There is no limit to the addition of SUP/EXH Blocks
  - It can be applied for dual pressure & back pressure applications.

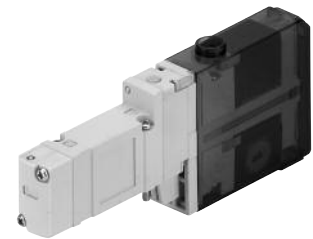
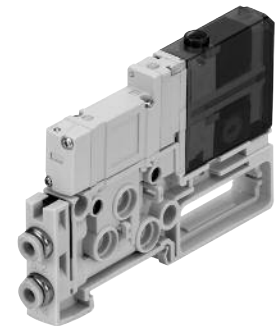


## Performance Specifications

|                            |  |
|----------------------------|--|
| <b>Operating Pressures</b> |  |
| <b>2-Position Single</b>   | 21.8 to 101.5 p.s.i. (1.5 -7.0 bar)  |
| <b>2-Position Double</b>   | 14.5 to 101.5 p.s.i. (1.0 -7.0 bar)  |
| <b>3-Position Double</b>   | 29.0 to 101.5 p.s.i.(2.0 -7.0 bar)   |
| <b>Operating Medium</b>    | Compressed Air only  |
| <b>Temperature</b>         | 23° to 122° F (-5° tp 50° C)   |
| <b>Coil Voltage</b>        | 12, 24 VDC (± 10%)   |
| <b>Power Consumption</b>   | 0.85 Watts   |
| <b>Flow</b>                | 10mm = 0.22 Cv (4.0mm <sup>2</sup> ), 15mm = 0.53 Cv (4.0mm <sup>2</sup> ) |

## Ordering

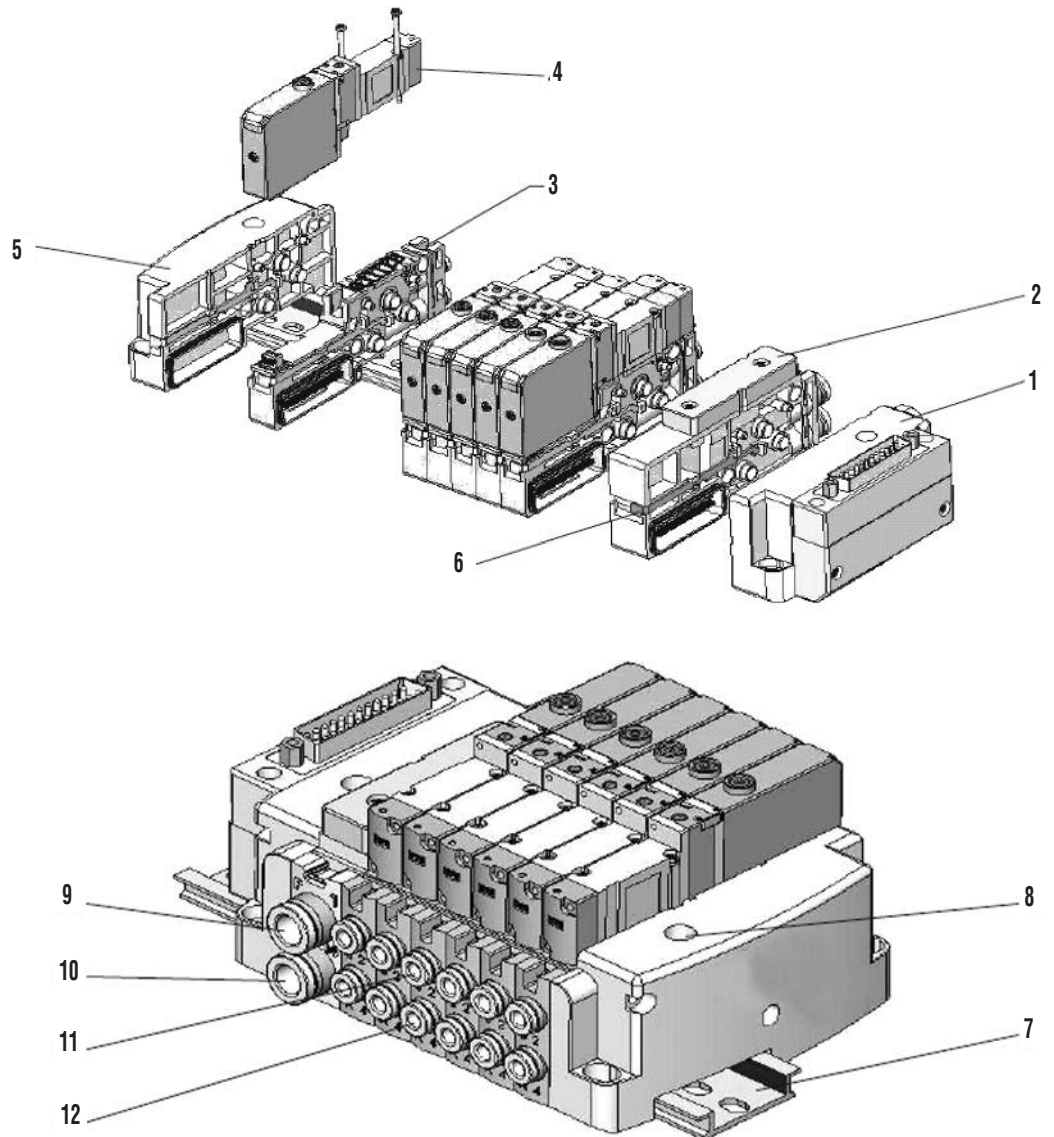
| Valve Action                                | 10mm Valve on Manifold | 10mm Valve Only | 15mm Valve on Manifold | 15mm Valve Only |
|---|------------------------|-----------------|------------------------|-----------------|
| <b>4-Way 2 Position</b>                     |                        |                 |                        |                 |
| Single Solenoid 12 VDC                      | TP12C4S-012-M          | TP12C4S-012-V   | TP22C7S-012-M          | TP22C7S-012-V   |
| Single Solenoid 24 VDC                      | TP12C4S-024-M          | TP12C4S-024-V   | TP22C7S-024-M          | TP22C7S-024-V   |
| Double Solenoid 12 VDC                      | TP12C4D-012-M          | TP12C4D-012-V   | TP22C7D-012-M          | TP22C7D-012-V   |
| Double Solenoid 24 VDC                      | TP12C4D-024-M          | TP12C4D-024-V   | TP22C7D-024-M          | TP22C7D-024-V   |
| <b>4-Way 3 Position (all ports blocked)</b> |                        |                 |                        |                 |
| Double Solenoid 12 VDC                      | TP13C4D-012-M          | TP13C4D-012-V   | TP23C7D-012-M          | TP23C7D-012-V   |
| Double Solenoid 24 VDC                      | TP13C4D-024-M          | TP13C4D-024-V   | TP23C7D-024-M          | TP23C7D-024-V   |
| <b>Manifold Kits</b>                        |                        | <b>10mm</b>     | <b>15mm</b>            |                 |
| 25 Pin Manifold Kit                         |                        | <b>114829</b>   |                        | <b>114834</b>   |
| 26 Pin Manifold Kit                         |                        | <b>114836</b>   |                        | <b>114841</b>   |
| Supply/Exh Block                            |                        | <b>114840</b>   |                        | <b>114842</b>   |
| Din Rail                                    |                        | <b>114839</b>   |                        | <b>114843</b>   |



**Manifold Kit includes:** 2-End Caps, 1-Supply/Exh block and 1-Din Rail (10 station)

## Assembly Instructions

- 1 End Plate
- 2 Supply Exhaust Block
- 3 Base
- 4 Valve
- 5 End Plate
- 6 Locking Clip
- 7 DIN Rail
- 8 DIN Rail Screw
- 9 "P" Port
- 10 "R" Port
- 11 "B" Port
- 12 "A" Port

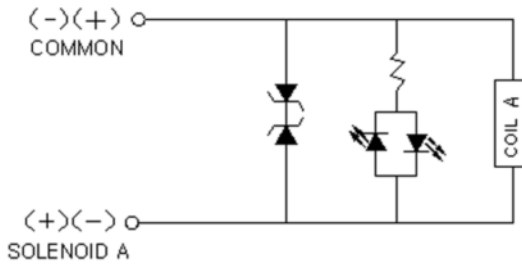


1. Before assemble, check for proper alignment of five "O" rings and (7) gasket.
  2. The (8) metal locking clip should be fully extended out before assembling.
  3. Position the (4) valves in the desired location in the stack. Align pins with sockets and push together. Slide the (8) metal locking clip into place to lock the 2 units together. Continue this procedure until all valve manifolds have been connected. Manifold Kit Attachment includes: two (1 and 6) end plates, (2) supply / exhaust block and (9) 1 - 10 DIN rail.
  4. Attach the (2) supply / exhaust block to the end of the stack and lock into place using the (8) metal locking clip.
  5. Align the (1) end plate to the (2) supply / exhaust block and lock into place using the (8) metal locking clip.
  6. Align the (6) end plate to the opposite end and lock into place using the (8) metal locking clip.
  7. Slide the (9) DIN rail onto the underside of the valve stack into the desired location. Tighten one (10) screw on top of each end plate. NOTE: (9) DIN rails may be cut to size.  
To replace a (4) valve unit without disturbing the valve stack: Loosen and remove two (5) screws located on top of valve. Pull up on (4) valve to remove. Align the electrical connection on the end of the valve with the manifold socket. Align and tighten (4) screws.
- NOTE:** Ten (4) valves per stack maximum.  
The (8) metal locking clip must be extended out before assembly to prevent bending of clip.  
Voltages cannot be mixed on the valve stack

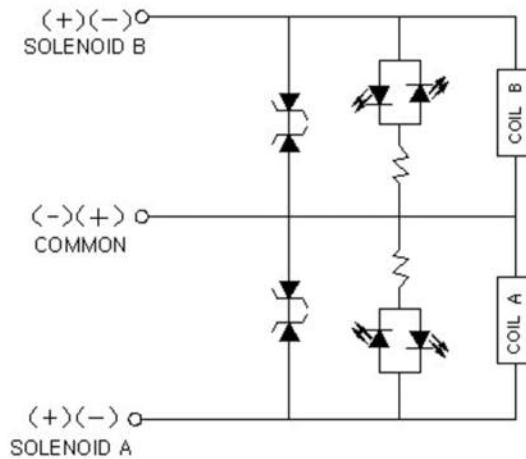


## Valve Circuits

1. Common
2. Solenoid "A"
3. Solenoid "B"
4. 1st Station
5. 2nd Station
6. 3rd Station
7. 11th Station
8. 12th Station



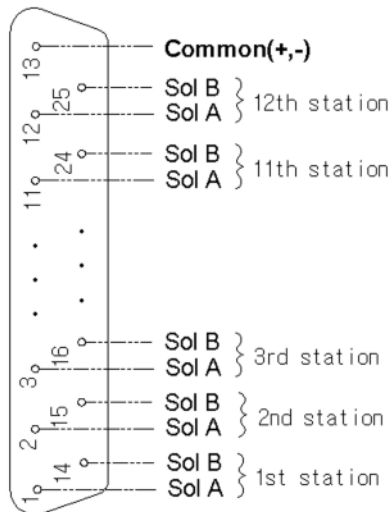
<Single Circuits>



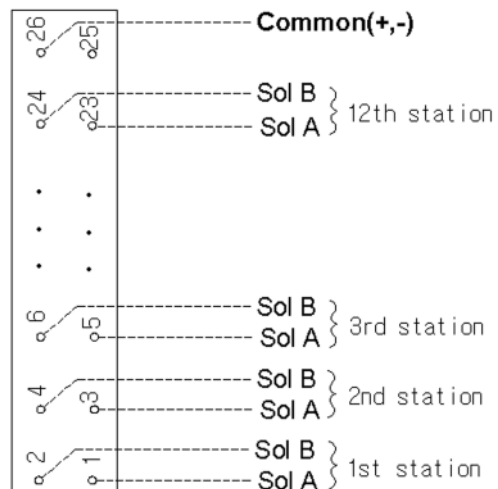
<Double Circuits>

## Manifold Electrical Arrangement

D\_Sub Connector type

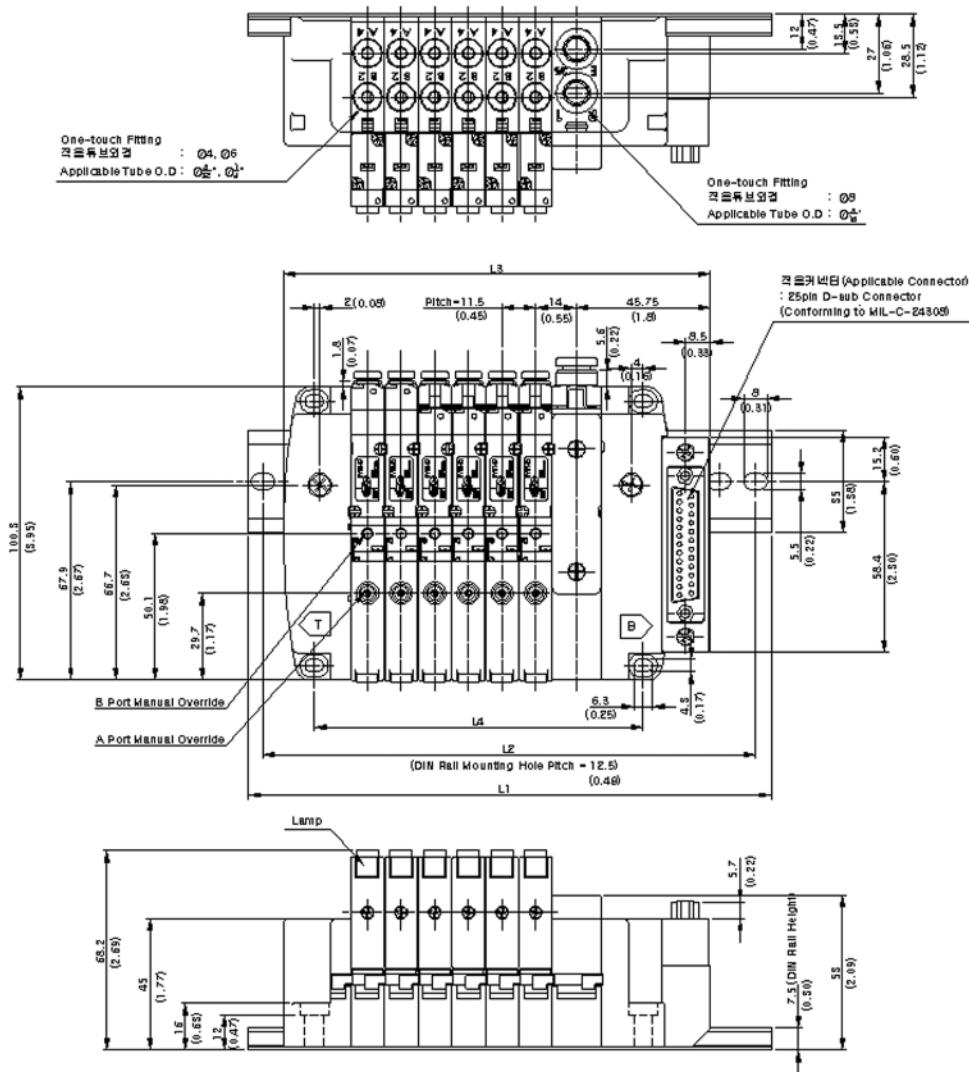


Flat Cable Connector type



# Dimensional Data, 10mm\*

## 25 Pin Sub-D Connector



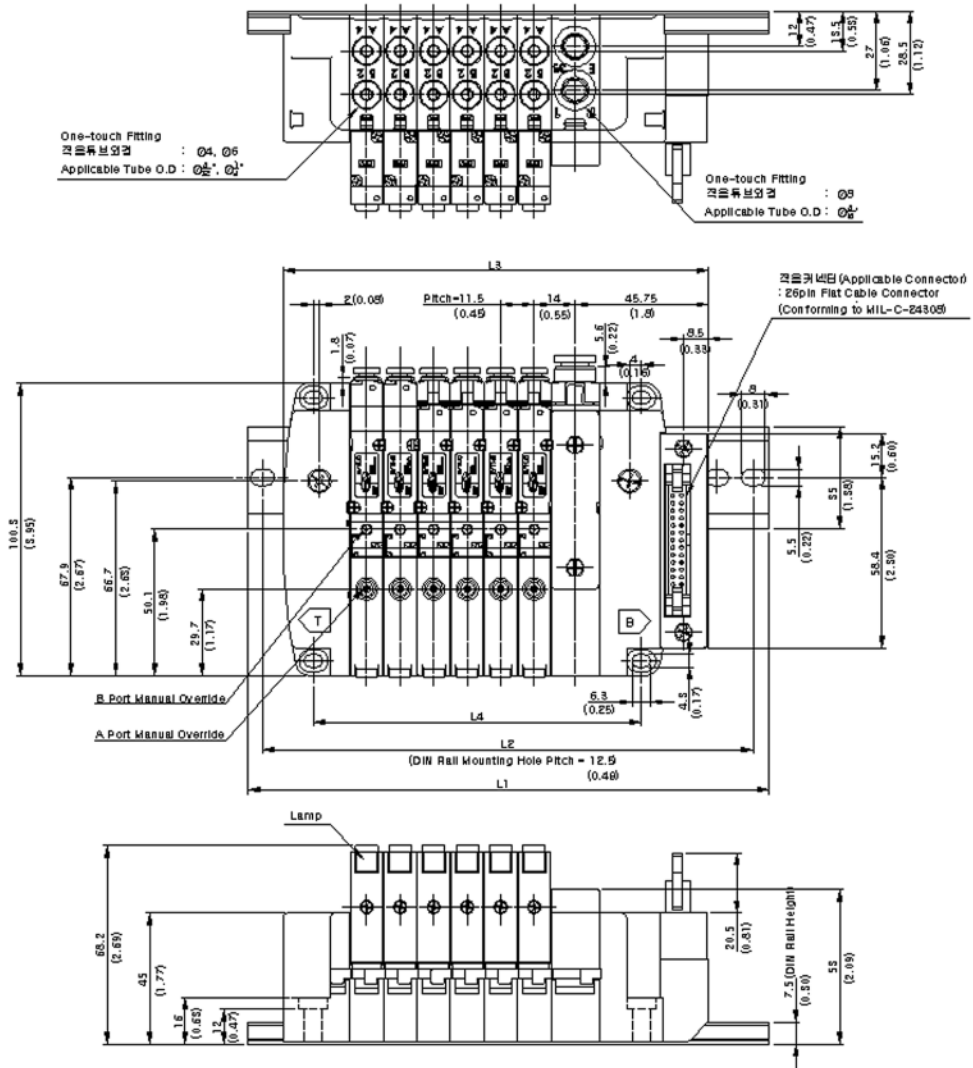
| L <sup>n</sup> | 2               | 3               | 4               | 5               | 6               | 7               | 8               | 9               | 10              | 11               | 12               |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|
| L1             | 5.83<br>(148)   | 6.32<br>(160.5) | 6.81<br>(173)   | 7.30<br>(185.5) | 7.80<br>(198)   | 8.29<br>(210.5) | 8.78<br>(223)   | 9.27<br>(235.5) | 9.76<br>(248)   | 10.26<br>(260.5) | 10.75<br>(273)   |
| L2             | 5.41<br>(137.5) | 5.91<br>(150)   | 6.40<br>(162.5) | 6.89<br>(175)   | 7.38<br>(187.5) | 7.87<br>(200)   | 8.37<br>(212.5) | 8.86<br>(225)   | 9.35<br>(237.5) | 9.84<br>(250)    | 10.33<br>(262.5) |
| L3             | 3.94<br>(100)   | 4.39<br>(111.5) | 4.84<br>(123)   | 5.30<br>(134.5) | 5.75<br>(146)   | 6.20<br>(157.5) | 6.65<br>(169)   | 7.11<br>(180.5) | 7.56<br>(192)   | 8.01<br>(203.5)  | 8.46<br>(215)    |
| L4             | 2.62<br>(66.5)  | 3.07<br>(78)    | 3.52<br>(89.5)  | 3.98<br>(101)   | 4.43<br>(112.5) | 4.88<br>(124)   | 5.33<br>(135.5) | 5.79<br>(147)   | 6.24<br>(158.5) | 6.69<br>(170)    | 7.15<br>(181.5)  |

L3, L4 Sup/Exh Block: 0.65 (16.5) x n

\*Contact factory for dimensional data on 15mm valves

# Dimensional Data

## 26 Pin Flat Cable Connector



| L \ n     | 13               | 14               | 15               | 16               | 17               | 18               | 19               | 20               | 21               | 22               | 23               | 24               |
|-----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| <b>L1</b> | 11.24<br>(285.5) | 11.73<br>(298)   | 12.22<br>(310.5) | 12.72<br>(323)   | 13.21<br>(335.5) | 13.71<br>(348)   | 14.19<br>(360.5) | 14.69<br>(373)   | 15.18<br>(385.5) | 15.67<br>(398)   | 16.16<br>(410.5) | 16.65<br>(423)   |
| <b>L2</b> | 10.83<br>(275)   | 11.32<br>(287.5) | 11.81<br>(300)   | 12.30<br>(312.5) | 12.80<br>(325)   | 13.29<br>(337.5) | 13.78<br>(350)   | 14.27<br>(362.5) | 14.76<br>(375)   | 15.26<br>(387.5) | 15.75<br>(400)   | 16.24<br>(412.5) |
| <b>L3</b> | 8.92<br>(226.5)  | 9.37<br>(238)    | 9.82<br>(249.5)  | 10.28<br>(261)   | 10.73<br>(272.5) | 11.18<br>(284)   | 11.63<br>(295.5) | 12.09<br>(307)   | 12.54<br>(318.5) | 12.99<br>(330)   | 13.44<br>(341.5) | 13.90<br>(353)   |
| <b>L4</b> | 7.60<br>(193)    | 8.05<br>(204.5)  | 8.50<br>(216)    | 8.96<br>(227.5)  | 9.41<br>(239)    | 9.86<br>(250.5)  | 10.31<br>(262)   | 10.77<br>(273.5) | 11.22<br>(285)   | 11.67<br>(296.5) | 12.13<br>(308)   | 12.58<br>(319.5) |



## Features

### Valve Performance Features

- CAT Series Valves are available as single station units, bar manifold or assembled as a stack.
- CAT Series valves are suitable for air or inert gas.
- Plugging the exhaust port allows single station valves to be plumbed as 2-way valves. See page 34 to order the optional exhaust port plug.
- CAT Series valves are available with a variety of coil options. See Pg. 80.
- Class F coils are rated for 100% duty cycle.

### CAT Series Valve Features and Benefits

- Quick change coil can be easily interchanged or replaced. Simply remove the top nut, slide off the coil and replace it with a new coil.
- The coil accepts DIN-style connectors, or automotive spade type connections. This helps reduce installation time and provides a secure electrical hook-up. See page 80.
- When mounted individually, the coil can be rotated to face one of four ways. As a stack, the coils can be mounted in two directions.
- Coils are UL-listed and comply with CSA standards. UL file #MH13513, CSA File #LR51090. NEMA 4 option available.



Single CAT Series Valve



Two Valve CAT Series Stack



High Flow Cat Valve

## Performance Specifications

|                            |                            |
|----------------------------|----------------------------|
| <b>Pressure Range:</b>     | 0 to 115 PSI Low Watt      |
| <b>Pressure Range:</b>     | 0 to 150 PSI (10.4 bar)    |
| <b>Temperature Rating:</b> | 0° to 122°F (-17° to 50°C) |
| <b>Flow:</b>               |                            |

### 1/8" Individual, Bar Manifold and Stacking Valves:

|         |  |
|---------|--|
| CAT33P: | Cv = .062 (2.2 SCFM), Seat Orifice .051, Stem .070 |
| CAT33S: | Cv = .048 (1.8 SCFM), Seat Orifice .051, Stem .070 |
| CAT44P: | Cv = .056 (2.0 SCFM), Seat Orifice .039, Stem .051 |
| CATXXB: | Cv = .062 (2.2 SCFM), Seat Orifice .051, Stem .070 |

**Operating Medium:** Compressed Air

**Response Time:** 5 - 9 ms

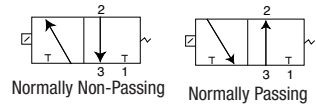


Six-Station Cat Valve Bar Manifold

## Ordering

### 1/8" Individual and Stacking Valves

| <b>Model Number:</b> | <b>Port Size</b> | <b>Valve Function</b> | <b>Body Style</b> |
|----------------------|------------------|-----------------------|-------------------|
| CAT33P-XXX-X         | 1/8"             | Non-Passing           | Ported            |
| CAT33S-XXX-X         | 1/8"             | Non-Passing           | Stackable         |
| CAT44P-XXX-X         | 1/8"             | Passing               | Ported            |



To stack CAT Series valves, tie-rod mounting kits are required. Order kits separately from the menu below.

### Coil Options

| Code  | Voltage                   | Current | Code   | Voltage          | Current |
|-------|---------------------------|---------|--------|------------------|---------|
| 000-N | Valve with <i>No</i> Coil |         | 024-D  | 24 Volt          | DC      |
| 005-D | 5 Volt                    | DC      | 120-A  | 120 Volt         | AC      |
| 012-A | 12 Volt                   | AC      | 240-A  | 240 Volt         | AC      |
| 012-D | 12 Volt                   | DC      | *005-L | 5 Volt Low Watt  | DC      |
| 024-A | 24 Volt                   | AC      | *012-L | 12 Volt Low Watt | DC      |
|       |                           |         | *024-L | 24 Volt Low Watt | DC      |

If coil option A or D is selected, a coil connector must be ordered. See Pg. 79 for coil & connector information.

\* Available on CAT33P-XXX-L & CAT33S-XXX-L only.

## Accessories

### Exhaust Plug

**59632-1** (10-32 Thread)

Plugs exhaust port to convert normally non-passing 3-way valve to 2-way.

NOTE: To make a normally passing 3-way valve to a 2-way valve requires a DC plug.

### Stacking Tie-Rod Kits

**116345-2** 2 Valve Stack

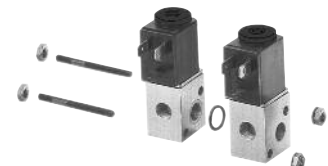
**116345-3** 3 Valve Stack

**116345-4** 4 Valve Stack

**116345-5** 5 Valve Stack

**116345-6** 6 Valve Stack

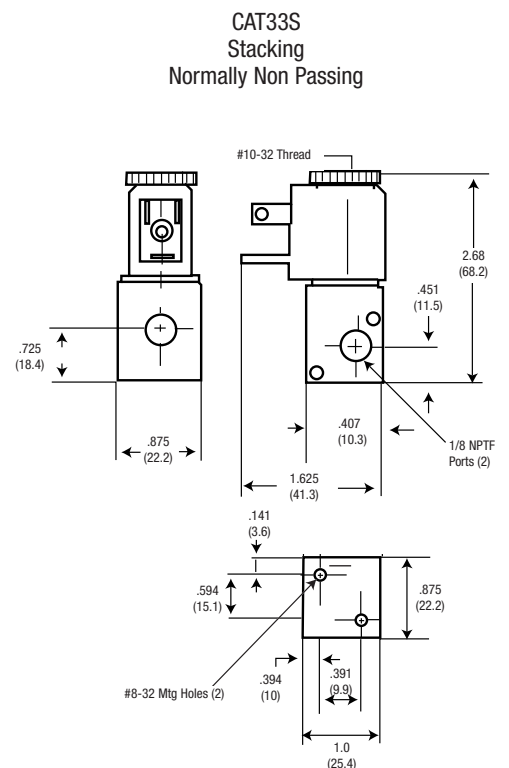
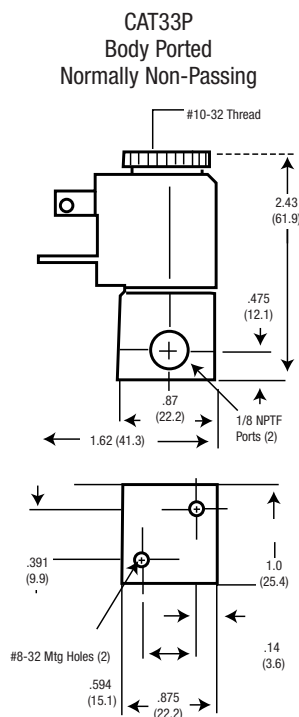
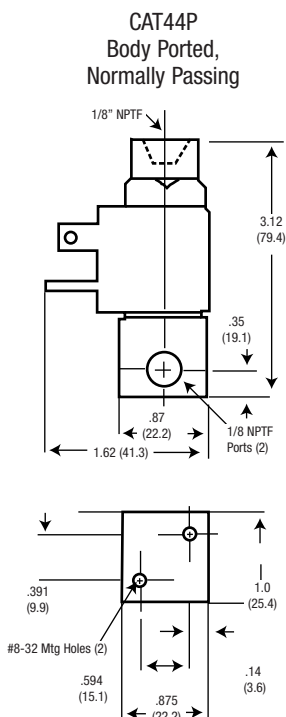
Tie-Rod Kits include tie rods, nuts, o-rings and a plug.



CAT Series Valve Stack and 116345-X Stacking Kit

## Dimensional Data

Dimensions given in Inches and (Millimeters)





## High Flow Cat Valve

| Model Number: | Port Size | Valve Function  | Body Style |
|---------------|-----------|-----------------|------------|
| CAT66P-XXX-X* | 1/4"      | Normally Closed | Ported     |
| CAT77S-XXX-X* | 1/4"      | Normally Closed | Stacking   |
| CAT88P-XXX-X* | 1/4"      | Normally Open   | Ported     |

### \* Coil Voltage

|        |             |
|--------|-------------|
| 012-D  | 12 Volt DC  |
| 120-A  | 120 Volt AC |
| 024-D  | 24 Volt DC  |
| 000-N  | No Coil     |
| *012-L | Low Watt DC |
| *024-L | Low Watt DC |

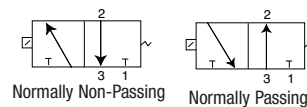
\*Available on normally closed valves only.



High Flow Cat Valve

## Performance Specifications

|                            |                            |
|----------------------------|----------------------------|
| <b>Pressure Range:</b>     | 0 to 150 PSI               |
| <b>Temperature Rating:</b> | 0° to 122° F               |
| <b>Operating Medium:</b>   | Compressed Air             |
| <b>High-Flow Valves:</b>   | CAT66P: Cv = .2 (6.9 SCFM) |
|                            | CAT77S: Cv = .2 (6.9 SCFM) |
|                            | CAT88P: Cv = .2 (6.9 SCFM) |



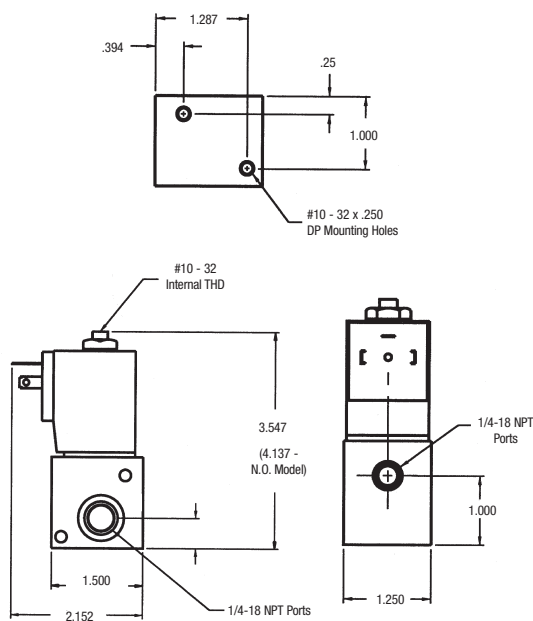
Normally Non-Passing

Normally Passing

To stack CAT Series valves, tie-rod mounting kits are required. Order kits separately from the menu below.

## Dimensional Data

### High Flow Cat Valve



## Accessories

### High-Flow Tie-Rod Kits

#### Stacking Tie-Rod Kits

|          |              |
|----------|--------------|
| 119698-2 | (2 Stations) |
| 119698-3 | (3 Stations) |
| 119698-4 | (4 Stations) |
| 119698-5 | (5 Stations) |
| 119698-6 | (6 Stations) |
| 119698-7 | (7 Stations) |

### Connector

|                  |                                   |
|------------------|-----------------------------------|
| <b>CDW-30</b>    | 30-mm connector with wire.        |
| <b>CSN-30</b>    | 30-mm connector, strain relief.   |
| <b>CHW-30</b>    | 30-mm connector, molded cable.    |
| <b>119690-XX</b> | See Page 79 for Coil information. |

## Ordering

### Cat Valve Bar Manifold

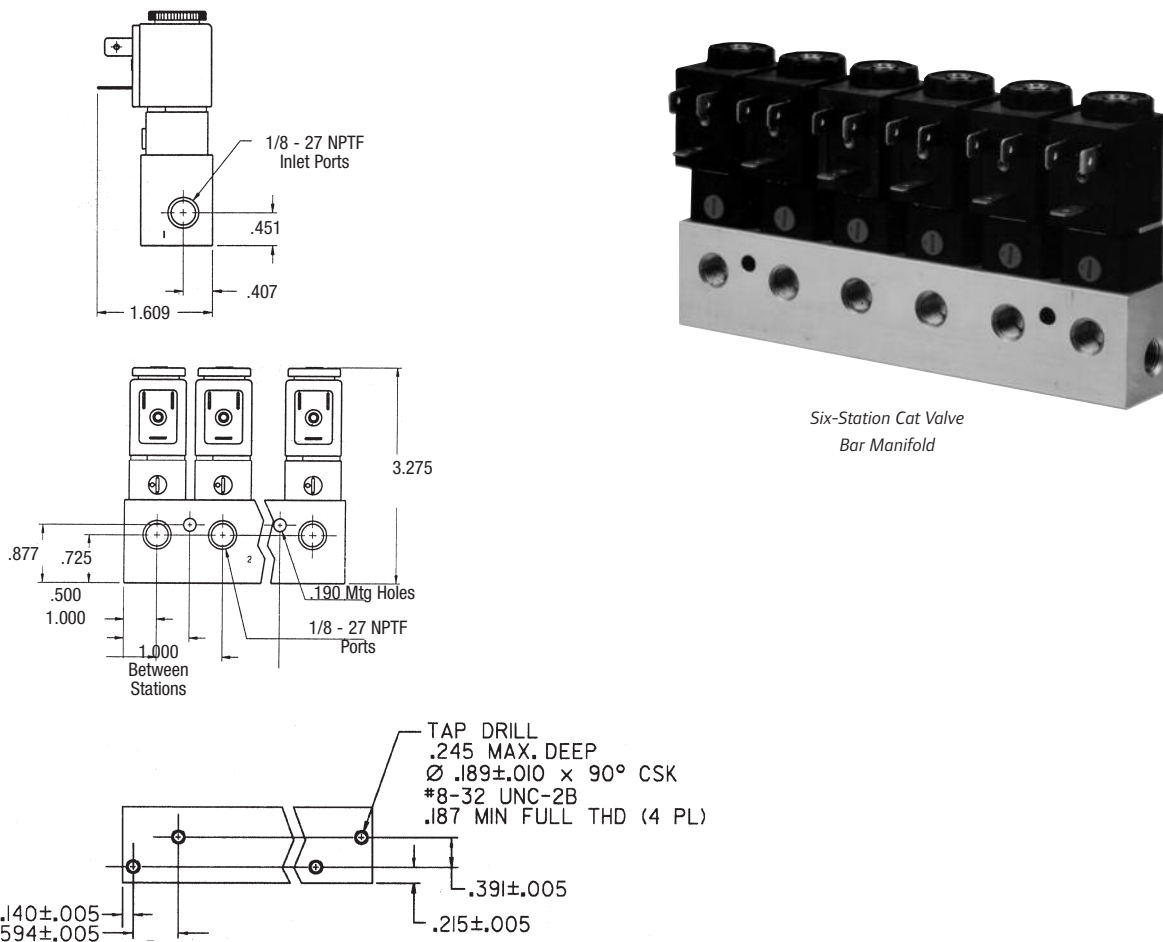
**C A T X X B - X X X - X**

| No. of Stations |    | Coil Options |            |         | Coil Options |                  |         |
|-----------------|----|--------------|------------|---------|--------------|------------------|---------|
|                 |    | Code         | Voltage    | Current | Code         | Voltage          | Current |
| 02              | 10 | 000-N        | Valve with | No Coil | 240-A        | 240 Volt         | AC      |
| 03              | 11 | 005-D        | 5 Volt     | DC      | 005-L        | 5 Volt Low Watt  | DC      |
| 04              | 12 | 012-A        | 12 Volt    | AC      | 012-L        | 12 Volt Low Watt | DC      |
| 05              | 13 | 012-D        | 12 Volt    | DC      | 024-L        | 24 Volt Low Watt | DC      |
| 06              | 14 | 024-A        | 24 Volt    | AC      |              |                  |         |
| 07              | 15 | 024-D        | 24 Volt    | DC      |              |                  |         |
| 08              | 16 | 120-A        | 120 Volt   | AC      |              |                  |         |
| 09              |    | 120-D        | 120 Volt   | DC      |              |                  |         |

See Page 79 for Connectors and other Coil options.

## Dimensional Data Dimensions given in Inches and (Millimeters)

### Cat Valve Bar Manifold



Six-Station Cat Valve Bar Manifold

## Miniature 3-Way and 4-Way Valves Ordering Information:

| Model        | Description  |
|--------------|--|
| P114400      | END PLATE FOR 3-WAY OR 4-WAY VALVE STACK             |
| 114806       | MOUNTING BRACKET FOR INLINE VALVES                   |
| 114807       | ISOLATOR PLUG KIT FOR STACKING VALVES                |
| CSN-MICRO    | CONNECTOR, STRAIN RELIEF                             |
| P251SS-012-D | 3-WAY BODY PORTED, LEAD WIRE, 12 DC                  |
| P251SS-012-E | 3-WAY BODY PORTED, PLUG-IN, 12 DC                    |
| P251SS-024-D | 3-WAY BODY PORTED, LEAD WIRE, 24 DC                  |
| P251SS-024-E | 3-WAY BODY PORTED, PLUG-IN, 24 DC                    |
| P251SS-120-A | 3-WAY BODY PORTED, LEAD WIRE, 120 AC                 |
| P251SS-120-B | 3-WAY BODY PORTED, PLUG-IN, 120 AC                   |
| P261SS-012-D | 3-WAY STACKING, LEAD WIRE, 12 DC                     |
| P261SS-012-E | 3-WAY STACKING, PLUG-IN, 12 DC                       |
| P261SS-024-D | 3-WAY STACKING, LEAD WIRE, 24 DC                     |
| P261SS-024-E | 3-WAY STACKING, PLUG-IN, 24 DC                       |
| P261SS-120-A | 3-WAY STACKING, LEAD WIRE, 120 AC                    |
| P261SS-120-B | 3-WAY STACKING, PLUG-IN, 120 AC                      |
| P211SS-012-D | 4-WAY BODY PORTED, LEAD WIRE, 12 DC                  |
| P211SS-012-E | 4-WAY BODY PORTED, PLUG-IN, 12 DC                    |
| P211SS-024-D | 4-WAY BODY PORTED, LEAD WIRE, 24 DC                  |
| P211SS-024-E | 4-WAY BODY PORTED, PLUG-IN, 24 DC                    |
| P211SS-120-A | 4-WAY BODY PORTED, LEAD WIRE, 120 AC                 |
| P211SS-120-B | 4-WAY BODY PORTED, PLUG-IN, 120 AC                   |
| P211SC-012-D | 4-WAY BODY PORTED W/SPEED CONTROL, LEAD WIRE, 12 DC  |
| P211SC-012-E | 4-WAY BODY PORTED W/SPEED CONTROL, PLUG-IN, 12 DC    |
| P211SC-024-D | 4-WAY BODY PORTED W/SPEED CONTROL, LEAD WIRE, 24 DC  |
| P211SC-024-E | 4-WAY BODY PORTED W/SPEED CONTROL, PLUG-IN, 24 DC    |
| P211SC-120-A | 4-WAY BODY PORTED W/SPEED CONTROL, LEAD WIRE, 120 AC |
| P211SC-120-B | 4-WAY BODY PORTED W/SPEED CONTROL, PLUG-IN, 120 AC   |
| P221SS-012-D | 4-WAY STACKING, LEAD WIRE, 12 DC                     |
| P221SS-012-E | 4-WAY STACKING, PLUG-IN, 12 DC                       |
| P221SS-024-D | 4-WAY STACKING, LEAD WIRE, 24 DC                     |
| P221SS-024-E | 4-WAY STACKING, PLUG-IN, 24 DC                       |
| P221SS-120-A | 4-WAY STACKING, LEAD WIRE, 120 AC                    |
| P221SS-120-B | 4-WAY STACKING, PLUG-IN, 120 AC                      |
| P221SC-012-D | 4-WAY STACKING W/SPEED CONTROL, LEAD WIRE, 12 DC     |
| P221SC-012-E | 4-WAY STACKING W/SPEED CONTROL, PLUG-IN, 12 DC       |
| P221SC-024-D | 4-WAY STACKING W/SPEED CONTROL, LEAD WIRE, 24 DC     |
| P221SC-024-E | 4-WAY STACKING W/SPEED CONTROL, PLUG-IN, 24 DC       |
| P221SC-120-A | 4-WAY STACKING W/SPEED CONTROL, LEAD WIRE, 120 AC    |
| P221SC-120-B | 4-WAY STACKING W/SPEED CONTROL, PLUG-IN, 120 AC      |



3-Way Body Ported



4-Way Body Ported



4-Way Body Ported with Speed Controls



3-Way and 4-Way Stacking Valves



### 114806 Mounting Bracket

Kit is designed for use with both 3-Way and 4-Way valves. Kit consists of a bracket, two #6-32 screws, and two nuts.



### P114400 End Plate Kit

Kit consists of two end plates, two o-rings, and two bolts. One kit required for each valve stack. Can be used for 3-Way or 4-Way valves, or any combination of valves.



### CSN-MICRO Connector

Plug-in DIN type connector conforms to Industrial Micro Type C. Order separately.

### 114807 Isolator Plug Kit

Kit consists of two plugs. Plugs can be used on stacking valves to convert 4-ways to 3-ways, or 3-ways to 2-ways. Also can be used to provide multiple pressures to a valve stack.



## 2-Way Direct Acting Solenoid Valves

- Valves are direct acting normally closed for fast response and are excellent for low operating pressure applications.
- Die-cast brass body, stainless steel stem and buna-n diaphragm provide excellent durability.
- Suitable for use with water, air, lightweight oil, liquid gas and vacuum\*.
- Available with 12 VDC, 24 VDC, AND 120 VAC coils.

### TB011B-XXX-X

Port Size: 1/8" NPT  
 Orifice: 1.2 mm, 3/64"  
 Cv: 0.1, SCFM: 3  
 Pressure Range: AC = 120 PSI  
 DC = 100 PSI



### TB022B-XXX-X

Port Size: 1/4" NPT  
 Orifice: 2.3 mm, 3/32"  
 Cv: 0.18, SCFM: 5  
 Pressure Range: AC = 120 PSI  
 DC = 100 PSI



### TB034B-XXX-X

Port Size: 3/8" NPT  
 Orifice: 8.0 mm, 5/16"  
 Cv: 1.0, SCFM: 28  
 Pressure Range: AC = 140 PSI  
 DC = 100 PSI



### TB035B-XXX-X

Port Size: 3/8" NPT

### TB045B-XXX-X

Port Size: 1/2" NPT  
 Orifice: 13 mm, 33/64"  
 Cv: 4.5, SCFM: 126  
 Pressure Range: AC = 120 PSI  
 DC = 100 PSI



### TB066B-XXX-X

Port Size: 3/4" NPT  
 Orifice: 20 mm, 25/32"  
 Cv: 8.6, SCFM: 240  
 Pressure Range: AC = 120 PSI  
 DC = 85 PSI



### TB087B-XXX-X

Port Size: 1" NPT  
 Orifice: 25 mm, 1"  
 Cv: 11, SCFM: 308  
 Pressure Range: AC = 100 PSI  
 DC = 70 PSI

## Technical Data

Temperature Range: 0 - 180 F  
 Duty Cycle: 100 %  
 Power consumption: 22 VA  
 Response Time: 30 ms

## Ordering Information

Replace XXX-X with voltage needed  
 000-N = No Coil  
 012-D = 12 VDC  
 024-D = 24 VDC  
 024-A = 24 VAC  
 120-A = 120 VAC  
 (Viton Seals Available, Consult Factory)

**NOTE:** All valves are shown with a CSN (1/8" and 1/4" ports) or CSN-30 (3/8" & larger) connector. Connector is to be ordered separately. See page 79 for ordering information.

\* Vacuum operation only available with TB011B-X, TB022B-X and TB034B-X.

## 2-Way Solenoid/Pilot Acting Valves

- Valves are internally piloted, normally closed and excellent for high flow applications.
- Die-cast brass body, stainless steel stem and buna-n diaphragm provide excellent durability.
- Suitable for use with water, air, lightweight oil, and liquid gas.
- Available in 12 VDC, 24 VDC, AND 120 VAC coils.



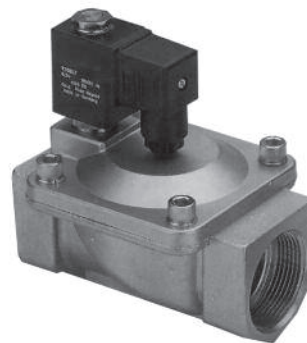
**TB03EB-XXX-X**  
 Port Size: 3/8" NPT  
 Orifice: 13 mm, 33/64"  
 Cv: 4.5, SCFM: 126  
 Pressure Range: 10-150 PSI



**TB04EB-XXX-X**  
 Port Size: 1/2" NPT  
 Orifice: 13 mm, 33/64"  
 Cv: 4.5, SCFM: 126  
 Pressure Range: 10-150 PSI



**TB06HB-XXX-X**  
 Port Size: 3/4" NPT  
 Orifice: 25 mm, 1"  
 Cv: 12, SCFM: 336  
 Pressure Range: 10-150 PSI



**TB08HB-XXX-X**  
 Port size: 1" NPT  
 Orifice: 25 mm, 1"  
 Cv: 12, SCFM: 336  
 Pressure Range: 10-150 PSI

### Ordering Information

Replace XXX-X with voltage needed  
 000-N = No Coil  
 012-D = 12 VDC  
 024-D = 24 VDC  
 024-A = 24 VAC  
 120-A = 120 VAC

### Technical Data

Temperature Range: 0 - 180 F  
 Duty Cycle: 100 %  
 Power consumption: 22 VA  
 Response Time: 50 ms

### TB12JB-XXX-X

Port Size: 1 1/4" NPT  
 Orifice: 38 mm, 1 1/2"  
 Cv: 22, SCFM: 615  
 Pressure Range: 10-150 PSI

### TB14JB-XXX-X

Port size: 1 1/2" NPT  
 Orifice: 38 mm, 1 1/2"  
 Cv: 22, SCFM: 615  
 Pressure Range: 10-150 PSI

**NOTE:** All valves are shown with a CSN-30 connector. Connector is to be ordered separately. See page 79 for ordering information.



## 2-Way Stainless Steel Solenoid/Pilot Acting Valves

- Valves are internally piloted, normally closed and excellent for high flow applications.
- # 304 stainless steel body, stainless steel stem and viton diaphragm provide excellent durability.
- Suitable for use with beverage dispensing, water, air, lightweight oil, and liquid gas and most chemical liquids.
- Available in 12 VDC, 24 VDC, AND 120 VAC coils.



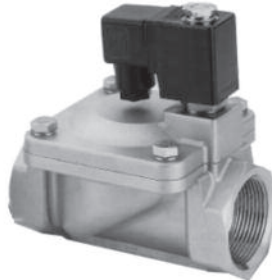
**TS03EV-XXX-X**  
Port Size: 3/8" NPT  
Orifice: 13 mm, 33/64"  
Cv: 4.5, SCFM: 126  
Pressure Range: 10-150 PSI  
**TS04EV-XXX-X**  
Port size: 1/2" NPT  
Orifice: 13 mm, 33/64"  
Cv: 4.5, SCFM: 126  
Pressure Range: 10-150 PSI



**TS06HV-XXX-X**  
Port Size: 3/4" NPT  
Orifice: 25 mm, 1"  
Cv: 12, SCFM: 336  
Pressure Range: 10-150 PSI  
**TS08HV-XXX-X**  
Port size: 1" NPT  
Orifice: 25 mm, 1"  
Cv: 12, SCFM: 336  
Pressure Range: 10-150 PSI



**TS12JV-XXX-X**  
Port Size: 1 1/4" NPT  
Orifice: 38 mm, 1 1/2"  
Cv: 22, SCFM: 615  
Pressure Range: 10-150 PSI



**TS14JV-XXX-X**  
Port Size: 1 1/2" NPT  
Orifice: 38 mm, 1 1/2"  
Cv: 30, SCFM: 839  
Pressure Range: 10-150 PSI



**TS20KV-XXX-X**  
Port Size: 2" NPT  
Orifice: 50 mm, 2"  
Cv: 48, SCFM: 1343  
Pressure Range: 10-150 PSI

### Ordering Information

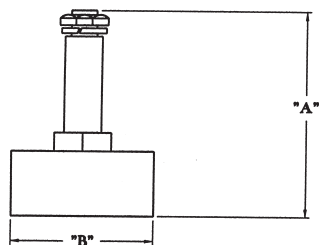
Replace XXX-X with voltage needed  
000-N = No Coil  
012-D = 12 VDC  
024-D = 24 VDC  
024-A = 24 VAC  
120-A = 120 VAC

### Technical Data

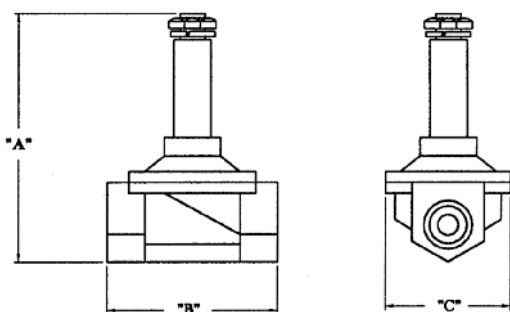
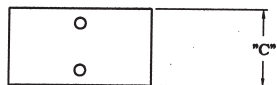
Temperature Range: 0 - 180 F  
Duty Cycle: 100 %  
Power consumption: 22 VA  
Response Time: 50 ms

**NOTE:** All valves are shown with a CSN-30 connector. Connector is to be ordered separately. See page 79 for ordering information.

### 2-Way Direct Acting



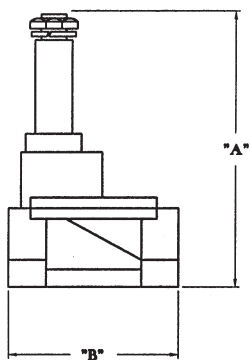
View A



View B

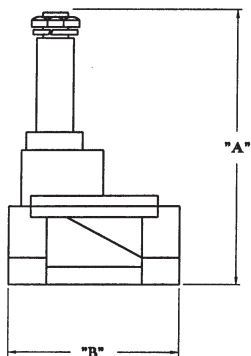
| P/N          | VIEW | "A"   | "B"   | "C"   | PORT SIZE | REPAIR KIT |
|--------------|------|-------|-------|-------|-----------|------------|
| TB011B-XXX-X | A    | 2.835 | .866  | .866  | 1/8       | -          |
| TB022B-XXX-X | A    | 2.972 | 1.378 | 1.000 | 1/4       | -          |
| TB034B-XXX-X | A    | 3.130 | 2.165 | 1.181 | 3/8       | -          |
| TB035B-XXX-X | B    | 4.232 | 2.618 | 1.890 | 3/8       | SK-T035B   |
| TB045B-XXX-X | B    | 4.232 | 2.618 | 1.890 | 1/2       | SK-T045B   |
| TB066B-XXX-X | B    | 4.449 | 2.795 | 2.283 | 3/4       | SK-T066B   |
| TB087B-XXX-X | B    | 4.921 | 3.780 | 2.756 | 1         | SK-T087B   |

### 2-Way Solenoid/Pilot Acting



| P/N          | "A"   | "B"   | "C"   | PORT SIZE | REPAIR KIT |
|--------------|-------|-------|-------|-----------|------------|
| TB03EB-XXX-X | 4.193 | 2.618 | 1.890 | 3/8       | SK-T03EB   |
| TB04EB-XXX-X | 4.193 | 2.618 | 1.890 | 1/2       | SK-T04EB   |
| TB06HB-XXX-X | 4.961 | 3.780 | 2.756 | 3/4       | SK-T06HB   |
| TB08HB-XXX-X | 4.961 | 3.780 | 2.756 | 1         | SK-T08HB   |
| TB12JB-XXX-X | 5.728 | 5.157 | 3.780 | 1-1/4     | SK-T12JB   |
| TB14JB-XXX-X | 5.728 | 5.157 | 3.780 | 1-1/2     | SK-T14JB   |

### 2-Way Stainless Steel



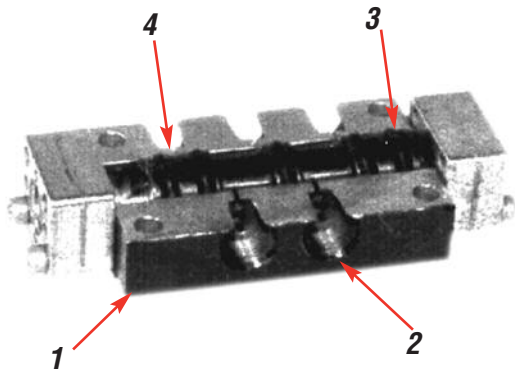
| P/N          | "A"   | "B"   | "C"   | PORT SIZE | REPAIR KIT |
|--------------|-------|-------|-------|-----------|------------|
| TS03EV-XXX-X | 4.193 | 2.618 | 1.890 | 3/8       | SK-T03EV   |
| TS04EV-XXX-X | 4.193 | 2.618 | 1.890 | 1/2       | SK-T04EV   |
| TS06HV-XXX-X | 4.980 | 3.937 | 2.756 | 3/4       | SK-T06HV   |
| TS08HV-XXX-X | 4.980 | 3.937 | 2.756 | 1         | SK-T08HV   |
| TS12JV-XXX-X | 5.728 | 5.157 | 3.780 | 1-1/4     | SK-T12JV   |
| TS14JV-XXX-X | 5.728 | 5.157 | 3.780 | 1-1/2     | SK-T14JV   |
| TS20KV-XXX-X | 6.319 | 6.299 | 4.409 | 2         | SK-T20KV   |

## Features

### 50 Series 3-Way & 4-Way Valves

- Numerous Styles and Options.  
3-Way or 4-Way Configurations.
- Six Actuator Styles.
 

|             |              |
|-------------|--------------|
| Hand Lever  | Cam Stem     |
| Palm Button | Pilot        |
| Roller Cam  | Manual Bleed |
- Compact Size provides greater design flexibility.
- Perfect for low to moderate flow applications requiring manual or mechanical valve operation.



### Comprehensive Valve Design

- 1. Aluminum Body**  
50 Series Valves feature an extruded aluminum body for less porosity, greater durability and lighter weight.
- 2. Body Threaded Ports**  
Port threads are 1/8" NPTF
- 3. Buna N Seals**  
The standard spool seals are Buna N. For high temperature applications, Viton seals are available. Consult the factory for ordering information.
- 4. Sturdy Valve Spools**  
Spools are steel on mechanical and manually actuated valves. Pilot and bleed actuator valves feature aluminum spools.



Hand Lever



Palm Button



Roller Cam



Cam Stem



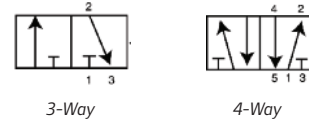
Pilot



Manual Bleed

# Ordering

## 3-Way and 4-Way Valves



**50 X X - XX**

50 Series Valves

### Valve Function

| Code | Description |
|------|-------------|
| 3    | 3-Way       |
| 4    | 4-Way       |

### Body Style

| Code | Description                         |
|------|-------------------------------------|
| 0    | 1/8" Side Ports                     |
| 1*   | 1/8" Side Ports with panel mounting |

\*Available only with Palm Button Actuators (02, 12, 21, 22, 32, 41)

### Actuator / Return

| Code | Actuator/Return           |
|------|---------------------------|
| 01   | Hand Lever/Spring         |
| 10   | Hand Lever/Manual         |
| 20   | Hand Lever/Pilot          |
| 02   | Palm Button/Spring        |
| 12   | Palm Button/Manual        |
| 21   | Palm Button/Pilot         |
| 22   | Palm w/o Button/Spring    |
| 32   | Palm w/o Button/Manual    |
| 41   | Palm w/o Button/Pilot     |
| 05   | Roller Cam/Spring         |
| 06   | Cam Stem/Spring           |
| 24   | Cam Stem/Pilot            |
| 07   | Pilot/Spring              |
| 35   | Pilot/Pilot               |
| 33   | Manual Bleed/Manual Bleed |

### Optional Palm Buttons

| Code     | Description    |
|----------|----------------|
| 13111    | Plastic, Black |
| 119243   | Metal, Plain   |
| 119244   | Metal, Red     |
| 119245   | Metal, Green   |
| MP3651-7 | Plastic, Red   |

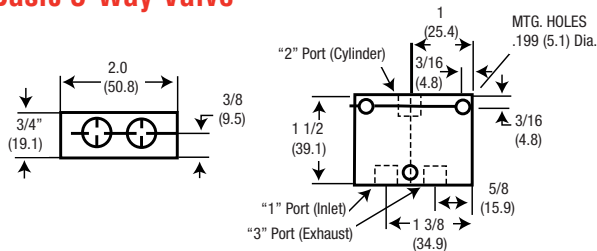
For 22, 32 or 41 Actuators

## Performance Specifications

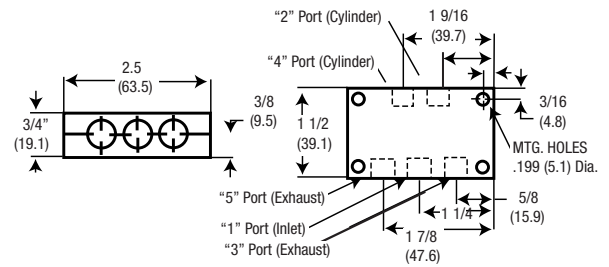
- Pressure Range:** 20-150 PSI Max.  
50-150 PSI Max. (Manual Bleed Actuator)
- Flow:** 16 SCFM
- Cv Factor:** .43 Cv
- Temperature Rating:** -10° to 180°F (-23° to 82°C)
- Minimum Pilot Pressure:** 30 PSI (2.1 Bar) Pilot Return  
60 PSI (4.2 Bar) Pilot Actuator/Spring Return Valves
- Lubrication:** Valves use O-ring seals. For maximum performance and life expectancy, standard air line lubrication should be used.

## Dimensional Data Dimensions given in Inches and (Millimeters)

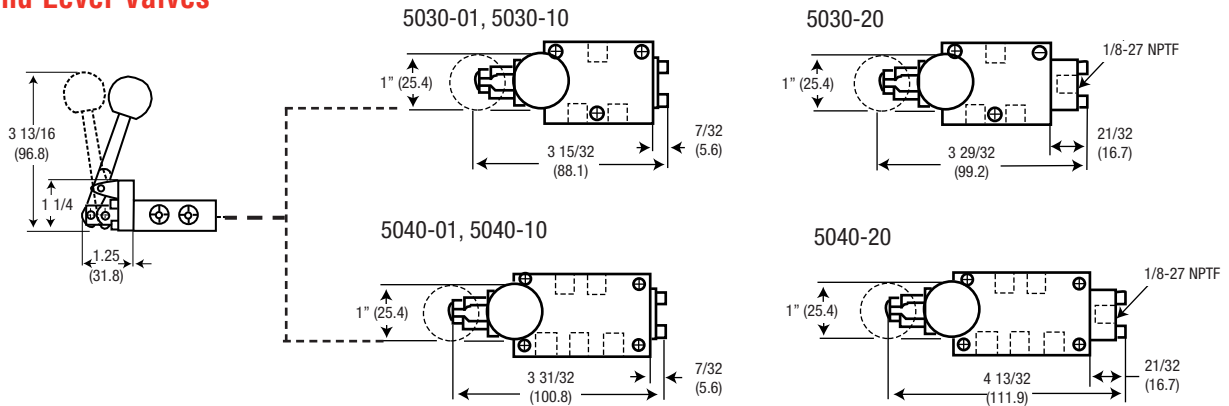
### Basic 3-Way Valve



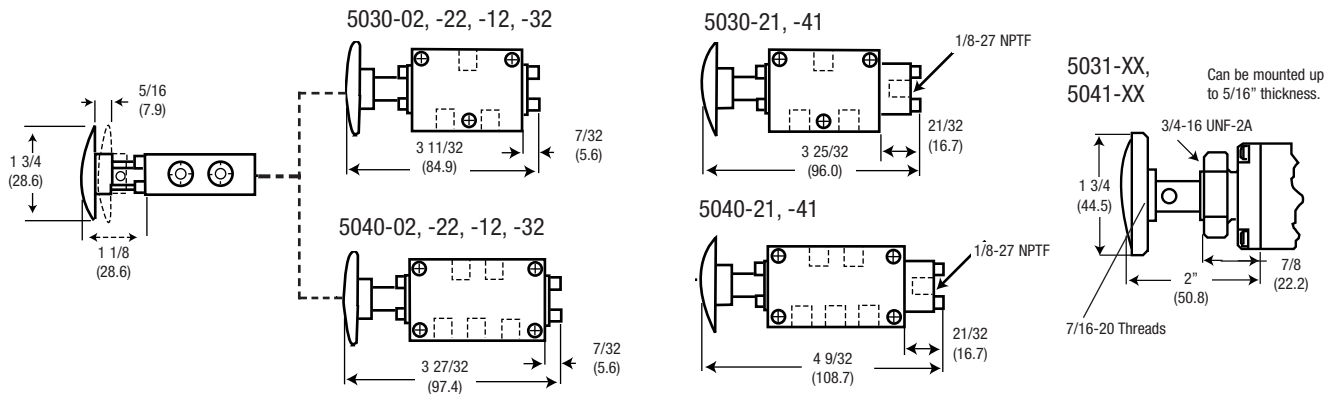
### Basic 4-Way Valve



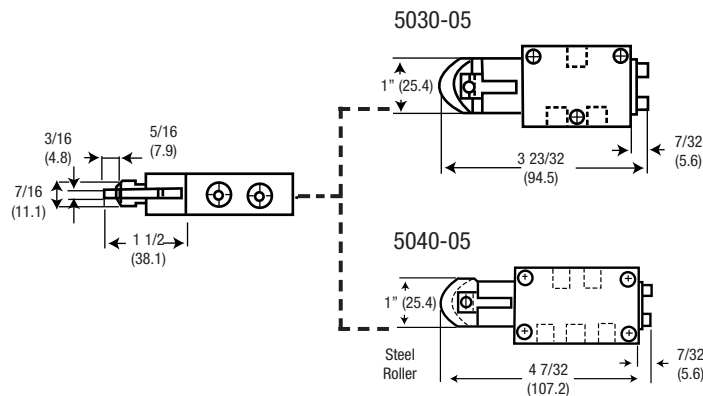
### Hand Lever Valves



### Palm Button Valves



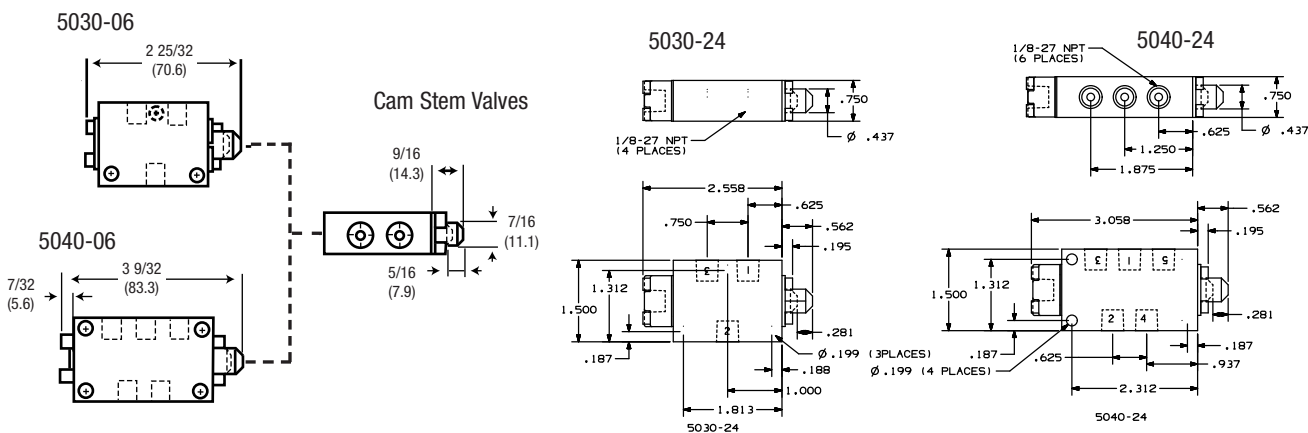
### Roller Cam Valves



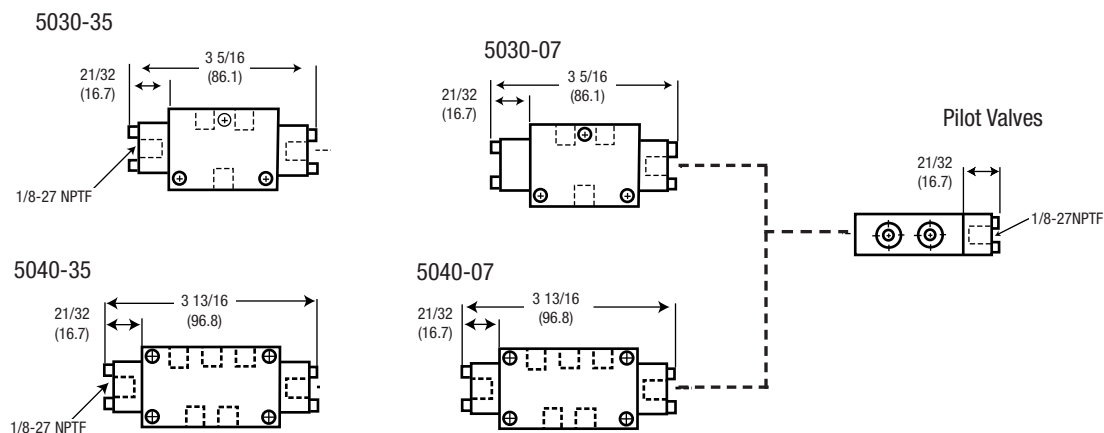
# Dimensional Data

Dimensions given in Inches and (Millimeters)

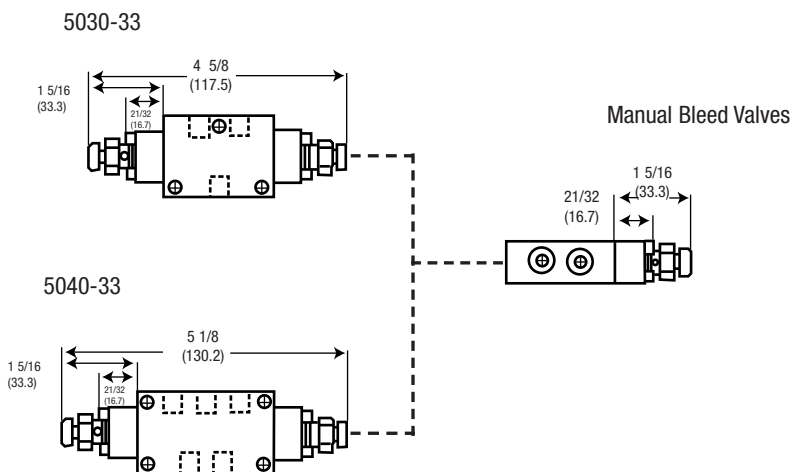
## Cam Stem Valves



## Pilot Valves



## Manual Bleed Valves





## Features

### 3-Way and 4-Way Hand Lever Valves 1/4" and 3/8" NPT Ports

- Light weight aluminum bodies and Buna-N seals are standard
- Ideal for packaging, material handling and air motor applications.
- Hand levers available with lever parallel or perpendicular to valve body.
- Parallel lever can be manifold mounted.
- See pg. 16 for manifold ordering information.
- 1/4" perpendicular hand lever valves can be panel mounted.



Perpendicular Levers

## Performance Specifications

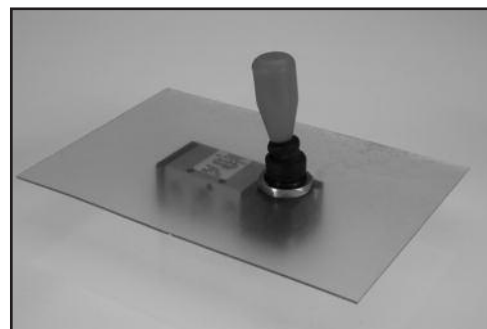
|                   |                                  |
|-------------------|----------------------------------|
| CV (Lever)        | 1/4" = .70, 3/8" = 1.14          |
| Operating Medium  | Non-lubricated or lubricated air |
| Pressure Range    | 20 -140 PSI                      |
| Temperature Range | 15° to 122°F (-10° to 50°C)      |
| Port Size NPT     | 1/4", 3/8"                       |
| Filtration        | 40 micron recommended            |



Parallel Levers

## Ordering

| MODEL                               | DESCRIPTION                                |
|-------------------------------------|--|
| <b>Levers Perpendicular to Body</b> |  |
| M212LM                              | 1/4", 4-Way, 2-Position, Lever/Manual      |
| M212LS                              | 1/4", 4-Way, 2-Position, Lever/Spring      |
| M312LS                              | 1/4", 4-Way, 3-Position, All Ports Blocked |
| M213LS                              | 3/8", 4-Way, 2-Position, Lever/Spring      |
| M213LM                              | 3/8", 4-Way, 2-Position, Lever/Manual      |
| M252LM                              | 1/4", 3-Way, 2-Position, Lever/Manual      |
| M252LS                              | 1/4", 3-Way, 2-Position, Lever/Spring      |
| <b>Levers Parallel to Body</b>      |  |
| M212LM-R                            | 1/4", 4-Way, 2-Position, Lever/Manual      |
| M212LS-R                            | 1/4", 4-Way, 2-Position, Lever/Spring      |



Panel Mounting is standard on 1/4" NPT Perpendicular Valves

## Dimensional Data See page 21

## Replacement Accessories

| MODEL  | DESCRIPTION         |
|--------|---------------------|
| 114420 | Black Knob          |
| 114421 | Red Knob            |
| 114418 | Boot for 1/4" Valve |
| 114419 | Boot for 3/8" Valve |
| 114822 | Lever               |





## Features

### 4-Way, 2 & 3-Position Rotary Lever Valves 1/4" & 3/8" 1/2" NPT Ports

- Light weight aluminum bodies and Buna-N seals are standard
- Ideal for packaging, material handling and air motor applications.
- Rotary lever valve is a 3-position, all ports blocked, manual return.
- Panel mount nut is supplies as standard.



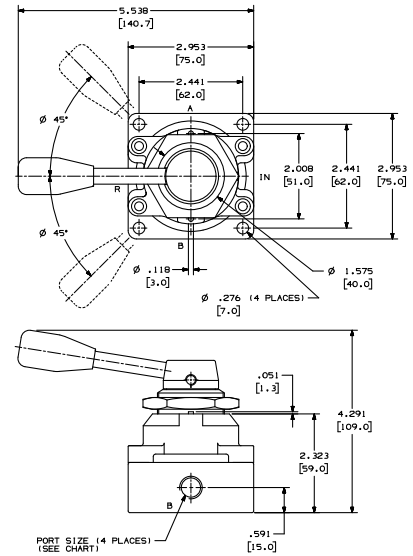
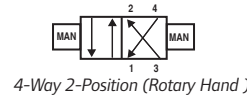
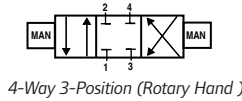
M512LR  
M513LR  
M514LR

## Performance Specifications

|                   |                                     |
|-------------------|-------------------------------------|
| SCFM              | 1/4" = 40, 3/8" = 65, 1/2" = 85     |
| CV (Rotary Lever) | 1/4" = 1.25, 3/8" = 2.0, 1/2" = 2.4 |
| Operating Medium  | Non-lubricated or lubricated air    |
| Pressure Range    | 20 -140 PSI                         |
| Temperature Range | 15° to 122°F (-10° to 50°C)         |
| Port Size NPT     | 1/4", 3/8", 1/2"                    |
| Filtration        | 40 micron recommended               |

## Ordering

| Model                    | Description                     |
|--------------------------|---------------------------------|
| <b>Rotary Hand Lever</b> |                                 |
| M112LR                   | 1/4", 4-Way, 2-Position, Manual |
| M113LR                   | 3/8", 4-Way, 2-Position, Manual |
| M114LR                   | 1/2", 4-Way, 2-Position, Manual |
| M512LR                   | 1/4", 4-Way, 3-Position, Manual |
| M513LR                   | 3/8", 4-Way, 3-Position, Manual |
| M514LR                   | 1/2", 4-Way, 3-Position, Manual |



## Features

### 3-Way & 4-Way Foot Pedal Valves

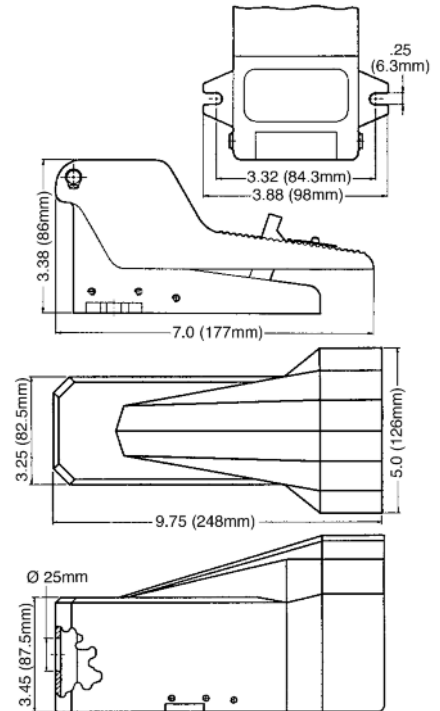
- Rugged aluminum alloy housing and pedal provide excellent durability and are light weight.
- Valves are available with a mechanical detent or as spring return.
- Mechanical detent 3-way and 4-way valves have a guard for applications where accidental actuation may result in injury or damage.
- Guard is safety yellow composite construction.



M252FS  
Foot Pedal Valve



Foot Pedal Valve  
Show with Guard



## Performance Specifications

|                    |                           |
|--------------------|---------------------------|
| Port Size:         | 1/4" NPT                  |
| Pressure Range:    | 30-150 PSI                |
| Temperature Range: | 32° to 160°F (0° to 71°C) |
| Media              | Compressed Air            |

## Ordering

| Model  | Description                          |
|--------|--------------------------------------|
| M252FS | 3-Way, Spring Return, No Guard       |
| M212FS | 4-Way, Spring Return, No Guard       |
| M252TM | 3-Way, Mechanical Detent, With Guard |
| M212TM | 4-Way, Mechanical Detent, With Guard |
| 114417 | Guard only                           |
| M252TS | 3-Way, Spring Return, With Guard     |
| M212TS | 4-Way, Spring Return, With Guard     |
| 114645 | Clip (Foot Pedal)                    |



### 3-Way, 1/8"



M291CS



M291RS



M291HS-10

- Rugged aluminum body is lightweight and durable.
- Valves are available with roller cam, cam stem, push button, or selector, with spring return.
- Ideal for sensing the position and controlling moving devices such as cylinders, slides and gates.
- 1/4" 3-way valves can be plumbed to perform as normally passing, normally non-passing, or selector. 1/8" 3-way can only be used as normally non-passing.
- Stock the basic cam stem valve and a selection of actuators to meet most application needs.

#### Technical Data

|                           |                   |
|---------------------------|-------------------|
| <b>Port size:</b>         | 1/8" NPT          |
| <b>Pressure Range:</b>    | 0-150 PSI         |
| <b>Temperature Range:</b> | 32-160 F (0-71 C) |
| <b>Media:</b>             | Compressed Air    |
| <b>Flow:</b>              | $C_v=.2$ , 8 scfm |

### 3-Way, 1/4"



M252CS



M252RS



M252HS-10

#### Technical Data

|                           |                    |
|---------------------------|--------------------|
| <b>Port size:</b>         | 1/4" NPT           |
| <b>Pressure Range:</b>    | 0-150 PSI          |
| <b>Temperature Range:</b> | 32-160 F (0-71 C)  |
| <b>Media:</b>             | Compressed Air     |
| <b>Flow:</b>              | $C_v=.7$ , 26 scfm |

### 4-Way, 1/4"



M212CS



M212RS



M212HS-10

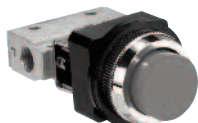
#### Technical Data

|                           |                    |
|---------------------------|--------------------|
| <b>Port size:</b>         | 1/4" NPT           |
| <b>Pressure Range:</b>    | 0-150 PSI          |
| <b>Temperature Range:</b> | 32-160 F (0-71 C)  |
| <b>Media:</b>             | Compressed Air     |
| <b>Flow:</b>              | $C_v=.7$ , 26 scfm |





M291HS-15



M291HS-11



M291HS-13



M291LS-10



M291LS-11



M291LS-10-2

### Ordering Information | 3-Way, 1/8" NPT

#### Complete Models Basic Valves

|             |   |
|-------------|---|
| M291HS-17   | 3-Way, Standard Palm Button, Spring Return (Green)      |
| M291HS-10   | 3-Way, Standard Palm Button, Spring Return (Red)        |
| M291HS-15   | 3-Way, Palm Button w/Detent, Spring Return              |
| M291HS-11   | 3-Way, Palm without Guard, Spring Return                |
| M291HS-13   | 3-Way, Palm w/Guard, Spring Return                      |
| M291LS-10   | 3-Way, Standard Selector, Manual                        |
| M291LS-11   | 3-Way, Long Knob Selector, Manual                       |
| M291RS      | 3-Way, Roller Lever, Spring Return                      |
| M291CS      | Basic Valve, 3-Way, Cam Stem, Spring Return             |
| M291LS-10-2 | 3-Way, Two Valve Kit (Both valves actuate at same time) |

#### Actuators Only

|           |                                       |
|-----------|---------------------------------------|
| 114597-10 | Standard Palm Button Actuator (Red)   |
| 114597-11 | Palm Button without Guard (Red)       |
| 114597-13 | Palm Button w/Guard (Red)             |
| 114597-15 | Palm Button w/Detent (e-stop) (Red)   |
| 114598-10 | Standard Knob (Black)                 |
| 114598-11 | Long Knob (Black)                     |
| 114599    | Roller Lever                          |
| 114597-17 | Standard Palm Button Actuator (Green) |



M252HS-15



M252HS-11



M252HS-13



M252LS-10



M252LS-11

### Ordering Information | 3-way, 1/4" NPT

#### Complete Models

|           |  |
|-----------|--|
| M252HS-17 | 3-Way, Standard Palm Button, Spring Return (Green) |
| M252HS-10 | 3-Way, Standard Palm Button, Spring Return (Red)   |
| M252HS-15 | 3-Way, Palm Button w/Detent                        |
| M252HS-11 | 3-Way, Palm without Guard, Spring Return           |
| M252HS-13 | 3-Way, Palm w/Guard, Spring Return                 |
| M252LS-10 | 3-Way, Standard Selector, Manual                   |
| M252LS-11 | 3-Way, Long Knob Selector, Manual                  |
| M252RS    | 3-Way, Roller Lever, Spring Return                 |
| M252CS    | Basic Valve, 3-Way, Cam Stem, Spring Return        |

#### Actuators Only

|           |                                       |
|-----------|---------------------------------------|
| 114597-10 | Standard Palm Button Actuator (Red)   |
| 114597-11 | Palm Button without Guard (Red)       |
| 114597-13 | Palm Button w/Guard (Red)             |
| 114597-15 | Palm Button w/Detent (e-stop) (Red)   |
| 114598-10 | Standard Knob (Black)                 |
| 114598-11 | Long Knob (Black)                     |
| 114599    | Roller Lever                          |
| 114597-17 | Standard Palm Button Actuator (Green) |



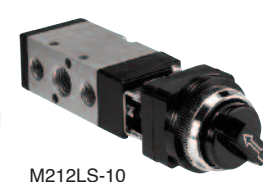
M212HS-15



M212HS-11



M212HS-13



M212LS-10



M212LS-11

### Ordering Information | 4-Way, 1/4" NPT

#### Complete Models

|           |  |
|-----------|--|
| M212HS-17 | 4-Way, Standard Palm Button, Spring Return (Green) |
| M212HS-10 | 4-Way, Standard Palm Button, Spring Return (Red)   |
| M212HS-15 | 4-Way, Palm Button w/Detent, Spring Return         |
| M212HS-11 | 4-Way, Palm without Guard, Spring Return           |
| M212HS-13 | 4-Way, Palm w/Guard, Spring Return                 |
| M212LS-10 | 4-Way, Standard Selector, Manual                   |
| M212LS-11 | 4-Way, Long Knob Selector, Manual                  |
| M212RS    | 4-Way, Roller Lever, Spring Return                 |
| M212CS    | Basic Valve, 4-Way, Cam Stem, Spring Return        |

#### Actuators Only

|           |                                       |
|-----------|---------------------------------------|
| 114597-10 | Standard Palm Button Actuator (Red)   |
| 114597-11 | Palm Button without Guard (Red)       |
| 114597-13 | Palm Button w/Guard (Red)             |
| 114597-15 | Palm Button w/Detent (e-stop) (Red)   |
| 114598-10 | Standard Knob (Black)                 |
| 114598-11 | Long Knob (Black)                     |
| 114599    | Roller Lever                          |
| 114597-17 | Standard Palm Button Actuator (Green) |



## Features

### 3-Way & 4-Way Valves

#### Several Styles and Options

3-Way or 4-Way Configurations. 2-and 3-position configurations.

#### Numerous Actuator Styles

| <u>Manual</u> | <u>Mechanical</u> | <u>Electric</u> | <u>Pneumatic</u> |
|---------------|-------------------|-----------------|------------------|
| Hand Lever    | Cam Stem          | Single Solenoid | Pilot            |
| Palm Button   | Roller Cam        | Double Solenoid | Bleed            |
| Pedal         |                   |                 |                  |
| Treadle       |                   |                 |                  |

#### Many Performance Features

Buna-N spool seals are standard. Viton seals are available for high temperature applications. Consult the factory for ordering information.

The E Series Valve has a low profile. An extruded aluminum body provides excellent durability and lighter weight.

An External Solenoid Supply Port allows service in low pressure applications. This requires a #116153 plug Kit. See Page 56 for operation and ordering information.

#### Solenoid Override

Manual locking override is standard on solenoid models. Turn override to operate.

Solenoid override is a convenient means to set-up and trouble shoot circuits. Air pressure at the solenoid exhaust will also override the solenoid.

#### Coils

Coils are UL and CSA Listed (Files: UL #MH13513; CSA #LR51090).

## Performance Specifications

#### Pressure Ranges:

| <u>Manual Actuators</u>                      | Min. Pilot Press  |           |
|--|-------------------|-----------|
|  | PSI (Bar)         | PSI (Bar) |
| Manual, Spring, and Spring Centered Returns: | 20-150 (1.4-10.2) | 30 (2)    |
| <u>Mechanical Actuators</u>                  |                   |           |
| Manual, Spring, and Spring Centered Returns: | 20-150 (1.4-10.2) | 30 (2)    |
| <u>Electric Actuators</u>                    |                   |           |
| Spring Return                                | 30-150 (2-10.2)   |           |
| Spring Centered Return                       | 35-150 (2.4-10.2) |           |
| Solenoid Return                              | 20-150 (1.4-10.2) |           |
| <u>Pneumatic Actuators</u>                   |                   |           |
| Pilot/Spring Return                          | 20-150 (1.4-10.2) | 30 (2)    |
| Pilot/Spring Centered                        | 20-150 (1.4-10.2) | 35 (2.4)  |
| Pilot/Pilot Return                           | 20-150 (1.4-10.2) | 15 (1)    |
| Bleed/Spring Return                          | 20-150 (1.4-10.2) |           |
| Bleed/Bleed                                  | 20-150 (1.4-10.2) |           |

**Flow:** 26 SCFM

**Cv Factor:** .70 Cv

**Temperature Ratings:** -10° to 180° F (-23° to 82° C)

**Weight:** Solenoid Valves 1.8 to 3.4 oz. (.82 to 1.5 g)  
Non-Solenoid Valves .7 to 1.3 oz (.32 to .6 g)

**Lubrication:** Valves use O-ring seals. For maximum performance and life expectancy, standard air line lubrication should be used.



Hand Lever



Palm Button



Pedal



Treadle



Cam Stem



Roller Cam



Solenoids



Pilot



Bleed

# Ordering

**E X X 2 XX - XXX - X**

### E Series Valves

#### Valve Type

| Code | Description  |
|------|--|
| 1    | 2 Position Detent  |
| 2    | 2 Position   |
| 3    | 3 Position Spring Centered   |
| 5    | 3 Position Detent<br>(3 & 5, all ports blocked)                              |
| 6    | 3 Position Detent (inlet ports blocked, cylinder ports open)                 |
| 7    | 3 Position Spring Centered (6 & 7, inlet ports blocked, cylinder ports open) |

#### Body Style

| Code | Description         |
|------|---------------------|
| 1    | 4 Way Side Ported   |
| 4*   | 4 Way Bottom Ported |
| 5    | 3 Way Side Ported   |

\*Solenoid and Pilot Models only.

#### Port Size

| Code | Description |
|------|-------------|
| 2    | 1/4" NPT    |

### Current Type

| Code | Description |
|------|-------------|
| A    | AC          |
| D    | DC          |
| N    | No Coil     |

Required only on Solenoid Valves. If coil option A or D is selected, a coil connector must be ordered. See Pg. 79 for coil & connector information.

### Coil Voltage

| Code | Description    | Code | Description     |
|------|----------------|------|-----------------|
| 000  | No Coil        | 024  | 24V (AC or DC)  |
| 005  | 5V (AC or DC)  | 120  | 120V (AC or DC) |
| 012  | 12V (AC or DC) | 240  | 240V AC         |

Required only when ordering Solenoid Valves.

### Actuator / Return

| Code | Actuator/Return                                       |
|------|---|
| BD   | Bleed Double  |
| BS   | Bleed/Spring  |
| CS   | Cam Stem/Spring                                       |
| US   | Cam Stem/Spring, 1/4" Spool travel, 3-way valve only. |
| RS   | Roller Cam/Spring                                     |
| HM   | Palm/Manual   |
| HP   | Palm/Pilot  |
| HS   | Palm/Spring   |
| WM   | Palm w/o Button/Manual                                |
| WP   | Palm w/o Button/Pilot                                 |
| WS   | Palm w/o Button/Spring                                |

### Actuator / Return

| Code | Actuator/Return      |
|------|----------------------|
| LM   | Hand Lever/Manual    |
| LP   | Hand Lever/Pilot     |
| LS   | Hand Lever/Spring    |
| PD   | Pilot/Double         |
| PS   | Pilot/Spring         |
| SD   | Double Solenoid      |
| SN   | Solenoid/Spring-N.O. |
| SS   | Solenoid/Spring      |
| FS   | Pedal/Spring         |
| TM   | Treadle/Manual       |
| TS   | Treadle/Spring       |

Numbering ends here if a Non-Solenoid Valve is being selected.

## Accessories

### Palm Buttons

For use with **WM**, **WP** or **WS** Actuators.

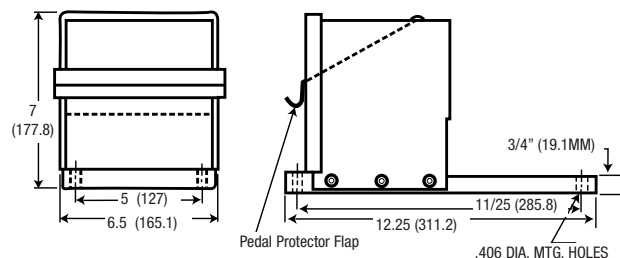
- 13111** Plastic, Black
- 119243** Metal, Plain
- 119244** Metal, Red
- 119245** Metal, Green
- MP3651-7** Plastic, Red



### Foot Pedal Guards

Recommended for applications where accidental actuation may result in damage or injury. Model 20965-1 is designed to comply with ANSI No. B11.1-1971 specifications and OSHA regulations.

- 20965-1** Pedal Guard with Flapper
- 20965-2** Pedal Guard without Flapper

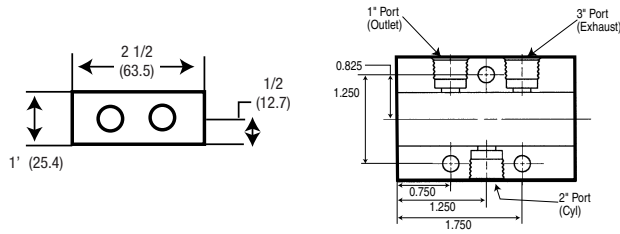


**NOTE:** Not for use with treadle actuator

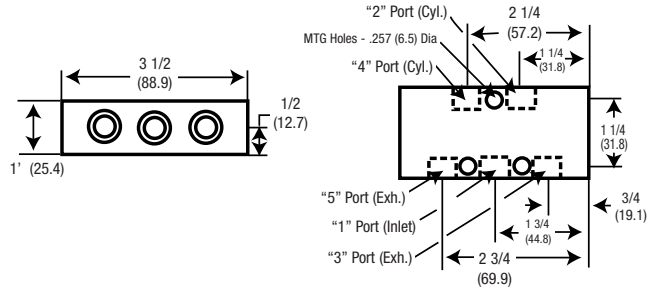
# Dimensional Data

Dimensions given in Inches and (Millimeters)

## Basic 3-Way Valve

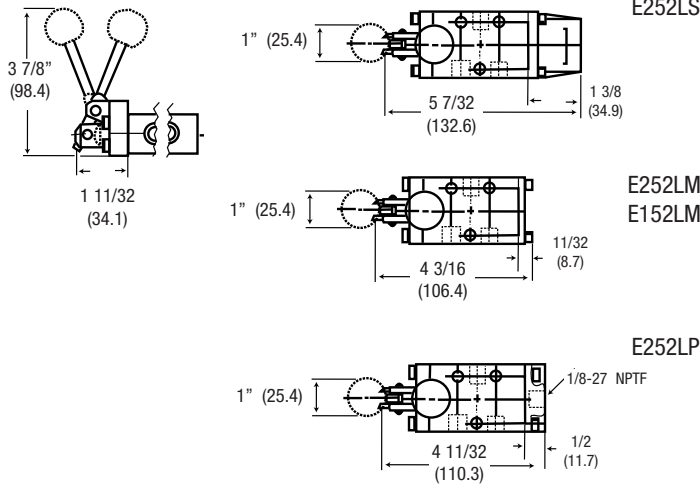


## Basic 4-Way Valve

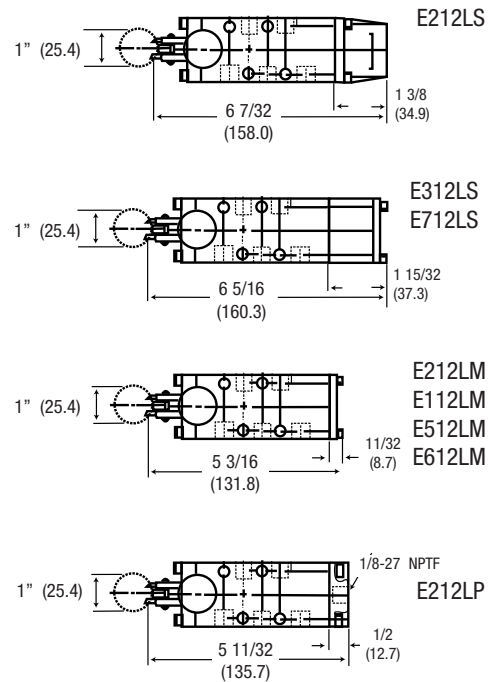


## Hand Lever Valves

### 3 Way Valves

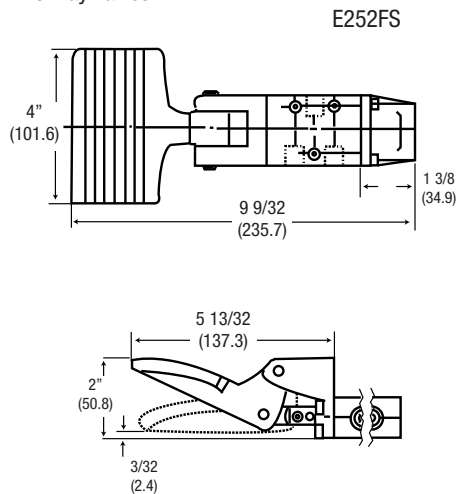


### 4 Way Valves

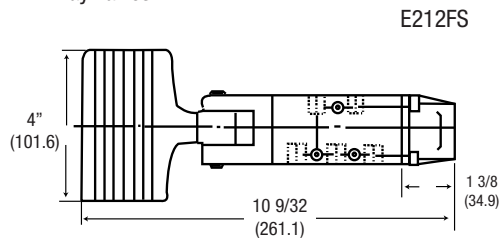


## Pedal

### 3 Way Valves



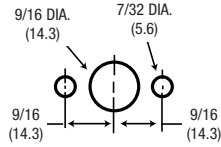
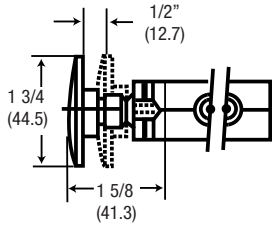
### 4 Way Valves



# Dimensional Data

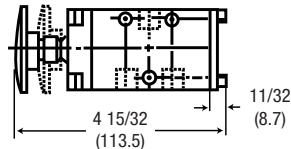
Dimensions given in Inches and (Millimeters)

## Palm Button Valves

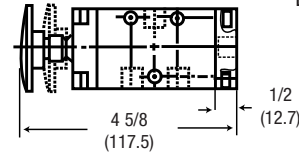


Palm Button Valves may be panel mounted. 1/8" Max. panel thickness utilizing two 10-24 UNC tapped holes in end cap  
**Not Available on detent models:**  
 E152HM or -WM  
 E112HM or -WM

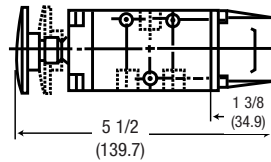
### 3 Way Valves



E252HM or -WM  
 E152HM or -WM

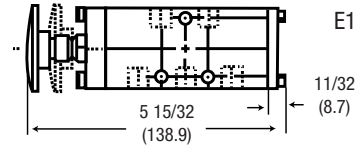


E252HP or -WP

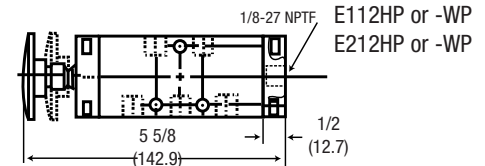


E252HS or -WS

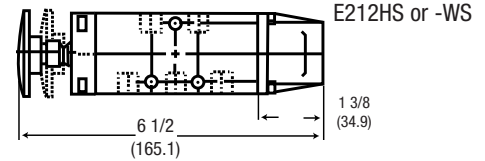
### 4 Way Valves



E212HM or -WM  
 E112HM or -WM

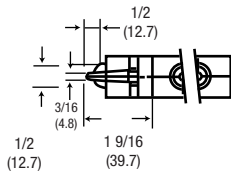


E112HP or -WP  
 E212HP or -WP

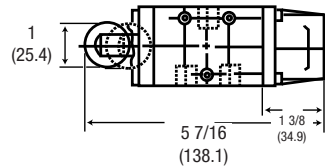


E212HS or -WS

## Roller Cam Valves

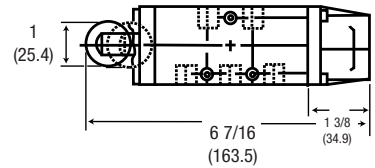


### 3 Way Valves



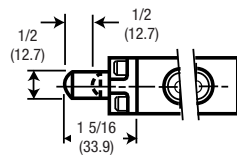
E252RS

### 4 Way Valves

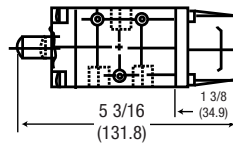


E212RS

## Cam Stem Valves

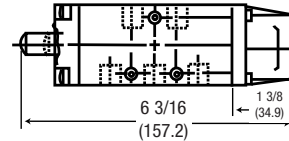


### 3 Way Valves



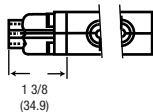
E252CS

### 4 Way Valves

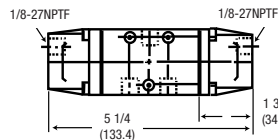


E212CS

## Pilot Valves

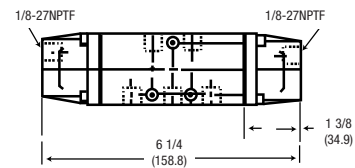


### 3 Way Valves

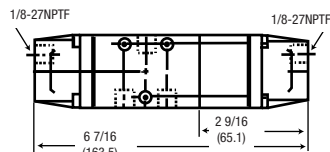


E252PS  
 E252PD

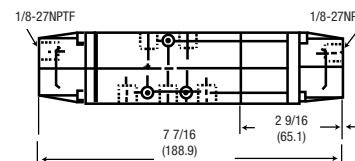
### 4 Way Valves



E212PS  
 E212PD



E152PD

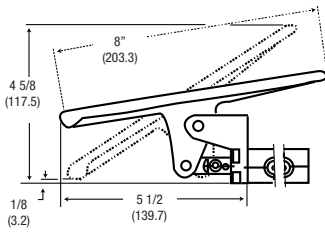


E112PD  
 E312PD  
 E712PD

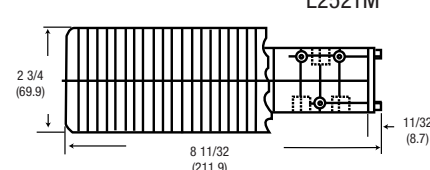
# Dimensional Data

Dimensions given in Inches and (Millimeters)

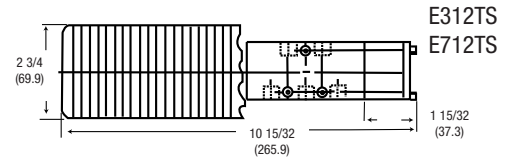
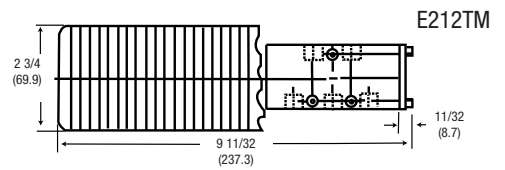
## Treadle Valves



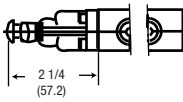
### 3 Way Valves



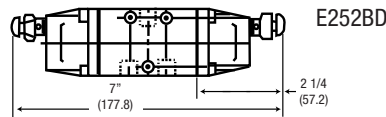
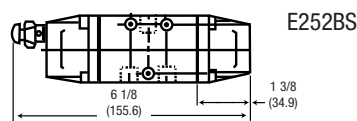
### 4 Way Valves



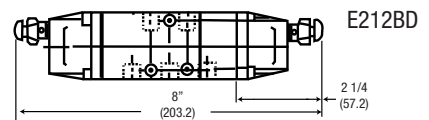
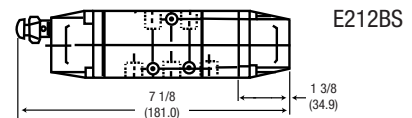
## Bleed Valves



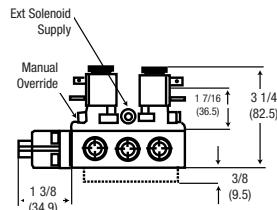
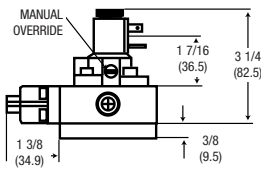
### 3 Way Valves



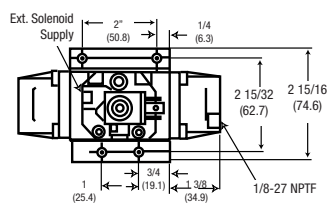
### 4 Way Valves



## Solenoid Valves

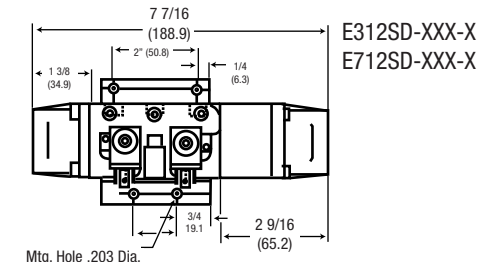
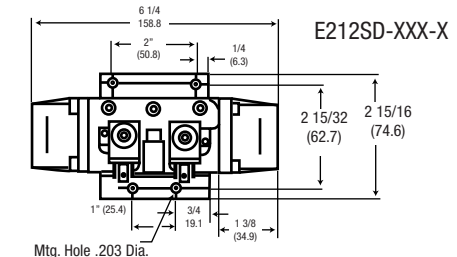
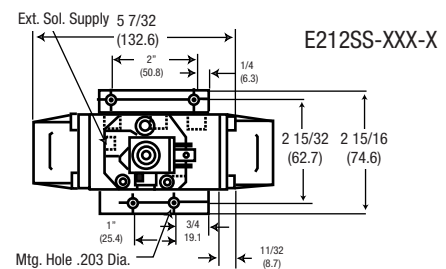


### 3 Way Valves



E252SN-XXX-X  
E252SS-XXX-X

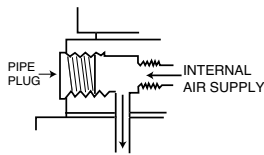
### 4 Way Valves



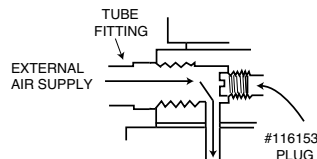
## Accessories

### 116153 Plug Kit

Kit needed for low pressure applications requiring an external Solenoid Supply Pressure. To use, remove and discard the standard pipe plug in the solenoid base. Thread the Plug/O-ring assembly into the threaded port. This blocks the internal supply connection. Finish by connecting an external air supply to the 1/8 NPTF port.



SOLENOID VALVE  
W/INTERNAL SOLENOID SUPPLY  
FROM VALVE BODY AS SHIPPED



CONVERTED SOLENOID VALVE  
W/EXTERNAL SOLENOID SUPPLY  
CONNECTION





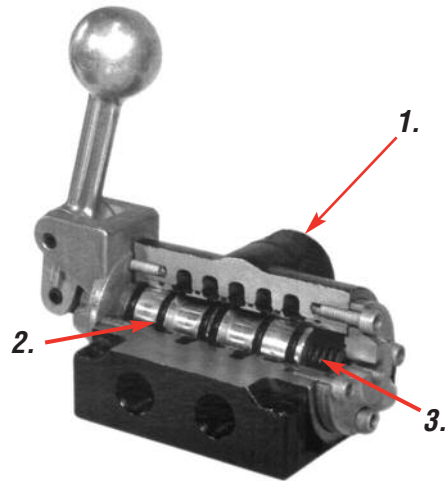
## Features

Styles and Options.

5-Port, 4-Way, 2 and 3-position directional control valves.

Seven Actuator Styles.

| <u>Manual</u> | <u>Electric</u> | <u>Pneumatic</u> |
|---------------|-----------------|------------------|
| Hand Lever    | Single Solenoid | Pilot            |
| Pedal         | Double Solenoid | Bleed            |
| Treadle       |                 |                  |
| Palm Button   |                 |                  |



### Comprehensive Valve Design

**1. Aluminum Body**

Sand cast aluminum body provides a rugged, reliable valve.

**2. Buna N Seals**

Standard seals are Buna N, for extended valve life. Viton seals are available for high temperature applications. Consult factory for ordering information.

**3. Sturdy Spools**

K-Series valves have an aluminum spool. This slides in a hard anodized Teflon non-stick aluminum sleeve (3/8" or 1/2" models) The sleeves are brass on 3/4" or 1" models.

**4. Standard Solenoid Override Feature**

3/8" and 1/2" models only.

**5. External Solenoid**

External Solenoid supply port enables valve operation for vacuum service or low pressure operations. For proper supply connection, consult factory. (Remove end cap and rotate gasket 90° for remote solenoid supply.)



Hand Lever



Pedal



Treadle



Solenoids



Pilot



Bleed

# Ordering

**K X X X XX - XXX - X**

**K Series Valves**

| Valve Type |   |
|------------|---|
| Code       | Description   |
| 2          | 2 Position  |
| 3          | 3 Position Spring Centered  |
| 5          | 3 Position Detent<br>(3 & 5 all ports blocked in neutral)                                 |
| 6          | 3 Position Detent<br>(inlet ports blocked, cylinder ports open in neutral)                |
| 7          | 3 Position Spring Centered<br>(6 & 7 inlet ports blocked, cylinder ports open in neutral) |

| Body Style |                   |
|------------|-------------------|
| Code       | Description       |
| 1          | 4 Way Side Ported |

| Port Size |             |
|-----------|-------------|
| Code      | Description |
| 3         | 3/8" NPT    |
| 4         | 1/2" NPT    |
| 6         | 3/4" NPT    |
| 8         | 1" NPT      |

| Current Type |             |
|--------------|-------------|
| Code         | Description |
| A            | AC          |
| D            | DC          |
| N            | No Coil     |

*If coil option A or D is selected, a coil connector must be ordered. See Pg. 79 for coil & connector information.*

| Coil Voltage |                 |
|--------------|-----------------|
| Code         | Description     |
| 000          | No Coil         |
| 005          | 5V (DC only)    |
| 012          | 12V (AC or DC)  |
| 024          | 24V (AC or DC)  |
| 120          | 120V (AC or DC) |
| 240          | 240V (AC only)  |


*Required only with Solenoid Valves*

| Actuator / Return |                   |
|-------------------|-------------------|
| Code              | Actuator/Return   |
| BD                | Bleed/Bleed       |
| BS                | Bleed/Spring      |
| *FP               | Pedal/Pilot       |
| *FS               | Pedal/Spring      |
| **HS              | Palm/Spring       |
| *LM               | Hand Lever/Manual |
| *LS               | Hand Lever/Spring |
| PD                | Pilot/Pilot       |
| PS                | Pilot/Spring      |
| SD                | Solenoid/Solenoid |
| SS                | Solenoid/Spring   |
| *TM               | Treadle/Manual    |

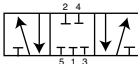
**\*FP, FS, LM, LS & TS** available in 3/8" and 1/2" port sizes only.

Numbering ends here if a Non-Solenoid valve is being selected.

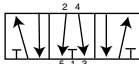
**\*\*HS** available in 3/8" port size only.




2-Position



3-Position, inlet ports blocked



3-Position, inlet blocked, cylinder ports open



20965-X Foot Pedal Guards, for use with Pedal Style valves. See Pg. 53 (bottom) for details.

# Performance Specifications

## Pressure Ranges:

| Actuator Type             | Manual Actuators | Mechanical Actuators | Electric Actuators  | Pneumatic Actuators   |
|---------------------------|------------------|----------------------|---|---|
| Manual, Spring, and Pilot | 0-150 (0-10.4)   | 0-150 (0-10.4)       | Spring Return: 50-150 (3.5-10.4)<br>Spring Centered Return: 60-150 (4.1-10.4)<br>Solenoid Return: 20-150 (1.4-10.4) | Pilot/Spring Return: 0-150 (0-10.4)<br>Pilot/Spring Centered: 0-150 (0-10.4)<br>Pilot/Pilot Return: 50-150 (3.5-10.4)<br>Bleed/Spring Return: 50-150 (3.5-10.4)<br>Bleed/Bleed: 20-150 (1.4-10.4) |
| Min. Pilot Press          | 20 (1.4)         | 20 (1.4)             | 50 (3.5)<br>60 (4.1)<br>20 (1.4)  |   |

## Flow & Cv Factor:

| Port Size | Flow     | Cv Factor |
|-----------|----------|-----------|
| 3/8"      | 83 SCFM  | 2.30      |
| 1/2"      | 90 SCFM  | 2.57      |
| 3/4"      | 270 SCFM | 7.54      |
| 1"        | 280 SCFM | 7.80      |

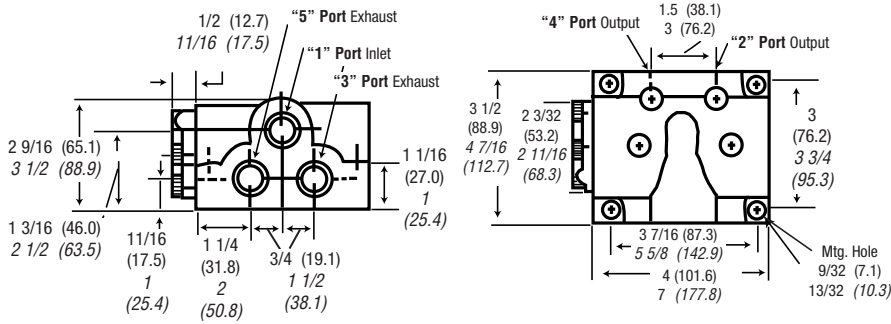
**Temperature Ratings:** -10° to 180° F (-23° to 82° C)

## Lubrication:

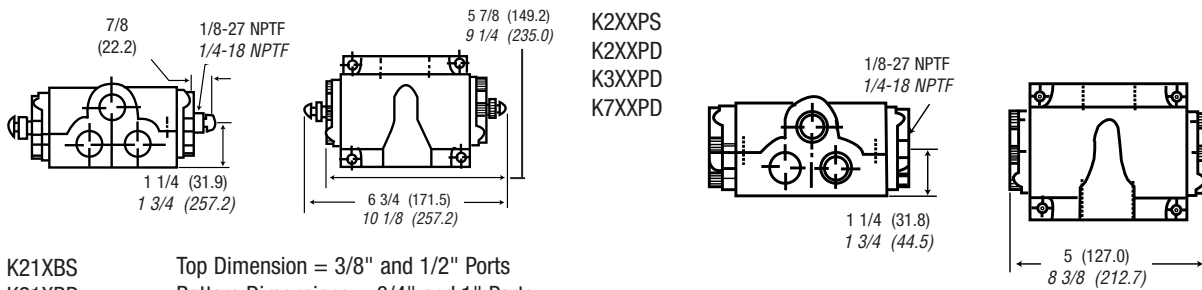
Valves use O-ring seals. For maximum performance and life expectancy, standard air line lubrication should be used.

## Dimensional Data Dimensions given in Inches and (Millimeters)

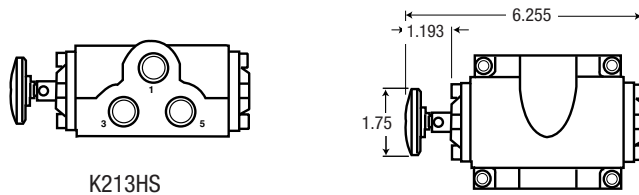
### Basic Valves



### Pilot and Bleed Valves



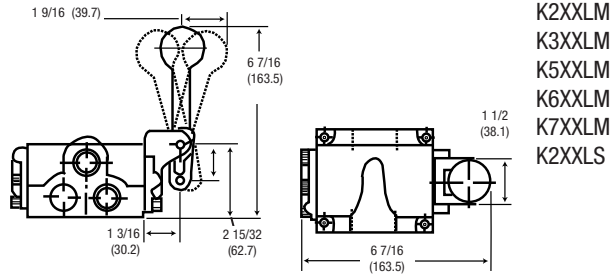
### Palm Valves



# Dimensional Data

Dimensions given in Inches and (Millimeters)

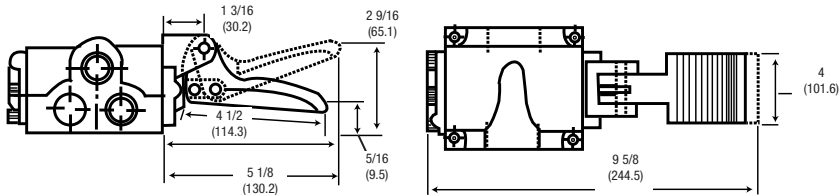
## Hand Lever



- K2XXLM
- K3XXLM
- K5XXLM
- K6XXLM
- K7XXLM
- K2XXLS

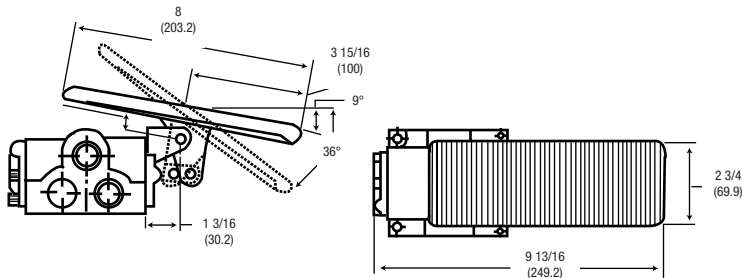
Top Dimension = 3/8" and 1/2" Ports  
 Bottom Dimensions = 3/4" and 1" Ports

## Pedal



- K2XXFS
- K2XXFP

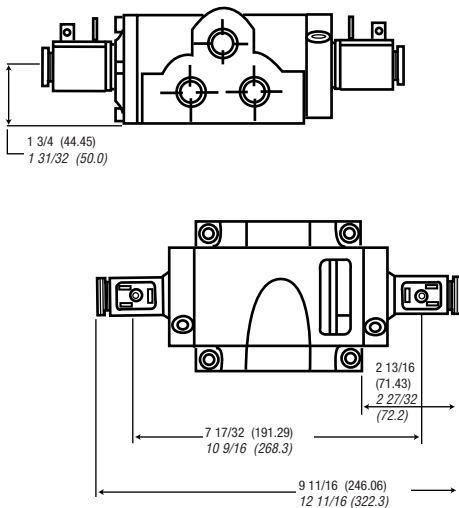
## Treadle



- K2XXTM
- K5XXTM
- K6XXTM
- K3XXTS
- K7XXTS

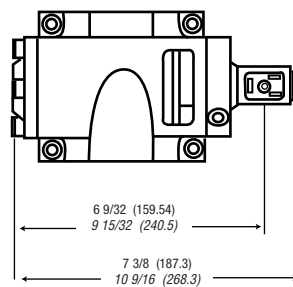
## Solenoid

Double Solenoid



- K2XXSD-XXX-X
- K3XXSD-XXX-X
- K7XXSD-XXX-X

Single Solenoid



- K2XXSS-XXX-X

Top Dimension = 3/8" and 1/2" Ports  
 Bottom Dimensions = 3/4" and 1" Ports

## Features

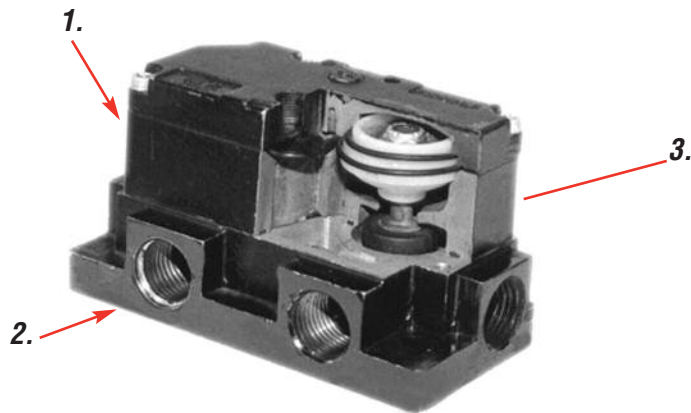
- H-Series Valves feature high-flow and fast response.
- Numerous Styles and Options.
- 3-Way and 4-Way 2-position Poppet Valves
- Several Actuator Styles.
- Override is not available with “H” Series Valves

### Electric

- 3-Way Single Solenoid
- 4-Way Single Solenoid
- 4-Way Double Solenoid

### Pneumatic

- 3-Way Pilot
- 4-Way Pilot
- 4-Way Pilot Bleed
- 4-Way Manual Bleed



## Comprehensive Valve Design

### 1. Durable Valve Body

Valve body is die-cast Zinc, with a zinc chromate coating for added corrosion resistance in harsh environments.

### 2. Superior Performance

Large, unrestricted air passages produce high flow and fast response times.

### 3. Superior Design

3-Way valves feature a single poppet. 4-Way valves (as shown) have two simultaneously driven poppets to provide the 4-way function.



3-Way  
Pilot



3-Way  
Solenoid



4-Way Solenoid



Manual Bleed



Pilot Bleed



4-Way Pilot

# Ordering

**H 2 X X XX - XXX - X**

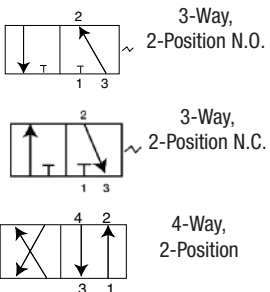
**H Series Valves**

**Valve Type**

| Code | Description |
|------|-------------|
| 2    | 2 Position  |

**Body Style**

| Code | Description       |
|------|-------------------|
| 1    | 4 Way Side Ported |
| 5    | 3 Way Side Ported |



3-Way, 2-Position N.O.

3-Way, 2-Position N.C.

4-Way, 2-Position

**Port Size**

| Code | Description |
|------|-------------|
| 2    | 1/4" NPT    |
| 3    | 3/8" NPT    |
| 4    | 1/2" NPT    |

**Current Type**

| Code | Description |
|------|-------------|
| A    | AC          |
| D    | DC          |
| N    | No Coil     |

Only on Solenoid Valves.

**Coil Voltage**

| Code | Description     |
|------|-----------------|
| 000  | No Coil         |
| 005  | 5V (DC only)    |
| 012  | 12V (AC or DC)  |
| 024  | 24V (AC or DC)  |
| 120  | 120V (AC or DC) |
| 240  | 240V (AC only)  |

Required only with Solenoid Valves.

**Actuator / Return**

| Code                | Actuator/Return           |
|---------------------|---------------------------|
| <b>3-Way Valves</b> |                           |
| PS                  | Pilot/Spring              |
| SS                  | Solenoid/Spring           |
| <b>4-Way Valves</b> |                           |
| BD                  | Manual Bleed/Manual Bleed |
| PA                  | Pilot/Internal Pilot      |
| PD                  | Pilot/Pilot               |
| SA                  | Solenoid/Internal Pilot   |
| SD                  | Solenoid/Solenoid         |

Numbering ends here for Non-Solenoid Valves

If coil option A or D is selected, a coil connector must be ordered. See Pg. 79 for coil & connector information.

# Performance Specifications

## Valve Performance Data

### 3-Way Valves

| Actuator | Return | Pressure Range<br>PSI (bar) | Minimum Pilot<br>Press PSI (bar) | 3-Way Valve Flow SCFM |             |           |
|----------|--------|-----------------------------|----------------------------------|-----------------------|-------------|-----------|
|          |        |                             |                                  | Port Size             | Side Ported | Cv Factor |
| Pilot    | Spring | 30-150 (2.1-10.4)           | 30 (2.1)                         | 1/4"                  | 55          | 1.51      |
| Solenoid | Spring | 30-150 (2.1-10.4)           |                                  | 3/8"                  | 81          | 2.27      |
|          |        |                             |                                  | 1/2"                  | 85          | 2.40      |

### 4-Way Valves

| Actuator     | Return                     | Pressure Range<br>PSI (bar) | Minimum Pilot<br>Press PSI (bar) | 4-Way Valve Flow SCFM |             |           |
|--------------|----------------------------|-----------------------------|----------------------------------|-----------------------|-------------|-----------|
|              |                            |                             |                                  | Port Size             | Side Ported | Cv Factor |
| Pilot        | Internal Pilot             | 20-150 (1.4-10.4)           | 20 (1.4)                         | 1/4"                  | 50          | 1.40      |
| Manual Bleed | Manual Bleed               | 20-150 (1.4-10.4)           |                                  | 3/8"                  | 88          | 2.38      |
| Pilot Bleed  | Pilot Bleed                | 20-150 (1.4-10.4)           | 20 (1.4)                         | 1/2"                  | 100         | 2.80      |
| Solenoid     | Internal Bleed or Solenoid | 25-135 (1.7-9.3)            |                                  |                       |             |           |

## Response Time @ 100 PSI

### 3-Way Valves

| Energized    | De-energized |
|--------------|--------------|
| N.O. - 23 ms | 20 ms        |
| N.C. - 22 ms | 26 ms        |

### 4-Way Valves

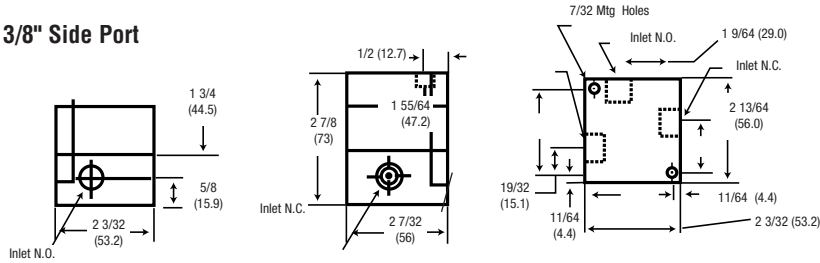
| Energized | De-energized |
|-----------|--------------|
| 44 ms     | 27 ms        |



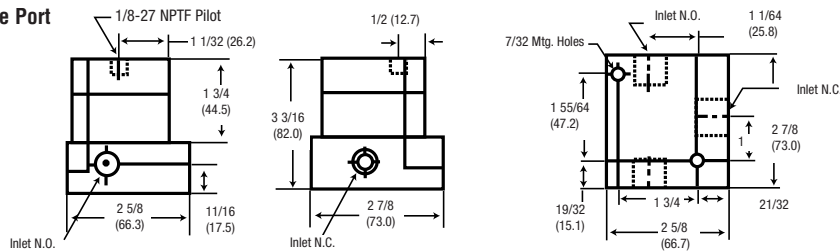
## Dimensional Data Dimensions given in Inches and (Millimeters)

### 3-Way Basic Valves

#### 1/4" and 3/8" Side Port

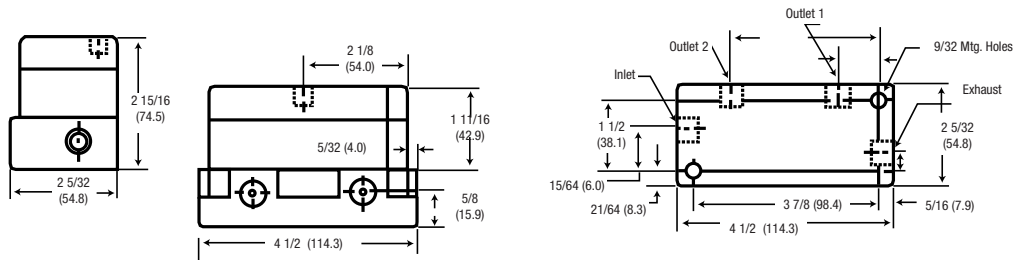


#### 1/2" Side Port

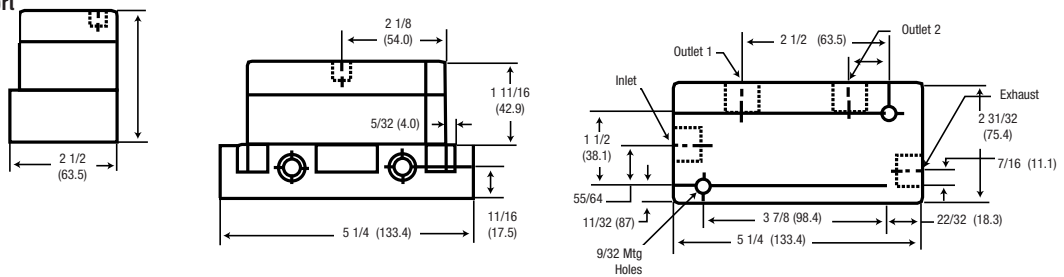


### 4-Way Basic Valves

#### 1/4" and 3/8" Side Port



#### 1/2" Side Port

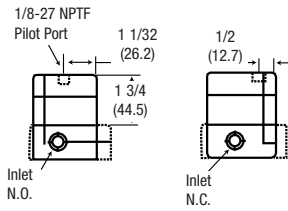


# Dimensional Data

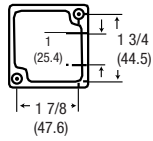
Dimensions given in Inches and (Millimeters)

## Pilot Valves

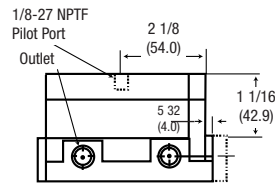
3-Way Pilot



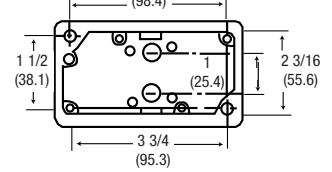
H25XPS



4-Way Pilot

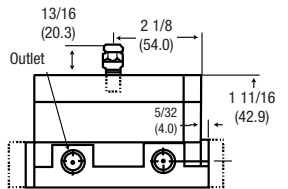


H21XPA

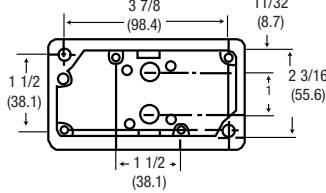


## Bleed Valves

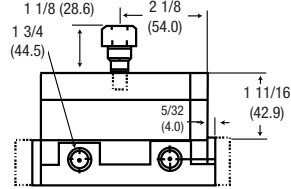
4-Way Manual Bleed



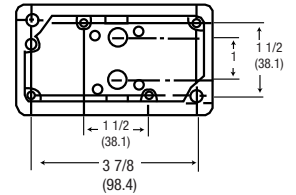
H21XBD



4-Way Pilot Bleed

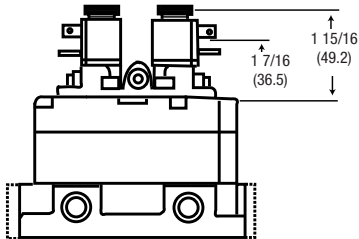


H21XPD

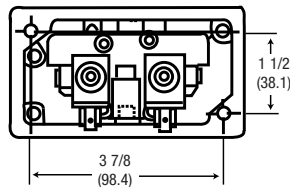


## Solenoid Valves

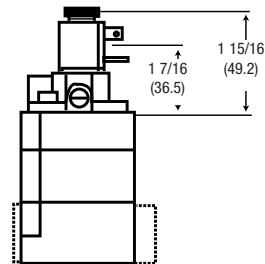
4-Way Double Solenoid



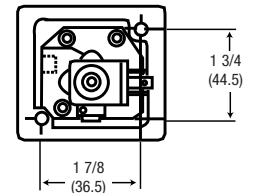
H21XSD-XXX-X



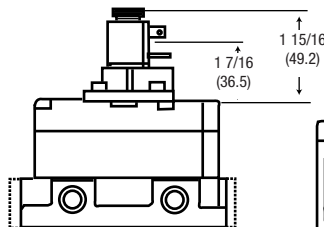
3-Way Single Solenoid



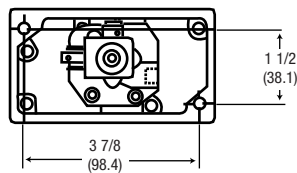
H25XSS-XXX-X



4-Way Single Solenoid



H21XSA-XXX-X



## Features

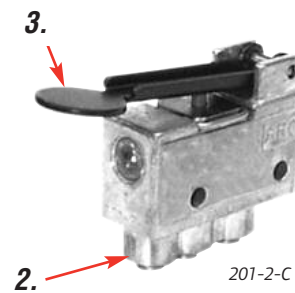
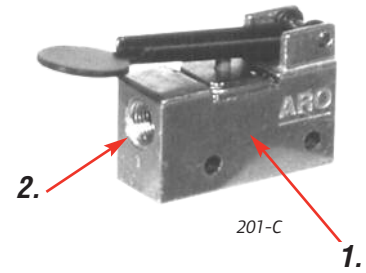
- 200-Series valves can be plumbed to perform as normally passing, normally non passing, selector or any 2-way function.
- Ideal for sensing the position of moving devices such as cylinders, slides or gates.
- Mounting holes are standard 1" electrical centers
- Numerous Actuator Styles:

Mechanical

- Short Roller Lever
- Long Roller Lever
- One-Way, Short Lever
- One Way, Long Lever
- Pin Plunger

Manual

- Short Ball Roller
- Long Ball Roller
- Straight Plunger
- Roller Plunger
- Cross-Roller Plunger
- Plain Lever
- Fingertip Lever
- Centering Toggle
- Retained Toggle
- Panel Button



### Comprehensive Valve Design

- 1. Durable Valve Body.**  
Body is die cast zinc for high wear resistance. Valve also features a stainless steel, Teflon coated spool, with Viton O-ring seals and Buna-N static seals.
- 2. Two Plumbing Options.**  
Available with 1/8" NPTF ports, or instant tube fittings for use with 5/32" (4mm) nylon tubing.
- 3. Numerous Actuator Styles.**  
Five manual, ten mechanical and one pilot actuators to choose from. Eight can be panel mounted.

## Performance Specifications

**Pressure Range:**

30 to 150 PSIG (2.1 to 10.4 bar)

**Temperature Range:**

32 to 160 F (0 to 71 C)

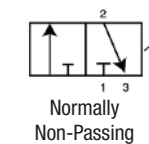
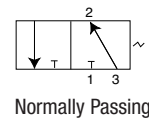
**Actuating Force:**

| Actuator | Force Oz.(N) | Stroke In (mm) | Travel In (mm) |
|----------|--------------|----------------|----------------|
| 200      | 20 (5.56)    | .195 (4.95)    | .055 (1.40)    |
| 201      | 20 (5.56)    | .289 (7.34)    | .086 (2.18)    |
| 202      | 36 (10.0)    | .086 (2.18)    | .024 (0.61)    |
| 203      | 21 (5.84)    | .160 (4.06)    | .040 (1.02)    |
| 204      | 34 (9.45)    | .089 (2.26)    | .027 (.69)     |
| 205      | 23 (6.39)    | .164 (4.17)    | .043 (1.09)    |
| 209      | 57 (15.9)    | .069 (1.57)    | .015 (.38)     |
| 212      | 57 (15.9)    | .069 (1.57)    | .015 (.38)     |
| 213      | 57 (15.9)    | .069 (1.57)    | .015 (.38)     |
| 214      | 57 (15.9)    | .062 (1.57)    | .089 (2.26)    |
| 215      | 57 (15.9)    | .062 (1.57)    | .089 (2.26)    |
| 216      | 57 (15.9)    | .062 (1.57)    | .089 (2.26)    |
| 222      | 24 (6.67)    | 70°            | ----           |
| 223      | 24 (6.67)    | 70°            | ----           |
| 224      | 57 (15.9)    | .062 (1.57)    | .025 (3.18)    |

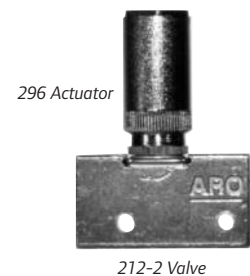
**Flow & Cv Factor:**

1/8" Ports: 7.5 SCFM Cv = .195

5/32" (4mm) Tube Fittings: 4.0 SCFM Cv = .104



206 consist of a 212-C and a model 296 actuator



**206-C Minimum Pilot Pressure PSIG (bar)**

| Supply Pressure   | 25 (1.7)   | 50 (3.4)   | 75 (5.1)   | 100 (6.9)  | 125 (8.6)  | 150 (10.4) |
|-------------------|------------|------------|------------|------------|------------|------------|
| Piped IN - N.N.P. | 11.5 (.8)  | 12.0 (.8)  | 12.5 (.9)  | 13.0 (.9)  | 13.5 (.9)  | 14.0 (1.0) |
| Piped IN - N.P.   | 14.5 (1.0) | 17.0 (1.2) | 19.5 (1.3) | 22.0 (1.5) | 24.5 (1.7) | 27.0 (1.9) |

# Ordering

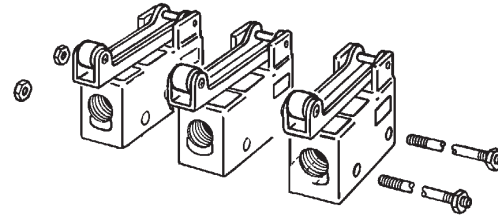
**2**   **XX**   -   **X**

| 200 Series |                      | Actuator Type |                      |
|------------|----------------------|---------------|----------------------|
| Code       | Description          | Code          | Description          |
| 00         | Plain Lever          | 12            | Short Ball Roller    |
| 01         | Fingertip Lever      | 13            | Long Ball Roller     |
| 02         | Short Roller Lever   | 14            | Straight Plunger     |
| 03         | Long Roller Lever    | 15            | Roller Plunger       |
| 04         | One-Way, Short Lever | 16            | Cross-Roller Plunger |
| 05         | One Way, Long Lever  | 22            | Centering Toggle     |
| 06         | Pilot Actuated       | 23            | Retained Toggle      |
| 09         | Pin Plunger          | 24            | Panel Button         |

| Port Type |                    |
|-----------|--------------------|
| Code      | Description        |
| -C        | 1/8" NPTF Ports    |
| -2-C      | 5/32" Tubing Ports |

## Stacking Kit

| Kit   | # of Valves |
|-------|-------------|
| 225-2 | 2 Valves    |
| 225-3 | 3 Valves    |
| 225-4 | 4 Valves    |
| 225-5 | 5 Valves    |

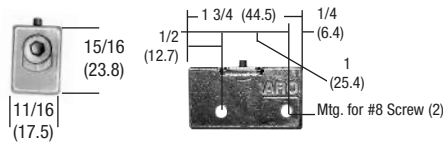


# Dimensional Data

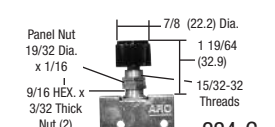
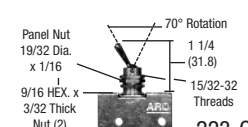
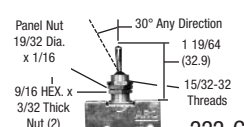
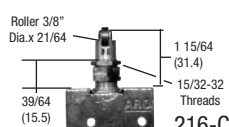
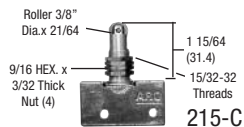
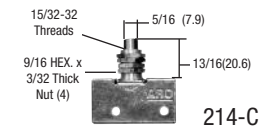
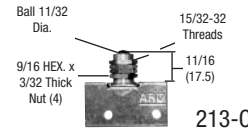
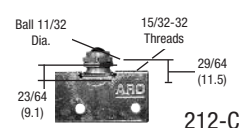
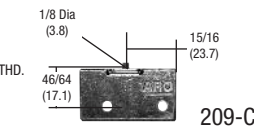
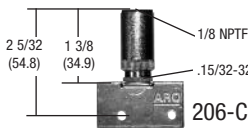
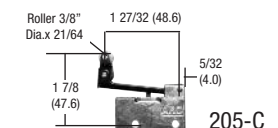
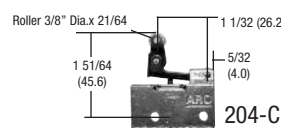
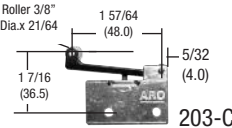
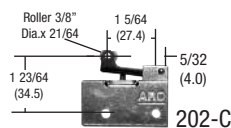
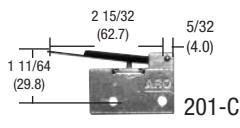
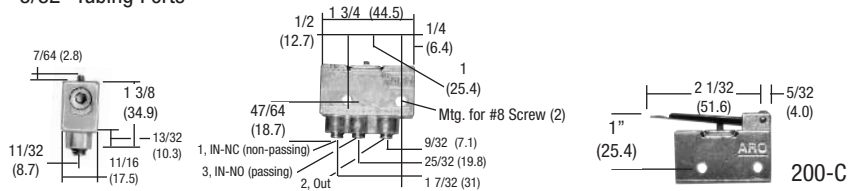
Dimensions given in Inches and (Millimeters)

## Basic Valves

1/8" NPT Ports

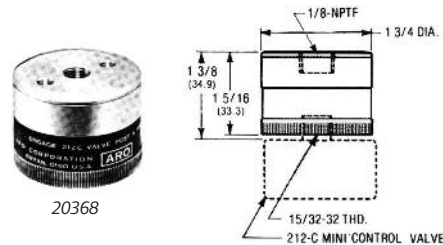


5/32" Tubing Ports



## Low-Pressure Pilot Actuator Switch

- Use on 212-C ball roller limit valve.
- For use in low pilot pressure applications.
- Maximum pilot pressure is 100 pSIG (6.9 bar)
- 1/8" NPTF air inlet ports.
- Aluminum-alloy construction with low friction Buna-N cup seal.
- Order Model 20368 and 212-C Aro ball roller limit valve separately.



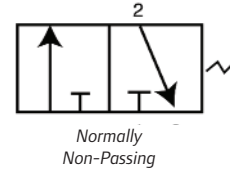
### Min. Pilot Pressure PSIG (bar)

| Supply Pressure | 25 (1.7)  | 50 (3.5)  | 75 (5.2)  | 100 (6.9) | 125 (8.6) | 150 (10.4) |
|-----------------|-----------|-----------|-----------|-----------|-----------|------------|
| Piped IN-N.P.   | 5.5 (0.4) | 6.0 (0.4) | 6.5 (0.4) | 7.0 (0.5) | 7.5 (0.5) | 8.0 (0.6)  |
| Piped IN-N.P.   | 5.5 (0.4) | 6.0 (0.4) | 6.5 (0.4) | 7.0 (0.5) | 7.5 (0.5) | 8.0 (0.6)  |

## Features

### Miniature Control Valves

- Ball Poppet valve provides fast response.
- Slotted Mounting holes for easy placement and adjustment.
- 100 Series Mini Valves are non-passing, non-lube limit valves.
- 33% glass reinforced polyester body is strong, lightweight and corrosion resistant.
- Available with #10-32 threaded ports or 5/32" tube fittings. Both ports are on one side for ease of plumbing and maintenance.
- Seals are Buna-N, Stainless Steel Spring, Brass Plunger and Delrin Roller.



## Performance Specifications

**Pressure Range:** 0 to 150 PSIG (0 to 10.4 bar)  
**Temperature Range:** -10° to 180° F (-23° to 82° C)  
**Flow & Cv Factor:** 3.4 SCFM at 100 PSIG (7 bar) input 85 PSI (5.8 bar) output. Cv = .09

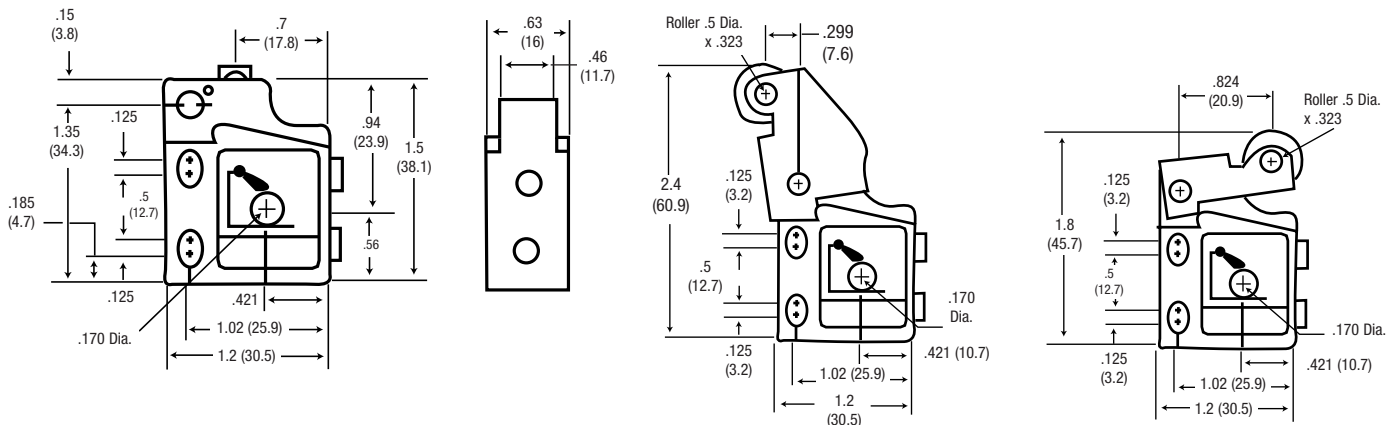
**Actuating Force:** **Travel Operation:**  
**Straight Plunger:** **Straight Plunger:**  
 52 oz. at 100 PSIG .03125" (.8mm) to actuate  
 (14.46 N at 7 bar) .109375" (2.8mm) total

**Levers:** **Levers:**  
 25 oz. at 100 PSIG .0625" (1.6mm) to actuate  
 (6.95 N at 7 bar) .21875" (5.5mm) total

## Ordering

| Model #: | Port Size:    | Actuator Type:   |
|----------|---------------|------------------|
| 103-A    | #10-32 Thread | Roller Lever     |
| 103-2-A  | 5/32" Tube    | Roller Lever     |
| 105-A    | #10-32 Thread | 90° Roller Lever |
| 105-2-A  | 5/32" Tube    | 90° Roller Lever |
| 109-A    | #10-32 Thread | Straight Plunger |
| 109-2-A  | 5/32" Tube    | Straight Plunger |

## 100 Series Dimensional Data Dimensions given in Inches and (Millimeters)



## Features

### MaxAir 3-Way and 4-Way, 1/8" Manual and Mechanical Valves

- Rugged aluminum alloy body is lightweight and durable.
- 3-way valves can be plumbed to perform as normally passing, normally non-passing, or selector.

## Performance Specifications

Port size: 1/8" NPT

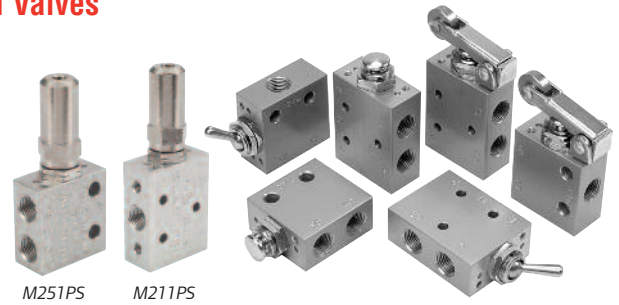
Pressure Range: 0-150 PSI

Temp. Range: 32-160 F (0-71 C)

Media: Compressed Air

Flow: 3-Way = 7 scfm

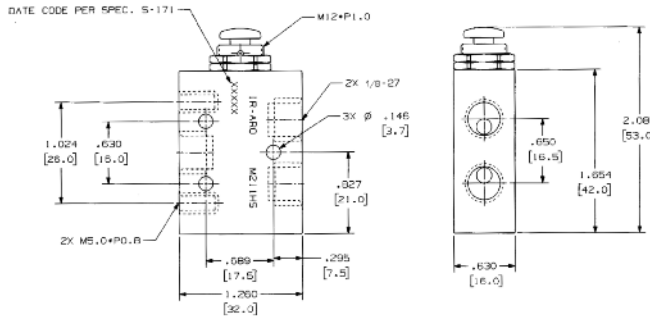
4-Way = 9 scfm



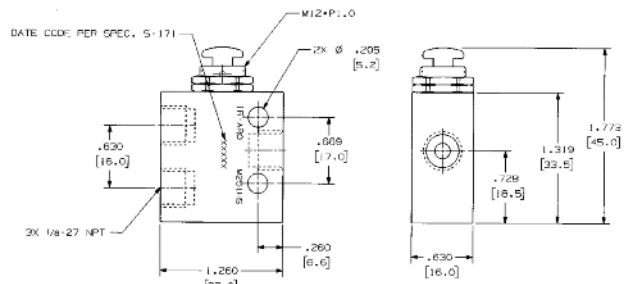
### Accessory Attachments for use on M251HS & M211HS Valves

|                          |               |
|--------------------------|---------------|
| One-way roller lever     | <b>104484</b> |
| Ball plunger attachment  | <b>104485</b> |
| Air pilot attachment     | <b>104486</b> |
| Finger button attachment | <b>104487</b> |

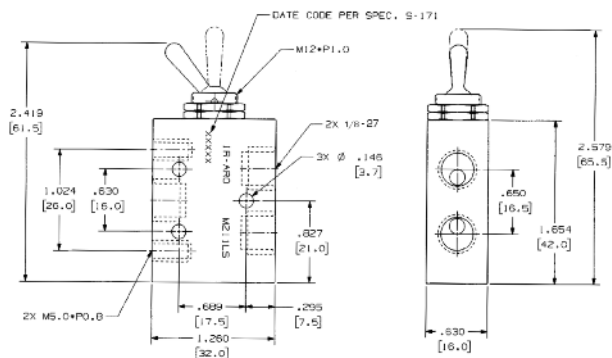
### M211HS 4-Way, Push Button, Spring Return



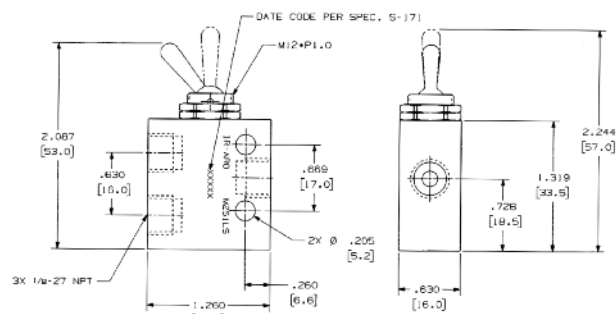
### M251HS 3-Way, Push button, Spring Return



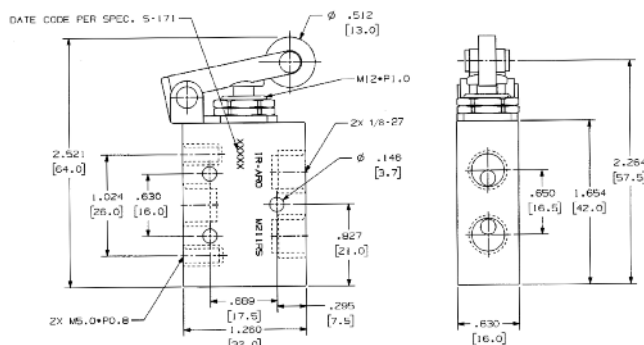
### M211LS 4-Way, Toggle, Maintained



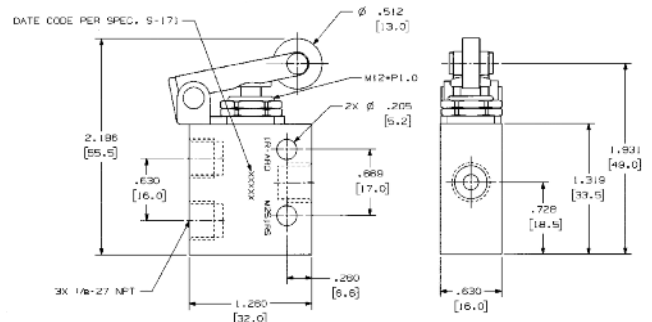
### M251LS 3-Way, Toggle, Maintained



### M211RS 4-Way, Roller, Spring Return



### M251RS 3-Way, Roller, Spring Return





## Features

### 3-Way Limit Valves

- Plumb 400 Series valves as normally passing, normally non-passing, selector or any 2-way valve function.
- Ports available with either 1/8" NPTF threads or 5/32" tube fittings.
- Four actuator options: Nylon Roller, Steel Roller, Rod Lever or Adjustable Roller. Actuators must be ordered separately. See menu below.
- Operating head may be adjusted to any of four positions.
- Outer case protects working parts from dirt.



## Performance Specifications

### Pressure Range:

30 to 150 PSIG (2.1 to 10.4 bar)

### Flow & Cv Factor:

1/8" Ports  
7.5 SCFMa

### Actuating Force:

| Actuator | Force (lbs.) |
|----------|--------------|
| 447      | 1.6          |
| 448      | 1.6          |
| 449      | 0.5          |
| 450      | 0.8          |

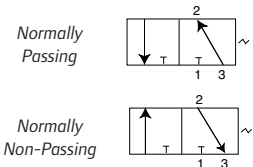
### Actuating Torque

2.4 in. lbs.

### Temperature Range:

32 to 160 F (0 to 71 C)

5/32" (4mm) Tube Fittings  
Cv = .195  
4.0 SCFM  
Cv = .104



**119605** Side Plate Cover. Used to cover body cavities.

## Ordering

### Valves:

| 1/8" Ports   | Tube Fittings  | Valve Action                 |
|--------------|----------------|------------------------------|
| <b>400-A</b> | <b>400-1-A</b> | One Way, Clockwise           |
| <b>401-A</b> | <b>401-1-A</b> | One Way, Counterclockwise    |
| <b>402-A</b> | <b>402-1-A</b> | Clockwise & Counterclockwise |

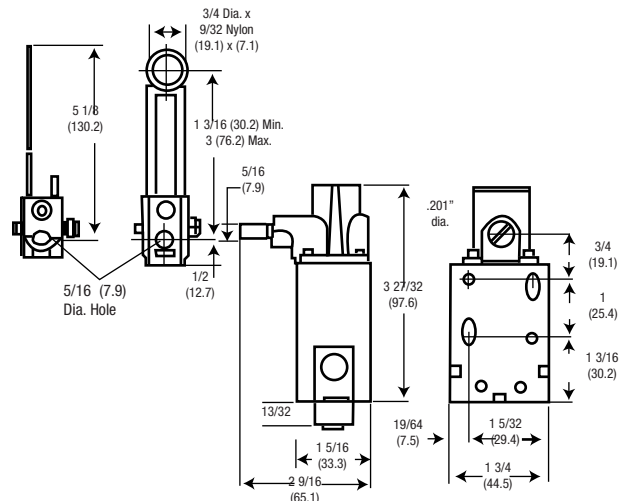
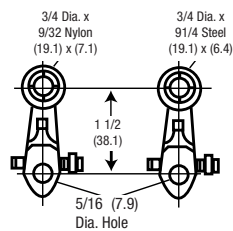
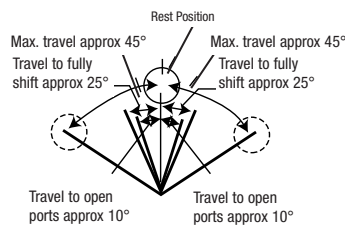
### Actuators:

| Code       | Description       |
|------------|-------------------|
| <b>447</b> | Nylon Roller      |
| <b>448</b> | Steel Roller      |
| <b>449</b> | Rod Lever         |
| <b>450</b> | Adjustable Roller |

## Dimensional Data

Dimensions given in Inches and (Millimeters)

### 400 Series



## Features

### Palm Button Control Valves

- Plumb each to perform as normally passing, normally non-passing, selector or any 2-way valve function.
- Ports available with either 1/8" NPT threads or 5/32" tube fittings.
- 2 1/2" Buttons (63.5mm) are available in four colors. If needed, order 20975 guard separately.
- 460-5 and 461-5 models use buttons that are threaded on rather than pushed on, making them more tamper resistant.



460-X

461-X with 20975 Guard



461-5 with 119244 Button

## Performance Specifications

### Pressure Range:

30 to 150 PSIG (2.1 to 10.4 bar)

### Temperature Range:

32 to 160 F (0 to 71 C)

### Actuating Force:

3 lbs.

### Flow & Cv Factor:

1/8" Ports

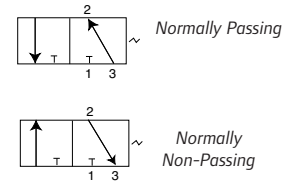
7.5 SCFM

Cv = .195

5/32" (4mm) Tube Fittings

4.0 SCFM

Cv = .104



## Ordering

| Port Size |              | Button Color |                  |
|-----------|--------------|--------------|------------------|
| Code      | Description  | Code         | Description      |
| 0         | 1/8" NPT     | -1           | Black            |
| 1         | 5/32" Tubing | -2           | Red              |
|           |              | -3           | Green            |
|           |              | -4           | Yellow           |
|           |              | -5           | Valve W/O Button |

(Order button for 7/16"-20 TH'd separately)

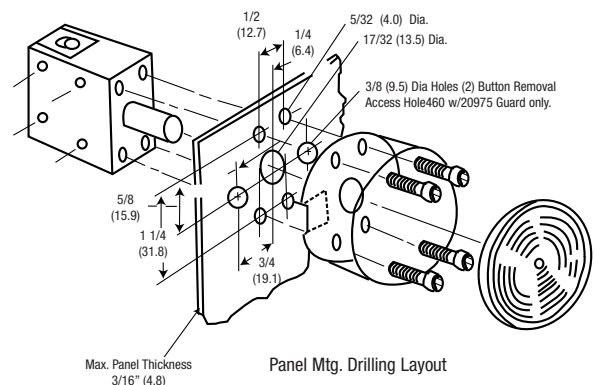
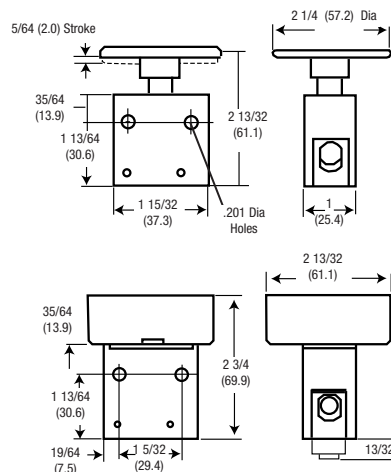
### Accessories

- 20975** Button Guard † **13111** Plastic, Black
  - \*20973-1** Black Button † **119243** Metal, Plain
  - \*20973-2** Red Button † **119244** Metal, Red
  - \*20973-3** Green Button † **119245** Metal, Green
  - \*20973-4** Yellow Button † **MP3651-7** Plastic, Red
- \* Tolerance ring 20972 must be ordered with accessory buttons. (Replacement buttons for -1, -2, -3, -4 options only.)
- † (Buttons for -5 models only)

## Dimensional Data

Dimensions given in Inches and (Millimeters)

### 460 Series



## Features

### Button Bleeders

- Provides remote control of bleeder pilot-operated valves.
- Reduces air pressure on valve, so valve can shift.
- Mounting blocks provide remote location of bleeder valve.
- 1/8" NPT thread. Maximum operating pressure of 150 PSIG (10.4 bar)

### Pilot Bleeder Valve

- Similar to button bleeder valves, but operated by a pressure signal.
- 1/8" NPT threads. Operating Pressures 20-150 PSIG (1.4 - 10.4 bar)

### Quick Exhaust Valves

- Provides quick dump of exhaust at cylinder.
- Eliminates need for large diameter piping or selector valves.
- Die cast aluminum body.

### Single Pulse Relay Valve

- Converts continuous inlet supply to a momentary pressure pulse.
- Ideal where input signal remains pressurized, but output must go "off" after performing its task.
- Locate PR10 as close to pilot port of valve as possible.



24130

24135



9600



EV30-A

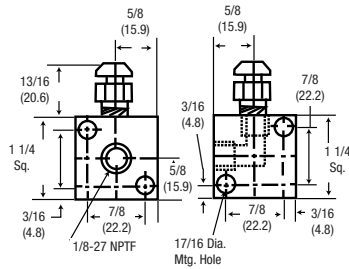


PR10

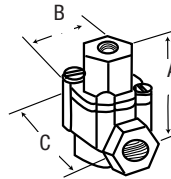
## Dimensional Data

Dimensions given in Inches and (Millimeters)

### Button Bleeders

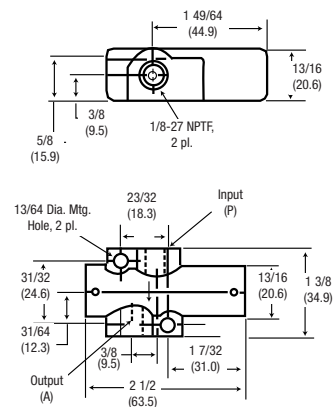


### Quick Exhaust Valves



| A             | B              | C              |
|---------------|----------------|----------------|
| 1 7/16 (36.5) | 1 23/32 (43.7) | 1 1/2 (38.1)   |
| 2 1/8 (54.0)  | 2 7/32 (56.4)  | 2 1/1 (52.4)   |
| 2 1/8 (54.0)  | 2 7/32 (56.4)  | 2 1/1 (52.4)   |
| 3 1/8 (79.4)  | 3 1/2 (88.9)   | 4 1/32 (102.4) |
| 3 1/8 (79.4)  | 3 1/2 (88.9)   | 4 1/32 (102.4) |

### Single Pulse Relay Valve



## Performance Specifications/Ordering

### Button Bleeders

| Model Number | Description             |
|--------------|-------------------------|
| 24130        | 1/2" (12.7) Dia. Head   |
| 24135        | 1 1/8" (28.6) Dia. Head |
| 24125        | Mounting Block          |

### Quick Exhaust Valves

| Model Number | Inlet Port | Cyl. Port | Exh Port | Pres Range PSI (bar) |
|--------------|------------|-----------|----------|----------------------|
| EV 125       | 1/8"       | 1/8"      | 1/4"     | 1-125 (.07-8.6)      |
| EV 250       | 1/4        | 1/4       | 3/8      | 1-125 (.07-8.6)      |
| EV 375       | 3/8        | 3/8       | 3/8      | 1-125 (.07-8.6)      |
| EV 30-A      | 1/2        | 1/2       | 3/4      | 5-125 (.35-8.6)      |
| EV 35-A      | 3/4        | 3/4       | 3/4      | 5-125 (.35-8.6)      |

### Single Pulse Relay Valve

| Supply PSIG Press. (bar) | Pulse Duration | Reset Time |
|--------------------------|----------------|------------|
| 50 (3.5)                 | 125ms          | 300 ms     |
| 75 (5.2)                 | 110ms          | 300 ms     |
| 100 (6.9)                | 105ms          | 300 ms     |
| 125 (8.6)                | 100ms          | 300 ms     |

## Features

### Shuttle Valves

- Allows one of two input sources to get the output. Prevents either input from exhausting at other input source.
- Check ball moves from inlet with the greatest pressure and against the port having the least pressure. Minimum pressure difference of 10 PSIG(.7 bar) is necessary to effect shuttle change. 200 PSIG (13.8 bar) maximum.

## Ordering

### Shuttle Valves

| Model Number | Inlet Ports | Outlet |
|--------------|-------------|--------|
| SV10-C       | 1/8"        | 1/8"   |
| SV20-C       | 1/4"        | 1/4"   |

### Microswitch

#### 20370 Microswitch Actuator

Pressure Range 25-125 PSIG (1.7-8.6 bar)

Temperature Range 0-180 F (-18-82 C)

#### 20467 Microswitch

Can be wired normally open or normally closed.

Single pole, double throw:

15 Amps, 125, 250 or 480 V-AC

1/2 Amp, 125 V-DC; 1/4 Amp, 250 V-DC

1/8 H.P., 125 V-AC; 1/4 H.P., 250 V-DC



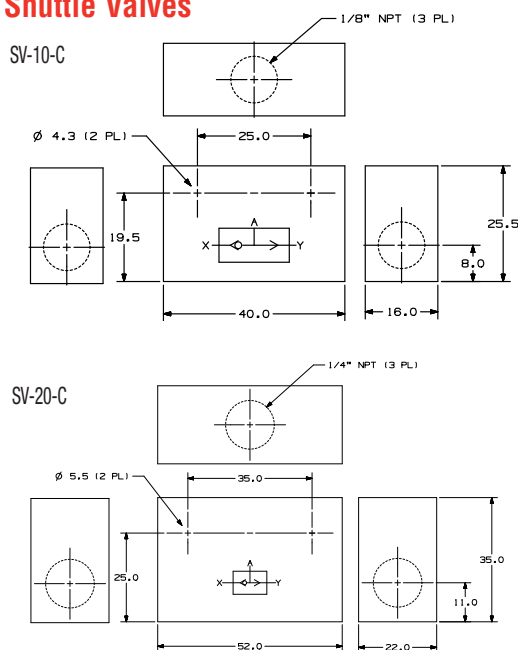
SV20-C



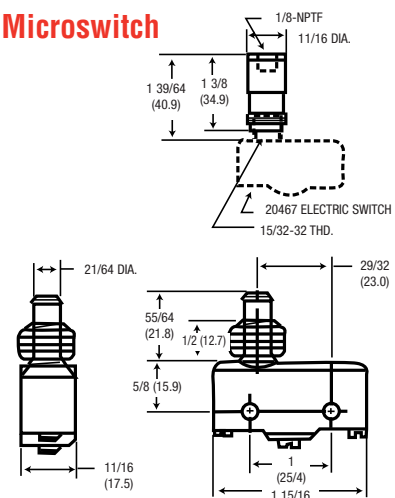
20467

## Dimensional Data Dimensions given in Inches and (Millimeters)

### Shuttle Valves



### Microswitch



## Features

### Breather Vents

- Use on valves and single acting cylinders to prevent dirt from entering ports open to atmosphere. Other uses are for vacuum relief or pressure equalization on gear boxes, reservoirs and air tanks.
- 40 micron filtration. Selection based on thread size.
- Nickel plated steel body.



20311-X

### Muffler

- Use on valve exhaust ports.
- Sintered bronze construction. Air muffler and exhaust diffuser.
- 40 micron nominal filtration; sound deadening qualities with low pressure drop.
- Nickel plated steel body.



20312-X

### Speed Controls

- Controls air flow on exhaust ports of air valves.
- Change cylinder operating speed by adjusting screw. Secure with lock nut.



20313-X

### Silencer

- Reduces noise of air powered motors and valves.
- For high SCFM applications. High flow, low back pressure with no build up.



20308-X

## Ordering

### Breather Vents

| Model Number | Port Size | Length In. (mm) | Hex    |
|--------------|-----------|-----------------|--------|
| 20311-1      | 1/8"      | 7/16 (11.1)     | 7/16   |
| 20311-2      | 1/4"      | 5/8 (15.9)      | 9/16   |
| 20311-3      | 3/8"      | 3/4 (19.1)      | 11/16  |
| 20311-4      | 1/2"      | 7/8 (22.2)      | 7/8    |
| 20311-6      | 3/4"      | 1 (25.4)        | 1-1/16 |
| 20311-8      | 1"        | 1-5/16 (33.3)   | 1-5/16 |

### Speed Controls

| Model Number | Port Size | Length Closed | Length Open In. (mm) |
|--------------|-----------|---------------|----------------------|
| 20313-1      | 1/8"      | 1 3/8 (34.9)  | 2 (50.8)             |
| 20313-2      | 1/4"      | 1 9/16 (39.7) | 2 3/16 (55.6)        |
| 20313-3      | 3/8"      | 1 7/8 (47.6)  | 2 13/16 (71.4)       |
| 20313-4      | 1/2"      | 2 1/4 (57.2)  | 3 5/16 (84.1)        |
| 20313-6      | 3/4"      | 2 3/4 (69.9)  | 3 13/16 (96.8)       |
| 20313-8      | 1"        | 3 1/4 (82.6)  | 4 5/8 (117.5)        |

### Muffler

| Model Number | Port Size | Length In. (mm) | Hex    |
|--------------|-----------|-----------------|--------|
| 116464       | 10-32     | 23/32 (18.2)    | 5/16   |
| 20312-1      | 1/8"      | 1 1/8 (28.6)    | 7/16   |
| 20312-2      | 1/4"      | 1 3/8 (34.9)    | 9/16   |
| 20312-3      | 3/8"      | 1 1/2 (38.1)    | 11/16  |
| 20312-4      | 1/2"      | 1 7/8 (47.6)    | 7/8    |
| 20312-6      | 3/4"      | 2 1/4 (57.2)    | 11/16  |
| 20312-8      | 1"        | 1 7/8 (73.0)    | 1 5/16 |

### Silencer

| Model   | Ports | Diameter | Length |
|---------|-------|----------|--------|
| 20308-1 | 1/8"  | 13/16    | 2-1/8  |
| 20308-2 | 1/4"  | 13/16    | 2-1/4  |
| 20308-3 | 3/8"  | 1-1/4    | 3-7/16 |
| 20308-4 | 1/2"  | 1-1/4    | 3-9/16 |
| 20308-6 | 3/4"  | 2        | 5-3/8  |
| 20308-8 | 1"    | 2        | 5-1/2  |

## Features

### 3-Way Sleeve Valve

- Provides low-cost on-off control of single-acting spring return cylinders.
- Use in both ports of double-acting cylinders to isolate from circuit.



600-X

## Ordering

### 3-Way Sleeve Valve

Max. Press: 200 PSI (13.8 bar)  
 Temp Range: -25° - 200°F (-32° - 93°C)

| Model Number | Port Size | 10 PSI Pressure Drop (SCFM) |        |
|--------------|-----------|-----------------------------|--------|
|              |           | 100 PSI                     | 80 PSI |
| 600-1        | 1/8"      | 16                          | 14.5   |
| 600-2        | 1/4"      | 40                          | 36     |
| 600-3        | 3/8"      | 65                          | 59     |
| 600-4        | 1/2"      | 140                         | 127    |

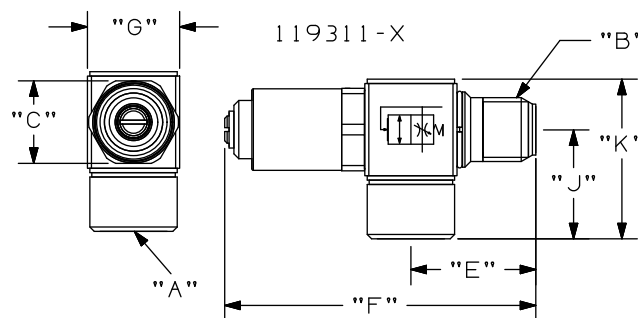
## Soft Start Valve Fittings

- Mount directly into cylinder ports
- Male on one end; female on the other
- Screwdriver adjustment
- Working pressure up to 200 psi
- Prevents air surge and slamming of the piston rod into other equipment



119311-500

| Model #    | Size (In.)  |
|------------|-------------|
| 119311-125 | 1/8x1/8 NPT |
| 119311-250 | 1/4x1/4 NPT |
| 119311-375 | 3/8x3/8 NPT |
| 119311-500 | 1/2x1/2 NPT |



## Dimensional Data

Dimensions given in Inches and (Millimeters)

| Port Size A & B | C          | E            | F            | G          | J            | K            |
|-----------------|------------|--------------|--------------|------------|--------------|--------------|
| 1/8 NPTF        | .512 (13)  | .780 (19.8)  | 2.217 (56.3) | .591 (15)  | .728 (18.5)  | 1.051 (26.7) |
| 1/4 NTPF        | .669 (17)  | 1.016 (25.8) | 2.472 (62.8) | .748 (19)  | .886 (22.5)  | 1.295 (32.9) |
| 3/8 NTPF        | .866 (22)  | 1.142 (29)   | 2.693 (68.4) | .906 (23)  | 1.122 (28.5) | 1.614 (41)   |
| 1/2 NTPF        | 1.063 (27) | 1.417 (36)   | 2.870 (72.9) | 1.102 (28) | 1.220 (31)   | 1.823 (46.3) |



## Features

- 360° swivel eases tube alignment. Preapplied thread sealant eliminates Teflon taping.
- Choose threaded or instant tube fitting inlets; slotted or knob flow adjustment.
- Sturdy components include nickel-plated brass body, black anodized aluminum swivel, Buna-N seals and a stainless steel spring.
- Ready for installation on all ARO and competitive cylinders.
- Consult factory for BSP size models.

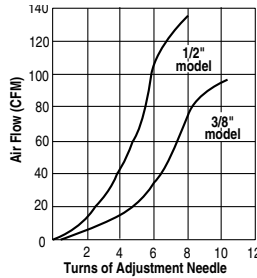
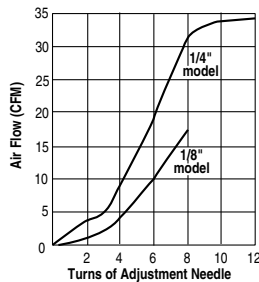
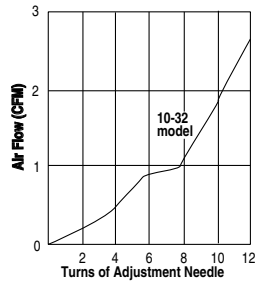
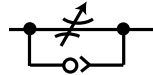


## Ordering

| SLOTTED ADJUST    |                 |                    |               | KNOB ADJUST       |                 |                    |               |
|-------------------|-----------------|--------------------|---------------|-------------------|-----------------|--------------------|---------------|
| 119307-XXX        |                 | 119309-XXX         |               | 119308-XXX        |                 | 119310-XXX         |               |
| Male x Female thd |                 | Male thd x fitting |               | Male x Female thd |                 | Male thd x fitting |               |
| Description       |                 | Description        |               | Description       |                 | Description        |               |
| XXX               | Male x Female   | xxx                | Male x Tubing | xxx               | Male x Female   | XXX                | Male x Tubing |
| 103               | 10-32x10-32     | 103                | 10-32 x 5/32" | 125               | 1/8" x 1/8" NPT | 120                | 1/8" x 5/32"  |
| 125               | 1/8" x 1/8" NPT | 120                | 1/8" x 5/32"  | 250               | 1/4" x 1/4" NPT | 125                | 1/8" x 1/4"   |
| 250               | 1/4" x 1/4" NPT | 125                | 1/8" x 1/4"   | 375               | 3/8" x 3/8" NPT | 250                | 1/4" x 1/4"   |
| 375               | 3/8" x 3/8" NPT | 250                | 1/4" x 1/4"   | 500               | 1/2" x 1/2" NPT | 255                | 1/4" x 3/8"   |
| 500               | 1/2" x 1/2" NPT | 255                | 1/4" x 3/8"   |                   |                 | 375                | 3/8" x 3/8"   |
|                   |                 | 375                | 3/8" x 3/8"   |                   |                 |                    |               |

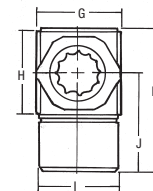
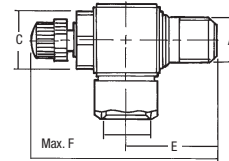
## Performance Specifications

**Operating Pressure:** 15-150 PSI (1-10 bar)  
**Operating Temperature:** -32°F - 158°F

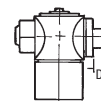
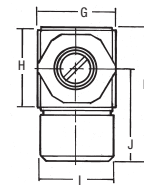
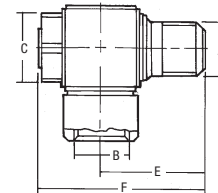


## Dimensional Data

KNOB ADJUST



SLOTTED ADJUST

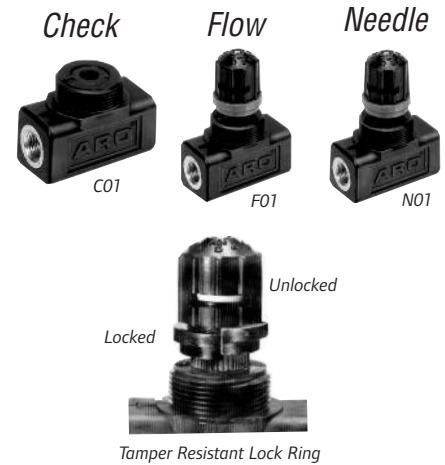


|                | PORT SIZE<br>"A" & "B" | "C"<br>inches<br>(mm) | "D"<br>inches<br>(mm) | "E"<br>inches<br>(mm) | "F"<br>inches<br>(mm) | "G"<br>inches<br>(mm) | "H"<br>inches<br>(mm) | "I"<br>inches<br>(mm) | "J"<br>inches<br>(mm) | "K"<br>inches<br>(mm) |
|----------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| SLOTTED ADJUST | 10/32                  | 5/16<br>(8)           | 1/8<br>(3.2)          | 27/64<br>(11)         | 53/64<br>(21)         | 27/64<br>(11)         | 11/32<br>(9)          | 7/16<br>(11)          | 37/64<br>(14.7)       | 53/64<br>(21.1)       |
|                | 1/8                    | 1/2<br>(13)           | 0                     | 25/32<br>(19.8)       | 1-17/64<br>(32)       | 19/32<br>(15)         | 19/32<br>(15)         | 33/64<br>(13)         | 47/64<br>(18.5)       | 1-3/64<br>(26.7)      |
|                | 1/4                    | 43/64<br>(17)         | 0                     | 1-1/64<br>(25.8)      | 1-39/64<br>(41)       | 3/4<br>(19)           | 3/4<br>(19)           | 23/32<br>(18)         | 7/8<br>(22.5)         | 1-19/64<br>(32.9)     |
|                | 3/8                    | 7/8<br>(22)           | 0                     | 1-9/64<br>(29)        | 1-27/32<br>(47)       | 29/32<br>(23)         | 29/32<br>(23)         | 29/32<br>(23)         | 1-1/8<br>(28.5)       | 1-39/64<br>(41)       |
|                | 1/2                    | 1-1/16<br>(27)        | 0                     | 1-27/64<br>(36)       | 2-9/32<br>(58)        | 1-7/64<br>(28)        | 1-7/64<br>(28)        | 63/64<br>(25)         | 1-7/32<br>(31)        | 1-53/64<br>(46.3)     |
| KNOB ADJUST    | 1/8                    | 33/64<br>(13)         | 0                     | 25/32<br>(19.8)       | 1-7/8<br>(47.5)       | 19/32<br>(15)         | 19/32<br>(15)         | 33/64<br>(13)         | 47/64<br>(18.5)       | 1-3/64<br>(26.7)      |
|                | 1/4                    | 43/64<br>(17)         | 0                     | 1-1/64<br>(25.8)      | 2-9/32<br>(58)        | 3/4<br>(19)           | 3/4<br>(19)           | 45/64<br>(18)         | 57/64<br>(22.5)       | 1-19/64<br>(32.9)     |
|                | 3/8                    | 7/8<br>(22)           | 0                     | 1-9/64<br>(29)        | 2-37/64<br>(65.5)     | 29/32<br>(23)         | 29/32<br>(23)         | 29/32<br>(23)         | 1-1/8<br>(28.5)       | 1-39/64<br>(41)       |
|                | 1/2                    | 1-1/16<br>(27)        | 0                     | 1-27/64<br>(36)       | 3-5/32<br>(80)        | 1-7/64<br>(28)        | 1-7/64<br>(28)        | 63/64<br>(25)         | 1-7/32<br>(31)        | 1-53/64<br>(46.3)     |

## Features

### In-Line, Composite

- Four Stage, tapered needle design provides infinite control settings.
- Composite body is tough and corrosion resistant.
- Color-coded micrometer & calibrated adjustment knob provide instant reference points for repeat settings. Press red locking ring down prevents adjustment. Tamper resistant wire supplied in package.
- Units are threaded for easy remote panel mounting. Order panel nuts below.
- Needle Valve is available with stainless steel needle & inserts. Order 104104-NS2.



## Ordering

| 104104 - X XX |              | Port Size |             |      |  |
|---------------|--------------|-----------|-------------|------|--|
| Code          | Description  | Code      | Description | Code | Description                                      |
| C             | Check Valve  | 01        | 1/8-27 NPTF | 04   | 1/2-14 NPTF                                      |
| F             | Flow Control | 02        | 1/4-18 NPTF | 06   | 3/4-14 NPTF                                      |
| N             | Needle Valve | 03        | 3/8-18 NPTF | * S2 | 1/4-18 NPTF<br>Stainless Steel<br>inserts & stem |

\* Available on needle valve only.

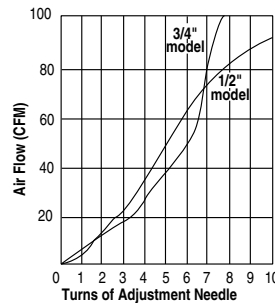
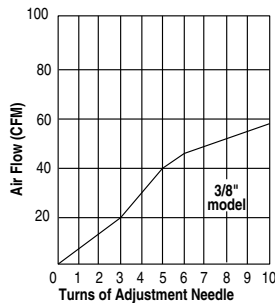
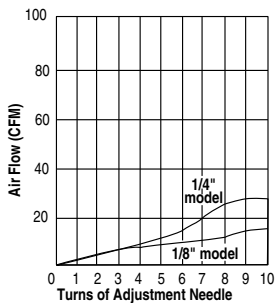
| Panel Mounting Nuts | Port Size         |
|---------------------|-------------------|
| 104096              | 1/8" & 1/4"       |
| 104094              | 3/8", 1/2" & 3/4" |

## Performance Specifications

**Operating Pressure:**  
200 PSI (13.8 bar)

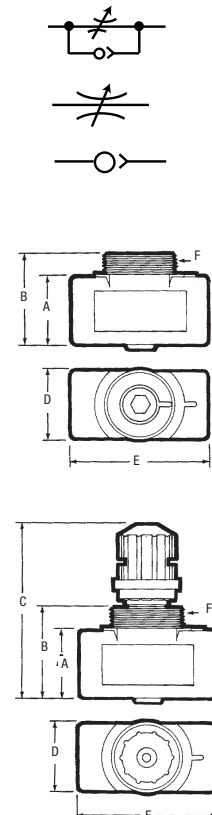
**Operating Temperature:**  
0° - 200°F (-18° - 93°C)

**Flow:**  
100 PSI Inlet



| MODEL | PORT* NPT(F) | A inches (mm) | B inches (mm)  | C inches Min. Max.             | D inches (mm) | E inches (mm)  | F inches (mm)     |
|-------|--------------|---------------|----------------|--------------------------------|---------------|----------------|-------------------|
| 01    | 1/8-27       | 15/16 (23.8)  | 1-11/32 (34.1) | 2-33/64 (63.9) 2-53/64 (71.6)  | 15/16 (23.8)  | 1-29/32 (48.4) | 1-20 UNEF-2A      |
| 02    | 1/4-18       | 15/16 (23.8)  | 1-11/32 (34.1) | 2-33/64 (63.9) 2-53/64 (71.6)  | 15/16 (23.8)  | 1-29/32 (48.4) | 1-20 UNEF-2A      |
| 03    | 3/8-18       | 1-5/16 (33.3) | 1-11/16 (42.9) | 3-23/64 (85.3) 3-55/64 (97.8)  | 1-5/16 (33.3) | 2-27/32 (72.2) | 1-3/16-18 UNEF-2A |
| 04    | 1/2-14       | 1-5/16 (33.3) | 1-11/16 (42.9) | 3-23/64 (85.3) 3-55/64 (97.8)  | 1-5/16 (33.3) | 2-27/32 (72.2) | 1-3/16-18 UNEF-2A |
| 06    | 3/4-14       | 1-9/16 (39.7) | 2 (50.8)       | 3-43/64 (93.3) 4-11/64 (105.7) | 1-9/16 (39.7) | 3 (76.2)       | 1-3/16-18 UNEF-2A |

## Dimensional Data



## Features

### In-Line, Brass

**CPXX-B** Check Valve

**FXX-BK** Flow Control

**NXX-BK** Needle Valve

- High Pressure (up to 2000 PSI) flow control for either pneumatic or hydraulic applications.
- Heavy-duty brass construction provides good corrosion resistance.
- Valve bodies, needle housings, locknuts & plugs are machined from brass stock.

- **Cracking Pressure**

CP10 - 1-1/2 PSI  
CP30 - 3 PSI

CP20 - 1-1/2 PSI  
CP35 - 4 PSI

CP25 - 2 PSI



## Ordering

### In-Line, Brass

Replace the "XX" with valve number corresponding to port size desired.

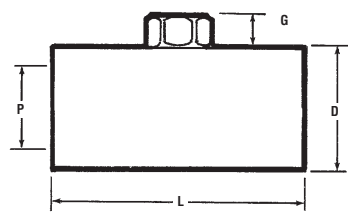
**Example:** F10-BK  
Flow Control Valve  
1/8" Ports

| MODEL         | VALVE NO. (XX) | NPTF PORT | P D HEX | E     | L       | G     |
|---------------|----------------|-----------|---------|-------|---------|-------|
|               | 10             | 1/8       | 11/16   | 1-1/4 | 1-1/2   | 9/32  |
| <b>FXX-BK</b> | 20             | 1/4       | 7/8     | 1-1/4 | 2       | 5/16  |
| <b>NXX-BK</b> | 25             | 3/8       | 1-1/16  | 1-3/8 | 2-1/4   | 11/32 |
| <b>CPXX-B</b> | 30             | 1/2       | 1-5/16  | 1-3/8 | 2-21/32 | 3/8   |
|               | 35             | 3/4       | 1-5/8   | 1-7/8 | 3       | 15/32 |

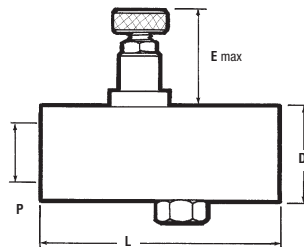
CP35-B Not available.

## Dimensional Data

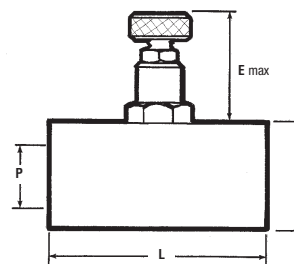
### In-Line, Brass



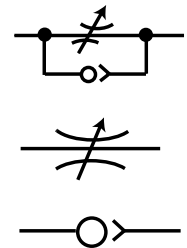
CPXX-B



FXX-BK



NXX-BK



## Features

### Coils

- Coils are Class F rated for 100% duty cycle (311°F/155°C) applications.
- AC and DC coils are interchangeable on the same solenoid stem.
- Low “inrush” and “holding” current keeps heat rise to a minimum. This maximizes coil life and reduces power consumption.

#### Code / Voltage

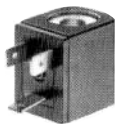
-31 = 12V AC  
 -33 = 120V AC  
 -35 = 240V AC  
 -37 = 5V DC

#### Code / Voltage

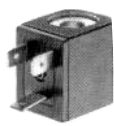
-38 = 24V AC or  
 12V DC  
 (22mm Coils only)  
 -39 = 24V DC



115046-XX



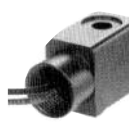
115064-XX



116218-XX



116647-XX



118154-XX



119378-XX



119690-XX



119416 Side exhaust coil nut.

### Connectors

- Protect electrical connections from humidity and moisture. Meet NEMA 4 classifications
- Each is its own junction box, eliminating need to wire solenoid to another box.

### Hazardous Location Coil

Coils are CSA certified and meet the requirements for use in hazardous locations.  
 Environmental Code: Division 1, Class I, II, III, Group A-G  
 FM Certification: 3006713  
 Electrical Entry: 1/2" - 14 NPT-1 w/24" Lead Wires  
 Class “H” rated, 100% duty cycle  
 Available in 120V AC & 24V DC only



114772-XX



CHW



CHL-XXX



CDN  
 CDW  
 CDL-XXX



CBW



CSN  
 CSL-XXX



CDW-30



CSN-30



CHW-30

## Ordering

### Coils

(Replace XX on model number with coil voltage required.)

#### 115046-XX Cable Coil (NEMA 4, 22mm)

10' AWG UL-listed elastomer cable. No solenoid connector needed.

#### 115064-XX Low Watt Coil (DC only) (NEMA 4, 22mm)

Low DIN coil. DC only, for use with 3-prong connectors. 5, 12 and 24V DC only. Used only on valves ordered as low wattage.

#### 116218-XX Standard Coil CSA & UL-listed (NEMA 4, 22mm)

AC or DC DIN coil for use with 3-prong connectors.

#### 116647-XX Coil with Molded Leads CSA & UL-listed (NEMA 4, 22mm)

AC or DC lead wire coil with 18" molded leads. No solenoid connector needed.

#### 118154-XX 1/2" Conduit (NEMA 4, 22mm)

1/2" Conduit coil connects directly to metal housing on the coil. Coil has 18" long 18-gauge heavy-duty wire. Available in -33 and -39 voltage only.

#### \*119378-XX Oversize (NEMA 4, 30mm)

AC or DC DIN coil for use with solenoid connector. Available in -33, -38 and -39 voltage only. For Alpha, E, K, H, Genesis, and 1/8" Cat Valves. (not for HF Cat)

#### \*119690-XX Oversize (NEMA 4, 30 mm)

High Flow Cat Valve and 2-way Valve coil. Available in -32, -33, -35, -37, -38 and -39 voltages

\* NOTE: -38 option is 12 VDC only on 30mm coils. 24 VAC is not available  
 See Page 81 for Voltage Operating Ranges and Voltage Ratings.

### Connectors

#### 22-mm Connectors:

(Replace XXX with voltage and type from chart below)

**CHW** Straight connector with cable (36") located on top.

**CBW** Straight connector with cable (36") located on back.

**CHL-XXX** Straight connector (36") with indicator light located on back.

**CSN** Strain Relief, without indicator light or cable.

**CSL-XXX** Strain Relief with indicator light located on back.

**CDN** 1/2" Conduit without lights or lead wires.

**CDW** 1/2" Conduit without lights, 18" lead wires.

**CDL-XXX** 1/2" Conduit with light and 18" lead wires.

#### 30-mm Connectors:

Use with High Flow Cat and intrinsically safe Genesis Valves

**CDW-30** Connector with wire.

**CSN-30** Connector, strain relief.

**CHW-30** Connector, molded cable.

#### Voltage (-XXX)

005 = 5V DC

012 = 12V AC/DC

024 = 24V AC/DC

120 = 120V AC

240 = 240V AC/DC

## Performance Specifications

### Coils

#### Voltage Operating Ranges

| Coil Voltage Ratings | Operating Range $\pm 10\%$ |         |
|----------------------|----------------------------|---------|
|                      | AC                         | DC      |
| 5                    | --                         | 4.5-5.5 |
| 2                    | 11-13                      | 11-13   |
| 24                   | 22-26                      | 22-26   |
| 120                  | 108-132                    | 108-132 |
| 240                  | 216-264                    | --      |
| 380                  | 342-418                    | --      |

| 22 mm Coil   | Current (Amps) | Watts |
|--------------|----------------|-------|
| 5 DC         | 0.97           | 4.9   |
| 12 DC        | 0.38           | 4.8   |
| 24 DC        | 0.20           | 4.8   |
| 120 DC       | 0.04           | 4.8   |
| 5, 12, 24 DC | .05            | 1.1   |

| 30 mm Coil | Current (Amps)   | Watts |
|------------|------------------|-------|
| 12 DC      | 0-.62            | 15    |
| 24 DC      | 0.62             | 15    |
| 24 DC      | (Hazardous Duty) | 5     |

#### 22 mm Coil Voltage Ratings

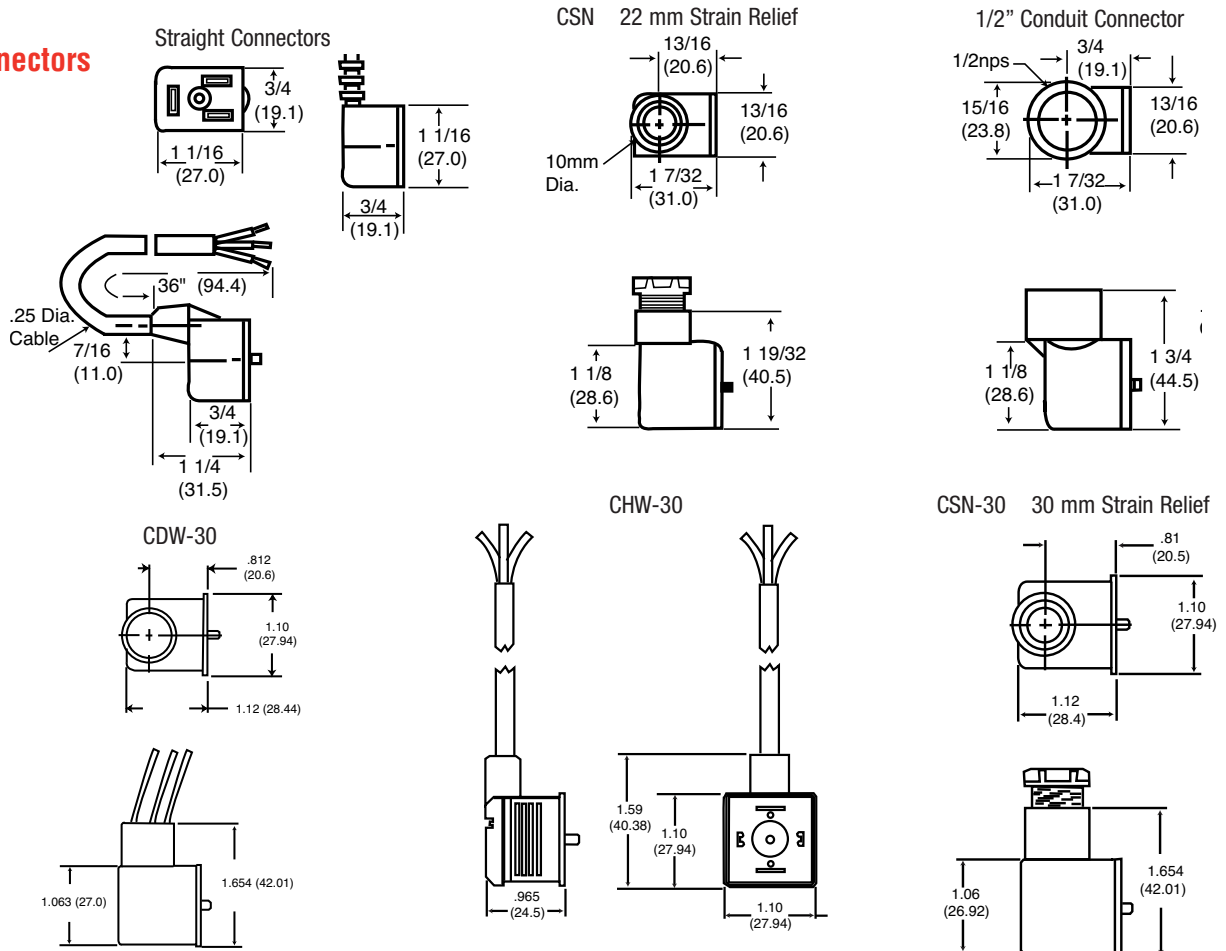
| Coil Voltage Rating | 50/60 Hz Current (Amps) |           | 50/60 Hz Volt-Amps, |         |
|---------------------|-------------------------|-----------|---------------------|---------|
|                     | Inrush                  | Holding   | Inrush              | Holding |
| 12AC                | .70/.63                 | .50/.42   | 8.4/7.5             | 6.0/5.0 |
| 24AC                | .46/.40                 | .36/.27   | 11.0/9.4            | 8.4/6.5 |
| 120AC               | .09/.08                 | .07/.05   | 11.0/9.4            | 8.4/6.5 |
| 240AC               | .05/.04                 | .04/.03   | 11.0/9.4            | 8.4/6.5 |
| 380AC               | .03/.026                | .024/.019 | 11.4/9.9            | 9.1/6.9 |

#### 30 mm Coil Voltage Ratings

| Coil Voltage Rating | 50/60 Hz Current (Amps) |         | 50/60 Hz Volt-Amps, |         |
|---------------------|-------------------------|---------|---------------------|---------|
|                     | Inrush                  | Holding | Inrush              | Holding |
| 24AC                | --                      | --      | 23                  | 20      |
| 120AC               | --                      | --      | 23                  | 20      |
| 120AC               | (Hazardous Duty)        |         | 11.5                | 8.5     |

## Dimensional Data

### Connectors



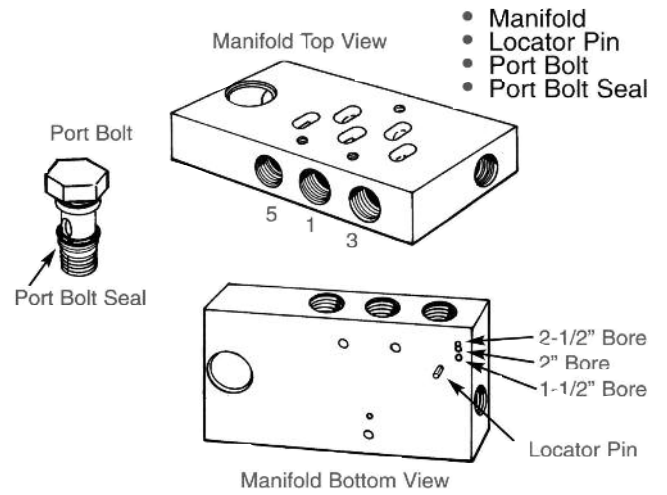
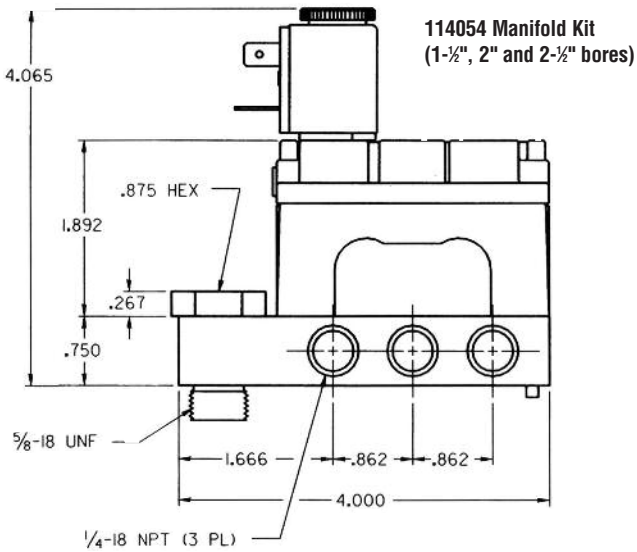
## Features

### Valve/Cylinder Manifold

- Mount any Alpha subbase valve to any NFPA cylinder
- Obtain maximum cylinder response and speeds
- Provides “clean” valve mounting method
- Mounts at cap or head end of cylinder
- Operates any NFPA Cylinder up to 2-1/2" bore
- Any stroke length (Minimum 3")



## Dimensional Data





# Ordering

## Alpha Valves

| Valve Model  | Kit Number |
|--|------------|
| All 2-Position, Spring Return, Urethane            | 118597-2   |
| All 2-Position, Pilot or Solenoid Return, Urethane | 118597-12  |
| All 2-Position, Spring Return, Viton               | 118598-4   |
| All 2-Position, Pilot or Solenoid Return, Viton    | 118598-14  |
| 3-Position, Closed, Urethane                       | 118597-3   |
| 3-Position, Open, Urethane                         | 118597-7   |
| 3-Position, Closed, Viton                          | 118598-8   |
| 3-Position, Open, Viton                            | 118598-9   |

## Genesis Valves

**GXXX XX - XXX - X**

| Plug-On Valves |             |            | Plug-In Valves |             |            |
|----------------|-------------|------------|----------------|-------------|------------|
| Code           | Rebuild Kit | Gasket Kit | Code           | Rebuild Kit | Gasket Kit |
| GN12           | 118820-3    | 118824     | GP12           | 118820-1    | 118823     |
| GN13           | 118822-3    | 118824     | GP13           | 118822-1    | 118823     |
| GN14           | 118820-4    | 118824     | GP14           | 118820-2    | 118823     |
| GN17           | 118821-3    | 118824     | GP17           | 118821-1    | 118823     |
| GN18           | 118822-4    | 118824     | GP18           | 118822-2    | 118823     |
| GN19           | 118821-4    | 118824     | GP19           | 118821-2    | 118823     |

Rebuild Kit selection is determined by the first four model numbers.  
[GX1X] XX-XXX-X (The positions within the brackets)

## MaxAir Valves

| Model        | Repair Kit |
|--------------|------------|
| M212LM       | RKM212-LM  |
| M212LS       | RKM212-LS  |
| M212PD       | RKM212-PD  |
| M212PS       | RKM212-PS  |
| M212SD-XXX-X | RKM212-SD  |
| M212SS-XXX-X | RKM212-SS  |
| M213LM       | RKM213-LM  |
| M213LS       | RKM213-LS  |
| M213PD       | RKM213-PD  |
| M213PS       | RKM213-PS  |
| M213SD-XXX-X | RKM213-SD  |
| M213SS-XXX-X | RKM213-SS  |
| M214-PD      | RKM214-PD  |
| M214PS       | RKM214-PS  |
| M214SD-XXX-X | RKM214-SD  |
| M214SS-XXX-X | RKM214-SS  |
| M2X2FS       | 114645     |
| M2X2TM       | 114645     |
| M312PD       | RKM312-PD  |
| M312SD-XXX-X | RKM312-SD  |
| M313PD       | RKM313-PD  |
| M313SD-XXX-X | RKM313-SD  |
| M314PD       | RKM314-PD  |
| M314SD-XXX-X | RKM314-SD  |

## Sierra Valves

| Model Number        | Repair Kit |
|---------------------|------------|
| All Sierra Model 15 | MQ3620     |
| M812SS-XXX-X        | RKM812-SS  |
| M812SD-XXX-X        | RKM812-SD  |
| M813SD-XXX-X        | RKM813-SD  |

## 50-Series Valves

| Model Number | Repair Kit |
|--------------|------------|
| All Models   | 7000       |

## Genesis Pressure Regulators

| Model     | Rebuild Kit | Press Adj. Kit |
|-----------|-------------|----------------|
| 118573-X2 | 119213      | 119212-30      |
| 118573-X3 | 119213      | 119212-60      |
| 118573-X4 | 119213      | 119212-120     |

## E-Series Valves

| Model  | Repair Kit | Model        | Repair Kit | Model        | Repair Kit | Model        | Repair Kit | Model                    | Repair Kit |
|--------|------------|--------------|------------|--------------|------------|--------------|------------|--------------------------|------------|
| E112HM | 116772     | E212JD       | 116702     | E252BD       | 116773     | E252LP       | 116772     | E712LS                   | 116773     |
| E112LM | 116772     | E212KD-XXX-X | 116702     | E252BS       | 116772     | E252LS       | 116772     | E312SD-XXX               | 116773     |
| E112PD | 116773     | E212KS-XXX-X | 116702     | E252CA       | 116772     | E252PA       | 116772     | E512LM                   | 116772     |
| E152HM | 116772     | E212LA       | 116772     | E252CS       | 116772     | E252PD       | 116773     | E612LM                   | 116772     |
| E152LM | 116772     | E212LM       | 116772     | E252CP       | 116772     | E252PE       | 116772     | E712SD-XXX-X             | 116773     |
| E152PD | 116773     | E212LP       | 116772     | E252FA       | 116772     | E252PS       | 116772     | <b>Solenoid Operator</b> |            |
| E212BS | 116772     | E212LS       | 116772     | E252FP       | 116772     | E252RA       | 116772     | E212KD-XXX-X             | 116575     |
| E212BD | 116773     | E212PA       | 116772     | E252FS       | 116772     | E252RP       | 116772     | E212KS-XXX-X             | 116573     |
| E212CA | 116772     | E212PD       | 116773     | E252GA       | 116772     | E252RS       | 116772     | E212SA-XXX-X             | 116573     |
| E212CS | 116772     | E212PE       | 116772     | E252GS       | 116772     | E252SA-XXX-X | 116772     | E212SP-XXX-X             | 116573     |
| E212CP | 116772     | E212PS       | 116772     | E252HA       | 116772     | E252SN-XXX-X | 116772     | E212SD-XXX-X             | 116575     |
| E212FA | 116772     | E212RA       | 116772     | E252HM       | 116772     | E252SP-XXX-X | 116773     | E212SS-XXX-X             | 116573     |
| E212FP | 116772     | E212RP       | 116772     | E252HP       | 116772     | E252SS-XXX-X | 116772     | E252KS-XXX-X             | 116573     |
| E212FS | 116772     | E212RS       | 116772     | E252HS       | 116772     | E252TM       | 116772     | E252SA-XXX-X             | 116573     |
| E212HA | 116772     | E212SA-XXX-X | 116772     | E252JS       | 116702     | E252UA       | 116772     | E252SN-XXX-X             | 116573     |
| E212HM | 116772     | E212SD-XXX-X | 116773     | E252JD       | 116702     | E252US       | 116772     | E252SP-XXX-X             | 116573     |
| E212HP | 116772     | E212SP-XXX-X | 116773     | E252KS-XXX-X | 116702     | E312LS       | 116773     | E252SS-XXX-X             | 116573     |
| E212HS | 116772     | E212SS-XXX-X | 116772     | E252LA       | 116772     | E312PD       | 116773     | E312SD-XXX-X             | 116575     |
| E212JS | 116702     | E212TM       | 116772     | E252LM       | 116772     | E312TS       | 116773     | E712SD-XXX-X             | 116575     |

# Ordering

## H-Series

| Model        | Repair Kit | Model        | Repair Kit | Model        | Repair Kit | Model                    | Repair Kit |
|--------------|------------|--------------|------------|--------------|------------|--------------------------|------------|
| H212BD       | 7103       | H214PD       | 7103       | H243SD-XXX-X | 7103       | <b>SOLENOID OPERATOR</b> |            |
| H212PA       | 7103       | H214SA-XXX-X | 7103       | H252PS       | 7102       | H212SA-XXX-X             | 116572     |
| H212PD       | 7103       | H214SD-XXX-X | 7103       | H252SS-XXX-X | 7102       | H212SD-XXX-X             | 116574     |
| H212SA-XXX-X | 7103       | H242BD       | 7103       | H253PS       | 7102       | H213SA-XXX-X             | 116572     |
| H212SD-XXX-X | 7103       | H242PA       | 7103       | H253SS-XXX-X | 7102       | H213SD-XXX-X             | 116574     |
| H213BD       | 7103       | H242PD       | 7103       | H254PS       | 7102       | H214SA-XXX-X             | 116572     |
| H213PA       | 7103       | H242SA-XXX-X | 7103       | H254SS-XXX-X | 7102       | H214SD-XXX-X             | 116574     |
| H213PD       | 7103       | H242SD-XXX-X | 7103       | H282PS       | 7102       | H242SA-XXX-X             | 116572     |
| H213SA-XXX-X | 7103       | H243BD       | 7103       | H282SS-XXX-X | 7102       | H242SD-XXX-X             | 116574     |
| H213SD-XXX-X | 7103       | H243PA       | 7103       | H283PS       | 7102       | H243SA-XXX-X             | 116572     |
| H214BD       | 7103       | H243PD       | 7103       | H283SS-XXX-X | 7102       | H243SD-XXX-X             | 116574     |
| H214PA       | 7103       | H243SA-XXX-X | 7103       | -            | -          | H252SS-XXX-X             | 116572     |
|              |            |              |            |              |            | H253SS-XXX-X             | 116572     |
|              |            |              |            |              |            | H254SS-XXX-X             | 116572     |
|              |            |              |            |              |            | H282SS-XXX-X             | 116572     |

## K-Series

| Model        | Repair Kit | Model        | Repair Kit | Model        | Repair Kit | Model        | Repair Kit | Model                    | Repair Kit | Model                          | Repair Kit |
|--------------|------------|--------------|------------|--------------|------------|--------------|------------|--------------------------|------------|--------------------------------|------------|
| K213BS       | 7006       | K233PD       | 7006       | K244BD       | 7006       | K314BD       | 7006       | K713SD-XXX-X             | 7006       | <b>SOLENOID OPERATOR CONT.</b> |            |
| K213FP       | 7006       | K233PS       | 7006       | K244BS       | 7006       | K334TS       | 7006       | K713TS                   | 7006       | K234SD-XXX-X                   | 116578     |
| K213FS       | 7006       | K233RS       | 7008       | K244FP       | 7006       | K336PD       | 7010       | K714LS                   | 7006       | K234SS-XXX-X                   | 116578     |
| K213HS       | 7006       | K233SD-XXX-X | 7006       | K244FS       | 7006       | K336SD-XXX-X | 7010       | K714PD                   | 7006       | K236SD-XXX-X                   | 116579     |
| K213LM       | 7006       | K233SS-XXX-X | 7006       | K244LM       | 7006       | K338PD       | 7010       | K714SD-XXX-X             | 7006       | K236SS-XXX-X                   | 116579     |
| K213LS       | 7006       | K233TM       | 7006       | K244LS       | 7006       | K338SD-XXX-X | 7010       | K714TS                   | 7006       | K238SD-XXX-X                   | 116579     |
| K213PD       | 7006       | K234BD       | 7006       | K244PD       | 7006       | K343LS       | 7006       | K716PD                   | 7010       | K238SS-XXX-X                   | 116579     |
| K213PS       | 7006       | K234BS       | 7006       | K244PS       | 7006       | K343PD       | 7006       | K716SD-XXX-X             | 7010       | K243SD-XXX-X                   | 116578     |
| K213RS       | 7008       | K234FP       | 7006       | K244RS       | 7008       | K343SD-XXX-X | 7006       | K718PD                   | 7010       | K243SS-XXX-X                   | 116578     |
| K213SD-XXX-X | 7006       | K234FS       | 7006       | K244SD-XXX-X | 7006       | K343TS       | 7006       | K718SD-XXX-X             | 7010       | K244SD-XXX-X                   | 116578     |
| K213SS-XXX-X | 7006       | K234LM       | 7006       | K244SS-XXX-X | 7006       | K344LS       | 7006       | K733PD                   | 7006       | K244SS-XXX-X                   | 116578     |
| K213TM       | 7006       | K234LS       | 7006       | K244TM       | 7006       | K344PD       | 7006       | K733LS                   | 7006       | K246SD-XXX-X                   | 116579     |
| K214BS       | 7006       | K234PD       | 7006       | K246BD       | 7010       | K344SD-XXX-X | 7006       | K733SD-XXX-X             | 7006       | K246SS-XXX-X                   | 116579     |
| K214BD       | 7006       | K234PS       | 7006       | K246BS       | 7010       | K344TS       | 7006       | K733TS                   | 7006       | K248SD-XXX-X                   | 116579     |
| K214FP       | 7006       | K234RS       | 7008       | K246FP       | 7010       | K346PD       | 7010       | K734PD                   | 7006       | K248SS-XXX-X                   | 116579     |
| K214FS       | 7006       | K234SD-XXX-X | 7006       | K246FS       | 7010       | K346SD-XXX-X | 7010       | K734LS                   | 7006       | K313SD-XXX-X                   | 116578     |
| K214LM       | 7006       | K234SS-XXX-X | 7006       | K246LM       | 7012       | K348PD       | 7010       | K734SD-XXX-X             | 7006       | K314SD-XXX-X                   | 116578     |
| K214LS       | 7006       | K234TM       | 7006       | K246LS       | 7010       | K348SD-XXX-X | 7010       | K734TS                   | 7006       | K316SD-XXX-X                   | 116579     |
| K214PS       | 7006       | K236BD       | 7010       | K246PS       | 7010       | K513LM       | 7007       | K736PD                   | 7010       | K318SD-XXX-X                   | 116579     |
| K214PD       | 7006       | K236BS       | 7010       | K246PD       | 7010       | K513TM       | 7007       | K736SD-XXX-X             | 7010       | K333SD-XXX-X                   | 116578     |
| K214RS       | 7008       | K236PD       | 7010       | K246RS       | 7010       | K514LM       | 7007       | K738PD                   | 7010       | K334SD-XXX-X                   | 116578     |
| K214SD-XXX-X | 7006       | K236PS       | 7010       | K248BD       | 7010       | K514TM       | 7007       | K738SD-XXX-X             | 7010       | K336SD-XXX-X                   | 116579     |
| K214SS-XXX-X | 7006       | K236RS       | 7012       | K248BS       | 7010       | K533LM       | 7007       | K743LS                   | 7006       | K338SD-XXX-X                   | 116579     |
| K214TM       | 7006       | K236SD-XXX-X | 7010       | K248FP       | 7010       | K533TM       | 7007       | K743SD-XXX-X             | 7006       | K343SD-XXX-X                   | 116578     |
| K216BD       | 7010       | K236SS-XXX-X | 7010       | K248FS       | 7010       | K534LM       | 7007       | K743TS                   | 7006       | K344SD-XXX-X                   | 116578     |
| K216BS       | 7010       | K238BS       | 7010       | K248LM       | 7010       | K534TM       | 7007       | K744LS                   | 7006       | K346SD-XXX-X                   | 116579     |
| K216PD       | 7010       | K238BD       | 7010       | K313LS       | 7006       | K543LM       | 7007       | K744PD                   | 7006       | K348SD-XXX-X                   | 116579     |
| K216PS       | 7010       | K238PD       | 7010       | K313PD       | 7006       | K543TM       | 7007       | K744SD-XXX-X             | 7006       | K713SD-XXX-X                   | 116578     |
| K216RS       | 7012       | K238PS       | 7010       | K313TS       | 7006       | K544LM       | 7007       | K744TS                   | 7006       | K714SD-XXX-X                   | 116578     |
| K216SD-XXX-X | 7010       | K238RS       | 7012       | K314LS       | 7006       | K544TM       | 7007       | K746PD                   | 7010       | K716SD-XXX-X                   | 116579     |
| K216SS-XXX-X | 7010       | K238SD-XXX-X | 7010       | K314PD       | 7006       | K613LM       | 7007       | K746SD-XXX-X             | 7010       | K718SD-XXX-X                   | 116579     |
| K218BD       | 7010       | K238SS-XXX-X | 7010       | K314SD-XXX-X | 7006       | K613TM       | 7007       | K748PD                   | 7010       | K733SD-XXX-X                   | 116578     |
| K218BS       | 7010       | K243BD       | 7006       | K314TS       | 7006       | K614LM       | 7007       | K748SD-XXX-X             | 7010       | K734SD-XXX-X                   | 116578     |
| K218PD       | 7010       | K243BS       | 7006       | K316PD       | 7010       | K614TM       | 7007       | <b>SOLENOID OPERATOR</b> |            | K736SD-XXX-X                   | 116579     |
| K218PS       | 7010       | K243FP       | 7006       | K316SD-XXX-X | 7010       | K633LM       | 7007       | K213SD-XXX-X             | 116578     | K738SD-XXX-X                   | 116579     |
| K218RS       | 7012       | K243FS       | 7006       | K318PD       | 7010       | K633TM       | 7007       | K213SS-XXX-X             | 116578     | K743SD-XXX-X                   | 116578     |
| K218SD-XXX-X | 7010       | K243LM       | 7006       | K318SD-XXX-X | 7010       | K634LM       | 7007       | K214SD-XXX-X             | 116578     | K744SD-XXX-X                   | 116578     |
| K218SS-XXX-X | 7010       | K243LS       | 7006       | K333LS       | 7006       | K634TM       | 7007       | K214SS-XXX-X             | 116578     | K746SD-XXX-X                   | 116579     |
| K233BD       | 7006       | K243PD       | 7006       | K333PD       | 7006       | K643LM       | 7007       | K216SD-XXX-X             | 116579     | K748SD-XXX-X                   | 116579     |
| K233BS       | 7006       | K243PS       | 7006       | K333SD-XXX-X | 7006       | K643TM       | 7007       | K216SS-XXX-X             | 116579     |                                |            |
| K233FP       | 7006       | K243RS       | 7008       | K333TS       | 7006       | K644LM       | 7007       | K218SD-XXX-X             | 116579     |                                |            |
| K233FS       | 7006       | K243SD-XXX-X | 7006       | K334LS       | 7006       | K644TM       | 7007       | K218SS-XXX-X             | 116579     |                                |            |
| K233LM       | 7006       | K243SS-XXX-X | 7006       | K334PD       | 7006       | K713LS       | 7006       | K233SD-XXX-X             | 116578     |                                |            |
| K233LS       | 7006       | K243TM       | 7006       | K334SD-XXX-X | 7006       | K713PD       | 7006       | K233SS-XXX-X             | 116578     |                                |            |



## Features

### Aro Pneumatic Logic Control Overview

**Elements:** Elements are miniature diaphragm operated poppet valves designed to perform specific functions. This includes "Or," "And," "Not," plus various "Memory" and "Delay" functions. Elements are designed so response times, shift ratios, flow and exhaust capacities are closely matched and all are compatible in a total system. This compatibility simplifies circuit design.

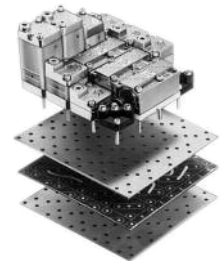
**Circuit Board Construction:** Aro's patented circuit board construction uses a gasket and two metal plates to create a custom air manifold. Interconnections between the elements are cut into the gasket (module) and sealed between the metal plates. The result is a completely interconnected circuit without tubing or fittings. Two gasket modules are used for more complex circuits. Circuit Boards produce a smaller circuit package at lower cost; increased tamper resistance; and provide a clean, neat assembly.

**Function Base Assembly Method:** A Function Base can be used when circuits require four or less elements. This consists of a gasket module, a thin metal plate and a porting strip. Interconnections between the elements are cut into the module. The porting strip has 1/8" NPTF ports, eliminating the need for porting blocks. This method can be mounted on any flat surface; it provides a neat, durable assembly; and it increases tamper resistance.

**Back Tubulation Construction:** This method uses a thin metal plate (base plate) and porting blocks for each element. Each block has built in fittings for 5/32" (4mm) tubing. Element interconnections are made by connecting tubes to these fittings. Back tubulation is often used for "bread boarding" new circuits, air circuit training and if circuits are frequently changed.



Individual Elements



Circuit Board Construction



Function Base Assembly



Back Tubulation

## Performance Specifications

### Air Supply Preparation

**Recommended Filtration:** Filter air with a 40 micron filter or better. Additional screens in the base of timing function elements and amplifiers prevent large particles from entering the element.

**Recommended Lubrication:** None required for individual elements, or for circuits including timing functions or amplifiers.

**Moisture:** All metal parts are chromate plated to resist corrosion from moisture and many chemicals. A dry air supply is recommended for maximum repeatability of timing and sensing functions.

#### Operating Air:

**Operating Pressure:** 30-150 PSI (2-10 bar). Two-hand anti-tie-down devices require 50-125 PSI (3.5-9 bar).

#### Shift Pressures:

**Snap-Acting Elements** (And, Not, Inhibitor, S/R -- Mem, Delay and Pulse) shift when the pilot pressure exceeds 70% of the supply. They return when pilot pressure is less than 40% (Inhibitor 5%) of the supply.

**Non-Snap-Acting Elements** (Or -- Flip-Flop) have a shift pressure of 50% of supply pressure.

#### Flow & Cv Factors:

Dependent on specific elements and flow paths.  
Flow = 9.3-16.2 SCFM, Cv = .14-.28

#### Identification:

**Symbols:** Each element has a symbol based on the National Standard for diagramming moving part logic control (attached method).

**Port Identification:** Letters cast into the cover and base of each element correspond to input and output designations.

**Mounting:** Elements have 5/8" (15.9mm) bolt extensions. All mounting hardware and seals are provided with each element.

**Test Ports:** Many elements have 1/8" NPT ports connected to the "C" (output) port. These can be used as optional output ports, or as test ports.

#### Anticipated Life:

**Element Life:** APLC elements have proven extremely durable, operating many millions of cycles, or several years, without failure. If needed, repair kits or parts are available for most elements.

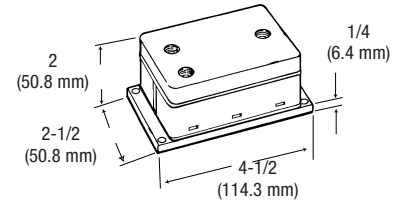
## Features

- Ideal for machines where position of operator's hands must be monitored.
- Actuate and hold both air valve buttons concurrently to maintain an output air signal. If either push button is released, the output air signal is exhausted, indicating the operator's hands are no longer in position.
- Operating Pressures: 50-125 PSI (3.5-8.6 bar). Designed to comply with OSHA regulations.

**Warning:** These provide only the anti-tie down logic function and are not stroke limiting devices. On machines with full revolution clutches and/or where repeat cycles can occur, approved safety and/or single stroke devices must be used in conjunction with the anti-tie down units.



59191



## Elements

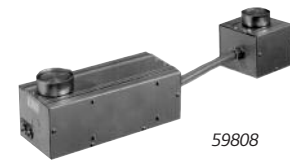
### 59191 Base Mounted

- Element has three 1/8" NPTF ports on top. 2 inputs, 1 output.
- Element is base mounted.  
See page 101 for additional information

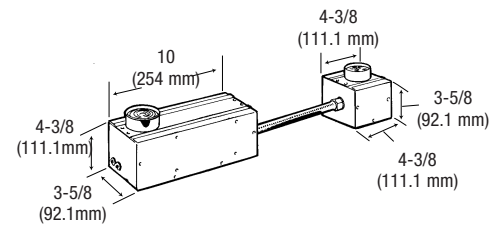
## Packages

### 59808

- Includes two enclosures with green push button valves separated by a length of flexible conduit. External supply and output to machine is made by 5/32" (4mm) instant tube fittings.
- Comes assembled with all internal connections ready to install on machine.
- Palm Buttons are 30" center to center.



59808

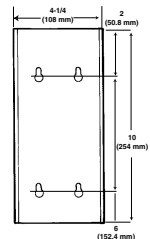


### 59809

- Green push buttons located on opposite ends of a single enclosure. External supply and output to machine is made by 5/32" (4mm) instant tube fittings.
- Comes assembled with all internal connections ready to install on machine.

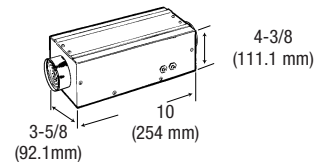


59809



### 59003-842

- Unassembled package.
- Includes 59191 anti-tie-down block, two 461-3 palm buttons with 20975 guards, 10 feet of 5/32" tubing and fittings for 59191.
- Customer can custom fit components to machine.

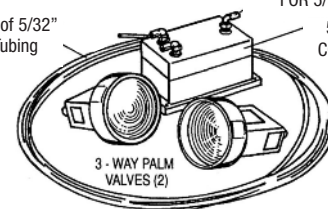


59003-842 CONTROL ASM.

59756\*4 (3) BOW FITTINGS FOR 5/32" TUBING

10' of 5/32" Tubing

59191 LOGIC CONTROL ASM.



## Accessories

### 59860 Signal Standardizer

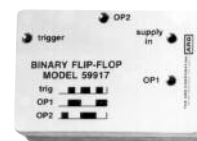
- Converts an input signal of any duration into a timed output signal.
- Built in 4-way function in which two output signals are provided; one normally on, the other normally off.
- Can be used for 3-way and 4-way valves of all types including single and double pilot-operated models.
- Timing Range is 0.1 to 3 seconds. Longer with use of an accumulator. Each additional cu. in. of space added will give an extra 8 seconds of timing.
- Use filtered, dry, non-lubricated air. 50-125 psi (3.5-8.6 bar)
- See page 101 for additional information.



59860



59861



59917

### 59861 Oscillator Circuit

- Use in applications involving cycling and oscillating valves and cylinders for manufacturing and testing; as well as, pumping, sorting & painting.
- Has two dial timers so both phases can be adjusted independently.
- Can be used for all types of 3-way and 4-way valves.
- Recommended Timing Range of .1 to 3 seconds. Longer when using an accumulator. Each additional cu. in. of space added will give an extra 8 seconds of timing.
- See page 101 for additional information.

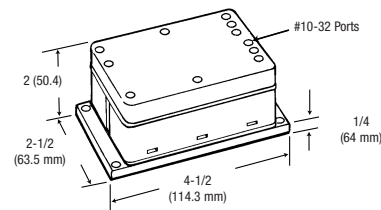
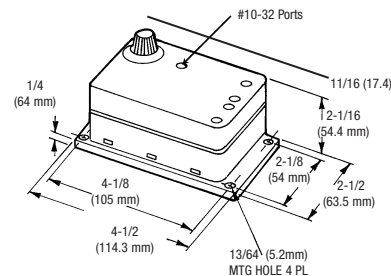
**NOTE:** For set-up or trouble-shooting, time delay functions can be adjusted far beyond their recommended range; however, if their normal operating time is longer than 3 seconds, additional volume should be connected to the port marked “Acu” (to the right of the adjustment dial). Each cubic inch additional volume connected to this port will increase the maximum range of the time delay by 8 seconds. A pressure gauge tee'd into the accumulator port can be very valuable as a visual aid when adjusting timers with extended ranges.

### 59917 Binary Flip-Flop

- With supply on, output one or output two will be on and the other off.
- Pressurizing the trigger port switches the outputs between on and off.

**NOTE:** All Flex-6 units have 10/32" ports.

### Dimensions for Base Mounted Units Ports are 10/32 Threads



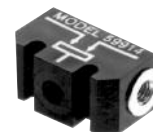
## In Line Logic Elements

### 59914 “OR” Element

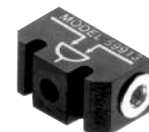
- Connects two inputs to one output. The output will be on when either, or both, inputs are on.

### 59913 “AND” Element

- Connects two inputs to one output. The output will be on when both inputs are on.



59914



59913

**Operating Pressure:** 30-150 PSIG (2-10 bar)

**Operating Temperature:** 32°-160°F (0°-71°C)

**Ports:** #10-32 threads

**Body Material:** Acetal Resin

**Flow:** “OR” = 4 SCFM

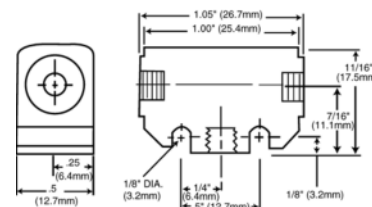
“AND” = 3.2 SCFM

**Shuttle/Poppet:** Buna N

**Inserts:** Aluminum

**Cv:** “OR” = .11

“AND” = .09





## Features

### Flex 6

#### Designed to Control Sequential Type Machines

- Simplifies design & installation of control circuits.
- Circuit changes or additions can be accomplished in seconds.
- Very economical for simple air operated machines and fixtures.
- Ideal for harsh and explosive environments.
- All ports are 10/32 threads.
- Use filtered, dry, non-lubricated air. 50-125 psi (3.5-8.6 bar)

**Set/Reset Memory:** The first step in each Flex-6 circuit is controlled by a set/reset memory. A momentary start signal pressurizes the set port, causes the memory to go on and starts the sequence. The memory remains on until the reset port is pressurized (end of cycle or emergency stop). Loss of supply pressure also resets the memory (output off).

**Automatic Reset Memory:** Other Flex-6 memory functions automatically reset. A momentary signal at the set port causes the memory output to go on, provided the previous stage is on. The output will remain on until the entire circuit is reset. This memory has the ability to ignore signals arriving at the wrong time and will reset regardless of the set input condition. You don't need to analyze if the set signal is momentary or maintained, nor are you required to connect limit valves in series with a previous output.

**Timer Adjustment:** Each time delay has a numbered dial (the numbers act as reference only). Screwdriver adjustment and fixed delay models are available on special order.

**Adjustment Range:** The recommended adjustment range is .1 to 3 seconds. If normal operating time is longer than 3 seconds, additional volume should be connected to the port marked "ACU." Each cubic inch additional volume connected to this port increases maximum time delay by 8 seconds.

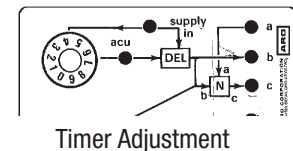
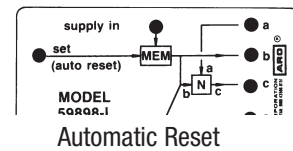
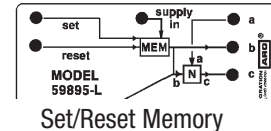
**Sequence Controlled with Input Signals:** If all steps are started by input signals, use one 59897 start/stop unit and an additional 59898 unit as required to complete the sequence.

**Sequence Controlled by Time Delay Functions:** If all steps are started by time delay (with the exception of the start button) use one piece 59895 start/stop unit and an additional 59896 to complete the sequence.

#### Both Input, Inhibit and Time Delay used to Control a Sequence:

Mixed circuits are easily accomplished by selecting from the units previously mentioned, plus two more. Models 59899 and 59900 provide a combination of a time delay and an input signal functions in a single unit. Using the 59899 and 59900 gives you the exact unit needed for all mixed circuits.

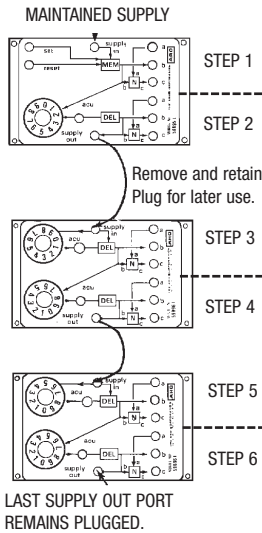
**Inhibitor:** Inhibitor models (59920 through 59925) are used as the first, second or later circuit, depending on the application requirements. Inhibitors can be used to sense position of a cylinder, or other actuator, when limit switches are not appropriate.



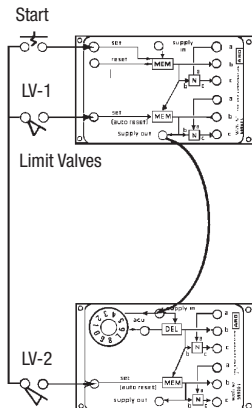
# Set-Up

## Steps to Connecting Flex-6 Units

1. Arrange the units in the order and sequence they are used (steps 1 & 2 top, 3 & 4 next, etc.).
2. Connect a maintained supply to the "supply in" port of the first unit. Then connect the "supply out" of the first unit to the "supply in" of the second unit. Connect subsequent units in this manner. The last "supply out" port will remain plugged.
4. Connect and "program" the outputs. Each unit has three ports on the right side marked "A," "B," and "C." The "C" port is the output and is connected to the pilot valve or other device causing action for each stage. The "C" output signal can be removed by a signal (maintained) to the "A" port. The "B" ports are used to provide this maintained signal.
5. Connect the reset signal from the last step in sequence to the port marked "reset" in the first. This signal resets the circuit, making it ready to start a new cycle.

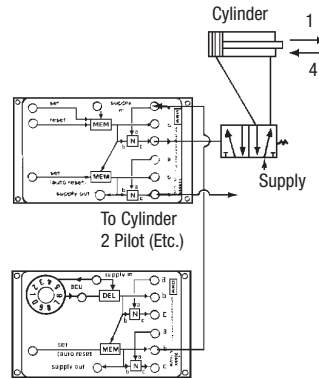


3. Connect the set input signals. The start signal and all other input signals are connected to the set ports of the units they will start.

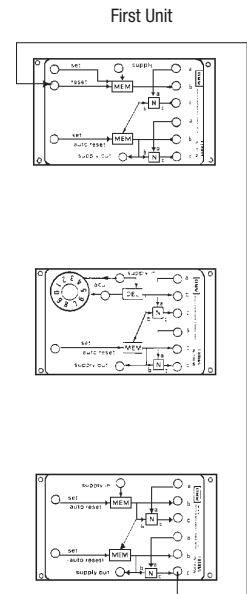


Example: Cylinder 1 extends in step 1 and retracts in step 4. The "C" port of step 1 is connected to a spring return pilot valve which extends the cylinder. The "B" port of step 4 is connected to the "A" port of step 1. This accomplishes the retract function.

**NOTE:** Once these connections have been made, plug all "B" and "C" ports not used. **"A" ports not used remain open.**



Remove plug and connect to "A" port to remove "C."



The Last Step of the Sequence is to RESET the Circuit

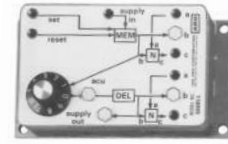
All Ports are 10/32 Threads

## Features

### Individual Units

#### 59895 S/R Mem-Delay Model

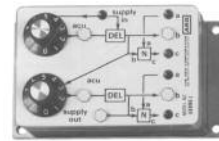
The first unit in a Flex-6 circuit when step two is a delay function. The first output is caused by the start input signal. The second output is caused by a time delay following the first output. Flex 6 Dimensional Data is located on Pg. 86.



59895

#### 59896 Double Delay

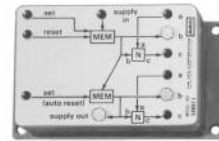
Used as the second unit, or later, in circuits when two time delay functions are needed. The first output is caused by a time delay after the supply signal is applied. The second output is caused by a time delay following the first output. Flex 6 Dimensional Data is located on Pg. 86.



59896

#### 59897 S/R Mem-Auto Mem Model

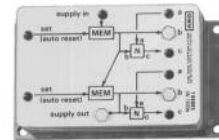
The first unit in Flex-6 circuits when step two is an input signal. The first output is caused by the start input signal. The second output is caused by a second input signal. Flex 6 Dimensional Data is located on Pg. 86.



59897

#### 59898 Double Auto Mem Model

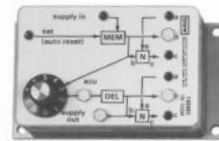
Used as the second unit, or later, in circuits when two input signals are available. Both outputs are caused by their respective inputs and both are controlled by automatic reset memory functions. Flex 6 Dimensional Data is located on Pg. 86.



59898

#### 59899 Auto Mem-Delay Model

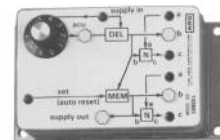
Used as the second unit, or later, in Flex-6 circuits when an input signal and a delay function are required. The first output is caused by an input signal. The second output is caused by a time delay following the first output. Flex 6 Dimensional Data is located on Pg. 86.



59899

#### 59900 Delay-Auto Mem Model

Used as the second unit, or later, in circuits when a delay and an input signal are required. The first output is caused by delay function after the supply signal is applied. The second output is caused by an input signal. Flex 6 Dimensional Data is located on Pg. 86.



59900

## Features

### Individual Units

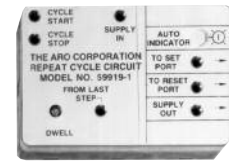
#### 59919-1 Cycle Repeat Circuit

Cycle Repeat Circuit provides continuous recycling of a control circuit started by a momentary start signal, end of cycle stop — momentary input, single cycle operation, emergency stop and an adjustable dwell between cycles.

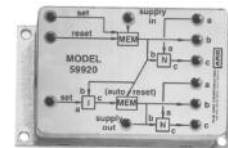
Add to any Flex-6 circuit so it cycles continuously.

Flex 6 Dimensional Data is located on Pg. 86.

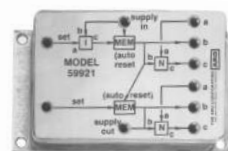
See page 102 for additional information.



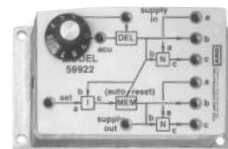
59919-1



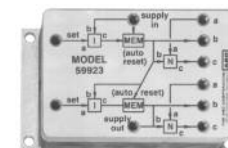
59920



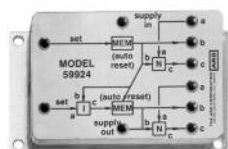
59921



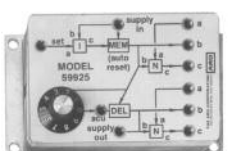
59922



59923



59924



59925

#### 59920 S/R Mem-Inhibitor Model

The first Flex-6 circuit when step two is an inhibitor function. The first output is caused by the start input signal. The second output is caused by the release of pressure on the inhibitor port.

Flex 6 Dimensional Data is located on Pg. 86.

#### 59921 Inhibitor-Input Model

Used as the second or later circuit when the first stage will be controlled by an inhibitor signal and the second from a pressure signal.

Flex 6 Dimensional Data is located on Pg. 86.

#### 59922 Delay-Inhibitor Model

Used as the second or later circuit when the first stage will be controlled by a delay and the second from an inhibitor signal.

Flex 6 Dimensional Data is located on Pg. 86.

#### 59923 Double Inhibitor Mem Model

Used as the second or later circuit when both stages are started by inhibitor signals.

Flex 6 Dimensional Data is located on Pg. 86.

#### 59924 Input-Inhibitor Model

Used as the second or later circuit when the first stage will be controlled by a pressure signal and the second from an inhibitor signal.

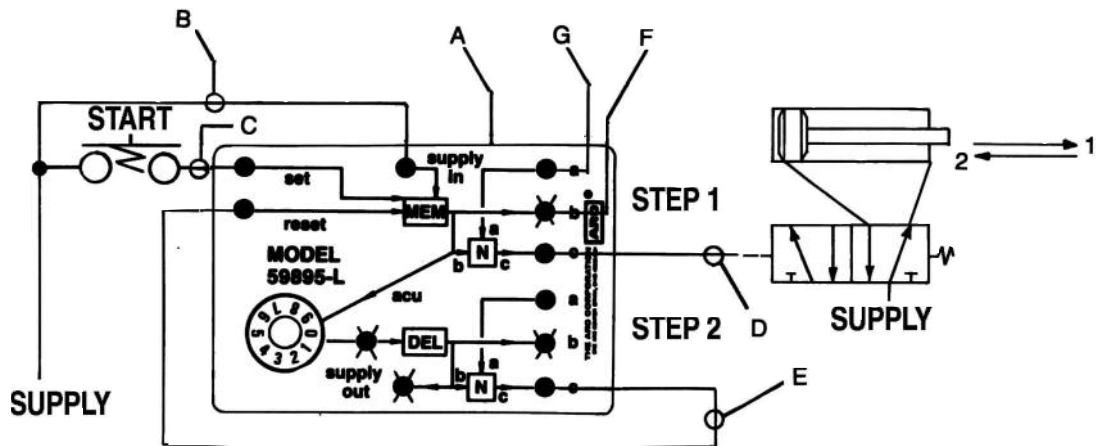
Flex 6 Dimensional Data is located on Pg. 86.

#### 59925 Inhibitor-Delay Model

Used as the second or later circuit when the first stage will be controlled by an inhibitor signal and the second from a delay.

Flex 6 Dimensional Data is located on Pg. 86.

## Illustration 1



### Description

Here we have a two step sequence using one cylinder. When a push button is actuated, the cylinder will extend for an adjustable period of time. When the time has elapsed, the cylinder will retract to its original position.

### Connections

- A. This sequence uses a model 59895 Flex-6 unit.
- B. Supply is connected to the "Supply In" port.
- C. The output of a start push button is connected to the "Set" input port.
- D. The step 1 output (top "c" port) is connected to the pilot port of the valve which will extend the cylinder.
- E. The step 2 output (lower "c" port) is connected to the "Reset" input port.
- F. Both "b" ports, the "Supply Out" port, and the "ACU" port are plugged (new units are shipped with these plugs installed.)
- G. "a" ports, not used, remain open.

### Function

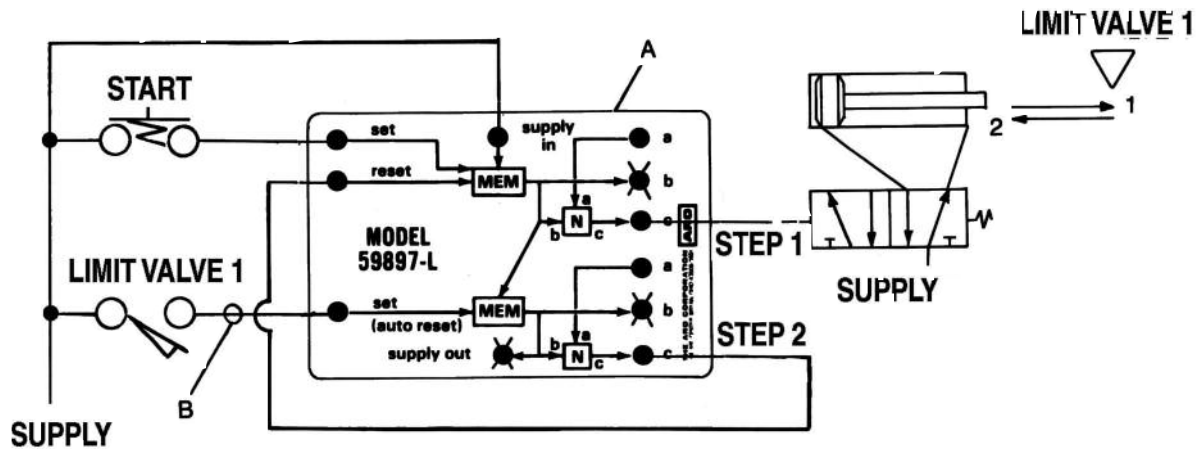
1. At rest, the cylinder is retracted.
2. The operator presses the start push button. This signals the set port and step 1 output goes on immediately. The cylinder extends and the time delay is started. At this point the signal is "Locked In" and the operator can release the start push button. The time delay is adjustable. Turning the dial clockwise, extends the time setting.
3. When the adjusted time is expired, step 2 output goes on. Step 2 output signals the reset port. This causes the Flex-6 unit to reset\* (unlocks the start signal) and outputs 1 and 2 go off., causing the cylinder to retract.
4. The circuit is now reset and ready for a new cycle when the start push button is again actuated.

\*Set signal must be off for this to take place.





### Illustration 3



### Description

Here we have a two step sequence described in Illustration 1. The difference is that this cylinder actuates a limit valve when it is fully extended. The limit valve signals the Flex-6 unit that the cylinder is extended and it is time to retract.

### Connections

- A. This sequence uses a model 59897 Flex-6 unit.
- B. The limit valve output is connected to the port marked Set (Auto Reset)
- C. All other connections are identical to those made in Illustration 1.

### Options

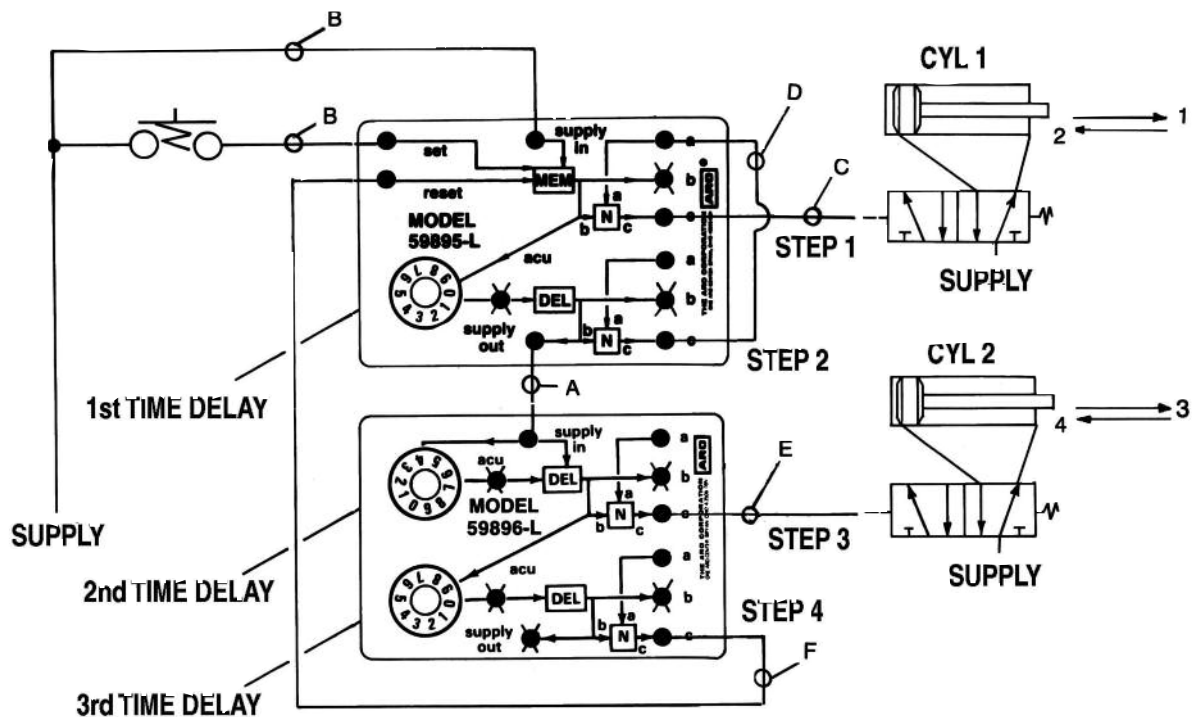
Option A, preventing the operator from holding the cylinder extended and Option B, providing an optional retract push button could be added to this circuit. These options are described in Illustration 2.

### Function

1. At rest, the cylinder is retracted.
2. The operator presses the start push button. This signals the set port and step 1 output goes on immediately. At this point, the signal is "Locked In" and the operator can release the start push button.
3. The cylinder actuates the extend limit valve (LV-1). Limit valve 1 signals the step 2 set port. This causes the step 2 output to go on immediately. The step 2 output signals the reset port, which resets the circuit\* removing the step 1 and 2 outputs and allows the cylinder to retract.

\* Set signal must be off for this to take place.

## Illustration 4



### Description

Here we have a two cylinder four step sequence.

1. When the push button is actuated, cylinder 1 extends. This also starts the first time delay.
2. When the first time delay times out, cylinder 1 retracts. This starts the second time delay.
3. When the second time delay times out, cylinder 2 extends. This starts the third time delay.
4. When the third time delay times out, cylinder 2 retracts. This also resets the circuit.

### Connections

This circuit uses a model 59896 Flex-6 unit.

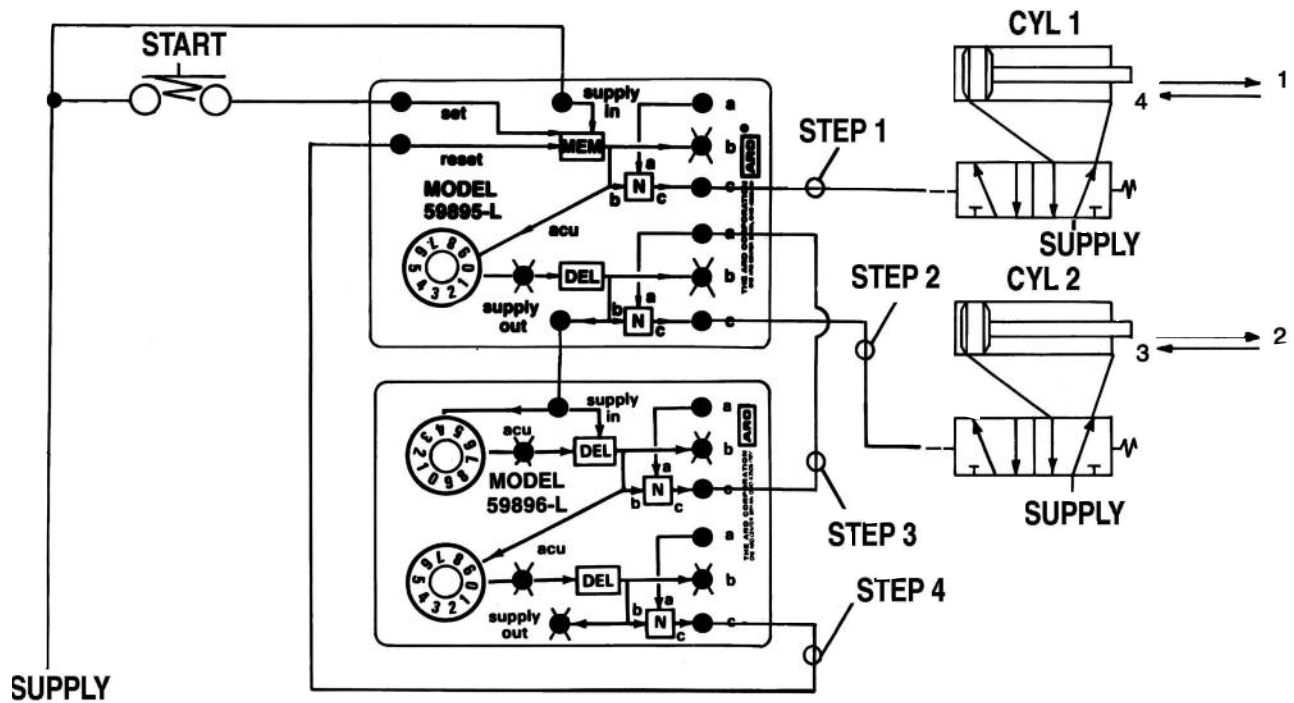
- A. The 59896 is added to the circuit simply by removing the "Supply Out" plug in the 59895 and connecting this port to the "Supply On" port of the 59896.
- B. The supply and start push buttons are connected as before.
- C. The step 1 output is connected to the valve that extends cylinder 1.
- D. The step 2 output is connected to the "a" port of step 1.
- E. The step 3 output is connected to the valve that extends cylinder 2.
- F. The step 4 output is connected to the reset port.
- G. All "b" ports, all accumulator ports and the supply out of the 59896 are plugged.
- H. All "a" ports not used are left open.

### Function

Looking closely at the diagram on top of the Flex-6 units, you may be able to trace the signals as the sequence progresses.

1. When the operator presses the start push button the signal sets the memory (MEM) in the first unit (MEM output on). This goes thru a "not" (N) element and to the step 1 output (CYL 1 extends). The output from the memory element is also connected to the first time delay by a diagonal line.
2. The output of delay 1 again goes through a "not" element to provide the step 2 output. This output is connected externally to the "a" input of step 1 and internally to the "a" port of the "not" element. This removes the output signal at step 1 and retracts cylinder 1. The output of delay 1 is also connected to the second time delay via the "supply out" to "supply in" connection.
3. Time delay 2 extends cylinder 2 and starts time delay 3.
4. Time delay 3 outputs resets the entire circuit and in doing so retracts cylinder 2.

## Illustration 5



### Description

Here we have a circuit similar to the one shown in Illustration 4. The difference between these circuits is the sequence that the cylinders extend and retract. This is shown by the numbered arrows to the right of the cylinders.

### Connections

Notice that the change in sequence is done entirely by changing the output connections on the right hand side of the Flex-6 units.

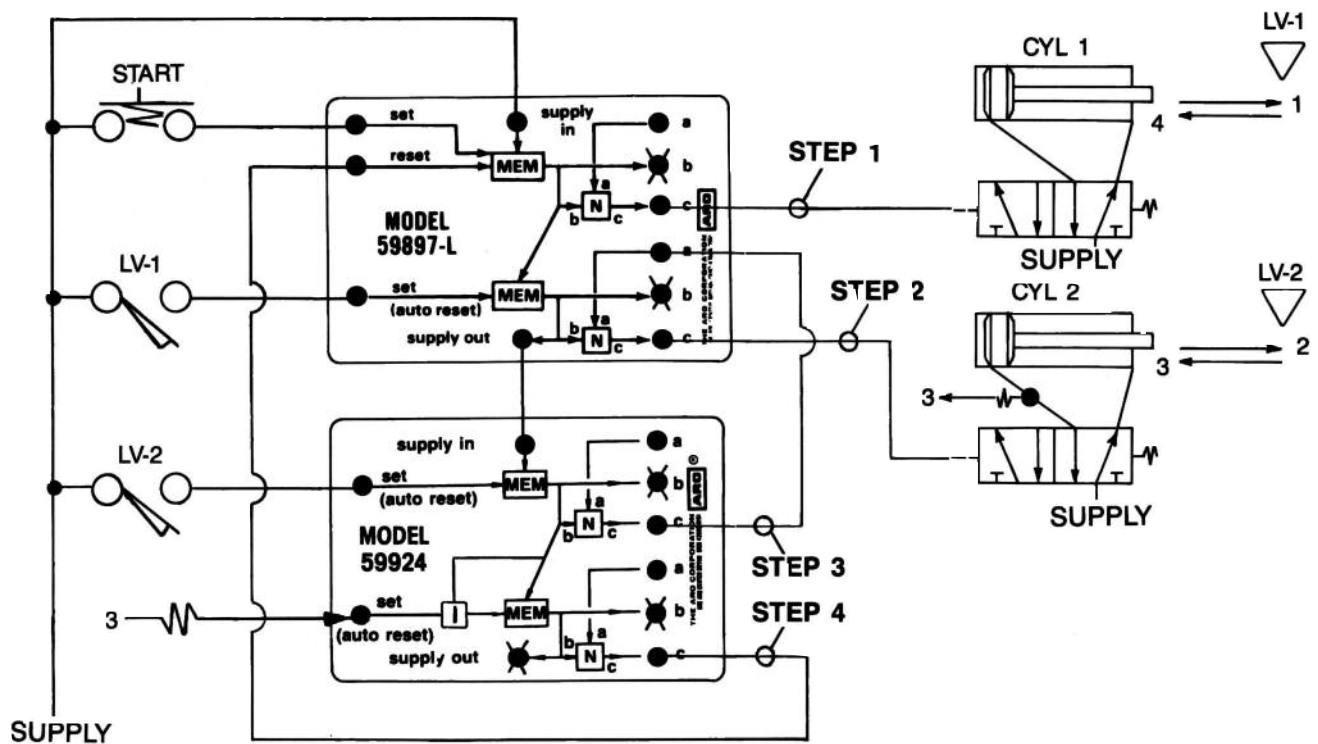
- A. Step 1 output is connected to the valve that extends cylinder 1 (as before).
- B. Step 2 output is connected to the valve that extends cylinder 2.
- C. Step 3 output is connected to the "a" input port of step 2. This removes the step 2 output and retracts cylinder 2.
- D. Step 4 output is connected to the reset port (as before).

Thus by rearranging the output connections any sequence can be performed.

### Options

1. To prevent the operator from holding cylinder 1 extended (by holding down the start push button), a connection can be made from the "b" port of step 4 to the "a" port of step 1.
2. An emergency retract push button can be added (See Illustration 2).
3. Additional accumulator and/or gauges can be added to each time delay (See Illustration 2).
4. Sequence step indicators can be added to the "b" ports (Model 59907-004).

## Illustration 6



### Description

This circuit is identical to the one shown in Illustration 5 except this circuit uses input signals and inhibitor function, rather than time delays, to start each step. The input signals come from limit valves that are mounted to detect the movement of each cylinder.

### Connections

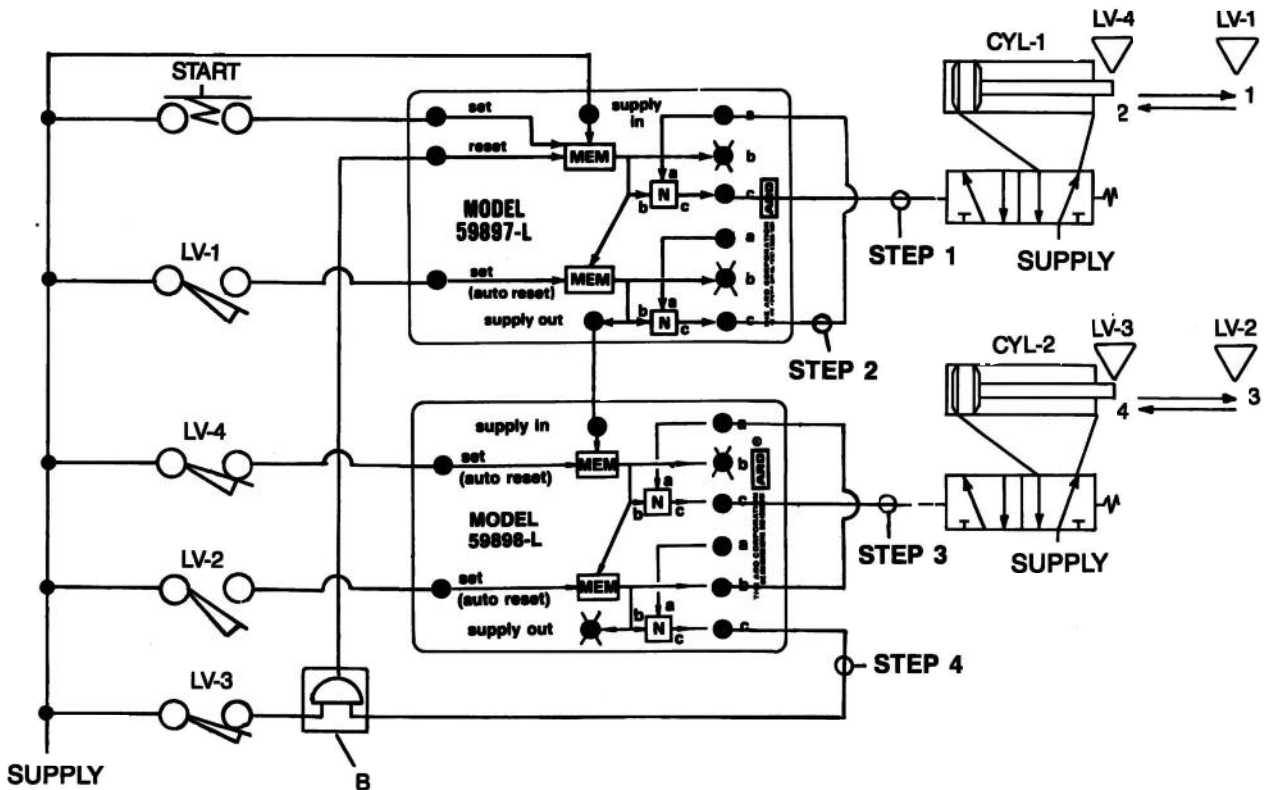
This circuit uses a 59897 and a 59924 Flex-6 unit. The output signals, the start signal and the supply are identical to those in Illustration 5. Three limit valves are mounted on the machine to detect the various cylinder positions. These positions are shown as triangles to the right of the cylinders. The same limit valves are shown again to the left of the Flex-6 circuit. They are connected to the Flex-6 circuit as follows:

- LV-1 to the set port of Step 2
- LV-2 to the set port of Step 3
- Signal 3 to the set port of Step 4

### Function

1. At rest both cylinders are retracted.
2. When the operator actuates the start push button step 1 output goes on and cylinder 1 extends.
3. Cylinder 1 actuates limit valve one when fully extended. Limit valve one signals step 2 and step 2 output extends cylinder 2.
4. Cylinder 2 extends actuating limit valve 2 when it is fully extended. Limit valve 2 signals step 3 and step 3 output goes on. Step 3 output is connected to the "a" port of step 2. This removes the step 2 output and cylinder 2 retracts.
5. Cylinder 2 releases limit valve 2 then it retracts. When cylinder #2 is retracted, the pressure in line from valve to cylinder #2 drops to 0 PSI, ("A" port of inhibitor) and output 4 comes on. Step 4 output resets the circuit and cylinder 1 retracts.

## Illustration 7



### Description

This is the same sequence as shown in Illustration 4 except that limit valves are used to signal the start of each step. Two options (A & B) have also been added to the circuit.

- A. Option A cancels step 3 output and retracts cylinder 2 when output 4 comes on.
- B. Option B resets the circuit only after cylinder 2 if fully retracted.

### Notes

The output connections and the input connections were changed from Illustration 6 to accomplish this sequence. Limit valve 4 was added so that each position of each cylinder could be detected. Step 5 is accomplished by “anding” step 4 output and the final limit valve input (LV-3). Using a 59913 in line “and” function. This could also be done by a series connection through limit valve 3.

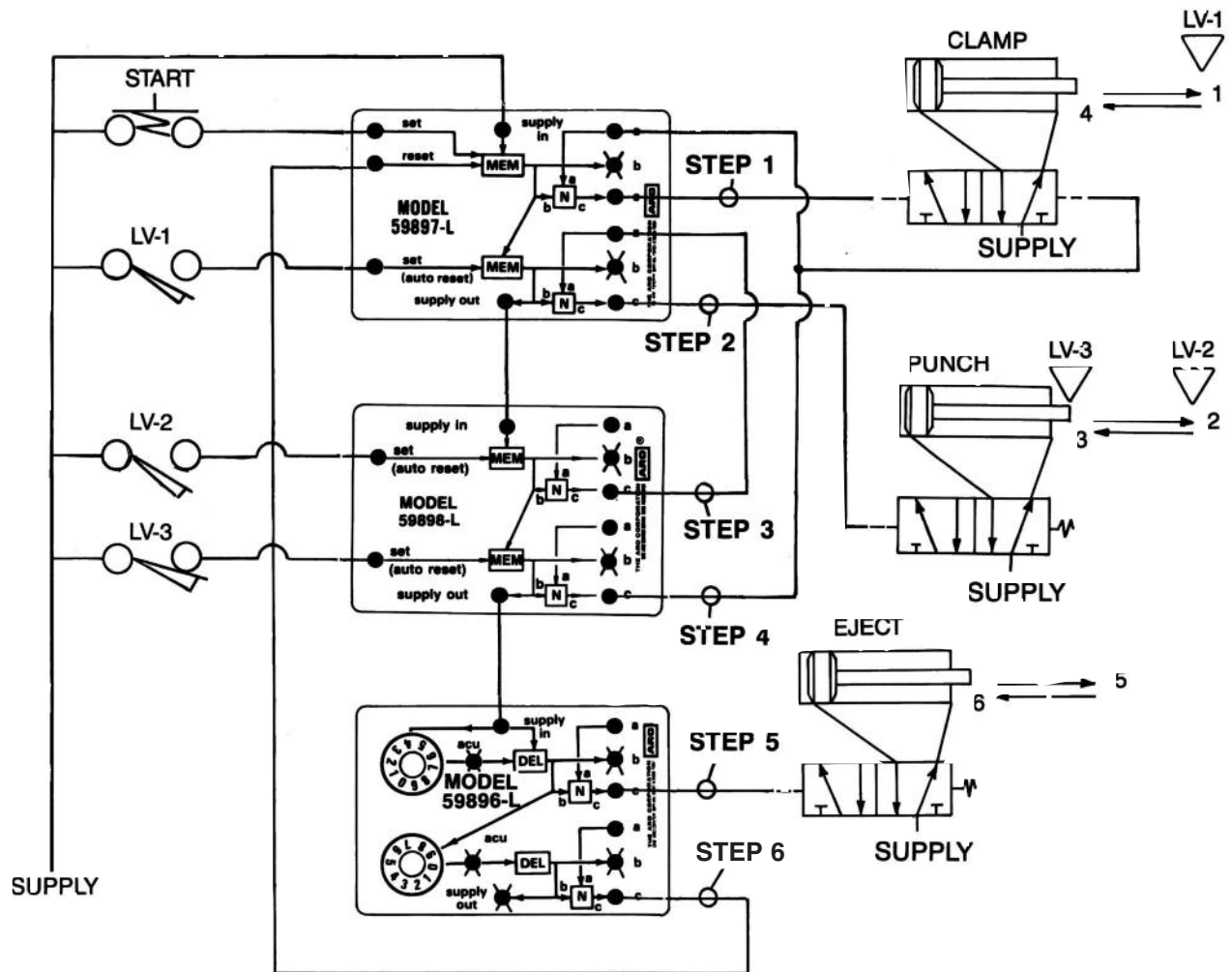
This option is often used when each step of the sequence must be monitored closely. Example: continuous operating circuits.

### Function

1. Operator actuates start push button. Cylinder 1 extends.
2. Cylinder 1 releases limit valve 4 and actuates limit valve 1. Step 2 output goes on retracting cylinder 1.
3. Cylinder 1 releases limit valve 1 and actuates limit valve 4. Step 3 output goes on extending cylinder 2.
4. Cylinder 2 releases limit valve 3 and actuates limit valve 2. Step 4 output goes on retracting cylinder 2.
5. Cylinder 2 releases limit valve 2 and actuates limit valve 3. Circuit resets and is now ready for a new cycle.



## Illustration 8



### Description

Here is a six step sequence involving three cylinders. The sequence is as follows:

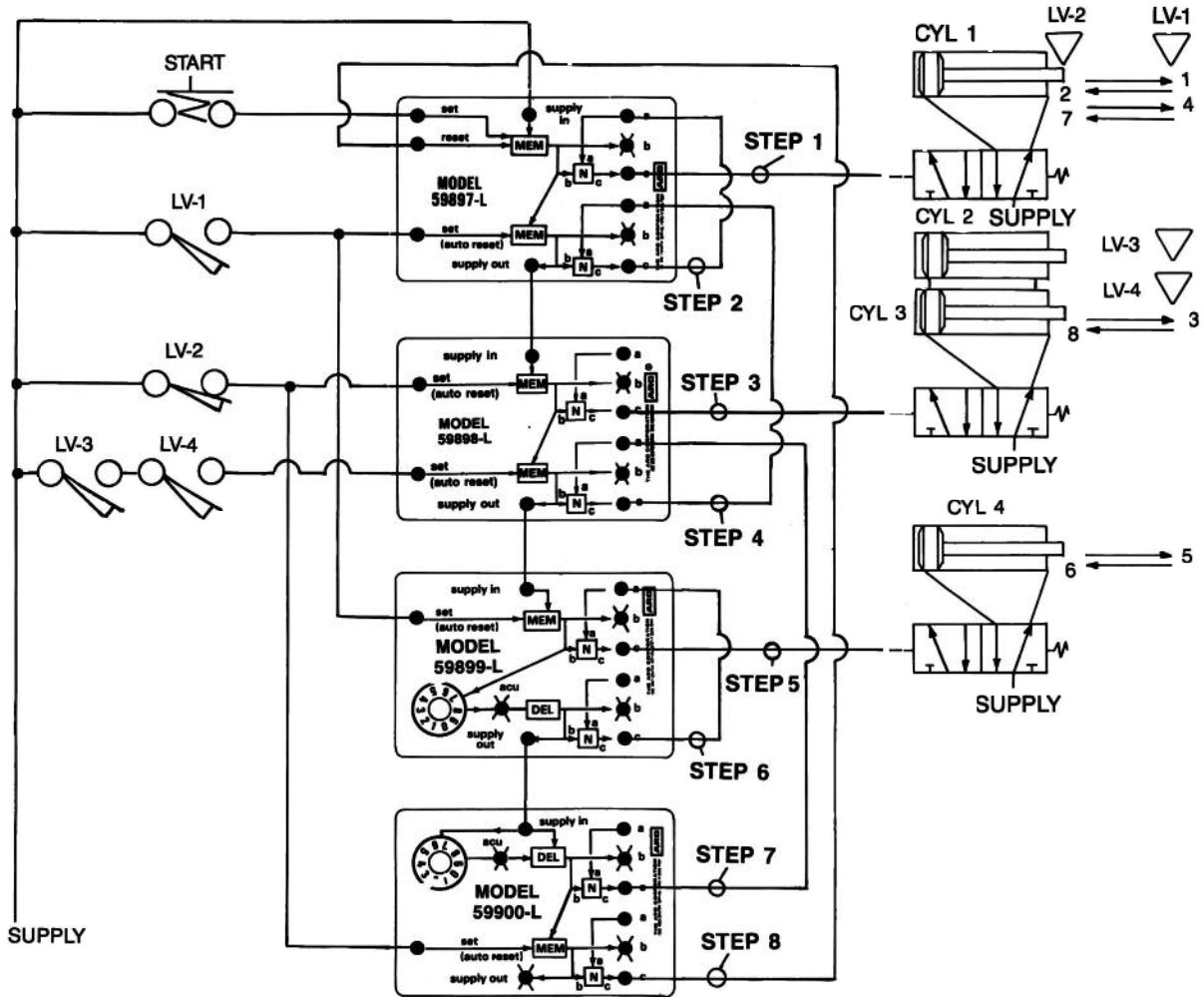
1. Operator actuates start push button. Clamp cylinder extends.
2. Clamp cylinder actuates limit valve 1. Punch cylinder extends.
3. Punch cylinder releases limit valve 3 and actuates limit valve 2. Punch valve retracts.
4. Punch cylinder releases limit valve 2 and actuates limit valve 3. Clamp cylinder retracts. Time delay 1 starts.
5. Time delay 1 times out. Eject cylinder extends, time delay 2 starts.
6. Time delay 2 times out. Eject cylinder is retracted and circuit is reset.

### Variations

1. Both the 59898 (double input) and the 59896 (double timer) units are used in the same circuit.
2. This circuit also includes a double pilot valve on the clamp cylinder. Notice that the return pilot signal is simply tee'd from the signal that removes the step 1 output.



## Illustration 9



### Description

The circuit in Illustration 9 shows several additional features of Flex-6 circuits.

1. Flex-6 circuits can include as many steps as necessary to complete the sequence. Additional Flex-6 blocks are simply added by connecting the “supply out” port of previous steps to the “supply in” port of new steps. Here we have 4 Flex-6 units providing 8 separate steps in the machine sequence.
2. We are also showing two new Flex-6 assemblies not previously shown. They are models 59899 and 59900 and are used in circuits such as this where some of the steps are controlled by timers and others by input signals.
3. Notice cylinders 2 and 3. When two cylinders work together their actions can be controlled by one step in the sequence. The only added provision here was to make sure both cylinder had fully extended before step 4 could take place. For this we provided limit valves 3 and 4. They can be connected in series (as shown) or “anded” together using a 59913 in line “and” function.
4. This drawing also shows a cylinder (cylinder 1) being extended and retracted twice in the sequence. First note how this is accomplished on the output side. Step one comes on and is later cancelled by step 2. Still later in the sequence step 4 output comes on, cancels step 2 and this allows step 1 to come back on. Finally step 7 comes on, cancels step 4, releasing step 2 and cancelling step 1. Notice also that limit valve 1 and 2 outputs can be used more than once in the same circuit. Simply tee their outputs and connect to the stage start ports indicated.

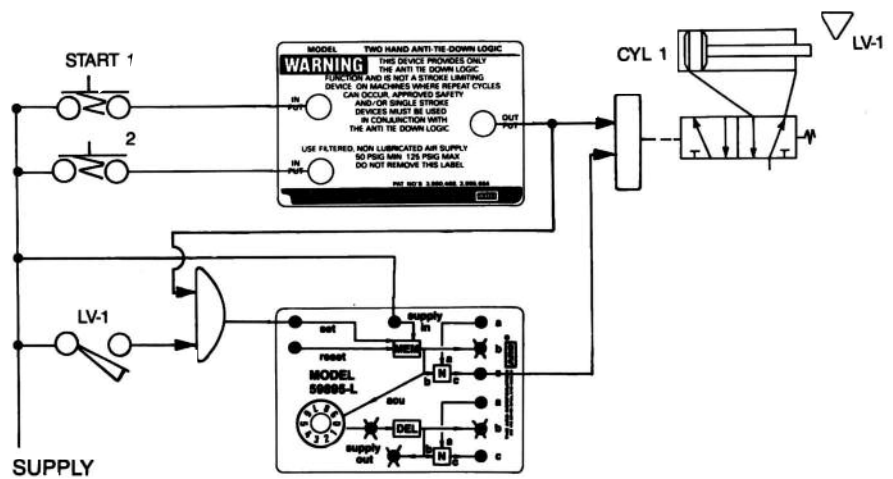
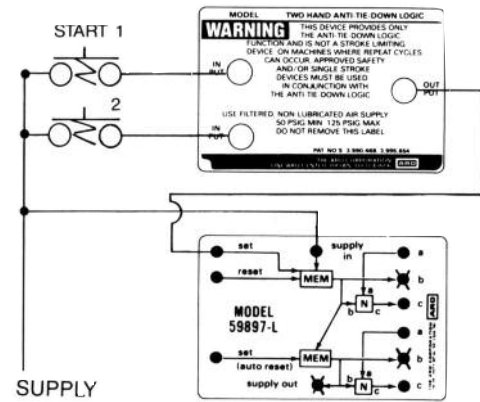
## Other Six Element Assemblies

Four other six element assemblies are available. These units are sometimes used with Flex-6 circuits and in other cases provide a complete function in themselves.

### Two-Hand Ant-Tie-Down Model 59191

The two-hand anti-tie-down is used to insure that both push buttons have been actuated before the cycle will start. When the anti-tie-down is used, both buttons must be actuated concurrently to create an output signal. Once either push button is released, the output signal goes off. Both push buttons must then be released and reactivated to start again.

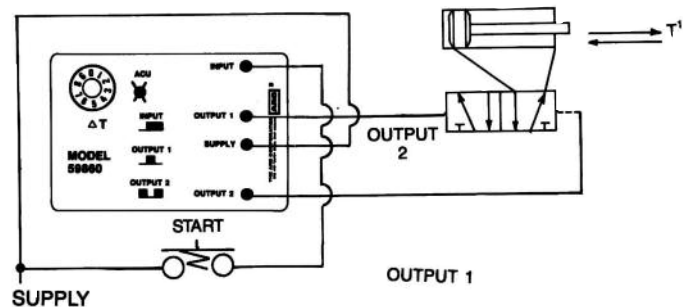
The first drawing shows a two-hand anti-tie-down added to the start of a Flex-6 circuit. The second drawing shows a more complex circuit which is used to insure that the operator hold both buttons until cylinder 1 is fully extended. Once cylinder 1 is extended and actuates limit valve 1, the push buttons can be released and the machine will continue its automatic



### The Signal Standardizer Model 59860

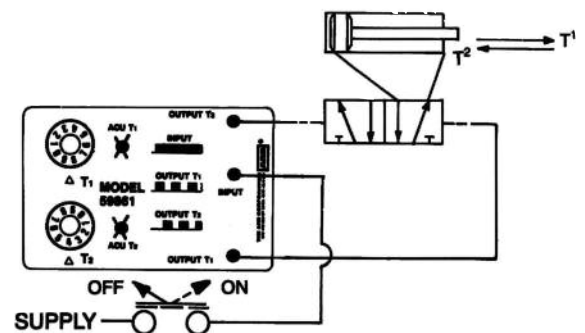
The 59860 signal standardizer (or signal shaper) can be used to convert a signal of any duration to outputs of a predetermined time period.

When the start signal is received, the cylinder will extend for the period of time adjusted on the timer. Then the cylinder will retract. The start input signal can be shorter or longer than the output signal(s)\* without affecting the timing function.



### The Oscillator Circuit Model 59861

When a signal is received at the input of the oscillator circuit output T<sup>1</sup> will come on. After an adjustable period of time (adjustable at timer T<sup>1</sup>) output T<sup>1</sup> will go off and output T<sup>2</sup> will go on.\* After another adjustable period of time (adjustable at T<sup>2</sup>) output will go off and output T<sup>1</sup> will go on. This will continue as long as the input remains on.



\* Outputs not used can be plugged. Small cylinders can be ported directly to these outputs.

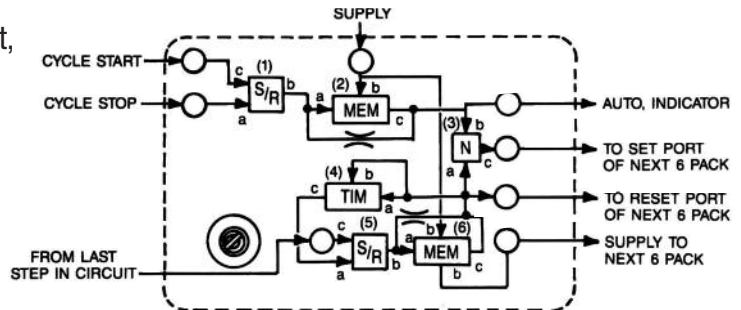
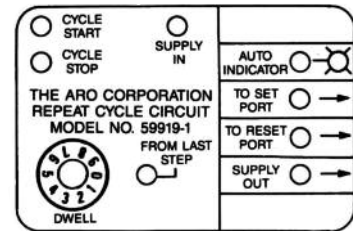
# Cycle Repeat Circuit

## Cycle Repeat Circuit Model 59919-1

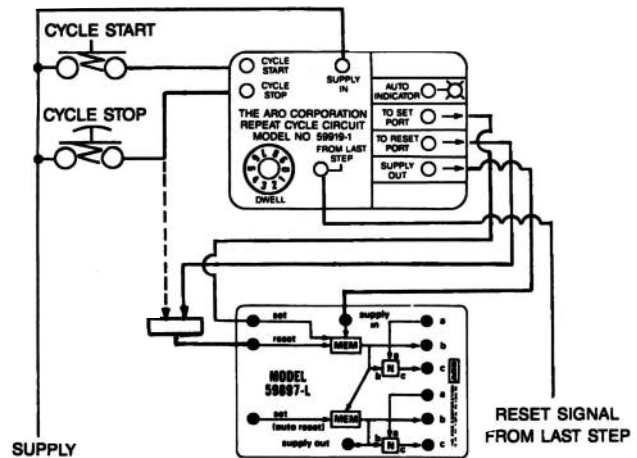
This circuit is designed to replace the 59003-099 cycle repeat circuit.

The cycle repeat circuit shown can be added to any Flex-6 circuit so that it will recycle continuously. The circuit contained in this assembly is shown at the right.

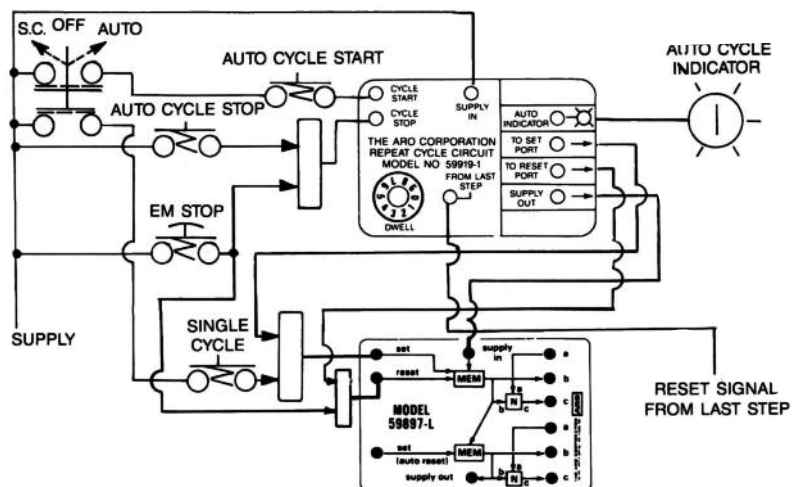
1. The cycle repeat circuit provides for:
  - A. Continuous recycling of a control circuit, started by a momentary start signal.
  - B. end of cycle stop – momentary input.
  - C. An adjustable dwell between cycles.
  - D. Single cycle operation.
  - E. Emergency stop.



The illustration at right shows a cycle repeat circuit connected in its simplest form. Actuation of the start push button starts the circuit to run in an auto-recycle mode. When the cycle stop push button is actuated the circuit will complete that cycle and will not start the next cycle. If you want the cycle to stop immediately, add the connection shown by the dotted line.



The illustration at right shows a more complex application of the cycle repeat circuit. Here we have provisions for either single cycle or automatic cycling and an auto cycle indicator. The circuit can be stopped either at the end of the cycle (with the auto cycle stop push button) or immediately (with the emergency stop button).



## Features

### Individual Elements

#### 59010 "OR" Element

#### 59023 "OR" Element on 1/8" Base

- Combines two air signals so either can produce an output.
- Output port C is pressurized when either input port A or B is pressurized "on".

Dimensions: 1 1/4" sq. x 1" (31.8mm sq. x 25.4mm)

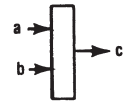
| Response Times:  | Input to Output | Milliseconds |
|------------------|-----------------|--------------|
| "A" on to "C" on |                 | 7.5          |
| "B" on to "C" on |                 | 7            |

Truth table

| A | B | C |
|---|---|---|
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 1 | 1 |
| 0 | 0 | 0 |



59070



#### 59111 "AND" Element

#### 59124 "AND" Element on 1/8" Base

- Combines two signals so both must be on to create an output.
- Output port C is pressurized only when both inputs A & B are pressurized "on".
- Can be used with timer elements to produce time-delay functions.
- Shifting is snap-action when input at "A" port increases to 70% of pressure at "B" port.

Return when "A" decreases to 40% of "B".

Dimensions: 1 1/4" Sq. x 1 21/32" (31.8mm sq. x 42.1mm)

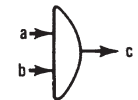
| Response Times:    | Input to Output | Milliseconds |
|--------------------|-----------------|--------------|
| "A" on to "C" on   |                 | 8            |
| "A" off to "C" off |                 | 9.5          |

Truth table

| A | B | C |
|---|---|---|
| 1 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 1 | 1 |
| 0 | 0 | 0 |



59111



#### 59112 "NOT" Element

#### 59125 "NOT" Element on 1/8" Base

- Combines two signals so that one ("B") must be on, and the other ("A") must be off to create an output.
- Output C is pressurized only when input B is pressurized and input A is off.
- Shifting is snap-action when input at "A" increases to 70% of pressure at "B". Return when "A" decreases to 40% of "B".

Dimensions: 1 1/4" Sq. x 1 21/32" (31.8mm sq. x 42.1mm)

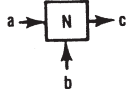
| Response Times:   | Input to Output | Milliseconds |
|-------------------|-----------------|--------------|
| "A" on to "C" off |                 | 8.5          |
| "A" off to "C" on |                 | 9            |

Truth table

| A | B | C |
|---|---|---|
| 1 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 1 | 0 |
| 0 | 0 | 0 |



59112



#### 59800 Inhibitor Element

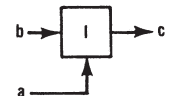
#### 59912 Inhibitor Assembly on 1/8" Base

- Functions as NOT element except pressure at A must drop below 5% of supply before element will reset, regaining output at C.
- Useful in detecting air cylinder motions where limit valves cannot be applied.

| Response Times: | Input to Output | Milliseconds |
|-----------------|-----------------|--------------|
| A on to C off   |                 | 15           |
| A off to C on   |                 | 25           |



59800



#### 59181 Set-Reset (S-R) Gate and 59113 Memory Models

#### 59185 Set-Reset (S-R) Gate and Memory Assembly on 1/8" Base

- The elements work together to perform a memory function.
- With constant supply at B of MEM and B of S-R connected to A of MEM, a momentary pressure signal at C of S-R will cause C of MEM to pressurize. C of MEM will remain pressurized until a pressure signal to A of S-R is received.
- The MEMORY is pneumatically retained. If supply is removed (B MEM off), output C will go off & remain off until a new set signal is received.
- The reset signal ("A" of S-R) is snap-action function and can be connected to a TIMER element to create a delayed reset function.

Dimensions: 1 1/4" sq. x 1 21/32" (31.8mm x 42.1mm)

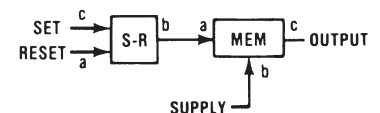
| Minimum Time: | Signal | Milliseconds |
|---------------|--------|--------------|
| To SET        |        | 17           |
| To RESET      |        | 19           |



59181



59113





## Features

### Flip-Flop

#### 59892 "FLIP FLOP" Model

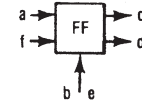
- A memory type element, Flip-Flop converts momentary signals received at the set and reset ports into maintained corresponding outputs.
- A set signal at A shifts the Flip-Flop to C port on and resets D to off. A reset signal at F shifts the Flip-Flop to D on and C off.
- If set or reset signals are maintained, later signals of equal pressure to the opposite input will not alter the output condition.
- The Flip-Flop has six ports and requires two element spaces.

A Set Input            D Reset Output  
 B Supply                E Supply  
 C Set Output          F Reset Input

- 59892 has two top ports (10-32) for C & D outputs.
- Shift pressure is 50% of supply pressure.
- Dimensions: 2 1/2" x 1 7/32" (63.5mm x 36.5mm)

#### Approximate Response Time

| Input to Output | Milliseconds |
|-----------------|--------------|
| A on to C on    | 11           |
| F on to D on    | 11           |



### Delay Elements & Assemblies

#### DELAY ELEMENTS

- Combine an AND and a TIMER function.
- With supply present at B, output will be pressurized (C on) a predetermined amount of time after input A is pressurized. Time can be fixed or adjustable.
- Reset time (time signal at "A" must be off between cycles) is 100 milliseconds.
- Timing ranges for individual elements cannot be increased. For longer delays, a base mounted assembly is needed.

#### DELAY TIMING IN FUNCTIONS

1. With the input off, the output will also be off.
2. The timing function starts when the input goes on.
3. When the timing is complete, the output goes on.
4. Output goes off immediately when input is removed.



#### Screwdriver Adjustable Delay Units

- ±4% timing accuracy.

##### Individual Element

**59121** Timing Range: .08 to 4.5 seconds

##### Base Mounted Elements (1/8" Base)

**59158** Timing Range: .08 to 4.5 seconds

**59879** Timing Range: 4.1 to 24.5 seconds



59121



59158



59156

#### Dial Adjustable Delay Units

- ±4% timing accuracy.

##### Individual Element

**59156** Timing Range .08 to 4.5 seconds

##### Base Mounted Elements (1/8" Base)

**59160** Timing Range: .08 to 4.5 seconds



59166-4

#### 59166-4 Fixed Delays

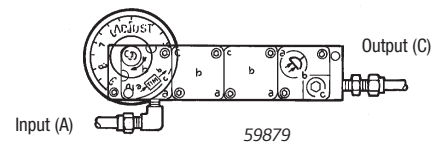
- Not adjustable. Order model for desired time.

Dimensions: 1 1/4" sq x 2 3/4" (31.8mm sq. x 69.9mm)

| Model          | Milliseconds |
|----------------|--------------|
| <b>59166-4</b> | 445 ± 40     |



Dimensions for Base Assemblies are on page 109.



59879

## Features

### Pulse Elements & Assemblies

#### PULSE ELEMENTS

- Combine a NOT and a TIMER function.
- These perform TIMING-IN inverted or PULSE functions, depending on connections to supply port B.

**For TIMING-IN INVERTED function:** With port B pressurized, C port remains on until port A is pressurized. When A is pressurized, C will go OFF after a predetermined amount of time.

**PULSE function:** When A & B are connected together, output C is normally off. If inputs are applied to A & B, output C goes on. C remains on for timer period, then goes off and remains off until inputs are removed and reapplied. Reset time is 100 milliseconds. The predetermined amount of time can be fixed or adjustable.

1. With input off, the output will also be off.
2. Output goes on & timing starts when input comes on.
3. When timing is completed, output goes off.
4. Remove & reapply input to get second output.

NOTE: Input must be longer than output for full times signal. If not possible, see momentary timers.

#### Screw Adjustable Pulse Timers

- $\pm 4\%$  timing accuracy.

##### Individual Element

**59120** Timing Range: .08 to 4.5 seconds

##### Base Mounted Elements (1/8" Base)

**59157** Timing Range: .08 to 4.5 seconds

**59874** Timing Range: 3.0 to 14.5 seconds

**59881** Timing Range: .20 to 24.5 seconds

#### Dial Adjustable Pulse Timers

##### Individual Element

**59155** Timing Range: .08 to 4.5 seconds

##### Base Mounted Elements (1/8" Base)

**59159** Timing Range: .08 to 4.5 seconds

**59875** Timing Range: 3.0 to 14.5 seconds

**59882** Timing range of 4.6 to 24.5

seconds

#### 59165-4 Fixed Pulse

- Not adjustable, order model for time desired;  $\pm 10\%$  timing accuracy.

Dimensions: 1 1/4" sq x 2 3/4" (31.8mm sq. x 69.9mm)

| Model          | Milliseconds |
|----------------|--------------|
| <b>59165-4</b> | 445 $\pm$ 40 |

#### 59114 Differentiator

- A non-adjustable pulse element.
- With A blocked, signal at B will produce an output at C of 80 to 130 milliseconds. Output can be lengthened by connecting a 59117 Accumulator to port A.
- Reset time is 110 milliseconds.

Dimensions: 1 1/4" sq. x 1 3/4" (31.8mm sq. x 44.5mm)

Dimensions for Base Assemblies are on page 109



59120



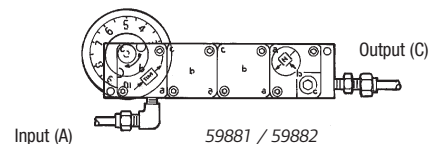
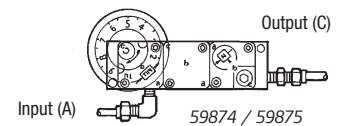
59157



59155



59165-4



59114



## Features

### Timer Elements

**TIMERS** are used in conjunction with snap-acting **59111 AND**, **59112 NOT**, **59181 S-R GATE** or **59800 INHIBITOR** to perform special functions not offered in one complete element.

- Overall height of circuit board can be reduced by using these combinations rather than elements which combine these functions.
- Timing periods can exceed 4.5 seconds when using with 59117 Accumulators.
- Time can be fixed or adjustable, depending on element selected.

#### 59115 Screw Adjustable Timer

- Connected to A of snap-acting AND or NOT element, these timing ranges can be accomplished.

Dimensions: 1 1/4" sq. x 2 7/64" (31.8mm sq. x 53.6mm)

| Timer | Number of 59117 Accumulators | Timing Range<br>±4% Seconds |
|-------|------------------------------|-----------------------------|
| 59115 | 0                            | .08 to 4.5                  |
| 59115 | 1                            | .14 to 14.5                 |
| 59115 | 2                            | .20 to 24.5                 |
| 59115 | 3                            | .26 to 34.5                 |
| 59115 | 4                            | .32 to 44.5                 |

#### 59116 Dial Adjustable Timer

- Connected to A of snap-acting element, these timing ranges can be accomplished.

Dimensions: 1 1/4" sq. x 3 5/16" (31.8mm sq. x 84.1mm)

| Timer | Number of 59117 Accumulators | Timing Range<br>±4% Seconds |
|-------|------------------------------|-----------------------------|
| 59116 | 0                            | 1.4 to 4.5                  |
| 59116 | 1                            | 3.0 to 14.5                 |
| 59116 | 2                            | 4.6 to 24.5                 |
| 59116 | 3                            | 6.2 to 34.5                 |
| 59116 | 4                            | 7.8 to 44.5                 |

### Accumulator

#### 59117 Accumulator

- Used with timing elements to extend timing range. C port is connected to output of timing element. Volume is approximately 1 cu. in. (16.4 cm<sup>3</sup>).

Dimensions: 1 1/4" sq. x 2 1/16" (31.8mm sq. x 52.4mm)

### Fixed Orifice plates and Port Plug

- Can be mounted in inlet or outlet ports of any element to reduce flow and/or increase response time.
- Fits into O-Ring cavity of element base.
- Plug is used to isolate port from channel connection.

| Model<br>(mm) | Orifice Size Inches |
|---------------|---------------------|
| 59671-1       | .0135 (.343)        |
| 59671-2       | .0180 (.475)        |
| 59671-3       | .0225 (.572)        |
| 59671-4       | .0260 (.660)        |
| 59718         | Plug                |



59115



59116



59117



59671-X

## Features

### NOT Amplifier

#### 59176 NOT Amplifier

- The element converts low pressure signals such as those used in liquid level sensing, to high pressure signals compatible with other APLC elements.
- Performs NOT function with exception when C output is greater than input of A<sub>1</sub>.
- Input A & B ports must be interconnected externally of element.
- Output C is on only when low pressure at A<sub>1</sub> is off. C output equals pressure at A & B.
- Shift pressure depends on element ordered and adjusted setting.
- Sensitivity adjustment screw allows adjustment of shift point within adjustable range.

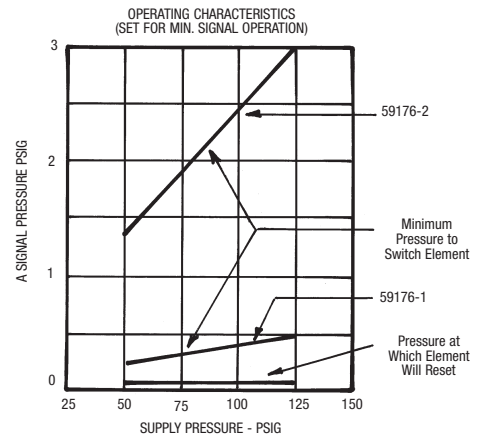
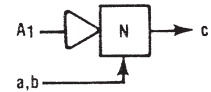
Dimensions: 1 1/4" sq. x 3" (31.8mm sq. x 76.2mm)

| Individual Element | Approximate Response Time Input to Output | Approximate Response Time Milliseconds | Adjustable A1 Pressure Range PSIG when a & b = 50 PSIG (3.4bar) |
|--------------------|---|--|---|
| 59176-1            | A <sub>1</sub> on to C off                | 10                                     | .24 to 1.5 (0.11 to .07)  |
| 59176-2            | A <sub>1</sub> off to C on                | 10                                     | 1.5 to 15 (0.7 to 1.0)  |

| Element on Base Assys. | Approximate Response Time Input to Output | Approximate Response Time Milliseconds | Adjustable A1 Pressure Range PSIG when a & b = 50 PSIG (3.4bar) |
|------------------------|---|--|---|
| 59162-2                | A <sub>1</sub> off to C on                | 10                                     | 1.5 to 15 (0.7 to 1.0)  |



59176-X



### AND Amplifier

#### 59175 "AND" Amplifier

- The amplifier converts low pressure signals such as those used in liquid level sensing, to high pressure signals compatible with other APLC elements.
- Performs AND function except when output at C is greater than input A<sub>1</sub>.
- Inputs A & B must be interconnected externally of the element.
- Output C is on only when A<sub>1</sub> receives a low pressure signal and inputs A & B are pressurized. Output at C equals pressure at inputs A & B.
- Shift pressure depends on element ordered and adjusted setting.
- Sensitivity adjustment screw allows adjustment of shift point within adjustable range.

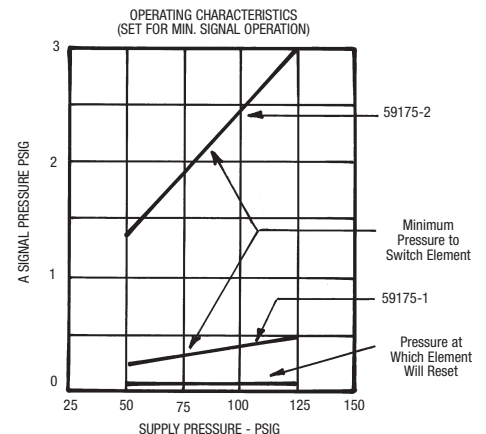
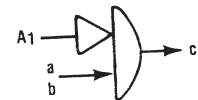
Dimensions: 1/4" sq. x 3" (31.8mm sq. x 76.2mm)

| Individual Element | Approximate Response Time Input to Output | Approximate Response Time Milliseconds | Adjustable A1 Pressure Range PSIG when a & b = 50 PSIG (3.4bar) |
|--------------------|---|--|---|
| 59175-1            | A <sub>1</sub> on to C on                 | 10                                     | .24 to 1.5 (0.11 to .07)  |
| 59175-2            | A <sub>1</sub> off to C off               | 10                                     | 1.5 to 15 (0.7 to 1.0)  |

| Element on Base Assys. | Approximate Response Time Input to Output | Approximate Response Time Milliseconds | Adjustable A1 Pressure Range PSIG when a & b = 50 PSIG (3.4bar) |
|------------------------|---|--|---|
| 59161-1                | A <sub>1</sub> on to C on                 | 10                                     | .24 to 1.5 (0.11 to .07)  |
| 59161-2                | A <sub>1</sub> off to C off               | 10                                     | 1.5 to 15 (0.7 to 1.0)  |



59175-X



Dimensions for Base Assemblies are on page 109.

## Features

### Special Purpose Elements

#### 59089 Two to Three-Way Converter

- Used to convert a two-way (bleed signal) to a three-way (pressure-exhaust) signal.
- With supply B pressurized, C will be pressurized if A is not blocked. When A port is blocked, C will go off.

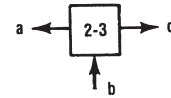
Dimensions: 1 1/4" sq. x 1 21/23" (31.8mm sq. x 42.1mm)

#### Approximate Response Time

| <u>Input to Output</u> | <u>With 6" (152mm) 5/32" (4mm) Tubing to A--Milliseconds</u> | <u>Add Milliseconds for each Foot more Tubing</u> |
|------------------------|--|---|
| A open to C on         | 14   | 5.5   |
| A blocked to C off     | 70   | 32.5  |
| Start up B to C pulse  | 90   | 33.5  |



59089



#### 59890 Vibrator Element

#### 59866 Vibrator on 1/8" Base

- With input B on, C output will come on and go off in a constant timed pattern until the input is removed.
- The on and off times are not independently adjustable.
- Adjustment timing range: .08 to 4.5 seconds. Output off equals 80% of on setting.
- C port must also be connected to the A input port on element.

Dimensions: 1 1/4" sq x 2 3/4" (31.8mm sq. x 69.9mm)



59890

#### 59891 Air to Electric Interface Device

- Normally open, single throw, single pole pressure switch.
- Mount to top of C port of standard element.

Dimensions: 1 7/16" dia. x 2 1/4" Wire is 22AWG

| <u>Model</u> | <u>Supply</u> | <u>Output</u> | <u>Connections</u> | <u>Response Time</u> |
|--------------|---------------|---------------|--------------------|----------------------|
| 59891        | 30-150 PSI    | 5 Amps Max    | 1/8-27 NPT         | On - 1 ms Off - 4 ms |



59891

#### 59915-XX Electric to Air Interface Device

- Normally non-passing, three-way, single solenoid actuated valve.
- With B pressurized and the coil energized, an air output occurs at C port.
- When de-energized, B is blocked and C exhausted.
- Must be mounted on perimeter of circuit board.

| <u>Model</u> | <u>Supply</u> | <u>Output</u> | <u>Connections</u> | <u>Coil Replacement</u> |
|--------------|---------------|---------------|--------------------|-------------------------|
| 59915-38     | 12V DC/24 VAC | Air Signal    | A blocked          | 116218-38               |
| 59915-39     | 24V DC        | 30-150PSI     | B supply           | 116218-39               |
| 59915-33     | 120V AC       | (2-10 bar)    | C output           | 116218-33               |



59915-XX

### Porting Block

#### 59109 Porting Block

- Provides three instant tube fittings. One each to A, B or C ports of elements.
- One porting block required for each element.

Dimensions for Base Assemblies are on page 109.



59109

# Features

## Mounting Equipment

### 59200-XX Base Plate

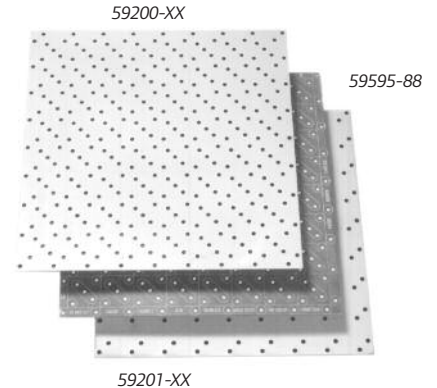
- Contains two mounting holes and three porting holes for each element.
- Surface is metallic grit etched and plated to resist corrosion.

### 59595-88 Module Gasket

- Corresponding circuit pattern of layout sheet is printed on module. Air channels are then cut into gasket for air passage.

### 59201-XX Cover Plate

- Used in conjunction with 59200 base plate to retain 59595 module.
- Contains only the mounting holes required by elements.
- Surface is metallic grit etched and plated to resist corrosion.



| Model:               | Dimensions in Inches (Millimeters)         | Element Coverage |
|----------------------|--|------------------|
| <b>Base Plate</b>    |  |                  |
| 59200-24             | 5/64 x 3 21/64 x 5 53/64 (2 x 85 x 148)    | 2 x 4            |
| 59200-44             | 5/64 x 5 53/64 x 5 53/64 (2 x 148 x 148)   | 4 x 4            |
| 59200-66             | 5/64 x 8 21/64 x 8 21/64 (2 x 212 x 212)   | 6 x 6            |
| 59200-88             | 5/64 x 10 45/64 x 10 45/64 (2 x 272 x 272) | 8 x 8            |
| <b>Module Gasket</b> |  |                  |
| 59595-88             | 1/16 x 10 45/64 x 10 45/64 (2 x 272 x 272) | 8 x 8            |
| <b>Cover Plate</b>   |  |                  |
| 59201-24             | 5/32 x 3 21/64 x 5 53/64 (4 x 85 x 148)    | 2 x 4            |
| 59201-44             | 5/32 x 5 53/64 x 5 53/64 (4 x 148 x 148)   | 4 x 4            |
| 59201-66             | 5/32 x 8 21/64 x 8 21/64 (4 x 212 x 212)   | 6 x 6            |
| 59201-88             | 5/32 x 10 45/64 x 10 45/64 (4 x 272 x 272) | 8 x 8            |

## Base Assembly Method

- Simple logic functions requiring up to four elements can be mounted using the function base assembly method.
- Interconnections between elements are made in a module below the elements. External connections are made via the 1/8" NPTF ports on the porting blocks.

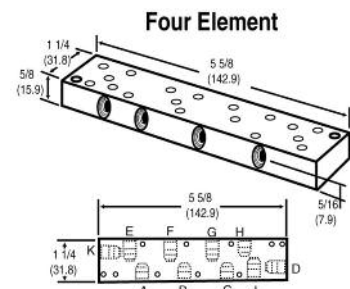
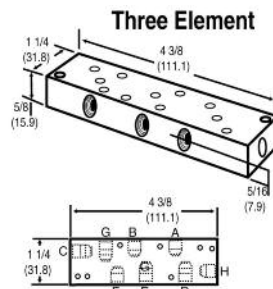
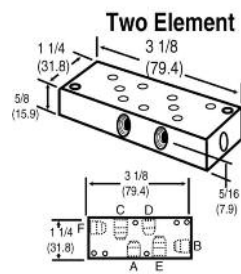
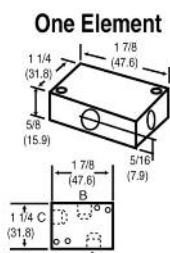


| Model: | Base Assembly | # of Ports |
|--------|---------------|------------|
| 59387  | 1-Element     | 3          |
| 59061  | 2-Elements    | 6          |
| 59062  | 3-Elements    | 8          |
| 59063  | 4-Elements    | 10         |

**Components**  
 Base, Washer & nuts.  
 Base, Cover plate,  
 module, pipe plugs,  
 nuts and washers.



58023 Split Bit  
 1/4" Hex Shank Bit used to build  
 function base assemblies



## Features

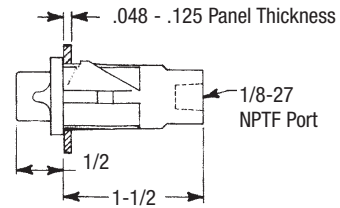
### Multiple Snap Indicator

- Bright sleeve within indicator extends to indicate pressurized condition. Sleeve retracts when pressure is removed.
- Snap-in design for installation into 11/16" (17.5mm) hole.

Pressure Range: 30-150 PSI (2.1-10.4 bar)

**59812-1** Red Indicator 1/8" Ports

**59812-3** Green Indicator 1/8" Ports

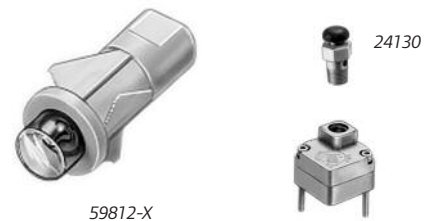


59812-X Dimensional Data

### Element Test Indicators

- Used to indicate an output pressure signal from an element.
- Thread into test port of "OR", "AND" or "MEM" elements.

**24130** Press to test indicator.

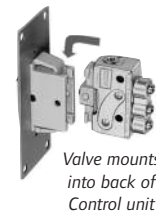


### Panel Mounted Miniature Control Valves

- Uses basic 200 Series 3-way valves.
- Valves are available with push button or rocker type selectors.
- Order legend sheets separately.

### 3-Way Control Valve Assembly

| 1/8" Ports<br>Models | Tube Fittings<br>Models | Actuation<br>Type         | Port<br>Designation       |
|----------------------|-------------------------|---------------------------|---------------------------|
| <b>59803</b>         | <b>59803-1</b>          | Pushbutton<br>(Momentary) | 1-in, Non-<br>Passing     |
| <b>59804</b>         | <b>59804-1</b>          | Rocker<br>(Maintained)    | 3-in, Passing<br>2-Output |

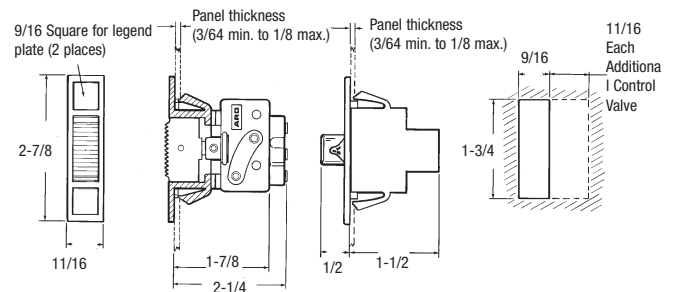


### 59724-X Legend Sheets

Self-adhesive. They fit into recesses of valves and indicators.

| Model          | Color |
|----------------|-------|
| <b>59724-1</b> | Black |
| <b>59724-2</b> | White |
| <b>59724-3</b> | Green |
| <b>59724-4</b> | Red   |

### Dimensions and Mounting Information



## Features

- Can be plumbed normally passing, non-passing, selector or any two-way function.
- Eight button styles. Oil tight, all metal construction.
- Fifteen legends available.
- Uses basic 200 Series 3-way valves.
- Can activate one or two control valves.
- **Order Valve Kits, Operators, and Legend Plates separately.**
- Kits shipped unassembled.

## Performance Specifications

### Pressure Range:

30 to 150 PSIG (2.1 to 10.4 bar)

### Temperature Range:

32 to 160 F (0 to 71 C)

### Flow & Cv Factor:

1/8" Ports

7.5 SCFM

Cv = .195

5/32" (4mm) Tube Fittings

4.0 SCFM

Cv = .104

### Valve Kits Ordering Menu

| <u>1/8" Ports</u> | <u>Tube Fittings</u> | <u># of Valves</u> |
|-------------------|----------------------|--------------------|
| 59064             | 59064-1              | 1                  |
| 59065             | 59065-1              | 2                  |

### Push Button Operators

| <u>Model</u> | <u>Description</u>                                 |
|--------------|--|
| 59067-10     | 1 3/8" (35mm) Red Button                           |
| 59067-11*    | Without Guard                                      |
| 59067-12*    | Extended Guard                                     |
| 59067-13*    | Full Guard   |
| 59067-15     | 1 3/8" (35mm) Red Button<br>Push/Pull Action       |
| 59067-16     | 2-1/4" (57mm) Red Button                           |
| 59067-17     | 2-1/4" (57mm) Green Button                         |
| 59067-18     | Momentary, universal,<br>dual function push button |

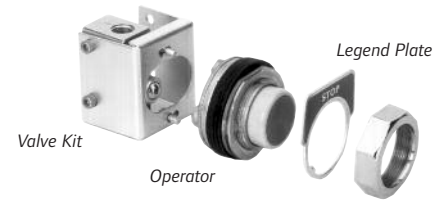
### Push Button

| <u>Model</u> |
|--------------|
| 59068-14     |
| 59068-15     |
| 59068-30     |
| 59068-33     |
| 59068-34     |
| 59068-42     |

### Legend Plates

| <u>Plate Marking</u> |
|----------------------|
| Emergency Stop       |
| Start                |
| Blank                |
| Down                 |
| Up                   |
| Reset                |

Push Button Assembly



59067-10



59067-15



59067-11



59067-16



59067-12



59067-17



59067-13

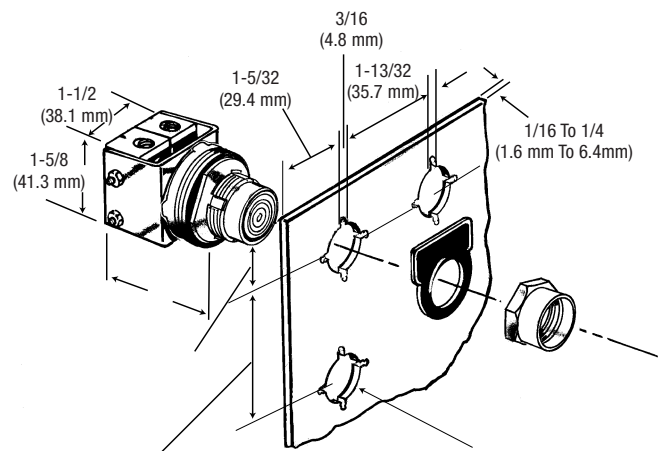


59067-18

\*Inserts included:

(Yellow, White, Green

Orange, Black, Blue, Red)





## Features

- Can be plumbed normally passing, non-passing, selector or any two-way function.
- Eight button styles. Oil tight, all metal construction.
- Fifteen legends available.
- Uses basic 200 Series 3-way valves.
- Can activate one or two control valves.
- **Order Valve Kits, Operators, and Legend Plates separately.**
- Kits shipped unassembled.

Selector Assembly



## Performance Specifications

**Pressure Range:**

30 to 150 PSIG (2.1 to 10.4 bar)

**Temperature Range:**

32 to 160 F (0 to 71 C)

**Flow & Cv Factor:**

1/8" Ports

7.5 SCFM

Cv = .195

5/32" (4mm) Tube Fittings

4.0 SCFM

Cv = .104

**Valve Kits Ordering Menu**

| <u>1/8" Ports</u> | <u>Tube Fittings</u> | <u># of Valves</u> |
|-------------------|----------------------|--------------------|
| 59064             | 59064-1              | 1                  |
| 59065             | 59065-1              | 2                  |



**Selector Operators**

| <u>Model</u>                 | <u>Description</u> |
|------------------------------|--------------------|
| <b>2-Position Maintained</b> |                    |
| 59066-10                     | Standard Knob      |
| 59066-11                     | Gloved Hand Knob   |
| 59066-133                    | Key Operated       |
| <b>3-Position Maintained</b> |                    |
| 59066-16                     | Standard Knob      |
| 59066-17                     | Gloved Hand Knob   |
| 59066-191                    | Key Operated       |

**Selector Legend Plates**

| <u>Model</u>      | <u>Plate Marking</u> |
|-------------------|----------------------|
| <b>2 Position</b> |                      |
| 59068-22          | Off-On               |
| 59068-24          | Open-Close           |
| 59068-30          | Blank                |
| 59068-62          | Forward-Reverse      |
| 59066-16          | Standard Knob        |
| 59068-66          | On-Off               |
| 59068-70          | Up-Down              |
| <b>3 Position</b> |                      |
| 59068-26          | Forward-Off-Reverse  |
| 59068-27          | Auto-Off-Hand        |
| 59068-28          | Open-Off-Close       |
| 59068-30          | Blank                |
| 59068-77          | Man-Off-Auto         |



## Features

### Control Enclosures

#### 58027

- Accepts single push button, selector or palm button valves.
- Standard 1/2" and 3/4" conduit knock-outs at top and bottom.

Dimensions: 4 3/8" x 4 3/8" x 3 5/8" (111.1mm x 111.1mm x 82.1mm)

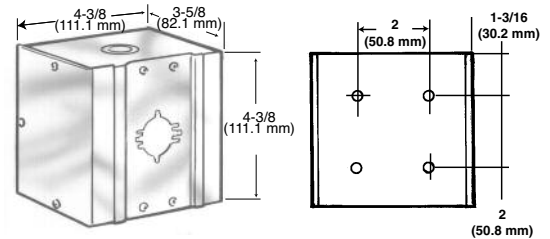


58027

#### 59361

- Accepts four push button, selector or palm button valves.
- Standard 1/2" and 3/4" conduit knock-outs at top and bottom.
- Includes grommets, screws, washers and nuts for installation.

Dimensions: 4 3/8" x 10" x 3 5/8" (111.1mm x 254mm x 82.1mm)



#### 59792

- Accepts single push button, selector or palm button valves.
- Standard 1/2" and 3/4" conduit knock-outs at top and bottom.
- Additional space provided for circuitry.

Dimensions: 4 3/8" x 10" x 3 5/8" (111.1mm x 254mm x 82.1mm)

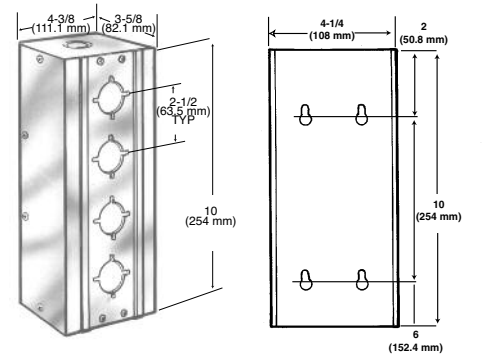
#### 59097-6 Hinged Mounting Plates

- Accepts 6 x 6 element circuit boards.
- Provides mounting and swing-out of circuit boards.
- Requires 5/8" (15.9mm) clearance for circuit boards, 2 3/8" (60mm) for back tubulation.

| Circuit Bds | Elements | Dimensions                 |
|-------------|----------|----------------------------|
| 59097-6     | 6 x 6    | 9 1/2" x 10" (241 x 254mm) |



59361



59792



59097-6

## Features

### Pneumatic Counters

#### Totalizing Counters/Manual Reset

##### 59095-1 Knob Reset/Base Mount

- Counter advances one digit each time a pneumatic pulse is received.
- 600 counts/minute maximum.

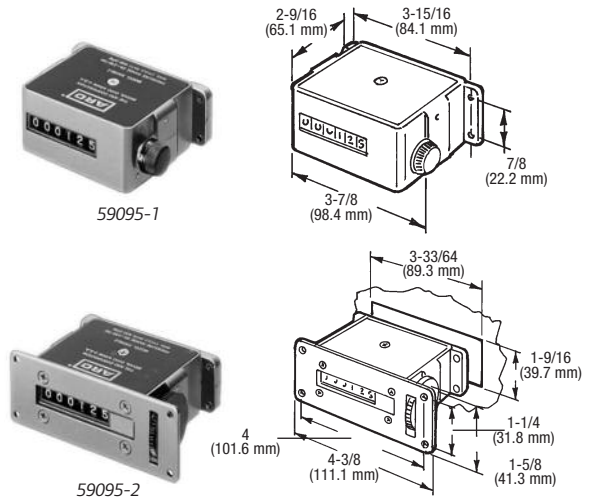
##### 59095-2 Dial Reset/Panel Mount

- Counter advances one digit each time a pneumatic pulse is received.
- 600 counts/minute maximum. Can also be base mounted.

#### Specifications

**Operating Pressure:** 30 to 150 PSIG (2 to 10 bar)  
**Operating Temperature:** 32° to 160°F (0° to 71°C)

**Minimum Signal Duration:** Pressure Signal 0.05 sec.  
**Ports:** 1/8" NPTF



#### Totalizing Counter/Manual or Pressure Reset

##### 59801 Panel Mount

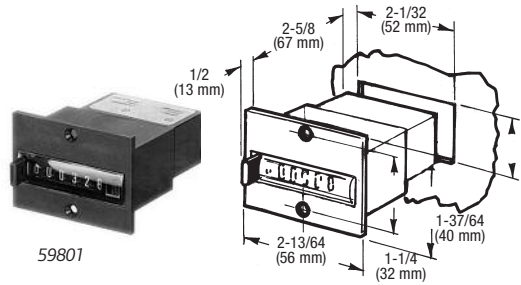
##### 59836 Surface Mount

- 6-digit readout. Records up to 1500 counts/minute
- Can be reset using reset button or pneumatic signal.

#### Specifications

**Operating Pressure:** 30 to 115 PSIG (2 to 8 bar)  
**Operating Temperature:** 32° to 140°F (0° to 60°C)

**Minimum Signal Duration:** Pressure Signal .008 sec.  
 Exhaust Signal .010 sec.  
 Reset Signal .150 sec.  
**Ports:** 5/32" (4mm) Tube Fittings



#### Predetermined Counter/Manual or Pressure Reset

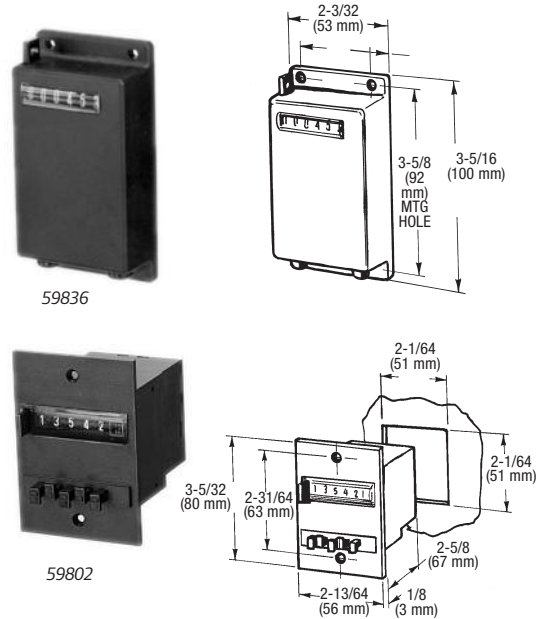
##### 59802 Panel Mount

- 5-digit readout.
- Each pneumatic pulse decreases predetermined number by one until zero is reached. An output signal is then provided.
- Counter is reset to predetermined number by the reset button or a pneumatic signal.

#### Specifications

**Operating Pressure:** 30 to 115 PSIG (2 to 8 bar)  
**Operating Temperature:** 32° to 140°F (0° to 60°C)

**Minimum Signal Duration:** Pressure Signal .008 sec.  
 Exhaust Signal .012 sec.  
 Reset Signal .180 sec.  
**Ports:** 5/32" (4mm) Tube Fittings  
**Flow:** 4.5 SCFM (2.1 dm³/s)



#### Port Designation:

P (3) Supply, A (4) Output,  
 Z (1) Count, Y (2) Reset.

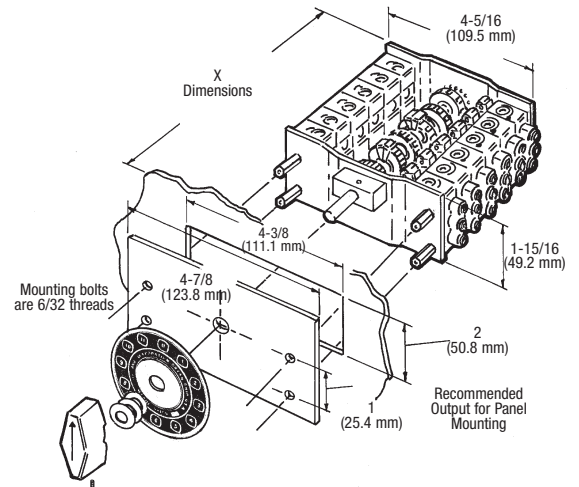
## Features

- Provides actuation of up to 12, 3-way valves in different positions.
- Each can be plumbed normally passing, normally non-passing, multipurpose, selector or any 2-way function.
- Cam lobes snap on in any of 12 positions.
- Available with 5/32" tube fittings or 1/8" ports.
- Pressure Range 30-150 PSI (2.1-10.4 bar)

| Model #<br>for<br>1/8" Ports | Model #<br>for 5/32"<br>Tubes | Number of<br>Camwheels | Valves | Number of<br>Cam Lobes |
|------------------------------|-------------------------------|------------------------|--------|------------------------|
| 59100-202                    | 59100-202-1                   | 2                      | 2      | 22                     |
| 59100-222                    | 59100-222-1                   | 2                      | 4      | 24                     |
| 59100-303                    | 59100-303-1                   | 3                      | 3      | 33                     |
| 59100-333                    | 59100-333-1                   | 3                      | 6      | 36                     |
| 59100-404                    | 59100-404-1                   | 4                      | 4      | 34                     |
| 59100-444                    | 59100-444-1                   | 4                      | 8      | 38                     |
| 59100-505                    | 59100-505-1                   | 5                      | 5      | 45                     |
| 59100-555                    | 59100-555-1                   | 5                      | 10     | 50                     |
| 59100-606                    | 59100-606-1                   | 6                      | 6      | 56                     |
| 59100-666                    | 59100-666-1                   | 6                      | 12     | 62                     |

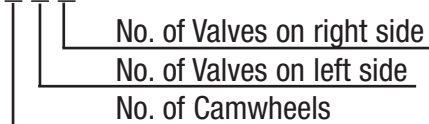


59100-XXX-1



### Model Number Significance:

59100 - X X X



### Model # "X" Dimensions Inches (mm)

|           |                  |
|-----------|------------------|
| 59100-2XX | 2-27/64 (62mm)   |
| 59100-3XX | 3-7/64 (79 mm)   |
| 59100-4XX | 3-51/64 (96 mm)  |
| 59100-5XX | 4-31/64 (114 mm) |
| 59100-6XX | 5-11/64 (131 mm) |

## Liquid Level Sensor

- Sensors produce a pneumatic output signal as fluid levels in an unpressurized vessel rise or fall past predetermined levels. Will accurately sense almost any fluid.
- Supply pressure range: 30 to 150 psig. Range recommended for quickest response is 50 to 100 psig.
- When on, the output is the same pressure as that supplied to the air inlet. When off, the output is connected to atmosphere through an internal exhaust port. This insures a sharp on-off signal from the sensor.
- Units supplied with 25' of flexible 1/4" tubing.

### 59916-1 High Level Sensor

- Provides an output signal when sensing tube is blocked by a liquid.

### 59916-2 Low Level Sensor

- Provides an output signal when sensing tube is not blocked by a liquid.



59916-X

## Features

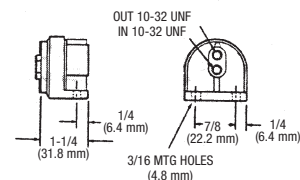
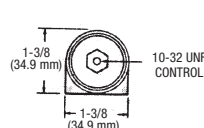
### Pneumatic Sensing Components

#### 59807 Amplifier

- Designed to amplify low pressure signals from sensors.
- Actuates at signal pressures as low as one to four inches (249 to 995 Pa) of water.



59807



### Tubing, Fittings & Connectors

| <u>Y-Connector</u>    | <u>Tube Size</u> |            |
|-----------------------|------------------|------------|
| 59482                 | 5/32             |            |
| <u>Male Connector</u> | <u>Tube Size</u> | <u>NPT</u> |
| 59474-4               | 5/32             | 1/8        |
| 59474-56              | 1/4              | 1/8        |
| 59474-156             | 1/4              | 1/4        |
| 59474-256             | 1/4              | 3/8        |



| <u>Union</u> | <u>Tube Size</u> |
|--------------|------------------|
| 59759-4      | 5/32             |
| 59759-56     | 1/4              |



| <u>Union Elbow</u> | <u>Tube Size</u> |
|--------------------|------------------|
| 59760-4            | 5/32             |
| 59760-56           | 1/4              |



| <u>Tubing (100' rolls)</u> | <u>Tube Size</u> |
|----------------------------|------------------|
| 59690-4                    | 5/32             |



| <u>Union Tee</u> | <u>Tube Size</u> |
|------------------|------------------|
| 59761-4          | 5/32             |
| 59761-56         | 1/4              |



| <u>Male Elbow</u> | <u>Tube Size</u> | <u>NPT</u> |
|-------------------|------------------|------------|
| 59756-103         | 5/32             | #10-32     |
| 59756-4           | 5/32             | 1/8        |
| 59756-56          | 1/4              | 1/8        |
| 59756-156         | 1/4              | 1/4        |



| <u>Union Bulkhead</u> | <u>Tube Size</u> |
|-----------------------|------------------|
| 59762-4               | 5/32             |
| 59762-56              | 1/4              |



| <u>Male Branch Tee</u> | <u>Tube Size</u> | <u>NPT</u> |
|------------------------|------------------|------------|
| 59757-4                | 5/32             | 1/8        |
| 59757-56               | 1/4              | 1/8        |
| 59757-156              | 1/4              | 1/4        |



| <u>Expander Tube</u> | <u>Male Tube Size</u> | <u>NPT</u> |
|----------------------|-----------------------|------------|
| 59765-4              | 5/32                  | 1/4        |



| <u>Plug</u> | <u>Tube Size</u> |
|-------------|------------------|
| 59463-4     | 5/32             |
| 59463-56    | 1/4              |



| <u>Reducer Tube</u> | <u>Male Tube Size</u> | <u>NPT</u> |
|---------------------|-----------------------|------------|
| 59765-56            | 1/4                   | 5/32       |

Maximum Working Pressure Vacuum to 250 PSI (17 bar)  
 Temperature Range - +5°F to 160°F (-15°F to 71°C)  
 Tubing Material: Nylon II

### Flex-6 Accessories

**59629** Adapter  
 1/8" to 10-32 Thread



**59634** Cross Junction  
 10-32 Thread



**5990X** Push On Connector  
 59905: 10-32 NPT x 1/16" Tube  
 59906: 10-32 NPT x 1/8" Tube



**5963X-100** Flexible Tubing  
 59630-100: 1/16" ID.  
 59631-100: 1/8" ID.



**59764-4** Male Connector  
 10-32 Thread x 5/32" Tube



**59908** Nipple  
 10-32 x 10-32 Thread



**59632-1** Plug  
 10-32 Thread



**59903** Swivel Connector



**59636** Bulkhead Fitting  
 10-32 x 10-32 Thread

## Features

Proper conditioning of compressed air is essential to ensure maximum performance and service life for pneumatic power tools and equipment. The small initial investment for installation of air preparation units in an air line system will pay long-term dividends in increased productivity, consistent quality and decreased maintenance costs.

Ingersoll-Rand's extensive line of air line filters, regulators and lubricators, including individual units, piggyback and combos, have been designed to meet every air preparation requirement.



C28121-800

### Filters

Ingersoll-Rand compressed air filters are designed to remove airborne solid and liquid contaminants which may plug small orifices and hinder performance, or cause excessive wear and premature equipment failure. Several filter elements are offered, including models with coalescing elements for removal of oil aerosols and particles down to .3 micron.

- Available pipe sizes from 1/8" thru 2" NPT



C28221-810

### Regulators

Ingersoll-Rand air line regulators provide controlled, consistent air pressure as required for specific pneumatic equipment when connected to the complete compressed air system.

- Available pipe sizes from 1/8" thru 1-1/2" NPT
- Flows to 440 CFM
- Maximum Inlet pressures to 250 PSIG

### F-R-L Product Selection

When selecting an FRL or individual filter, regulator and lubricator units, the air consumption of the tools or equipment to be serviced should be correlated with the flow capacity of the FRL. Please reference flow capacity chart below.

| Series          | Net Port Size | FLOW CAPACITY (CFM)  |                     |           |            |            | Pressure Range PSIG |
|-----------------|---------------|----------------------|---------------------|-----------|------------|------------|---------------------|
|                 |               | Filter (Particulate) | Filter (Coalescing) | Regulator | Piggy Back | Lubricator |                     |
| Module Air 1000 | 1/8"          | 28                   | 15                  | 13        | 12         | 41         | 0-125               |
|                 | 1/4"          | 38                   | 17                  | 13        | 12         | 60         | 0-125               |
| Module/Air 2000 | 1/4"          | 54                   | 40                  | 100       | 93         | 75         | 0-200               |
|                 | 3/8"          | 100                  | 51                  | 135       | 135        | 100        | 0-200               |
|                 | 1/2"          | 122                  | 53                  | 140       | 140        | 110        | 0-200               |
| Super-Duty      | 3/4"          | 345                  | 50                  | 180       | –          | 150        | 0-250               |
|                 | 1"            | 345                  | 150                 | 200       | –          | 300        | 0-250               |



C28453-810



## Ordering

### Standard Filters

Designed to remove rust, scale, condensed water and other debris from compressed air lines which may cause wear and premature failure of tools, valves, cylinders and other pneumatic equipment.

| Port Size   | Model      | Filter Element | Flow* cfm | Bowl                | Bowl Size | Drain  | Max. Inlet Pressure |
|---|------------|----------------|-----------|---------------------|-----------|--------|---------------------|
| <b>1/8" &amp; 1/4" Port - ARO Module/Air 1000 Series</b>            |            |                |           |                     |           |        |                     |
| 1/8"  | F25111-200 | 20 Micron      | 28        | Polycarbonate/Guard | 1.0 oz.   | Manual | 200 PSIG            |
| 1/4"  | F25121-200 | 20 Micron      | 38        | Polycarbonate/Guard | 1.0 oz.   | Manual | 200 PSIG            |
| <b>1/4" &amp; 3/8" &amp; 1/2" Port - ARO Module/Air 2000 Series</b> |            |                |           |                     |           |        |                     |
| 1/4"  | F25221-110 | 40 Micron      | 54        | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 3/8"  | F25231-110 | 40 Micron      | 100       | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 1/2"  | F25241-110 | 40 Micron      | 122       | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| <b>3/4" &amp; 1" Port - ARO Super-Duty Series</b>                   |            |                |           |                     |           |        |                     |
| 3/4"  | F25451-110 | 40 Micron      | 345       | Metal w/sight glass | 32 oz.    | Manual | 250 PSIG            |
| 1"  | F25461-110 | 40 Micron      | 345       | Metal w/sight glass | 32 oz.    | Manual | 250 PSIG            |

\* Air Flow is at 90 PSI Inlet and 5 PSI pressure drop.



F25121-200

### Coalescing Filters

Designed for paint spraying, instrumentation, controls and other applications where the delivered air must be free of oil and fine particles. Effective in removing 99.9% of oil aerosols. Also effective in removing debris particles down to .3 micron. Recommended for use in conjunction with an upstream filter to maximize the life of replacement element.

| Port Size   | Model      | Filter Element | Flow* cfm | Bowl                | Bowl Size | Drain  | Max. Inlet Pressure |
|---|------------|----------------|-----------|---------------------|-----------|--------|---------------------|
| <b>1/8" &amp; 1/4" Port - ARO Module/Air 1000 Series</b>            |            |                |           |                     |           |        |                     |
| 1/8"  | F25111-300 | Coalescing     | 15        | Polycarbonate       | 1.0 oz.   | Manual | 200 PSIG            |
| 1/4"  | F25121-300 | Coalescing     | 17        | Polycarbonate       | 1.0 oz.   | Manual | 200 PSIG            |
| <b>1/4" &amp; 3/8" &amp; 1/2" Port - ARO Module/Air 2000 Series</b> |            |                |           |                     |           |        |                     |
| 1/4"  | F25221-310 | Coalescing     | 40        | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 3/8"  | F25231-310 | Coalescing     | 51        | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 1/2"  | F25241-310 | Coalescing     | 53        | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| <b>3/4" &amp; 1" Port - ARO Super-Duty Series</b>                   |            |                |           |                     |           |        |                     |
| 3/4"  | F25452-310 | Coalescing     | 50        | Metal w/sight glass | 32 oz.    | Manual | 250 PSIG            |
| 1"  | F25462-310 | Coalescing     | 150       | Metal w/sight glass | 32 oz.    | Manual | 250 PSIG            |

\* Air Flow is at 90 PSI Inlet and 5 PSI pressure drop.



F25221-110



F25451-020

## Accessories

| Part Number                       | Description        | Part Number                       | Description         |
|-----------------------------------|--------------------|-----------------------------------|---------------------|
| <b>ARO Module/Air 1000 Series</b> |                    | <b>ARO Module/Air 2000 Series</b> |                     |
| 29660-2                           | 20 Micron Element  | 100031-1                          | 40 Micron Element   |
| 29586                             | Coalescing Element | 100032                            | Coalescing Element  |
| 104257                            | Service Kit        | 104068                            | Auto Drain Kit      |
| 104264                            | Auto Drain Kit     | 104204                            | Metal w/sight glass |
| 104258                            | Polycarbonate Bowl | 104176                            | Service Kit         |
| 104259                            | Composite Bowl     | <b>ARO Super/Duty Series</b>      |                     |
|                                   |                    | 104119                            | 40 Micron Element   |
|                                   |                    | 10423                             | Coalescing Element  |
|                                   |                    | 104116                            | Service Kit         |
|                                   |                    | 104068                            | Auto Drain          |
|                                   |                    | 104163                            | Sight Glass Kit     |

## Ordering

### Piggyback Filter/Regulators

Combined air filtration and regulation in a single, compact unit. Saves space for added system design flexibility. Piggyback Filter Regulators supplied with pressure gauge.

| Port Size   | Model      | Pressure Range | Filter Element | Flow* cfm | Bowl                | Bowl Size | Drain  | Max. Inlet Pressure |
|---|------------|----------------|----------------|-----------|---------------------|-----------|--------|---------------------|
| <b>1/8" &amp; 1/4" Port - ARO Module/Air 1000 Series</b>            |            |                |                |           |                     |           |        |                     |
| 1/8"  | P29112-600 | 5-125 PSIG     | 20 Micron      | 12        | Polycarbonate/Guard | 1.0 oz.   | Manual | 200 PSIG            |
| 1/4"  | P29122-600 | 5-125 PSIG     | 20 Micron      | 12        | Polycarbonate/Guard | 1.0 oz.   | Manual | 200 PSIG            |
| <b>1/4" &amp; 3/8" &amp; 1/2" Port - ARO Module/Air 2000 Series</b> |            |                |                |           |                     |           |        |                     |
| 1/4"  | P29221-610 | 5-125 PSIG     | 40 Micron      | 93        | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 3/8"  | P29231-610 | 5-125 PSIG     | 40 Micron      | 135       | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |
| 1/2"  | P29241-610 | 5-125 PSIG     | 40 Micron      | 140       | Metal w/sight glass | 6.0 oz.   | Manual | 175 PSIG            |

\* Air Flow is at 90 PSI Inlet and 5 PSI pressure drop.



P29122-600

P29221-610

## Accessories

### ARO Module/Air 2000 FRL Components

#### A. Threaded Pipe Adapters - Model 104168 ( )

Pipe adapters allow a single component or assembled combo to be removed for service without disturbing hard piping. Also allows for different pipe diameters (in and out) in the plumbing installation. Kit includes two adapters and two spacer kits.

| Port Size | Model    |
|-----------|----------|
| 1/4"      | 104168-2 |
| 3/8"      | 104168-3 |
| 1/2"      | 104168-4 |
| 3/4"      | 104168-5 |



#### B. Safety Shutoff, Lockout Valve - Model 104174 ( )

Exhaust-type safety shutoff valve can be used in either a modular arrangement, with out FRL's or as a stand alone unit. Should be installed upstream from the FRL, and is ideal for isolating and depressurizing a downstream unit requiring maintenance. Valve may be locked in the exhaust position.

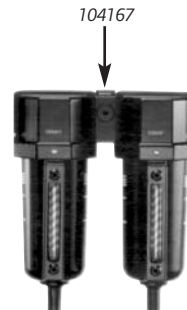
| Port Size | Model    |
|-----------|----------|
| 1/4"      | 104174-2 |
| 3/8"      | 104174-3 |
| 1/2"      | 104174-4 |



104174-2

#### C. Modular Spacer Kit - Model 104167

One spacer kit is required to connect any two components or accessories. Kit includes the spacer block, two clamps and two O-rings. Fits all port sizes.



104167

#### D. T-Type Wall Mounting Bracket - Model 104171

T-Type Brackets provide heavy duty wall mounting of a single unit or multiple units in a modular arrangement. Kit includes a spacer, bracket and clamp.



104171

#### E. Modular Manifold Block - Model 104170

Provides four additional 1/4" NPT ports for greater circuit design flexibility. Kit includes manifold, two spacer kits and three hole plugs.



104170

#### F. Wall Mounting Kit - Model 104172

May be used to mount FRL combo units which include a regulator, "Piggyback" Filter/Regulator units, or individual regulators. Kit includes Model 29623 Bracket and Model 104173 Panel Mounting Nut. Bracket and Nut may be ordered individually.



104172

## Air Line Relieving Regulators

Provide controlled, consistent air pressure as required for specific pneumatic equipment connected to the compressed air system. Relieving models vent downstream overpressure. Available spring options enable convenient pressure range conversions as requirements change. Unit supplied with gauge.

| Port Size  | Model             | Pressure Range | Flow* cfm | Gauge Port | Max. Inlet Pressure |
|--|-------------------|----------------|-----------|------------|---------------------|
| 1/8"   | <b>R27111-600</b> | 0-125 PSIG     | 13        | 1/8"       | 250 PSIG            |
| 1/4"   | <b>R27121-600</b> | 0-125 PSIG     | 13        | 1/8"       | 250 PSIG            |
| <b>1/4" &amp; 3/8" &amp; 1/2" Port - ARO Module/Air Series</b> |                   |                |           |            |                     |
| 1/4"   | <b>R27221-600</b> | 5-125 PSIG     | 105       | 1/4"       | 200 PSIG            |
| 3/8"   | <b>R27231-600</b> | 5-125 PSIG     | 106       | 1/4"       | 200 PSIG            |
| 1/2"   | <b>R27241-600</b> | 5-125 PSIG     | 125       | 1/4"       | 200 PSIG            |
| <b>1/2" &amp; 3/4" &amp; 1" Port - ARO Heavy-Duty Series</b>   |                   |                |           |            |                     |
| 1/2"   | <b>27344-600</b>  | 5-125 PSIG     | 256       | 1/4"       | 250 PSIG            |
| 3/4"   | <b>27354-600</b>  | 5-125 PSIG     | 287       | 1/4"       | 250 PSIG            |
| 1"   | <b>27364-600</b>  | 5-125 PSIG     | 293       | 1/4"       | 250 PSIG            |

\* Air Flow is at 90 PSI Inlet and 5 PSI pressure drop.



## Accessories



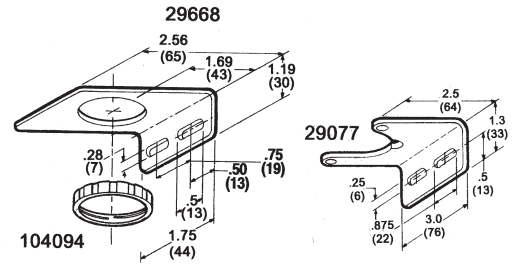
29850



100067



104172



### Air Line Relieving Regulators

#### ARO Module/Air 1000 Series

| Part Number       | Description            |
|-------------------|------------------------|
| <b>29846</b>      | Gauge, 0-15 PSIG       |
| <b>29863</b>      | Gauge, 0-60 PSIG       |
| <b>29850</b>      | Gauge, 0-160 PSIG      |
| <b>100095-160</b> | Gauge, 0-150 PSIG      |
| <b>29668</b>      | Mounting Bracket       |
| <b>104094</b>     | Panel Mounting Nut     |
| <b>104255</b>     | Service Kit, Relieving |

#### Models

#### ARO Module/Air 2000 Series

| Part Number   | Description                                   |
|---------------|---|
| <b>100067</b> | Gauge, 0-160 PSIG                             |
| <b>104172</b> | Wall Mount Kit (Includes Bracket & Panel Nut) |
| <b>104173</b> | Panel Mounting Nut                            |
| <b>104175</b> | Tamper Resistant Kit                          |
| <b>104178</b> | Service Kit, Relieving                        |

#### Models

#### 29728

Gauge, 0-160 PSIG

#### ARO Super-Duty Series

| Part Number   | Description           |
|---------------|-----------------------|
| <b>100067</b> | Gauge, 0-160 PSIG     |
| <b>100083</b> | Gauge, 0-300 PSIG     |
| <b>104020</b> | Service Kit           |
| <b>29077</b>  | Wall Mounting Bracket |

## Ordering

### Fog-Type Lubricators

Help ensure that pneumatic devices receive the required lubrication to maintain operating performance, reduce wear and prolong service life. They are designed to provide the correct amount of oil needed for most general applications in a pneumatic system, delivering a constant ratio of oil to CFM. Precise oil feed adjustment allows the proper oil delivery rate.

Lubricators should be installed close to the downstream application to ensure effective distribution of oil to the pneumatic components.

| Port Size  | Model      | Flow* cfm | Bowl                | Bowl Size | Max. Inlet Pressure |
|--|------------|-----------|---------------------|-----------|---------------------|
| <b>1/8" &amp; 1/4" Port - ARO Module/Air 1000 Series</b>       |            |           |                     |           |                     |
| 1/8"   | L26111-100 | 41        | Polycarbonate/Guard | 1.0 oz.   | 200 PSIG            |
| 1/4"   | L26121-100 | 60        | Polycarbonate/Guard | 1.0 oz.   | 200 PSIG            |
| <b>1/4" &amp; 3/8" &amp; 1/2" Port - ARO Module/Air Series</b> |            |           |                     |           |                     |
| 1/4"   | L26221-110 | 75        | Metal w/sight glass | 6.0 oz.   | 175 PSIG            |
| 3/8"   | L26231-110 | 100       | Metal w/sight glass | 6.0 oz.   | 175 PSIG            |
| 1/2"   | L26241-110 | 110       | Metal w/sight glass | 6.0 oz.   | 175 PSIG            |
| <b>3/4" &amp; 1" Port - ARO Super-Duty Series</b>              |            |           |                     |           |                     |
| 3/4"   | L26451-110 | 190       | Metal w/sight glass | 32 oz.    | 250 PSIG            |
| 1"   | L26461-110 | 200       | Metal w/sight glass | 32 oz.    | 250 PSIG            |

\* Air Flow is at 90 PSI Inlet and 5 PSI pressure drop.



L26121-100



L26221-110



L26451-110

## Accessories

### Lubricator

| Part Number                       | Description              |
|-----------------------------------|--------------------------|
| <b>ARO Module/Air 1000 Series</b> |                          |
| 104181                            | Service Kit              |
| 104260                            | Polycarbonate Bowl       |
| 104261                            | Composite Bowl           |
| 104262                            | Mounting Bracket         |
| <b>ARO Module/Air 2000 Series</b> |                          |
| 104176                            | Service Kit              |
| 104205                            | Metal Bowl w/sight Glass |
| <b>ARO Super-Duty Series</b>      |                          |
| 104023                            | Service Kit              |
| 104163                            | Sight Glass Kit          |

### Air Line Lubricator Oil

ARO Lubricating Oil is recommended for use with pneumatic power tools, motors, valves, cylinders and hoists. It is specially formulated for use in air line lubricators. Proper and regular lubrication helps ensure longer, trouble-free operation by reducing wear, saving power and cutting equipment maintenance costs.

ARO Lubricating Oil is available in 1-quart containers and may be ordered by specifying part number 29665. (Available in cases of 12).

**Viscosity:** 100-200 S.S.U. @ 100°F (38° C) min.  
aniline point of 200°F (93°C)

**Class:** II Lubricant

**Approx. SEA No:** Light SAE 10, non-detergent.



29665

## Accessories

### OSHA Approved Safety Blow Guns

Safety Blow Guns are designed to prevent pressure buildup above 29 PSIG if the nozzle is obstructed which meets OSHA requirement 29 CFR1910.242 (b).

| Body      | Model         | Tip      | Throttle | Max. Inlet Pressure | Temperature Range | Inlet NPT | Weight  |
|-----------|---------------|----------|----------|---------------------|-------------------|-----------|---------|
| Composite | <b>8440</b>   | Standard | Lever    | 180 PSI             | 32° to 175° F     | 1/4"      | 2.7 oz. |
| Metal     | <b>8451-1</b> | Standard | Lever    | 180 PSI             | 32° to 175° F     | 1/4"      | 2.7 oz. |



8440



8451-1

### Tool Suspension Balancer

Compact, rugged balancer features center-pull design for smooth performance. Adjustable spring tension to accommodate weight of suspended equipment. Adjustable cable clamp sets length of travel. Ideal for use with small to medium power tools, small fixtures, pendent stations and air hoses.

| Model          | Capacity      | Working Cable Length | Dimensions   |         |
|----------------|---------------|----------------------|--------------|---------|
|                |               |                      | Hook to Hook | Width   |
| <b>7472</b>    | 3 to 5 lbs.   | 8.0 ft.              | 10.5 in.     | 5.4 in. |
| <b>7072</b>    | 6 to 10 lbs.  | 8.0 ft.              | 14.0 in.     | 8.1 in. |
| <b>7072-15</b> | 11 to 15 lbs. | 8.0 ft.              | 14.0 in.     | 8.1 in. |



7472



7072 /  
7072-15

## Warnings

### Harmful Compressor Oils & Other Materials

Some oils used in air compressors contain chemicals harmful to Buna-N seals, if not adequately filtered at the compressor. The most common of these oils, in addition to other harmful material, are listed below.

| COMPRESSOR OILS                                    | COMPRESSOR OILS                                      | OTHER MATERIALS   |
|--|--|---|
| Cellulube No. 150 & 220                            | Phrano   | Garlock No. 98403 (Polyurethane)                                  |
| Haskel No. 568-023                                 | Pydraul AC   | Parco No. 3106 (Neoprene)   |
| Houghton & Co. Oil No. 1120,<br>No. 1130, No. 1055 | Sears Regular Motor Oil<br>Sinclair Oil "Lily White" | Some Loctite Compounds<br>Stillman No. SR269-75<br>(Polyurethane) |
| Houtosafe 1000                                     | Skydrol  | Stillman No. SR513-70 (Neoprene)                                  |
| Kano Kroil   | Tenneco Anderol No. 495                              |   |
| Keyston Penetrating Oil No. 2<br>& No. 500 Oils    |  |   |
| Marvel Mystery Oil                                 |  |   |

**CAUTION:** Compounded oils containing graphite and fillers are not recommended for use with cylinders.

### Air & Lubrication Requirement

**AIR PRESSURE:** Limited to 200 psig (14 bar) FILTRATION: 40 Micron. Proper moisture removal and filtration of contaminants will promote good service life and operation. Install an air regulator to control the operating pressure, insure smooth operation and conserve energy.

**LUBRICATION:** All valve components have been lubricated at the factory and can be operated without additional air line lubrication. Minimal lubrication may extend the life of the valve. 50 Series, E-Series and K-Series Valves use o-ring seals. For maximum performance and life expectancy, standard air line lubrication should be used. If air line cylinders or other air line devices, used in conjunction with ARO valve, require lubrication, be sure the lubricating oils used are compatible with the valve seals and are of sufficient viscosity to assure adequate lubrication. Aro recommends an oil lubricant with a viscosity of 100-200 SUS at 100° F and an airline point above 200° F.

**NOTICE:** The use of compound oils containing graphite filters, extremely low viscosities and other non-fluid lubricants is not recommended.

**RECOMMENDED:** Aro 29665 air line lubricator oil is available in one quart containers.

### Warning

The following are hazards or unsafe practices which could result in severe personal injury, death or substantial property damage. Heed the following. Use safeguards. Insure that provisions are made to prevent the valve from being accidentally operated (actuated.)

**Hazardous Air Pressure.** Shut off, disconnect and relieve any trapped air pressure from system before performing service or maintenance.

**Hazardous Voltage.** Do not attempt any service without disconnecting all electrical supply sources.

**NOTICE:** Genesis Series Valves must be grounded.

Do not use the valve as a safety device or to operate or control the operation of full revolution clutch systems or brake systems on power presses or similar equipment. These valves are not intended for such applications. Do not subject the valve to any condition that exceeds the limits set forth in the specifications for a particular valve model. Keep all hoses, electrical wiring, fittings and connections in good working condition. Damaged air pressure hoses, electrical wiring, or connections, could cause accidental valve operation (actuation). Only allow qualified technicians to install or maintain the valve system. It is necessary to have a thorough understanding of the operation and application of all valves being used in a particular system and how they interact with

### General Information

To obtain information or to receive technical literature for specific valves: contact ARO Customer Service at (800) 495-0276 or contact your nearest Aro distributor. Refer to the Service Kit Director for Valves and Cylinders form #9326-M, available from Aro. Selected parts are provided in kit form. The ARO Parts List/Service Instructions contain Repair Kit information and complete Service Parts information and are available upon request. Order Manuals as shown. The following Operator's Manuals are available.

| <u>Operator's Manual</u> | <u>Part Number</u> |
|--------------------------|--------------------|
| ALPHA SERIES             | 119999-015         |
| CAT SERIES               | 119999-036         |
| E SERIES                 | 119999-034         |
| GENESIS SERIES           | 119999-021         |
| H SERIES                 | 119999-037         |
| K SERIES                 | 119999-035         |
| 50 SERIES                | 119999-045         |



## ***5 Year Warranty***

Ingersoll Rand/ARO warrants to the user purchaser of the ARO products depicted in this catalog that the products be free of defects in material and workmanship for a period of five (5) years from the date of purchase.

ARO will repair or replace, at its election, any product which is found upon its inspection to be defective during the period prescribed above. The product must be shipped prepaid to ARO factory or ARO Customer Service Center together with proof of purchase.

This warranty does not apply to failures or defects occurring as a result of abuse, misuse, negligent repairs, corrosion, erosion and normal wear and tear.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE), EXPRESSED OR IMPLIED, AND THERE ARE NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE IS INTENDED OR MADE .

THE REMEDIES OF THE USER PURCHASER SET FORTH UNDER THE WARRANTY OUTLINED ABOVE ARE EXCLUSIVE AND THE TOTAL LIABILITY OF ARO WITH RESPECT TO THIS TRANSACTION, WHETHER BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE SHALL NOT EXCEED THE PURCHASE PRICE OF THE PRODUCT.

ARO SHALL IN NO EVENT BE LIABLE TO THE USER PURCHASER FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, SPECIAL OR PUNITIVE DAMAGES ARISING OUT OF THIS TRANSACTION, OR ANY BREACH THEREOF, WHETHER OR NOT SUCH LOSS OR DAMAGE IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE.

# Progress in Motion

For more than 100 years, we've helped drive innovation with revolutionary technology — creating new standards for how the world gets work done. We've done it by producing class-leading Ingersoll Rand / ARO pump and dispensing technologies, and by knowing our customers' industries and the demands placed on productivity and quality.

No matter what your product, process, or location, Ingersoll Rand / ARO offers a broad range of pumps and accessories, fully customizable dispensing systems, and a worldwide distribution and service network guaranteed to solve any fluid handling challenge.



## **Piston Pumps**

Ingersoll Rand/ARO Piston Pumps are used in some of the toughest applications throughout industry. This broad range of pumps are used with low-to-high viscosity fluids for general transfer, fluid recirculation and extrusion.

## **Extrusion Packages**

Extrusion Packages allow you to get an application up and running as easily as possible. These are divided into three categories: lift mount, single-post rams and two-post rams. In all cases, the package comes ready to use, no assembly required. Attach an outlet hose, fluid container and air supply, and your Ingersoll Rand/ARO Extrusion Package is up and running.

## **Dispensing Systems**

Ingersoll Rand Dispense Systems creates turnkey systems for automatic and manual dispensing applications. Our complete dispensing solutions are configured from standard components to meet customer specific requirements for applications within many different industries.

## **Lubrication Equipment**

Ingersoll Rand lubrication equipment has a full range of products that will keep all types of fluids moving efficiently. They are backed by more than 70 years of experience in pump and air system technology, and include models specifically designed for popular applications.

## **Pneumatic Valves**

Ingersoll Rand/ARO offers a full line of pneumatic valves to meet all your needs. Valves are offered in configurations of 2-, 3-, and 4-Way, available with electric, manual, mechanical, and pneumatic actuators. Miniature to full size valves to fit any application. A line of accessory and specialty valves are also available.

## **Pneumatic Cylinders**

Small bore non-repairable interchangeable cylinders, round and square compact, interchangeable cylinders perfect for OEM and MRO applications, as well as medium-heavy duty round line repairable cylinders. NFPA, interchangeable cylinders are available in extruded aluminum barrel up to 4" bore and in an entirely stainless steel cylinder with tie rod construction up to 8" bore.

## **Air System Components**

With Ingersoll Rand /ARO brand filters, regulators, and lubricators (FRLs) in your operation, you get a cost-effective solution to increasing the life of your pneumatic equipment. You can save space, time, and piping costs. Our FRLs also give you greater mounting flexibility and convenience.



Ingersoll Rand Industrial Technologies provides products, services and solutions that enhance our customers' energy efficiency, productivity and operations. Our diverse and innovative products range from complete compressed air systems, tools and pumps to material and fluid handling systems and environmentally friendly microturbines. We also enhance productivity through solutions created by Club Car®, the global leader in golf and utility vehicles for businesses and individuals.

[fluids.ingersollrand.com](http://fluids.ingersollrand.com)