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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.



Ingersoll Rand



About ARO®

ARO® is a worldwide manufacturer of fluid management products that are skillfully engineered to deliver performance and serviceability, allowing success to flow freely in our customers' businesses. That's why ARO® is fluid intelligence—the smart choice in fluid management products for industrial operations.

With over an 85-year legacy of premier product performance and service excellence, ARO® provides fluid management equipment for customers and industries around the globe. ARO® has the right product to meet our customers' specific needs. We offer air-operated diaphragm pumps, piston pumps and packages, filters, regulators, and lubricators (FRLs), lubrication equipment, and pneumatic valves and cylinders.

ARO's Fluid Power Products Keep the Unknown In Check

The smallest things pose the biggest threats to your facility. Air particle contaminates, improper pressure levels, lack of safety switches, and more can cause major damage to equipment and employees. Too often than not, plant managers are unaware of these threats until suddenly an essential tool doesn't work or their facility is shut down and they lose major time diagnosing the issue. ARO® builds the quality products to keep you from getting too familiar with the unknown. ARO® valves, cylinders, logic controls, and filters/regulators/lubricators (FRLs) make it easy to manage the small stuff. ARO® products are expertly engineered to protect your equipment and your employees from unscheduled downtime, premature breakdown, and injury risks. And because they integrate perfectly together, building a complete system for full protection is a breeze.

Our robust valve offering is broad and deep

We have a valve for almost every solenoid, manual and mechanical application. In the rare case we don't have it, we can expertly modify or customize our standard product to meet your application needs. ARO® can provide customized pneumatic control solutions to meet the needs of large customers and OEMs

The performance you deserve. The reliability you expect

ARO® has always delivered on a promise of performance, and valves are no exception. Built with the rugged reliability to handle heavy duty and dirty applications while offering excellent flow rates, our valves can control cylinder movement and machine sequence, operate pumps, and more with top-of-the-line efficiency.

ARO®

Table of Contents

Valves

Actuator Styles — Page

Manual

Max Air 36, 39, 40, 59
50 Series 32
E Series 42
K Series 48
200 Series 56
460 Series 61

Mechanical

Maxair 40, 59
50 Series 32
E Series 42
100 Series 58
200 Series 56
400 Series 60

Pilot

Max Air 13
50 Series 32
E Series 42
K Series 48
H Series 52
200 Series 56
Alpha 18

Solenoid

Max Air 13, 30
Sierra 4
Alpha 18
CAT 24
E Series 42
H Series 52
K Series 48
Premair 28

Accessories and Specialty Valves

24130 Button Bleeder 62
24135 Button Bleeder 62
9600 Pilot Bleeder 62
EV-30-A Quick Exhaust 62
PR10 Single Pulse Relay 62
SV10-C Shuttle 63
SV20-C Shuttle 63
20370 Micro Switches 63
20467 Micro Switches 63
20311-X Breather 64
20312-X Muffler 64
20313-X Speed Control 64
20308-X Exhaust Silencer 64
600 3-Way Sleeve 65
Coils and Connectors 69, 70
Tubing, Fittings and Connectors 95
Flow Controls 66, 67, 68

Air Pneumatic Logic Controls

Specifications 73
Two -Hand Anit-Tie-Down 74
Flex-6 Accessory Units 75
Flex-6 Controls 78
Logic Elements 81
Indicators 88
Enclosures 91
Counters 92
Liquid Level Sensors 93
Fittings 95
Panell Mounted Valves 89, 90

Repair Kits

Repair Kits 72, 73

Pneumatic Valves

Descriptions

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

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

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.

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.

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

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

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.

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

Premair™
3 & 4-way direct acting solenoid valve. Rugged construction & lightweight, stand alone & stacking. Available in 1/8″ ports.

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 & 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, & selector.
- In line and right angle flow controls, in line needle & check valves.

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.

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.

Selection Charts

Product line size range - body style solenoid valves

Valve Series (Page No.)	10-32 Port Size	1/8" Port Size	1/4" Port Size	3/8" Port Size	1/2" Port Size	3/4" Port Size	1" Port Size
Sierra (PG 4-12)	9 SCFM (0.25 Cv)	30 SCFM (0.70 Cv)					
Premair (PG 28,29)		10 SCFM (0.144 Cv)					
Maxair (PG 13-17)			26 SCFM (0.70 Cv)	61 SCFM (1.65 Cv)	150 SCFM (1.70 Cv)		
Alpha (PG 18-23)		30 SCFM (0.90 Cv)	50 SCFM (1.50 Cv)	61 SCFM (0.70 Cv)			
E (PG 42-47)			26 SCFM (0.70 Cv)				
H (PG 52,55)			55 SCFM (1.51Cv)	81 SCFM (2.27 Cv)	85 SCFM (2.40 Cv)		
K (PG 48-51)				83 SCFM (2.30 Cv)	90 SCFM (2.57 Cv)	270 SCFM (7.54 Cv)	280 SCFM (7.80 Cv)

Product line size range - manifold/stacking solenoid valves

Sierra (PG 4-12)	9 SCFM (0.25 Cv)	30 SCFM (0.70 Cv)					
Premair (PG 28,29)		10 SCFM (0.14 Cv)					
Maxair (PG 13-17)			26 SCFM (0.70 Cv)	61 SCFM (1.65 Cv)	150 SCFM (1.75 Cv)		
Alpha (PG 16-23)		43 SCFM (1.32 Cv)	54 SCFM (1.60 Cv)	54 SCFM (1.60 Cv)	57 SCFM (1.75 Cv)		
Cat (PG 24-27)		1.8 SCFM (0.048 Cv)	2.2 SCFM (0.0.62 Cv)				

Product line size range - body style manual/mechanical

Valve Series (Page No.)	5/32" Push to Connect	1/8" Port Size	1/4" Port Size	3/8" Port Size	1/2" Port Size	3/4" Port Size	1" Port Size
200 (PG 56-57)	4 SCFM (0.104 Cv)	7.5 SCFM (0.195 Cv)					
400 (PG 60-61)	4 SCFM (0.104 Cv)	7.5 SCFM (0.195 Cv)					
50 (PG 32-35)		16 SCFM (0.43 Cv)					
Maxair (PG 36-40)		8 SCFM (0.70 Cv)	26 SCFM (1.14 Cv)				
E (PG 42-47)			26 SCFM (0.70 Cv)				
K (PG 48-51)				83 SCFM (2.30 Cv)	90 SCFM (2.57 Cv)		

Sierra 15

Features

At Last. A Miniature Valve with Maximum Range. 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.



Sierra Body-Ported Valve with Lead Wire

Durable Body Construction

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

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.



Base Mounted Sierra Valves on a SMH51N-04 Manifold

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.



Sierra Valves on SML51N-04 Low Profile Manifold

Performance Specifications

Pressure Range:	22 to 115 PSI (0.8 M pa)
Shift Pressures:	22 PSI Single or Double-Solenoid
Flow:	9 SCFM, .25 Cv
Operating Medium:	Compressed Air
Lubrication:	None Required
Cycle Rate:	120 Cycles Per Minute

Temperature Rating:	0° to 122°F (-17° to 50°C)
Signal Response Time	14 ms
Rated Voltage:	120V AC, 24V DC and 12V DC
Current Ratings:	120V AC = 16 mA in-rush; 11 mA holding 12V DC & 24V DC = 67 mA
Power Consumption:	2.1/1.8 VA 1.9 W



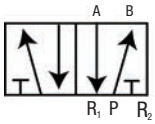
Single Solenoid
(Lead Wire)



Double Solenoid
(Plug-In Model)

Ordering - Body Ported

Position	1	2	3	4	5	
Example:	S5	X	S	M	X	- 1



Position 1 Sierra Valve Size	Position 2 Number of Coils	Positon 3 Valve Style	Positon 4 Body Style	Positon 5 Coil Style / Voltage
S5 15 mm	**S** Single Solenoid, Spring Return **D** Double Solenoid	**S** Standard Solenoid Operator	**M** M5 (10-32)	**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

Low Profile Manifold

Position	1		2
Example:	SML51N	-	XX

Position 1 Sierra Manifold	Position 2 Number of Stations
15mm valve low profile manifold with 1/8" Supply and Exhaust Ports	**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
119892-33	120 VAC Plug-In
119892-39	24 VDC Plug-In
119892-38	12 VDC Plug-In
119893-33	120 VAC Lead Wire
119893-39	24 VDC Lead Wire

Sierra 15

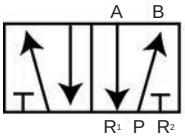
Ordering - Base Mounted Valves

Position	1	2	3	4	5	
Example:	S5	X	X	9	X	- 1

Position 1 Sierra Valve Size	Position 2 Number of Coils	Positon 3 Valve Style	Positon 4 Body Style	Positon 5 Coil Style / Voltage
S5 15 mm	**S** Single Solenoid, Spring Return **D** Double Solenoid	**S** Standard Solenoid Operator	**9** Base Mounted	**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



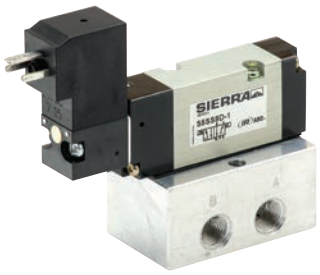
Single Solenoid, Plug-In Model
Shown with CSN Connector



Subbase

Position	1
Example:	11936X

Position 1 Port Size
119367 M5 Subbase (10/32" threads) **119368** 1/8" Subbase



Sierra Valve on 1/8"
Stand-alone Subbase

Manifold

Position	1		2
Example:	SMH51N	-	XX

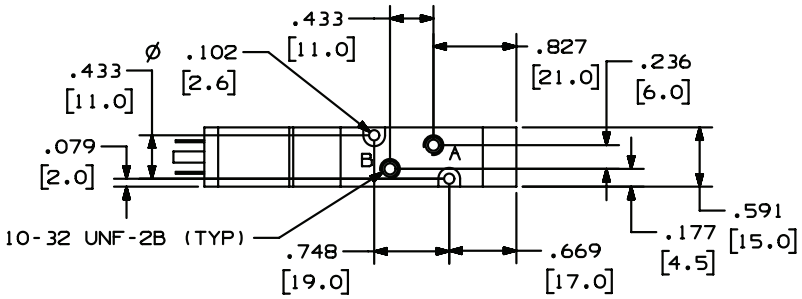
Position 1 Sierra Manifold	Position 2 Number of Stations
15mm valve with 1/8" Ports	**02** 2 Stations **10** 10 Stations **04** 4 Stations **12** 12 Stations **06** 6 Stations **16** 16 Stations **08** 8 Stations

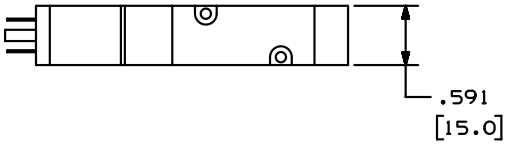


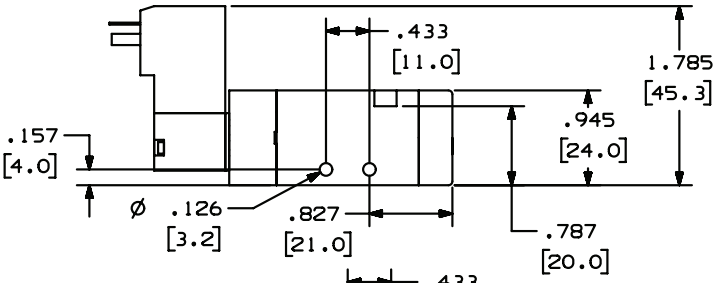
Manifold Close-Up

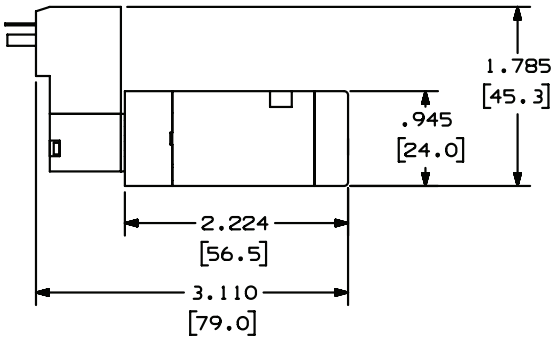
Replacement Coils

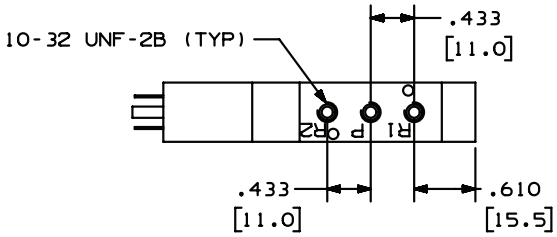
Part Number	Description
119892-33	120 VAC Plug-In
119892-39	24 VDC Plug-In
119892-38	12 VDC Plug-In
119893-33	120 VAC Lead Wire
119893-39	24 VDC Lead Wire

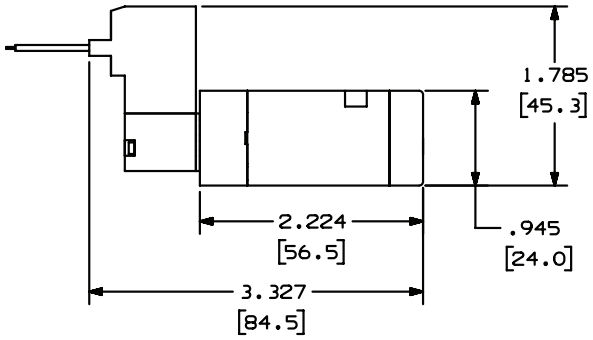




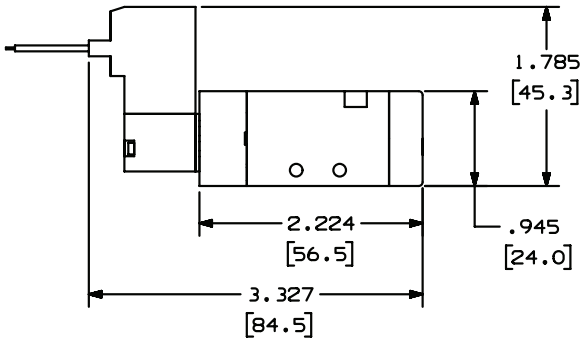






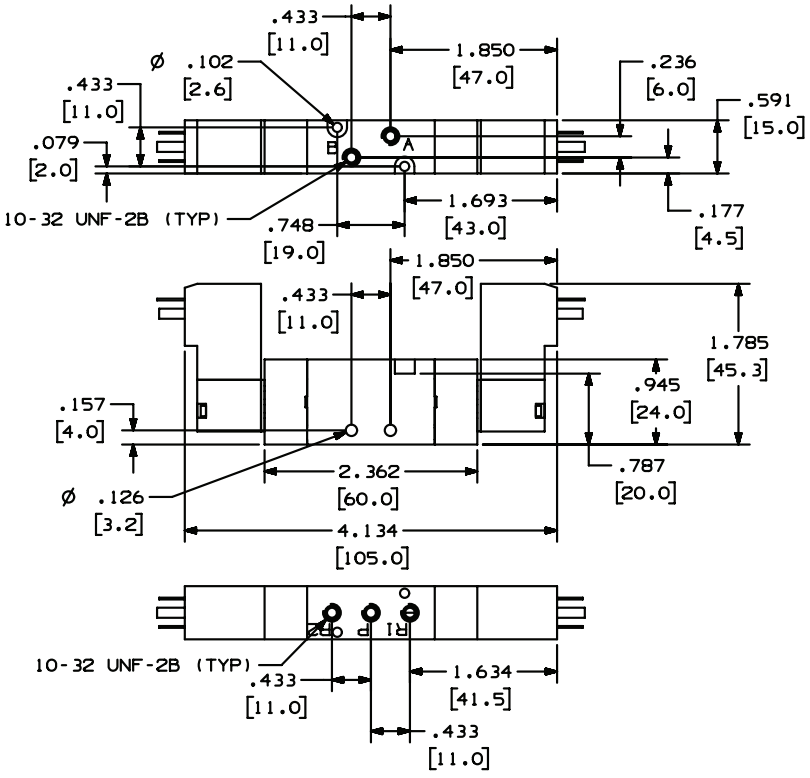


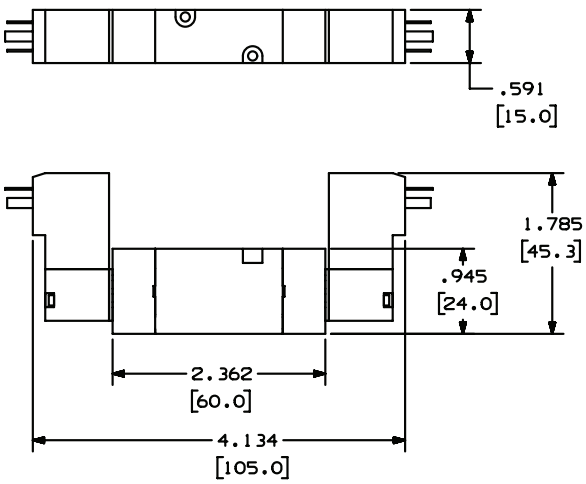
S5SS9X-1



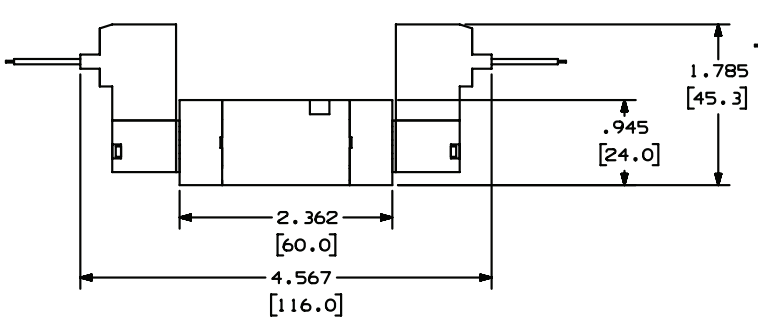
S5SSMX-1

Sierra 15

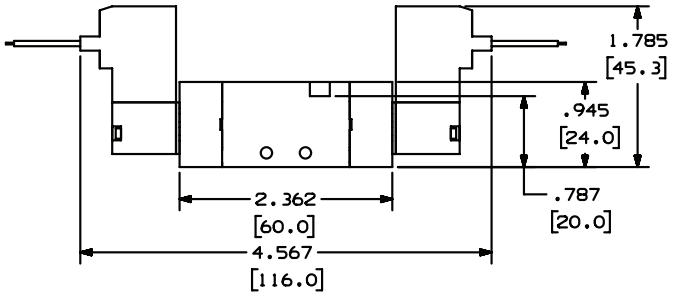




S5DS9X-1



S5DSMX-1

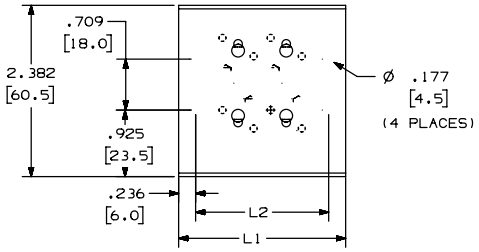


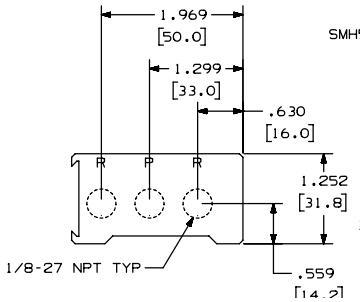
Standard Manifold Dimensions

High Profile Manifold Dimensions

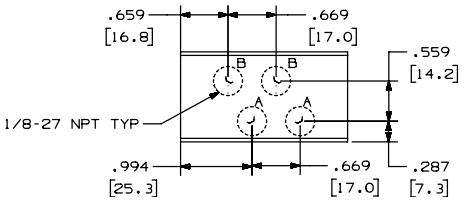
SMH51N-X

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)



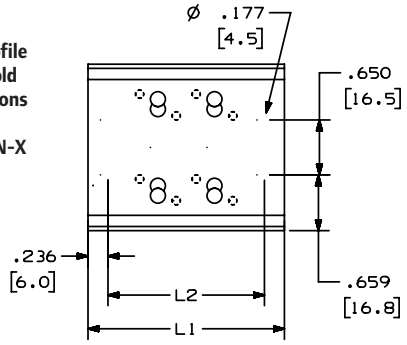


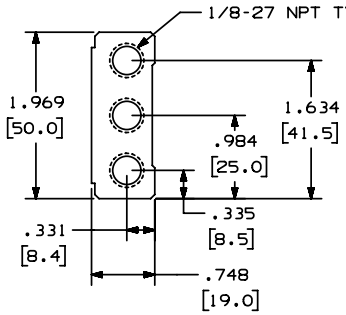
SMH51N-02



Low Profile Manifold Dimensions

SML51N-X





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

Gasketted 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.

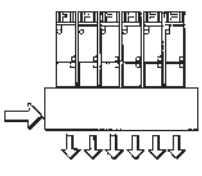
119376
Pipe Plug Kit

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

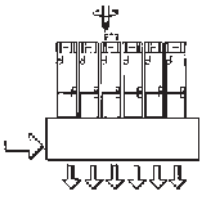
Ordering

119350 "Sandwich" Shut Off Block

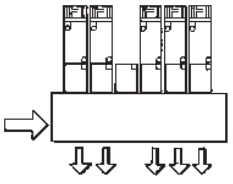
Allows a specific manifold valve to be removed without shutting down pressure to rest of the manifold.



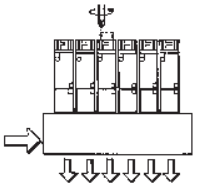
One Solenoid Valve needs to be replaced during set-up.



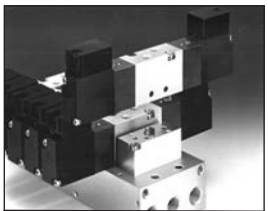
Loosen the valve's retaining screws and ift off valve.



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.

Sierra 18

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, .7 Cv 2-position) is required.

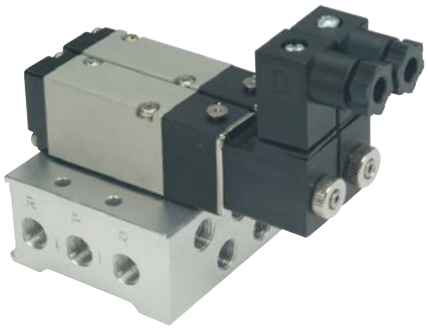
2 Styles Available: Choose Between Body-Threaded or Manifold - Mounted:

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 valve with complete flexibility and delivery.

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.

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

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

Rated Voltage	Power Consumption In-rush	Power Consumption Holding	Current Draw In-rush	Current Draw Holding
20 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 - Base Mounted Valves

Position	1	2	3	4		5		6
Example:	M8	X	X	XX	-	XXX	-	X

Position 1 Body Style	Position 2 Series	Positon 3 Valve Type	Positon 4 Operator	Positon 5 Coil Voltage	Positon 6 Coil Option
M8 18 mm	**1** 1/8" NPTF	**Body Ported** **2** Two Position **3** Three Position Spring Centered (All Ports Blocked) **7** Three Position Spring Centered (Cylinder Ports Open to exhaust) **A** Three Position Spring Centered (Cylinder Ports Pressurized) **Manifold Mount** **9** Two Position, Manifold Mount Valve (Order High Profile Manifold Separately)	**SD** Double Solenoid **SS** Solenoid/ Spring	**000** No Coil **012** 12 Volt DC **024** 24 Volt DC **120** 120 Volt AC	**A** Standard Coil AC **D** Standard Coil DC **N** No Coil



Low Profile
(kit includes gaskets and mounting hardware)



High Profile

Low Profile Manifold & Blanking Plate

Model	Description
SML81N-02	2-Station Manifold
SML81N-04	4-Station Manifold
SML81N-06	6-Station Manifold
SML81N-08	8-Station Manifold
SML81N-10	10-Station Manifold
SML81N-16	16-Station Manifold
114155	Blanking Plate
114803	Replacement gasket Screw Kit (one gasket and two screws)

High Profile Manifold & Blanking Plate

Model	Description
SMH81N-02	2-Station Manifold
SMH81N-04	4-Station Manifold
SMH81N-06	6-Station Manifold
SMH81N-08	8-Station Manifold
SMH81N-10	10-Station Manifold
114808	Blanking Plate

Coil and Connector

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



CHL6-120

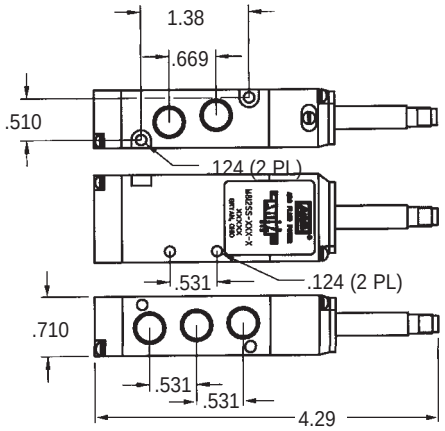


CHW6

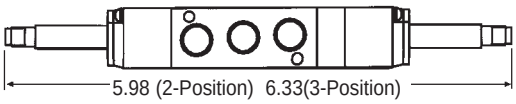


CSN6

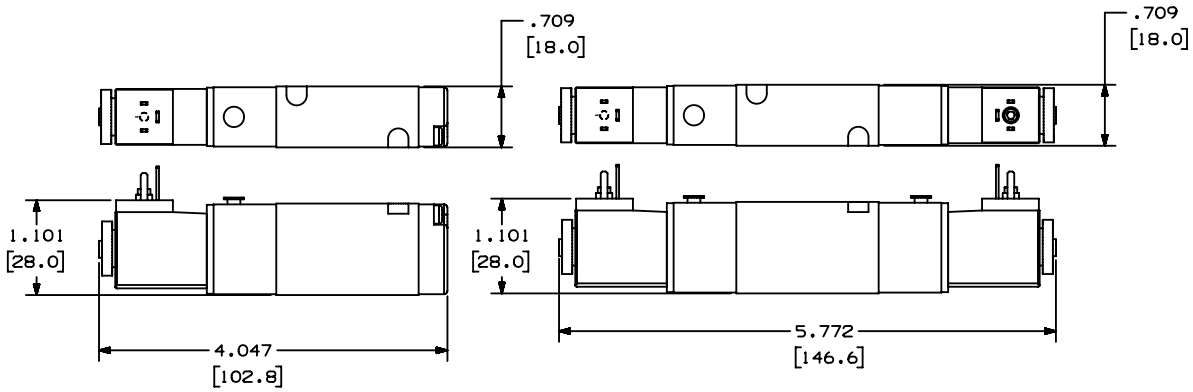
Sierra 18



M812SS-XXX-X



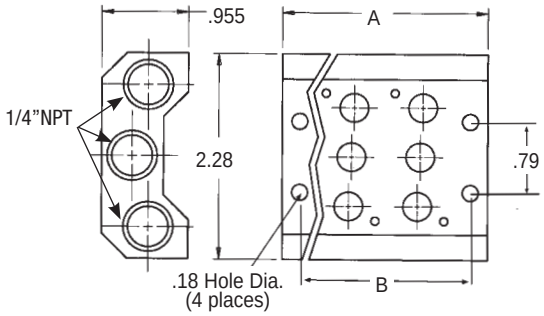
M812SD-XXX-X
M813SD-XXX-X



M819SS-XXX-X

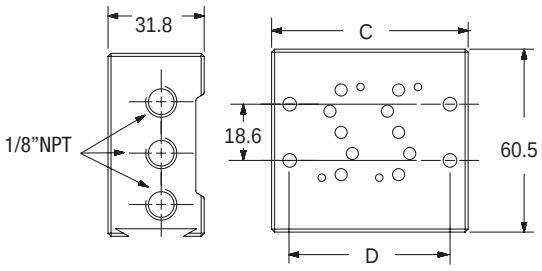
M819SD-XXX-X

Low Profile Manifold Dimensions



	A	B
2-Station	2.24	1.85
4-Station	3.74	3.35
6-Station	5.24	4.84
8-Station	6.73	6.34
10-Station	8.23	7.84

High Profile Manifold Dimensions



	C	D
2-Station	2.56	2.09
4-Station	4.06	3.59
6-Station	5.56	5.08
8-Station	7.05	6.58
10-Station	8.55	8.08

MaxAir

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

Position	1	2	3	4		5		6		7
Example:	M	X	X	X	-	XX	-	120	-	A

Position 1 Body Style	Position 2 Valve Type*	Positon 3 Body Style	Positon 4 Port Size	Positon 5 Actuation/Return*	Positon 6 Coil Volage	Positon 7 Coil Option
M MaxAir	**2** 2 Position **3** 3 Position All Ports Blocked Spring Centered (Sol. & Pilot Only)	**1** 4 Way Side Ported **5** 3 Way Side Ported	**2** 1/4" NPT **3** 3/8" NPT **4** 1/2" NPT	**SS** Single Solenoid/Spring **SD** Double Solenoid **PS** Pilot / Spring* **PD** Pilot / Double*	**000** No Coil **012** 12VDC **024** 24 VDC **120** 120 VAC	**N** No Coil **A** AC **D** DC

* Model number ends here on pilot activated valves.

Performance Specifications

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

Ordering - Manifold



Manifold Kits
Kits include: manifold, seals and valve attaching hardware



CHW



CBW



CHL-XXX



CSN, CSL-XXX



CDN, CDW
CDL-XXXX

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

Blanking Plate Kit

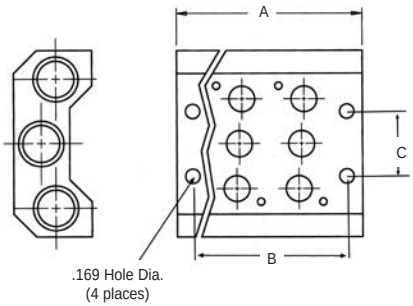
M26MB Fits 1/4" (26 mm) manifolds
M30MB Fits 3/8" (30 mm) manifolds
M34MB Fits 1/2" (34 mm) manifolds

22mm Connector Model	Description
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 the back.
CDN	1/2" conduit without light or lead wire
CDW	1/2" conduit without light, 18" lead wire
CDL-XXX	1/2" conduit with light, 18" lead wire

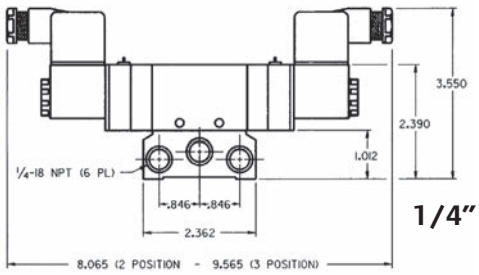
Voltage (-XXX)

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

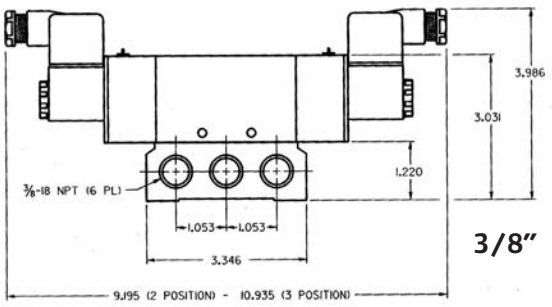
Dimensions



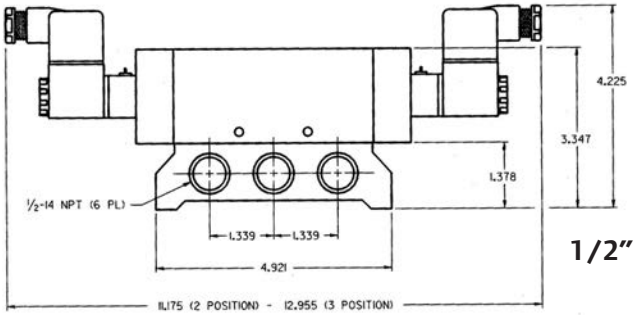
Stations	1/4" A	1/4" B	1/4" C	3/8" A	3/8" B	3/8" C	1/2" A	1/2" B	1/2" C
2	3.189	2.638	0.866	3.661	3.031	1.063	4.134	3.346	1.181
4	5.315	4.764	0.866	6.101	5.471	1.063	6.890	6.102	1.181
6	7.441	6.890	0.866	8.541	7.911	1.063	9.646	8.858	1.181
8	9.567	9.016	0.866	10.981	10.351	1.063	12.402	11.614	1.181
10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



1/4"

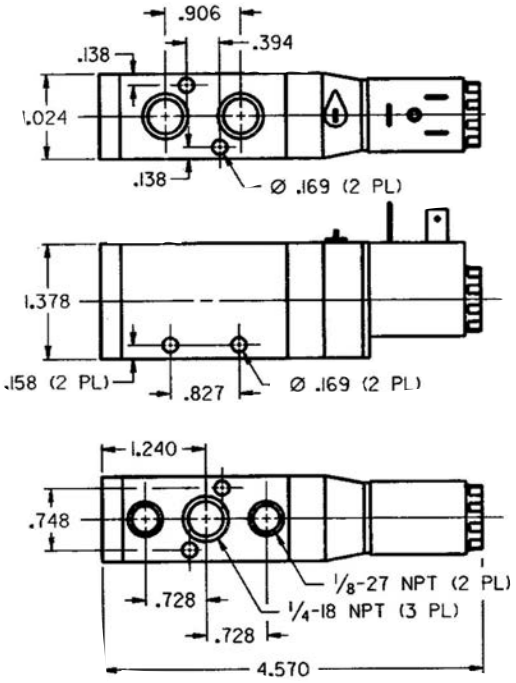


3/8"

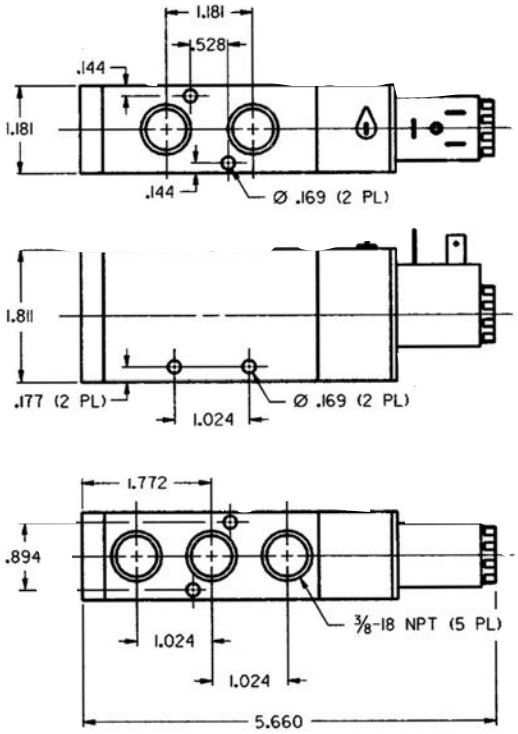


1/2"

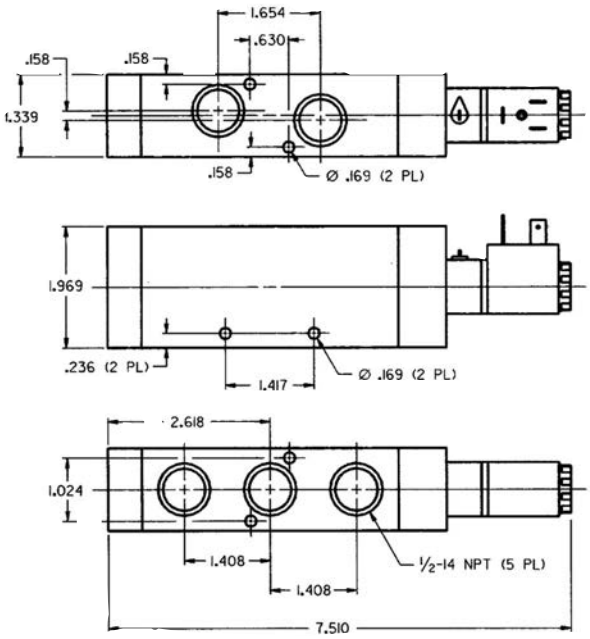
Dimensions - Solenoid



M212SS
M252SS*



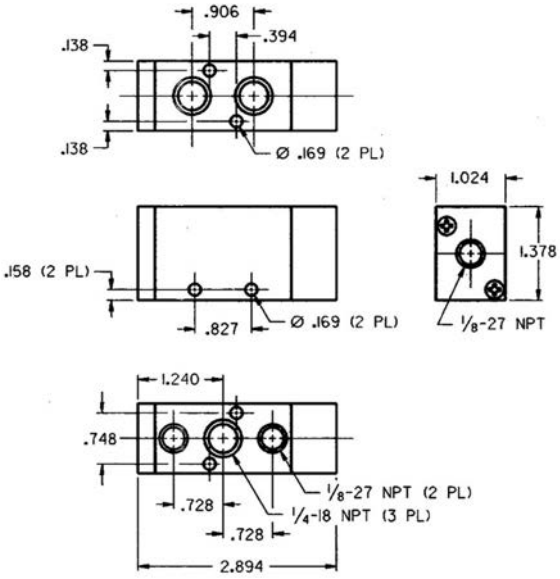
M213SS
M253SS*



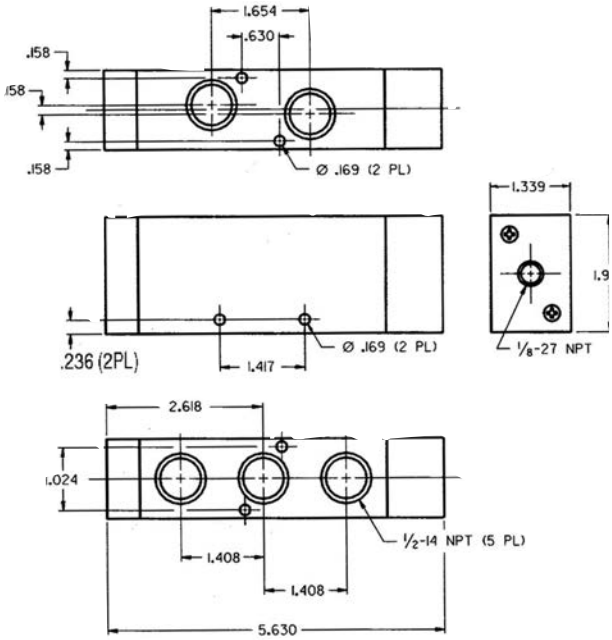
M214SS
M254SS*

* Dimensions are the same for 3-way and 4-way valves

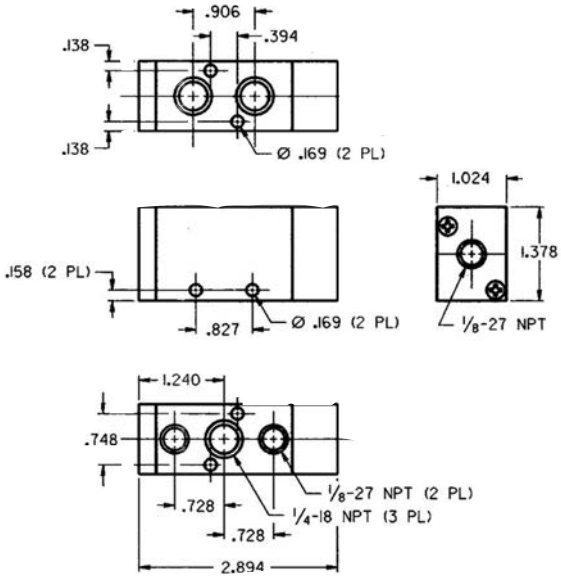
Dimensions - Pilot



M212PS, M252PS*



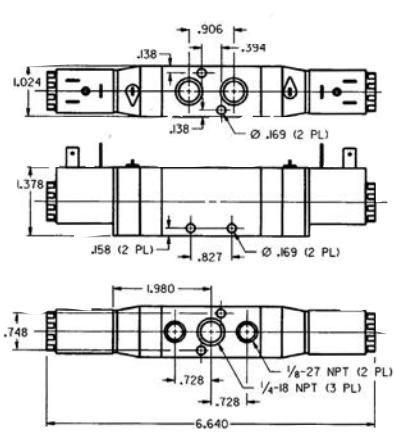
M214PS, M254PS*



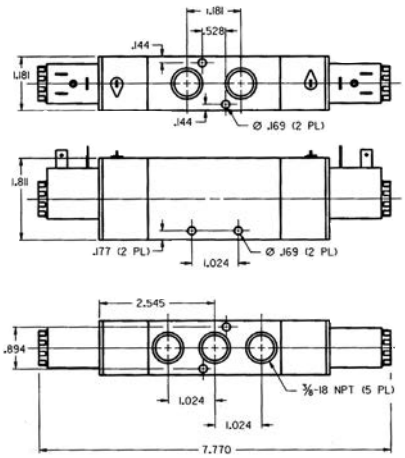
M213PS, M253PS*

* Dimensions are the same for 3-way and 4-way valves

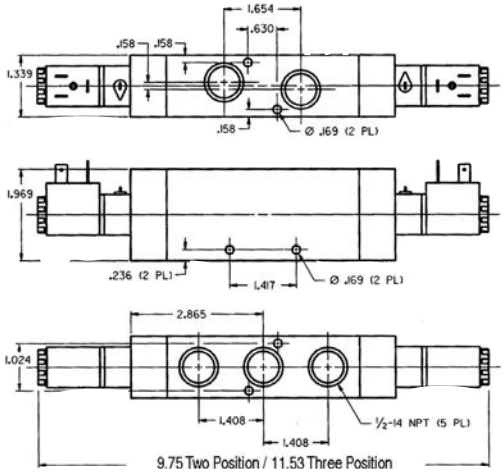
Dimensions - Solenoid



M212SD
M312SD

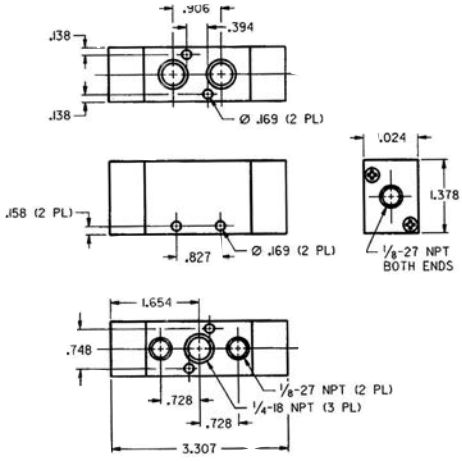


M213SD
M313SD

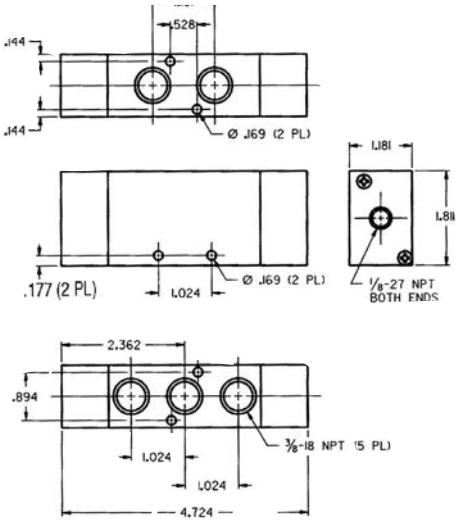


M214SD
M314SD

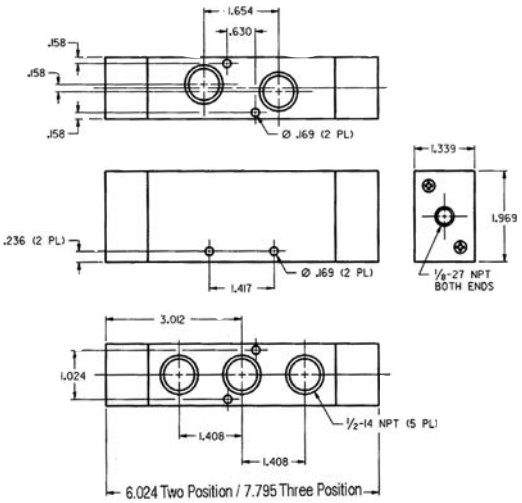
Dimensions - Pilot



M212PD
M312PD



M213PD
M313PD



M214PD
M314PD

Alpha

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.

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 1/4" working ports in the valve body.

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 1/4" 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.

"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 2-position or 3-position valve
- 5-Year Warranty
- Valve Body, End Plate and Manifold material is zinc

Superb Performance

- ALPHA's bonded, precision ground spool resists wear and 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 5 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 cURus listed

Performance Specifications

Pressure Range:	Vacuum to 150 psi (10.2 bar)
Operating Medium:	Compressed Air or inert gas
Lubrication:	None Required
Filtration:	40 Micron recommended
Cycle Rate:	600 Cycles Per Minute
Temperature Rating:	0° to 180°F (-17° to 82°C)
Shift Pressures:	50 psi (3.4 bar) 2-Position Single Solenoid or Single Pilot, Spring Return.
	20 psi (1.4 bar) 2-position double pilot or double solenoid.
	60 psi (4.0 bar) 3-Position Double Solenoid or Double Pilot, Spring Centered.

Signal Response Time:

Double Pilot Actuator:	14 ms
Double Solenoid:	20 ms
Single Pilot (Pilot On)	19 ms
Single Pilot (Pilot Off)	26 ms
Single Solenoid (Energized)	22 ms
Single Solenoid (De-energized)	27 ms

Flow:

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

Alpha

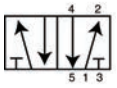
Ordering

Position	1	2	3	4	5		6		7
Example:	A	X	X	X	XX	-	XXX	-	X

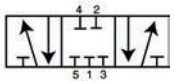
Position 1 Body Style	Position 2 Valve Spool Type	Positon 3 Body Style	Positon 4 Port Size	Positon 5 Actuation/Return*	Positon 6 Coil Volage	Positon 7 Current Type
A Alpha	**2** 2-Position, Urethane **3** 3-Position, Urethane **8** 3-Position, Viton (3 and 8 are Spring Centered, all ports blocked in neutral. Available only with PD or SD Actuators) **4** 2-Position, Viton **7** 3-Position, Urethane **9** 3-Position, Viton (7 & 9 are Spring Centered, inlet ports blocked (cylinder ports open) in neutral. Available only with PD or SD Actuators)	**1** 4-Way, Body Ported Valves **2** 4-Way, Stacking Valves Order End Plates from menu on Page 20. Order Mounting Brackets from Page 20. **3** 4-Way, Subbase Mounted Valves Order Subbase Manifolds from menu on Page 21. **4** 4-Way, Alpha Thin Valves Order Alpha Thin Manifolds and Speed Control Kits from menus on Page 21.	**1** 1/8" NPTF (Available on Body Ported valves only) **2** 1/4" NPTF (Available on Body Ported or Stacking Valves) **3** 3/8" NPTF (#3 available on Body Ported Valves only) **9** NONE (#9 used on Subbase or Alpha Thin Valves)	***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.	**000** No coil **024** 24V AC/DC **120** 120V AC **012** 12V AC/DC **240** 240V AC	**A** AC **D** DC **N** No Coil **L** Low Watt** **(DC Only, 115 PSI Max.) If coil option A, D or L is selected, a coil connector must be ordered. See Pg. 69 for coil & connector information. (Low Watt coils work only on valves with low watt option)

Ordering Examples

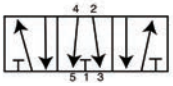
Body Ported Valve: A212SS-120-A
"2" 2-Position Valve, Urethane Spool
"1" 4-Way Body Ported Valve
"2" 1/4" NPTF Ports
"SS" Actuator-Solenoid, Return-Spring
"120-A" 120 Volt Coil, AC Current



4-Way, 2-Position



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



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

"Thin" Valve: 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
Manifold information on Page 21

119306 External Supply Conversion Kit, Page 21.
Use when supply pressure is under 50 PSI or vacuum is used.

Alpha

Accessories - Alpha Stacking Valves

End Plates and Isolator Plates

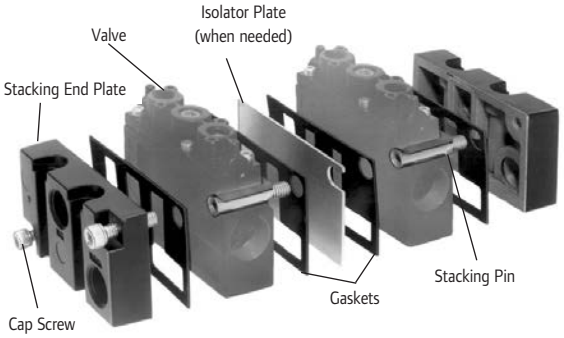
MKN One MKN Kit is required to stack 1-to-6 Valves without Isolator Plates. Each contains 2 End Plates, 2 Cap Screws and 1 Gasket.

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.



Typical Stacking Valve Assembly

Mounting Brackets

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

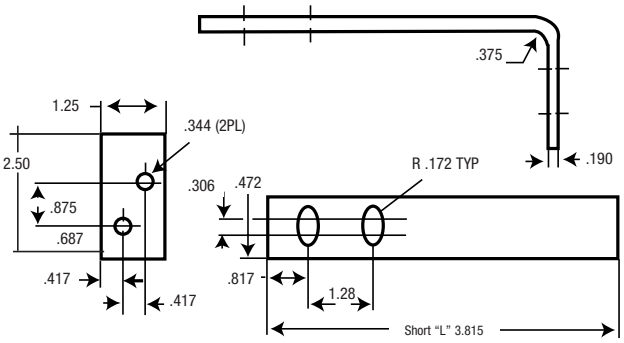
116710 Tie Bolt Kit

116808 Short L - 3.75″ long

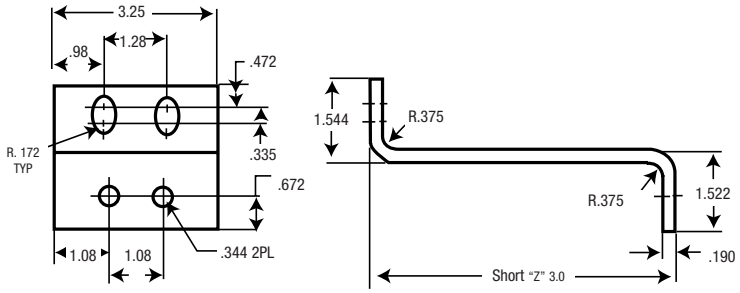
117987 Short Z - 3″ high


116808 Short L

Dimensions - Mounting Brackets



"L" Brackets 116808



"Z" Brackets 117987

Accessories

Breather Vent, External Supply Plug

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. Figure 2.

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

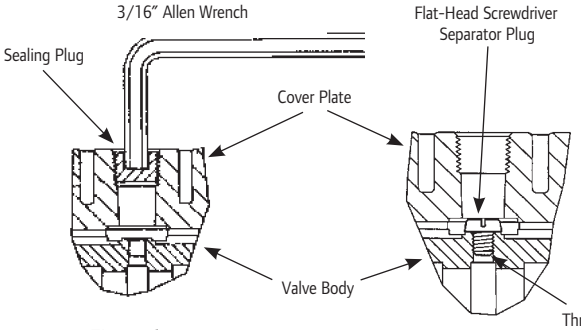


Figure 1 Figure 2

Alpha "Thin" Valves

Alpha Thin Manifolds

Position	1		2
Example:	118605	-	X

Position 1 Port Size	Position 2 Number of Stations
1/4″ NPT	**2** 2 Station **4** 4 Station **6** 6 Station **8** 8 Station **10** 10 Station



11860X-X ALPHA Thin Manifold Stack

Alpha Thin Speed Controls

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

118618 Includes both 119230 (Port #2) and 119231 (Port #4) control kits.

118612 Station blanking kit.



118618 Speed Control Kit

Sub-base Valves

Manifold and 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.

Port Size	Manifold Kit	End Plate Kit
1/4″	**115455-1**	**116916-1**
1/2″	**116899-1**	**116926-1**

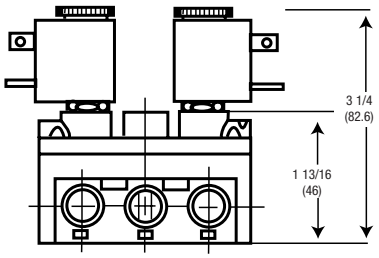


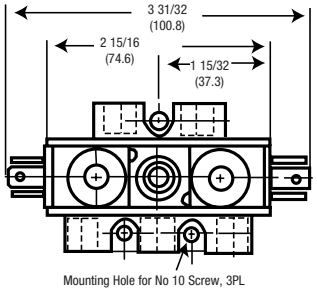
Subbase Valve Manifolds & End Plates

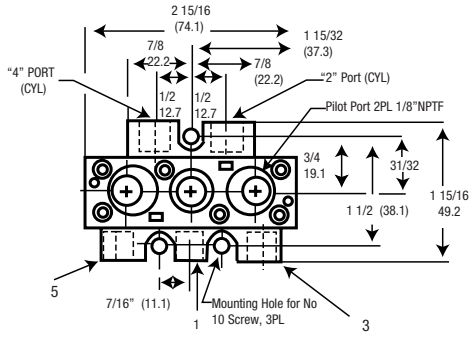
Alpha

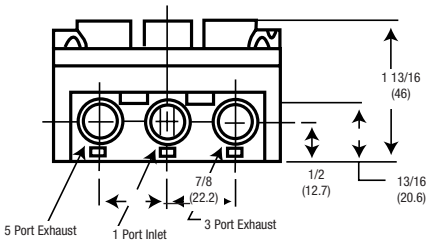
Dimensions Dimensions given in Inches and (Millimeters)

1/8" and 1/4" Body Ported

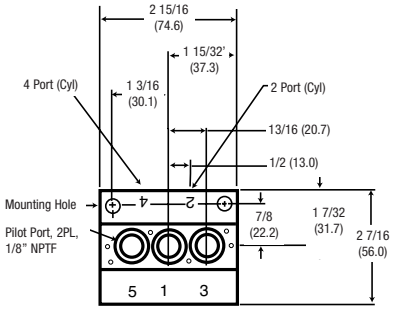


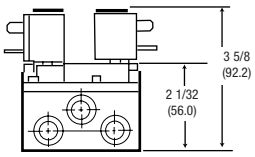


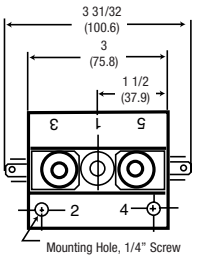


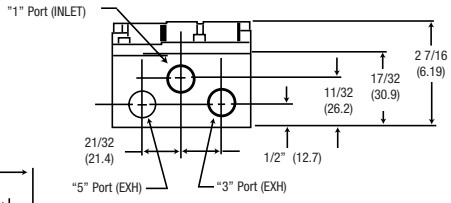


3/8" Body Ported Valves

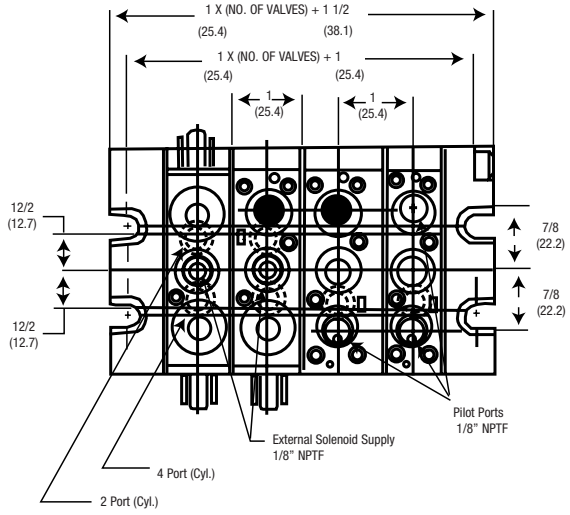


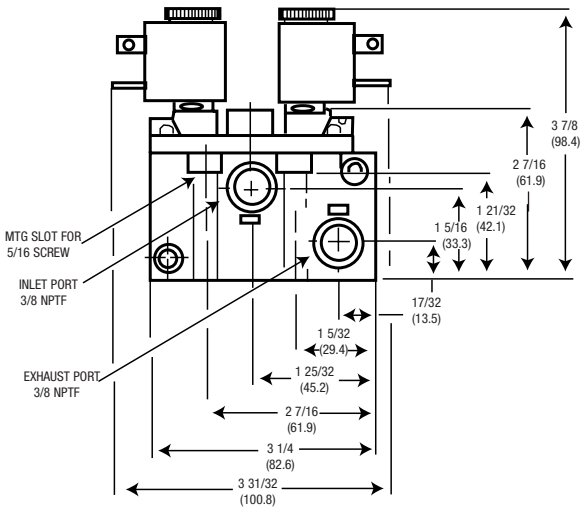






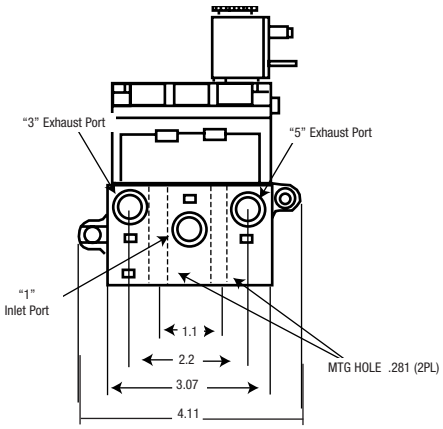
Stacking Valves

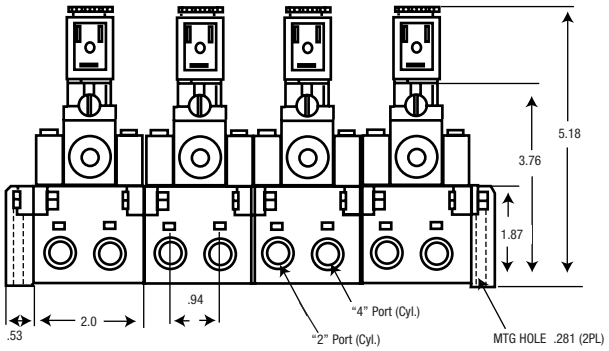




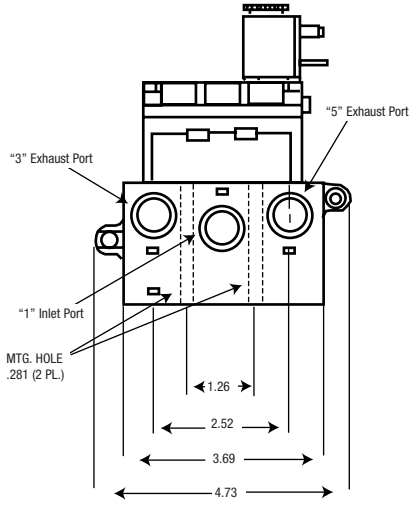
Dimensions Dimensions given in Inches and (Millimeters)

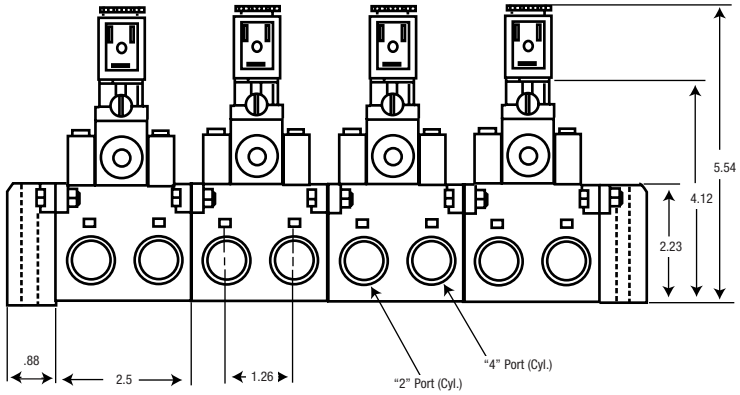
Subbase Valves with 1/4" Cylinder Ports



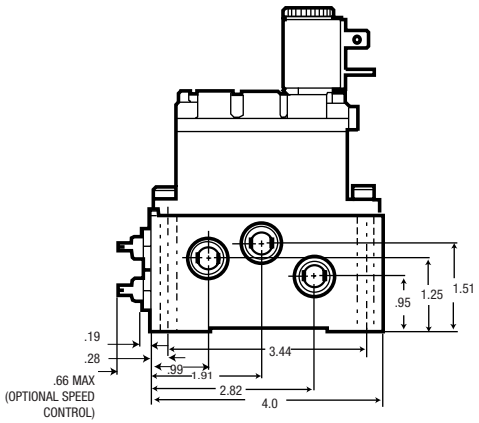


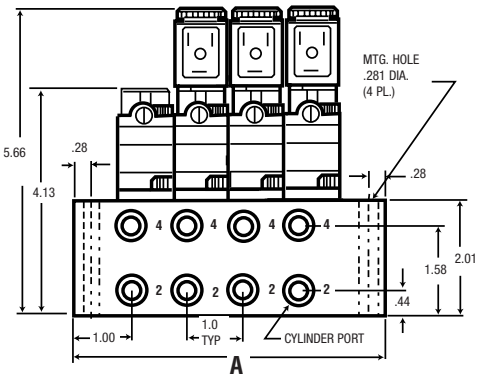
Subbase Valves with 1/2" Cylinder Ports





Thin Manifolds with 1/4" Cylinder Ports





No. of Stations	A
2	3.57
4	5.57
6	7.57
8	9.57
10	11.57

Cat Series

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.
- Cat Series valves are available with a variety of coil options. See Pg. 69.
- Class F coils are rated for 100% duty cycle.



Single CAT Series Valve

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 69.
- 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.



Three Valve CAT Series Stack



High Flow Cat Valve

Performance Specifications

Pressure Range: 0 to 115 PSI Low Watt

Pressure Range: 0 to 150 PSI (10.4 bar)

Temperature Rating: 0° to 122°F (-17° to 50°C)

Flow:

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

Performance Data, Ordering Menus and Dimensional Data for High-Flow CAT Valves are found on page 26.



Six-Station Cat Valve Bar Manifold

Cat Series

Ordering

1/8" Individual and Stacking Valves

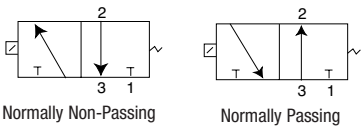
Model Number	Port Size	Valve Function	Body Style
CAT33P-**XXX-X**	1/8"	Non-Passing	Ported
CAT33S-**XXX-X**	1/8"	Non-Passing	Stackable
CAT44P-**XXX-X**	1/8"	Passing	Ported

Coil Options (for above model numbers)

Code	Voltage	Current	Code	Voltage	Current
000-N	Valve with No Coil		**024-D**	24 Volt	DC
012-A	12 Volt	AC	**120-A**	120 Volt	AC
012-D	12 Volt	DC	**240-A**	240 Volt	AC
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. 69 for coil & connector information.

* Available on CAT33P-XXX-L and CAT33S-XXX-L only.



Normally Non-Passing Normally Passing

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

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

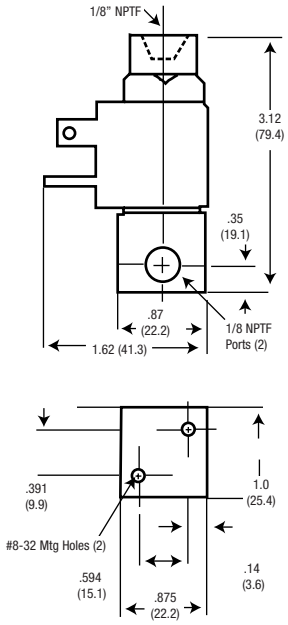
Tie-Rod Kits include tie rods, nuts, o-rings and a plug.



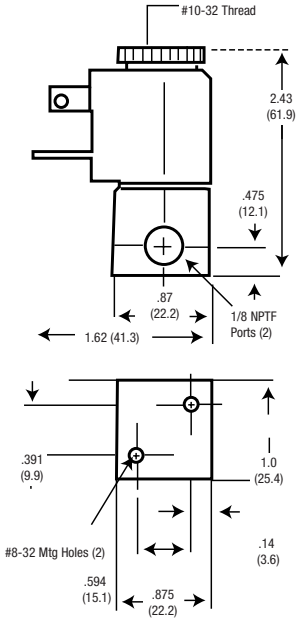
CAT Series Valve Stack and116345-X Stacking Kit

Dimensions Dimensions given in Inches and (Millimeters)

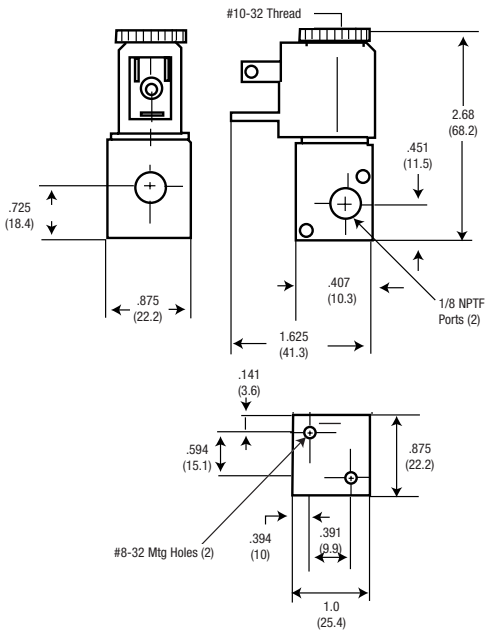
CAT44P
Body Ported,
Normally Passing



CAT33P
Body Ported
Normally Non-Passing



CAT33S
Stacking
Normally Non Passing



Cat Series

Ordering

High Flow Cat Valves

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* (for above model numbers)

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

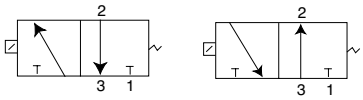
Performance Specifications

Pressure Range: 0 to 150 PSI

Temperature Rating: 0° to 122° F

Operating Medium: Compressed Air

High-Flow Valves: CAT66P: Cv = .2 (6.9 SCFM)
CAT77S: Cv = .2 (6.9 SCFM)
CAT88P: Cv = .2 (6.9 SCFM)

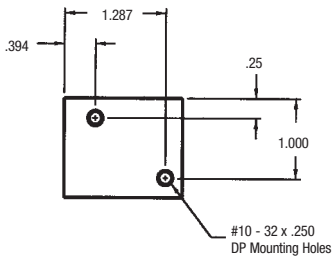


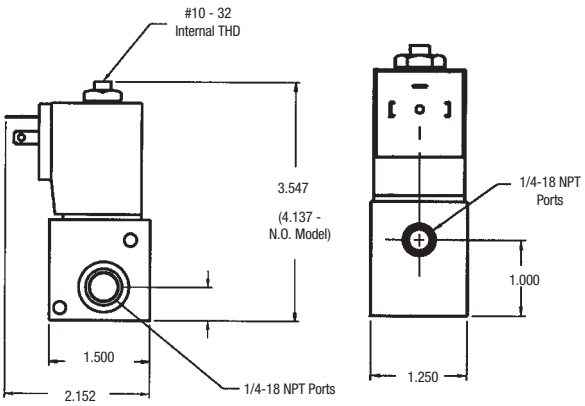
Normally Non-Passing Normally Passing

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

Dimensions

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

CDW-30	30-mm connector with wire.
CSN-30	30-mm connector, strain relief.
CHW-30	30-mm connector, molded cable.
119690-XX	See Page 69 for Coil information.

Cat Series

Ordering

Cat Valve Bar Manifold

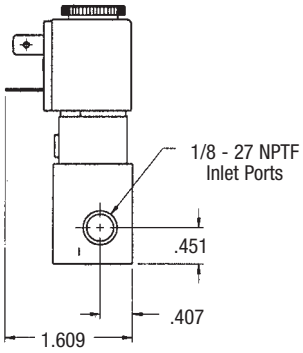
Position	1		2
Example:	CATXXB	-	XXX-X

Position 1 Number of Stations			Position 2 Coil Options					
			Code	Voltage	Current	Code	Voltage	Current
02	07	12	000-N	Valve with No Coil		120-A	120 Volt	AC
03	08	13	012-A	12 Volt	AC	120-D	120 Volt	DC
04	09	14	012-D	12 Volt	DC	240-A	240 Volt	AC
05	10	15	024-A	24 Volt	AC	012-L	12 Volt Low Watt	DC
06	11	16	024-D	24 Volt	DC	024-L	24 Volt Low Watt	DC

See Page 69 for Connectors and other Coil options.

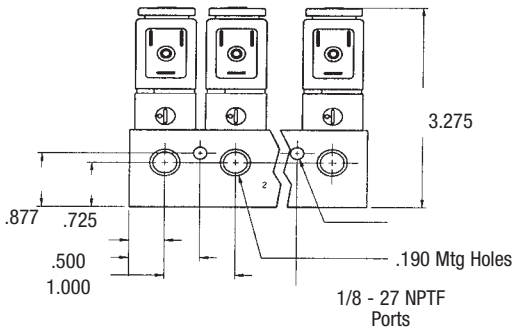
Dimensions Dimensions given in Inches and (Millimeters)

Cat Valve Bar Manifold

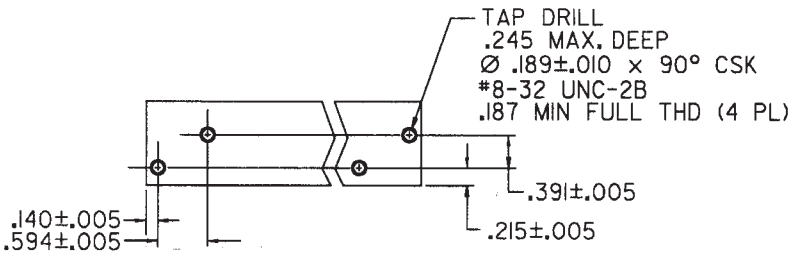




Six-Station Cat Valve Bar Manifold



1.000 Between Stations



Ordering

Miniature 3-Way and 4-Way Valves

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.

Premair

3-Way Valves

- Quick Response
- Direct Acting/Single Solenoid
- Non-Locking Manual Override
- Continuous Duty Coil
- 1/8" NPT
- 2-Position/Spring Return
- Can be used as a Diverter or Selector Valve

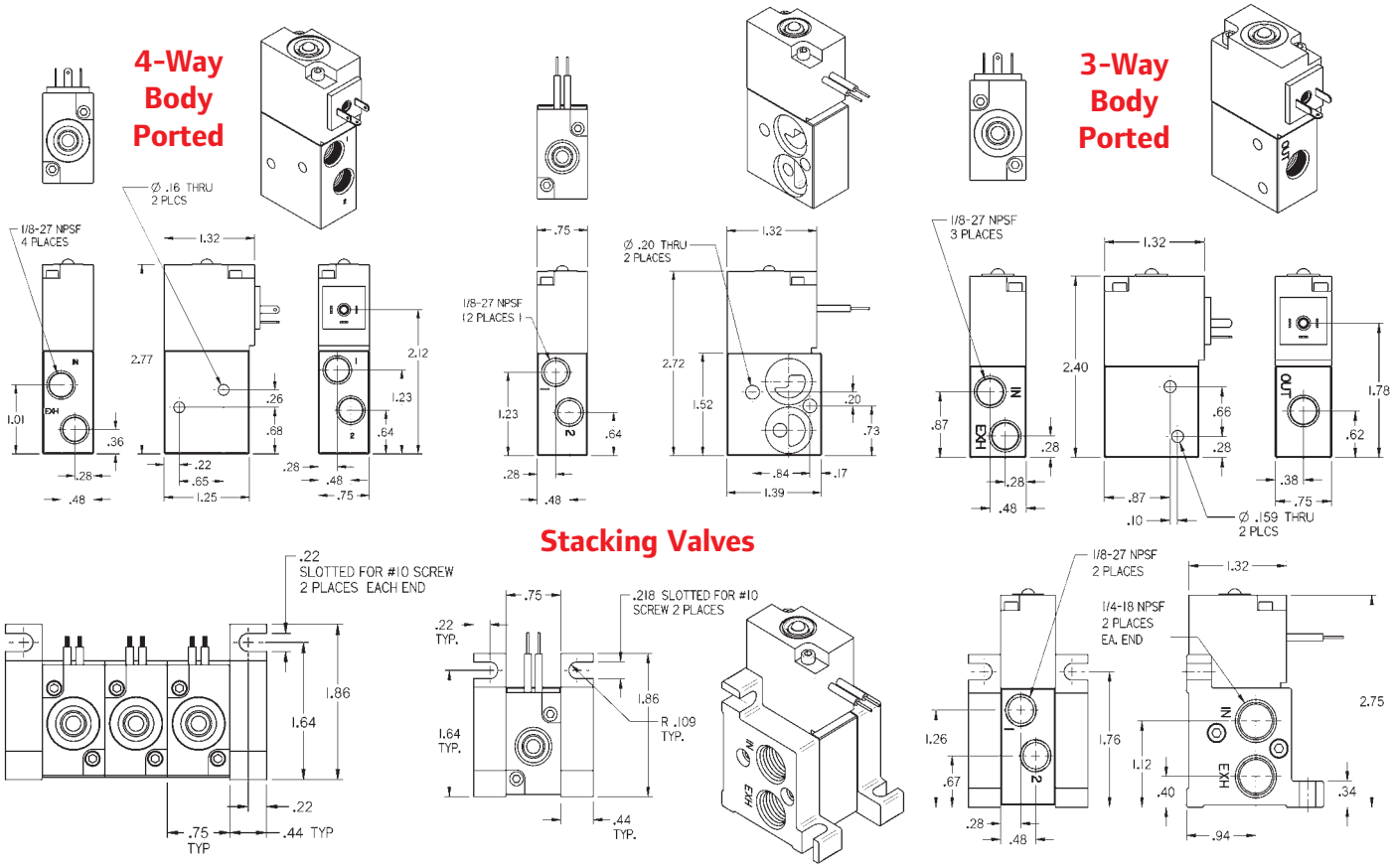
4-Way Valves

- Quick Response
- Can be used in a variety of 2-, 3-, and 4-Way functions
- Direct Acting/Single Solenoid
- Non-Locking Manual Override
- Continuous duty Coil
- 1/8" NPT
- 2-Position/Spring Return
- Optional Built-In Dual Flow Controls

Performance Specifications

Port Size-NPT	1/8" NPT
Media	Air or Inert Gas
Operating Pressure	3-Way, 0 to 125 PSI 4-Way, Vac to 125 PSI
Ambient Temperature Range	32 to 125 F (0 to 50 C)
Cv Factor	.144
Coil Rated Voltage	120VAC (50/60Hz); 12, 24 VDC
Allowable Voltage Fluctuation	+ or - 10% of Rated Voltage
Coil Insulation Type	Class B Rated, 100% Duty Cycle
Power Consumption	DC 4.5 Watts
Electrical Entry	24" Lead Wire (22 AWG) Plug-In DIN Connector (Industrial Micro Type C)
Manual Override	Yes, Top of Coil, Non-Locking
Materials	Seals; Buna-N, Coil: Acetal Body; Aluminum, Brass and Stainless
Response Time (On/Off)	.012/.010 (DC), .012/.020 (AC) Sec.
Max. Cycle Rate	2700 (DC), 1875 (AC)
SCFM @ 100 PSIG	>10
Leak Rate (Max. Allowed)	4cc/Min. @ 100 PSIG
Lubrication	None Required, Factory Pre-Lubed
Weight	3-Way; .26 lbs (116g) 4-Way; .28 lbs. (128g)

Dimensions



MaxAir

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 & 120VAC coils

2-Way Solenoid/Pilot Acting Valves

- Valves are internally piloted, normally closed & are 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 with 12 VDC, 24 VDC and 120VAC coils

2-Way Stainless Steel Solenoid/Pilot Acting Valves

- Valves are internally piloted, normally closed and are 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, liquid gas and most chemical liquids
- Available with 12 VDC, 24 VDC & 120VAC coils

Model No.	Port Size	Orifice	Cv	SCFM	Pressure Range (PSI)
2-Way Direct Acting Solenoid Valves					
TB011B-XXX-X	1/8" NPT	3/64" (1.2mm)	0.1	3	AC = 120, DC = 100
TB022B-XXX-X	1/4" NPT	3/32" (2.3 mm)	0.18	5	AC = 120, DC = 100
TB034B-XXX-X	3/8" NPT	5/16" (8.0 mm)	1.0	28	AC = 140, DC = 100
TB035B-XXX-X	3/8" NPT	33/64" (13 mm)	4.5	126	AC = 120, DC = 100
TB045B-XXX-X	1/2" NPT	33/64" (13 mm)	4.5	126	AC = 120, DC = 100
TB066B-XXX-X	3/4" NPT	25/32" (20 mm)	8.6	240	AC = 120, DC = 85
TB087B-XXX-X	1" NPT	1" (25 mm)	11	308	AC = 100, DC = 70
2-Way Solenoid/Pilot Acting Valves					
TB03EB-XXX-X	3/8" NPT	33/64" (13 mm)	4.5	126	10-150
TB04EB-XXX-X	1/2" NPT	33/64" (13 mm)	4.5	126	10-150
TB06HB-XXX-X	3/4" NPT	1" (25 mm)	12	336	10-150
TB08HB-XXX-X	1" NPT	1" (25 mm)	12	336	10-150
TB12JB-XXX-X	1-1/4" NPT	1-1/2" (38 mm)	22	615	10-150
TB14JB-XXX-X	1-1/2" NPT	1-1/2" (38 mm)	22	615	10-150
2-Way Stainless Steel Solenoid/Pilot Acting Valves					
TS03EV-XXX-X	3/8" NPT	33/64" (13 mm)	4.5	126	10-150
TS04EV-XXX-X	1/2" NPT	33/64" (13 mm)	4.5	126	10-150
TS06HV-XXX-X	3/4" NPT	1" (25 mm)	12	336	10-150
TS08HV-XXX-X	1" NPT	1" (25 mm)	12	336	10-150
TS12JV-XXX-X	1-1/4" NPT	1-1/2" (38 mm)	22	615	10-150
TS14JV-XXX-X	1-1/2" NPT	1-1/2" (38 mm)	30	839	10-150
TS20KV-XXX-X	2" NPT	2" (50 mm)	48	1343	10-150

NOTE: Connector is to be ordered separately. See page 69 for ordering information.
* Vacuum operation only available with TB011B-X, TB022B-X and TB034B-X.


TB034B-120-A


TB066B-120-A


TB04EB-120-A


TS04EV-120-A

Ordering

(Replace XXX-X with voltage requirement)

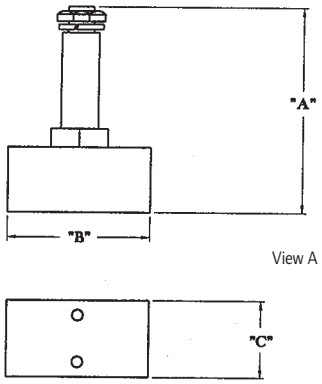
000-N No Coil
012-D 12 VDC
024-D 24 VDC
024-A 24 VAC
120-A 120 VAC

Performance Specifications

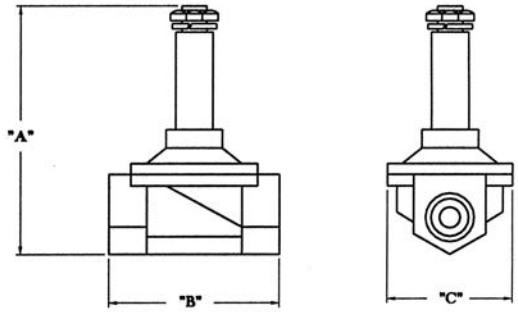
Temperature Range: 0° - 180° F
Duty Cycle: 100%
Power Consumption: 22 VA
Response Time: 30 ms
50 ms

MaxAir

2-Way Direct Acting



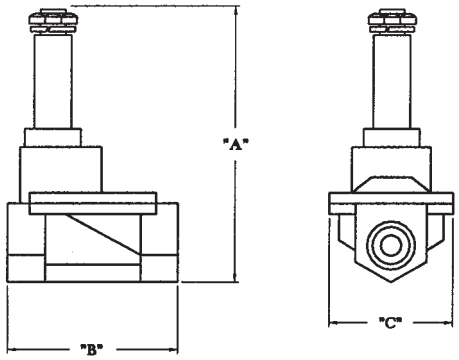
View A



View B

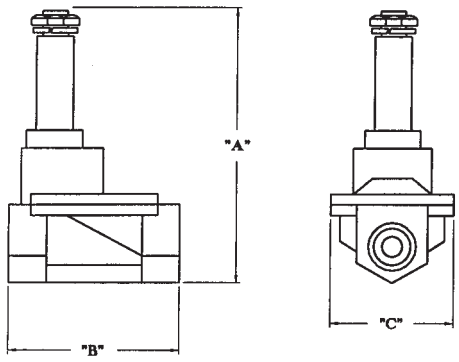
P/N	View	"A"	"B"	"C"	Port Size	Repair Kit
TB011B-XXX-X	A	2.835	.866	.866	1/8	–
TB022B-XXX-X	A	2.972	1.378	1.000	1/4	–
TB034B-XXX-X	A	3.130	2.165	1.181	3/8	–
TB035B-XXX-X	B	4.232	2.618	1.890	3/8	SK-T035B
TB045B-XXX-X	B	4.232	2.618	1.890	1/2	SK-T045B
TB066B-XXX-X	B	4.449	2.795	2.283	3/4	SK-T066B
TB087B-XXX-X	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

50 Series

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



Hand Lever



Palm Button

Comprehensive Valve Design

Aluminum Body
50 Series Valves feature an extruded aluminum body for less porosity, greater durability and lighter weight.

Body Threaded Ports
Port threads are 1/8″ NPTF

Buna N Seals
The standard spool seals are Buna N.
For high temperature applications, Viton seals are available.
Consult the factory for ordering information.

Sturdy Valve Spools
Spools are steel on mechanical and manually actuated valves.
Pilot and bleed actuator valves feature aluminum spools.



Roller Cam



Cam Stem



Pilot



Manual Bleed



50 Series

Ordering

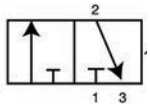
3-Way and 4-Way Valves

Position	1	2	3		4
Example:	50	X	X	-	XX

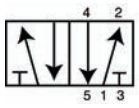
Position 1 Series	Position 2 Valve Function	Positon 3 Body Style	Positon 4 Actuation/Return	
50 50 Series	**3** 3-Way **4** 4-Way	**0** 1/8″ Side Ports **1*** 1/8″ Side Ports with panel mounting *Available only with Palm Button Actuators (02, 12, 21, 32, 41)	**Code** **Actuator/Return** **01** Hand Lever/Spring **10** Hand Lever/Manual **20** Hand Lever/Pilot **02** Palm Button/Spring **12** Palm Button/Manual **21** Palm Button/Pilot **32** Palm w/o Button/Manual **41** Palm w/o Button/Pilot	**Code** **Actuator/Return** **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 32 or 41 Actuators	



3-Way



4-Way

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)

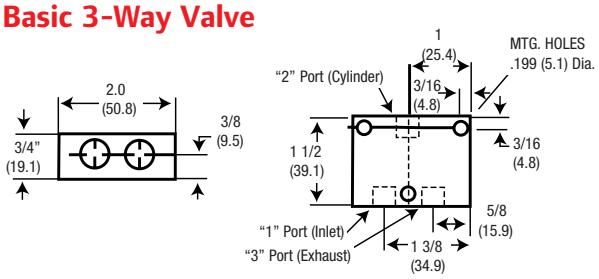
Minimum Pilot Pressure: 30 PSI (2.1 Bar) Pilot Return
60 PSI (4.2 Bar) Pilot Actuator/Spring Return Valves

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

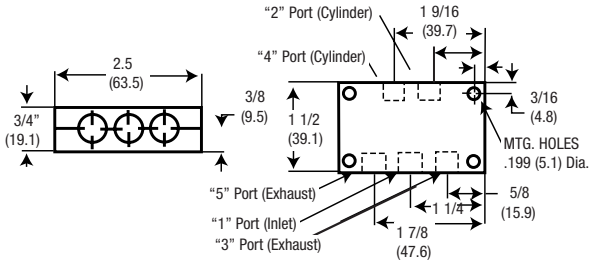
50 Series

Dimensions Dimensions given in Inches and (Millimeters)

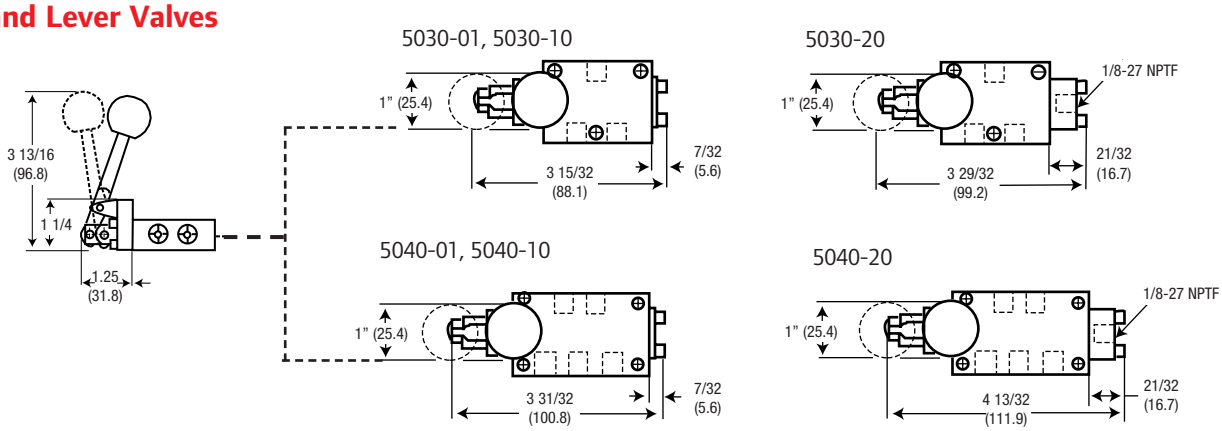
Basic 3-Way Valve



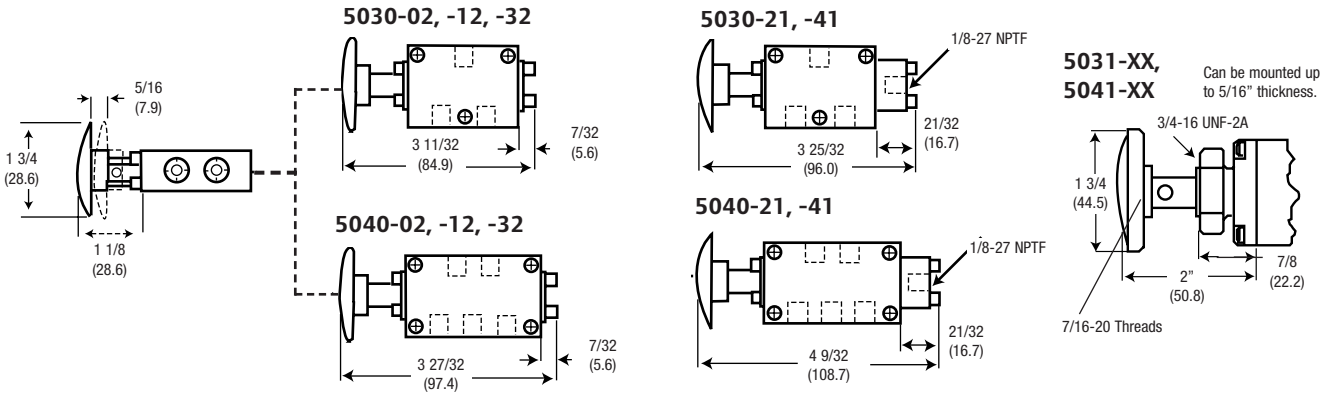
Basic 4-Way Valve



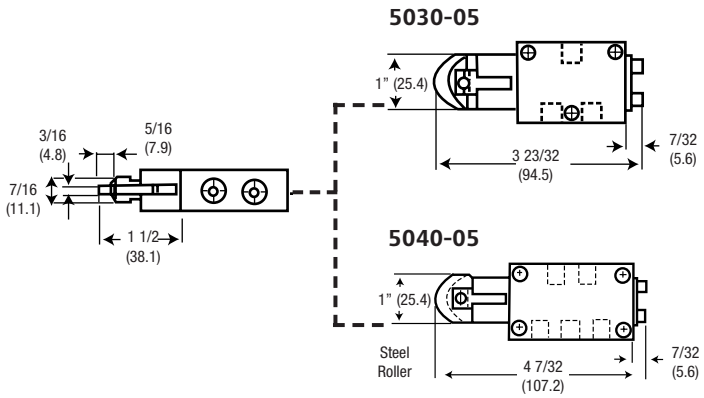
Hand Lever Valves



Palm Button Valves

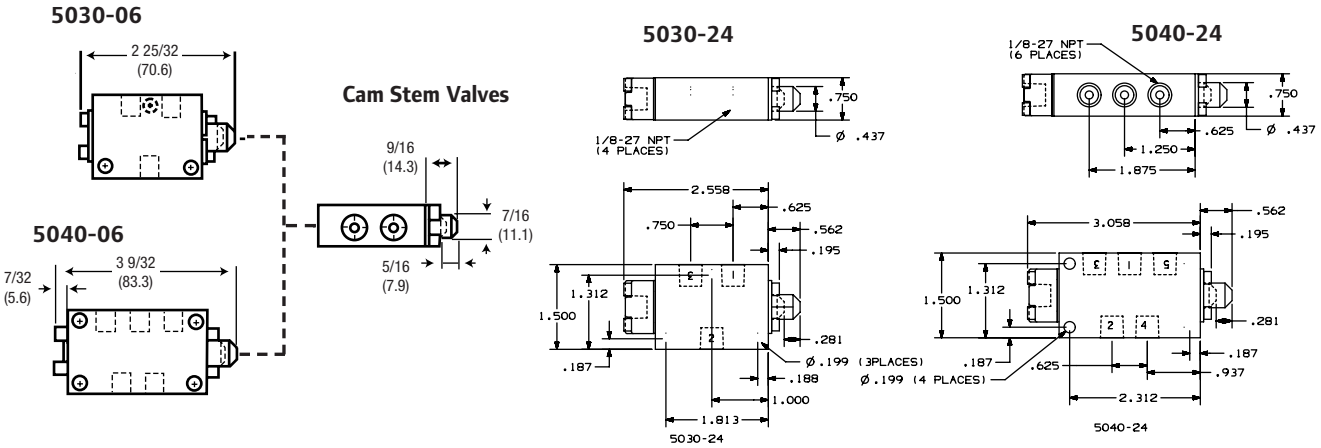


Roller Cam Valves

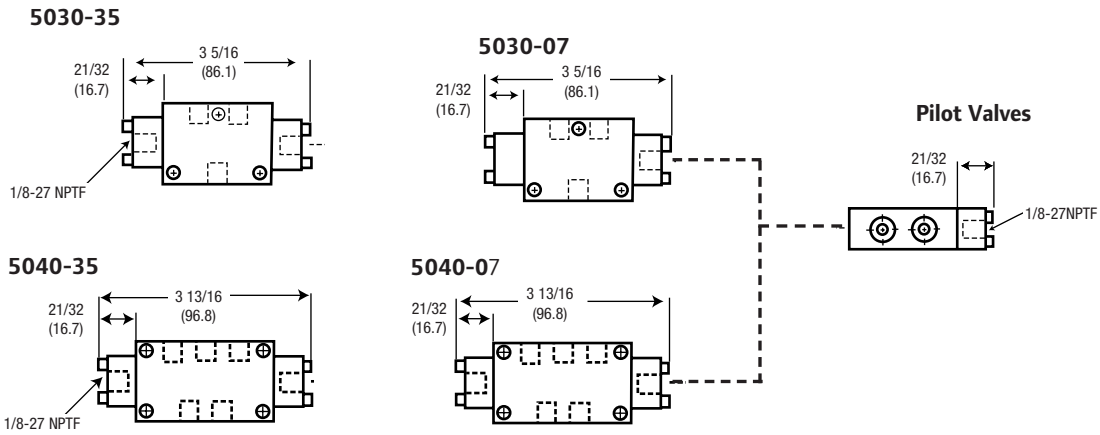


50 Series

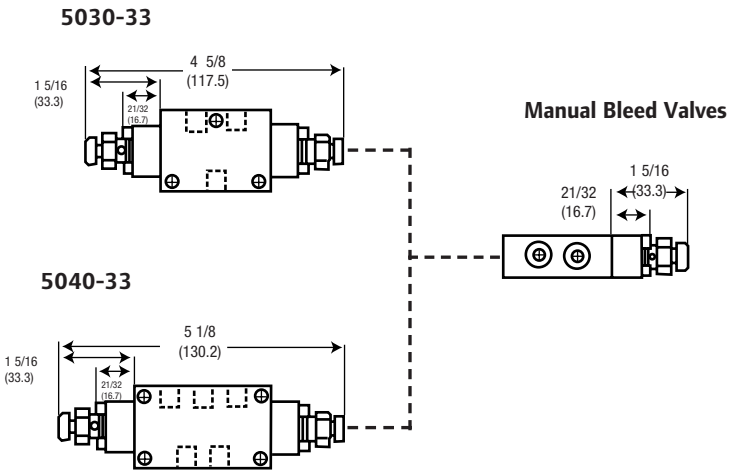
Cam Stem Valves



Pilot Valves



Manual Bleed Valves



MaxAir

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. 14 for manifold ordering information.
- 1/4″ perpendicular hand lever valves can be panel mounted.



Perpendicular Lever / Springl Return



Perpendicular Lever / Manual Return

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

Ordering

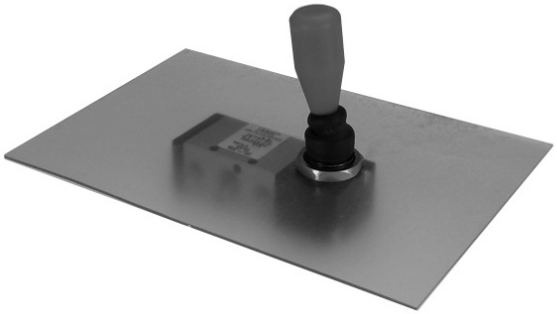
Model	Description
Levers Perpendicular to Body	
M212LM	1/4″, 4-Way, 2-Position, Lever/Manual
M212LS	1/4″, 4-Way, 2-Position, Lever/Spring
M312LS	1/4″, 4-Way, 3-Position, All Ports Blocked
M213LS	3/8″, 4-Way, 2-Position, Lever/Spring
M213LM	3/8″, 4-Way, 2-Position, Lever/Manual
M252LM	1/4″, 3-Way, 2-Position, Lever/Manual
M252LS	1/4″, 3-Way, 2-Position, Lever/Spring
Levers Parallel to Body	
M212LM-R	1/4″, 4-Way, 2-Position, Lever/Manual
M212LS-R	1/4″, 4-Way, 2-Position, Lever/Spring



Parallel Levers

Replacement Accessories

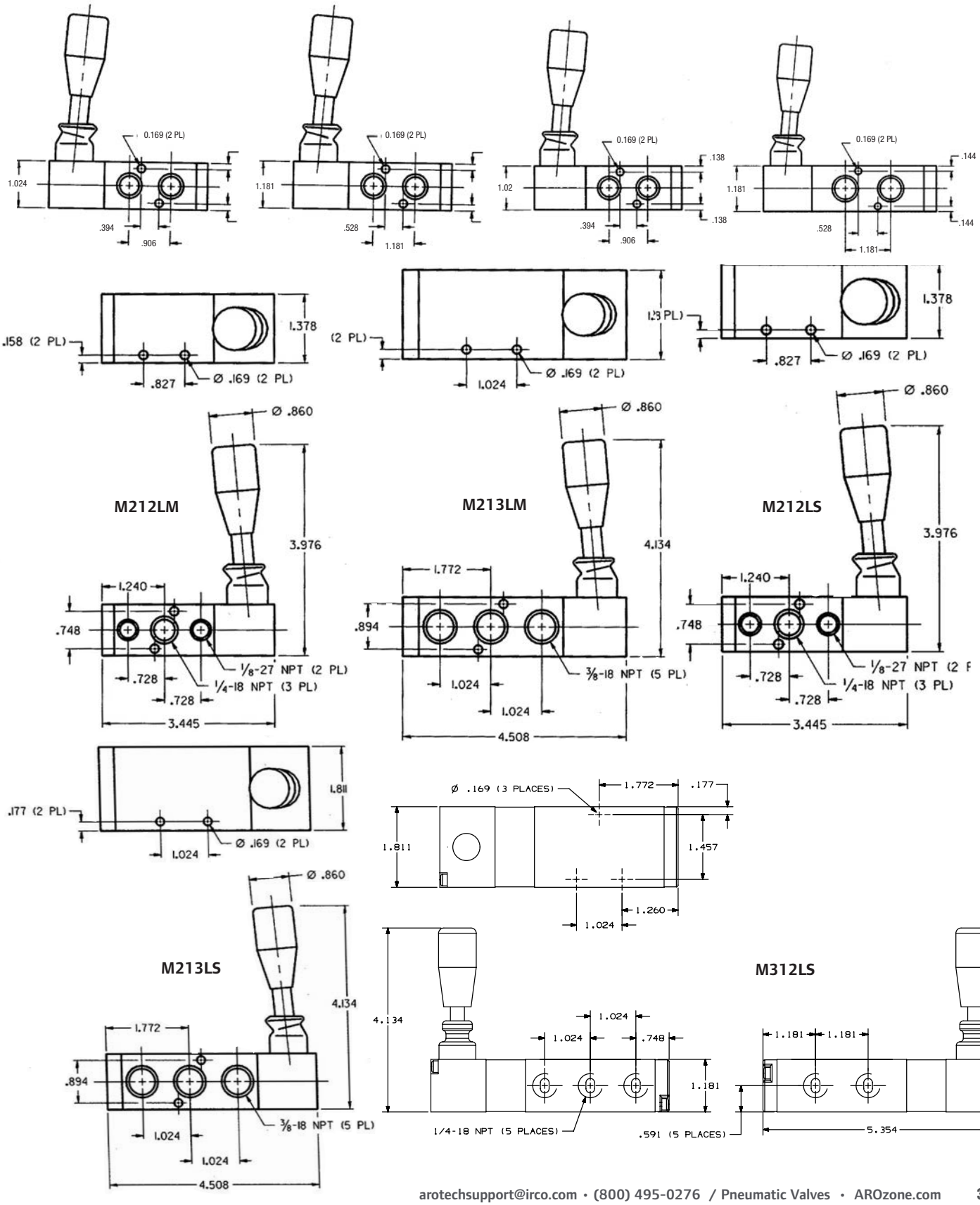
Model	Description
114420	Black Knob
114421	Red Knob
114418	Boot for 1/4″ Valve
114419	Boot for 3/8″ Valve
114822	Lever



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

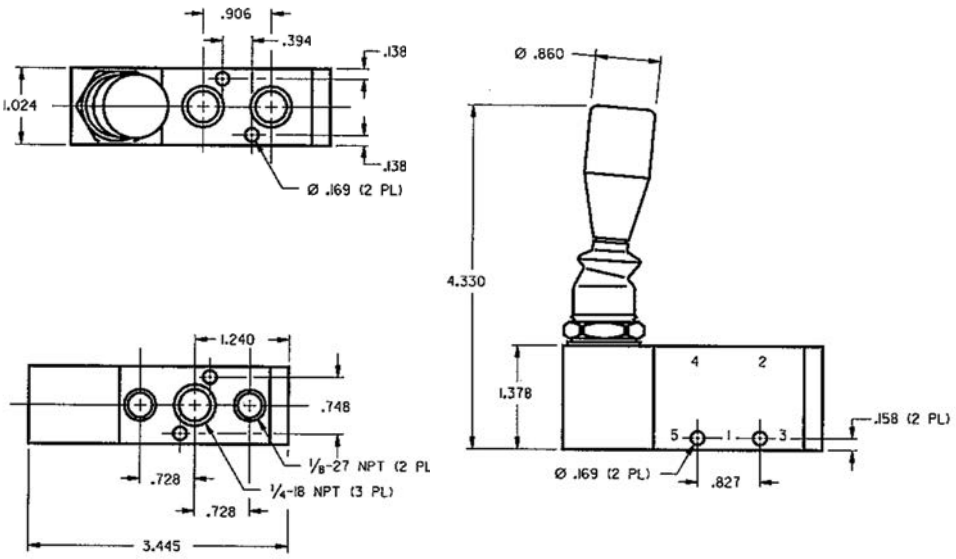
Dimensions

4-Way Hand Lever (Perpendicular)

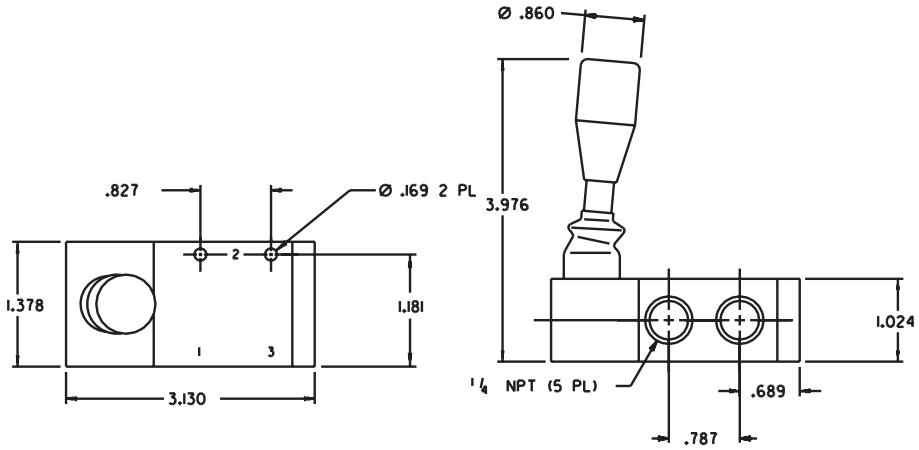


Dimensions

4-Way Hand Lever (Parallel)



3-Way Hand Lever (Perpendicular)



MaxAir

Features

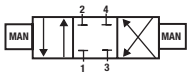
4-Way, 2 & 3-Position Rotary Lever Valves 1/4" & 3/8" 1/2" NPT Ports



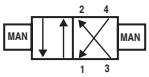
- Light weight aluminum bodies and Buna-N seals are standard
- Ideal for packaging, material handling and air motor applications.
- Rotary lever valve is a 3-position, all ports blocked, manual return.
- Panel mount nut is supplied as standard.

Performance Specifications

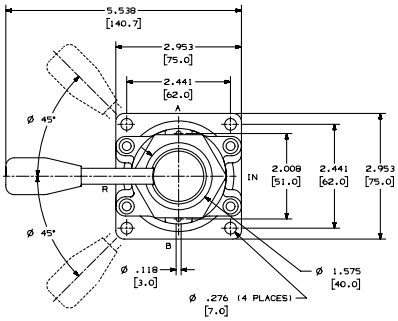
SCFM	1/4" = 40, 3/8" = 65, 1/2" = 85
Cv (Rotary Lever)	1/4" = 1.25, 3/8" = 2.0, 1/2" = 2.4
Operating Medium	Non-lubricated or lubricated air
Pressure Range	20 -140 PSI
Temperature Range	15° to 122°F (-10° to 50°C)
Port Size NPT	1/4", 3/8", 1/2"
Filtration	40 micron recommended

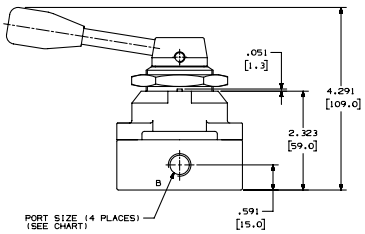


4-Way 3-Position (Rotary Hand)



4-Way 2-Position (Rotary Hand)





Ordering

Model	Description
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



M252FS
Foot Pedal Valve

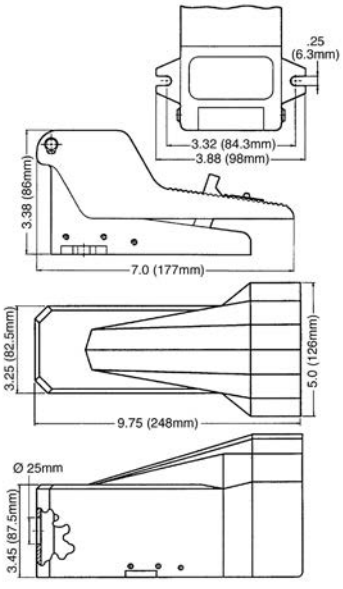


Foot Pedal Valve
Shown with Guard

- 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

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)

MaxAir

Features

- 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.


M291CS


M291RS


M291HS-10

3-Way, 1/8"

Performance Specifications

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


M252CS


M252RS


M252HS-10

3-Way, 1/4"

Performance Specifications

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


M212CS


M212RS


M212HS-10

4-Way, 1/4"

Performance Specifications

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

MaxAir


M291HS-15


M291HS-11


M291HS-13


M291LS-10


M291LS-11


M291LS-10-2

Ordering - 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 - 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 - 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)

E Series

Features

3-Way and 4-Way Valves

Several Styles and Options

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

Numerous Actuator Styles

Manual	Mechanical	Electric	Pneumatic
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 47 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


Hand Lever


Palm Button


Pedal


Treadle


Cam Stem


Roller Cam


Solenoids


Pilot


Bleed

Performance Specifications

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.

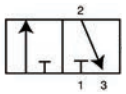
	Pressure Range PSI (Bar)	Minimum Pilot Pressure PSI (Bar)
Manual Actuators		
Manual, Spring, and Spring Centered Returns	20 -150 (1.4 - 10.2)	
Mechanical Actuators		
Manual, Spring, and Spring Centered Returns	20 -150 (1.4 - 10.2)	
Electric Actuators		
Spring Return	30-150 (2-10.2)	
Spring Centered Return	35-150 (2.4-10.2)	
Solenoid Return	20-150 (1.4-10.2)	
Pneumatic Actuators		
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)	

E Series

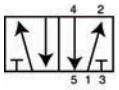
Ordering

Position	1	2	3	4	5		6		7
Example:	E	X	X	2	XX	-	XXX	-	X

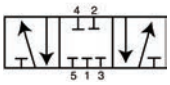
Position 1 Body Style	Position 2 Valve Type	Positon 3 Body Style	Positon 4 Port Size	Positon 5 Actuation/Return*	Positon 6 Coil Volage	Positon 7 Current Type
E E Series	**1** 2 Position Detent **2** 2 Position **3** 3 Position Spring Centered **5** 3 Position Detent (3 & 5, all ports blocked) **6** 3 Position Detent (inlet ports blocked, cylinder ports open) **7** 3 Position Spring Centered (6 & 7, inlet ports blocked, cylinder ports open)	**1** 4 Way Side Ported **4*** 4 Way Bottom Ported **5** 3 Way Side Ported *Solenoid and Pilot Models only.	**2** 1/4" NPT	**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 **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.	**000** No coil **024** 24V AC/DC **120** 120V AC **012** 12V AC/DC **240** 240V AC Required only when ordering Solenoid Valves.	**A** AC **D** DC **N** No Coil Required only on Solenoid Valves If coil option A, D or L is selected, a coil connector must be ordered. See Pg. 69 for coil & connector information.



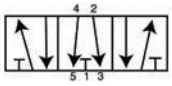
3-Way



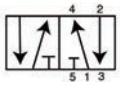
4-Way, 2-Position



4-Way, 3-Position all ports blocked



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



4-Way, 2-Position Bleed Valve

Accessories

Palm Buttons

For use with WM, WP or WS Actuators.

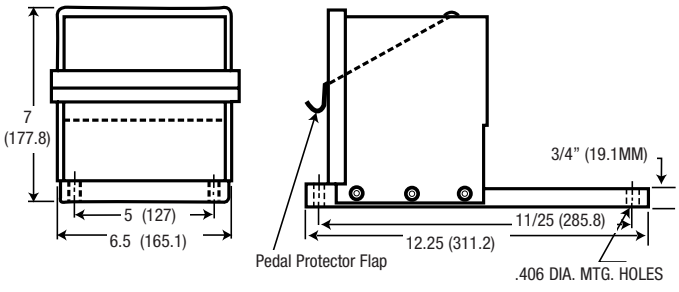
13111	Plastic, Black
119243	Metal, Plain
119244	Metal, Red
119245	Metal, Green
MP3651-7	Plastic, Red


20965-1

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

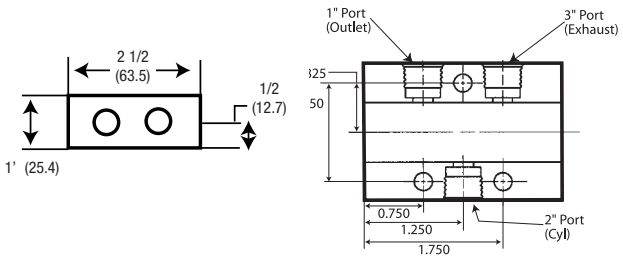


NOTE: Not for use with treadle actuator

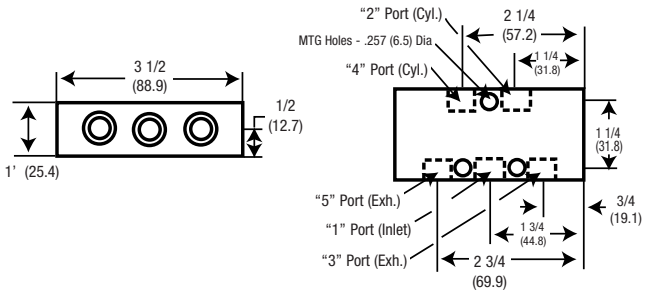
E Series

Dimensions Dimensions given in Inches and (Millimeters)

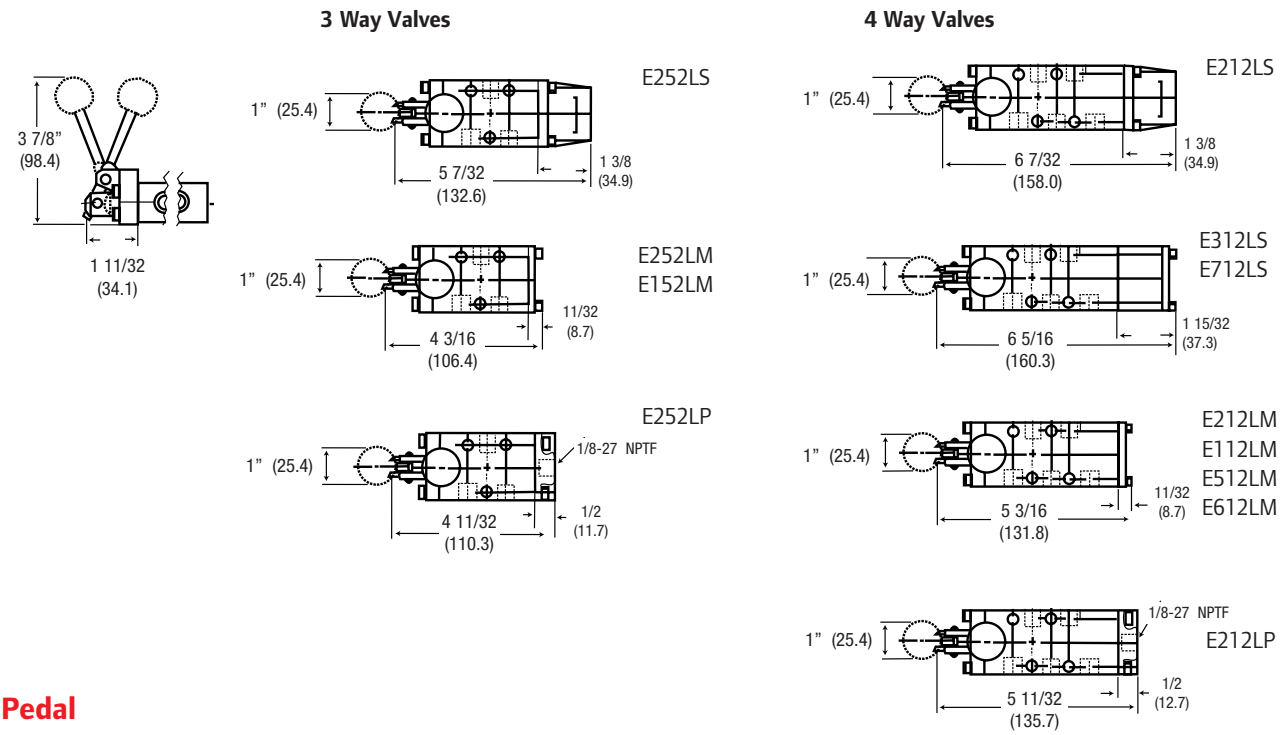
Basic 3-Way Valve



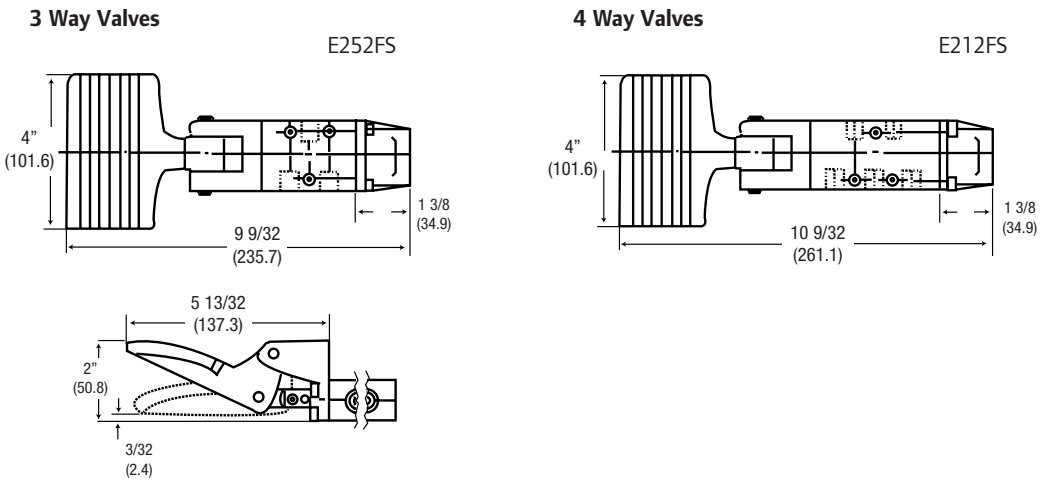
Basic 4-Way Valve



Hand Lever Valves

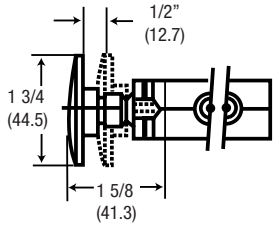


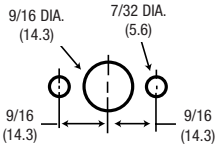
Pedal



E Series

Palm Button Valves



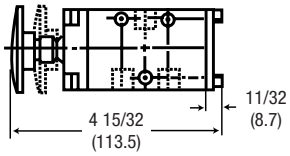


Palm Button Valves may be panel mounted. 1/8" Max. panel thickness utilizing two 10-24 UNC tapped holes in end cap

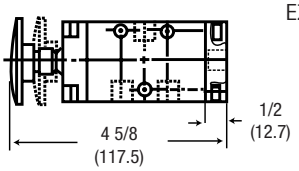
Not Available on detent models:

E152HM or -WM
E112HM or -WM

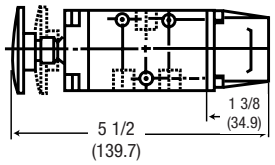
3 Way Valves



E252HM or -WM
E152HM or -WM

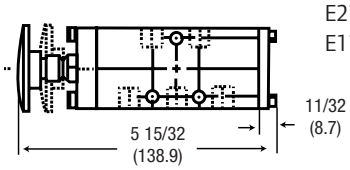


E252HP or -WP

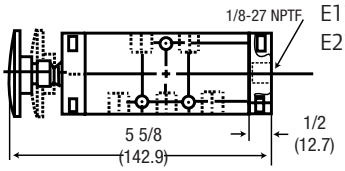


E252HS or -WS

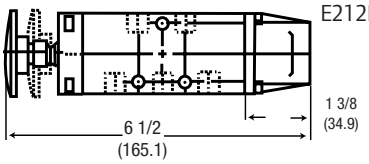
4 Way Valves



E212HM or -WM
E112HM or -WM

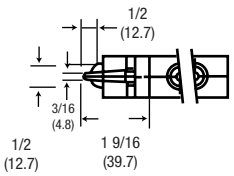


E112HP or -WP
E212HP or -WP

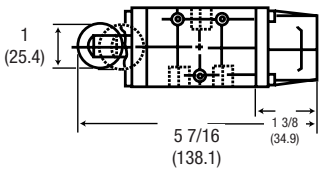


E212HS or -WS

Roller Cam Valves

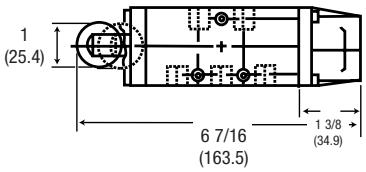


3 Way Valves



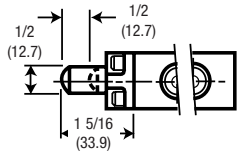
E252RS

4 Way Valves

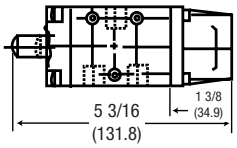


E212RS

Cam Stem Valves

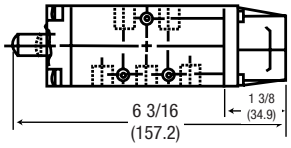


3 Way Valves



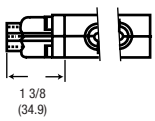
E252CS

4 Way Valves

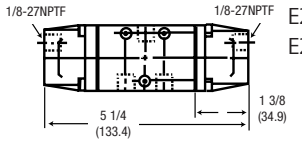


E212CS

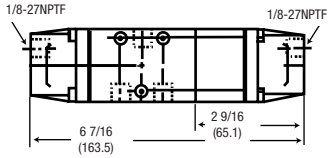
Pilot Valves



3 Way Valves

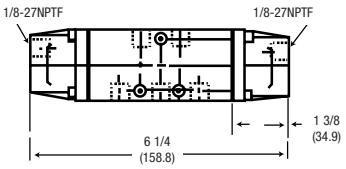


E252PS
E252PD

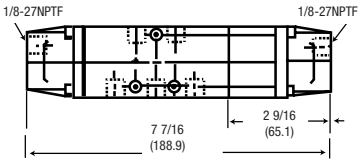


E152PD

4 Way Valves



E212PS
E212PD

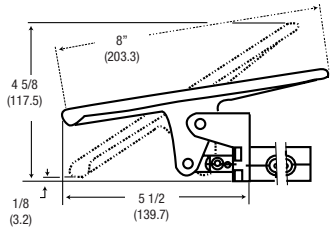


E112PD
E312PD
E712PD

E Series

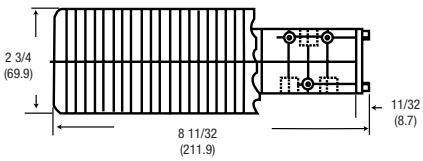
Dimensions Dimensions given in Inches and (Millimeters)

Treadle Valves



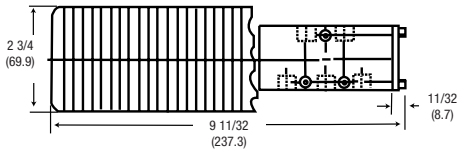
3 Way Valves

E252TM

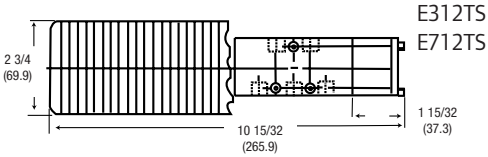


4 Way Valves

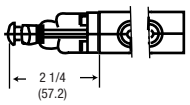
E212TM



E312TS
E712TS

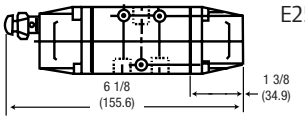


Bleed Valves

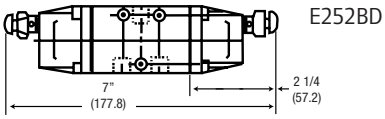


3 Way Valves

E252BS

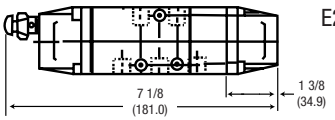


E252BD

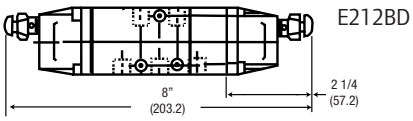


4 Way Valves

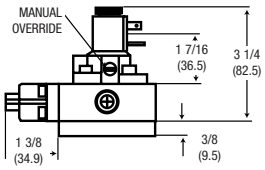
E212BS

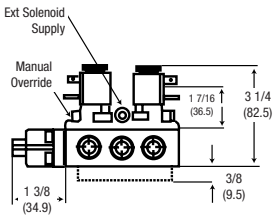


E212BD

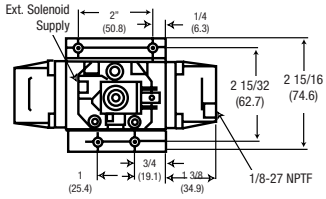


Solenoid Valves



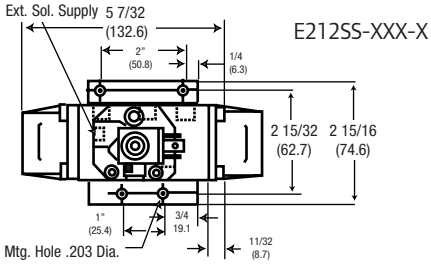


3 Way Valves

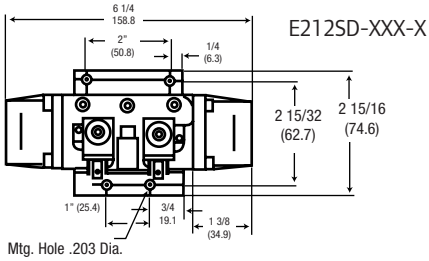


E252SN-XXX-X
E252SS-XXX-X

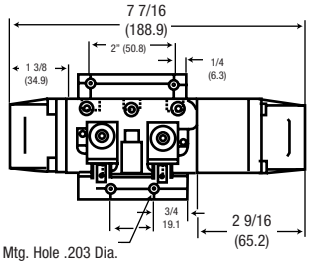
4 Way Valves



E212SS-XXX-X



E212SD-XXX-X

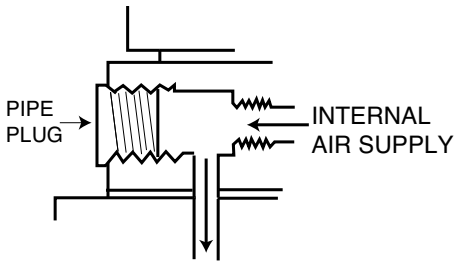


E312SD-XXX-X
E712SD-XXX-X

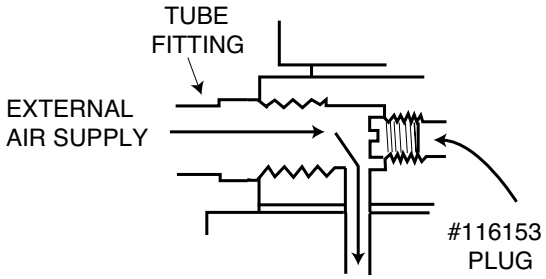
Accessories

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

K Series

Features

Several Styles and Options

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

Numerous Actuator Styles

Manual	Electric	Pneumatic
Hand Lever	Single Solenoid	Pilot
Palm Button	Double Solenoid	Bleed
Pedal		
Treadle		

Comprehensive Valve Design

Aluminum Body

Sand cast aluminum body provides a rugged, reliable valve.

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.

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.

Standard Solenoid Override Feature

3/8″ and 1/2″ models only.

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

K Series

Ordering

Position	1	2	3	4	5		6		7
Example:	K	X	1	X	XX	-	XXX	-	X

Position 1 Body Style	Position 2 Valve Type	Positon 3 Body Style	Positon 4 Port Size	Positon 5 Actuation/Return*	Positon 6 Coil Volage	Positon 7 Current Type
K K Series	**2** 2 Position **3** 3 Position Spring Centered **5** 3 Position Detent (3 & 5, all ports blocked in neutral) **6** 3 Position Detent (inlet ports blocked, cylinder ports open in neutral) **7** 3 Position Spring Centered (6 & 7, inlet ports blocked, cylinder ports open in neutral)	**1** 4 Way Side Ported	**3** 3/8″ NPT **4** 1/2″ NPT **6** 3/4″ NPT **8** 1″ NPT	**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.	**000** No coil **012** 12V AC or DC **024** 24V AC or DC **120** 120V AC or DC **240** 240V AC only Required only when ordering Solenoid Valves.	**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. 69 for coil & connector information.

Performance Specifications

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.

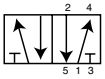
Flow & Cv Factor:

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

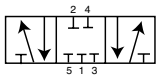


20965-X Foot Pedal Guards, for use with Pedal Style valves. See Pg. 43 (bottom) for details.

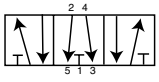
	Pressure Range PSI (Bar)	Minimum Pilot Pressure PSI (Bar)
Manual Actuators		
Manual, Spring, and Pilot	0-150 (0-10.4)	20 (1.4)
Mechanical Actuators		
Manual, Spring, and Pilot	0-150 (0-10.4)	20 (1.4)
Electric Actuators		
Spring Return	50-150 (3.5-10.4)	
Spring Centered Return	60-150 (4.1-10.4)	
Solenoid Return	20-150 (1.4-10.4)	
Pneumatic Actuators		
Pilot/Spring Return	0-150 (0-10.4	50 (3.5)
Pilot/Spring Centered	0-150 (0-10.4	60 (4.1)
Pilot/Pilot Return	50-150 (3.5-10.4)	20 (1.4)
Bleed/Spring Return	50-150 (3.5-10.4)	
Bleed/Bleed	20-150 (1.4-10.4)	



2-Position



3-Position, inlet ports blocked

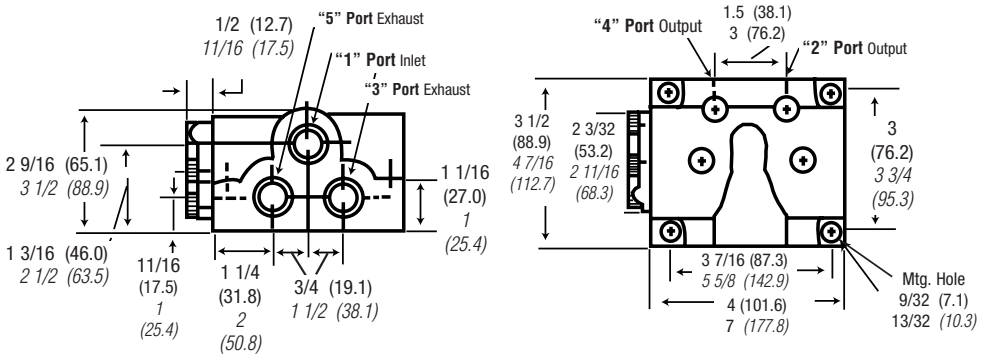


3-Position, inlet blocked, cylinder ports open

K Series

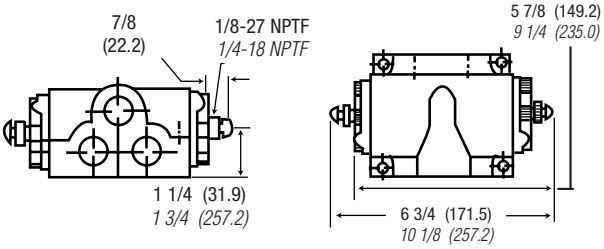
Dimensions Dimensions given in Inches and (Millimeters)

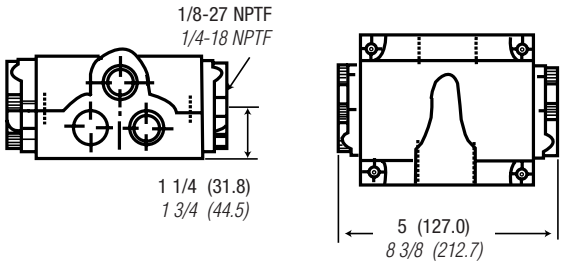
Basic Valves



Pilot and Bleed Valves

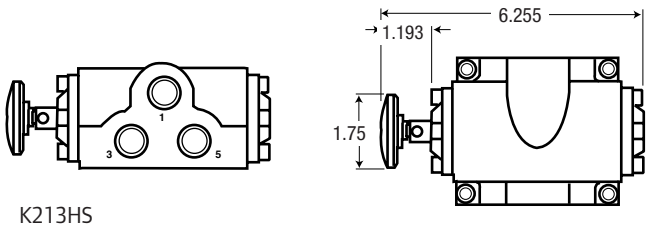
K2XXPS
K2XXPD
K3XXPD
K7XXPD





K21XBS Top Dimension = 3/8″ and 1/2″ Ports
K21XBD Bottom Dimensions = 3/4″ and 1″ Ports

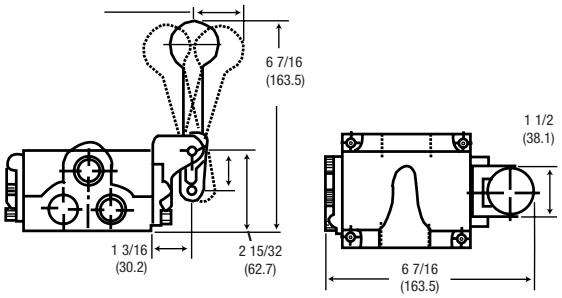
Palm Valves



K213HS

K Series

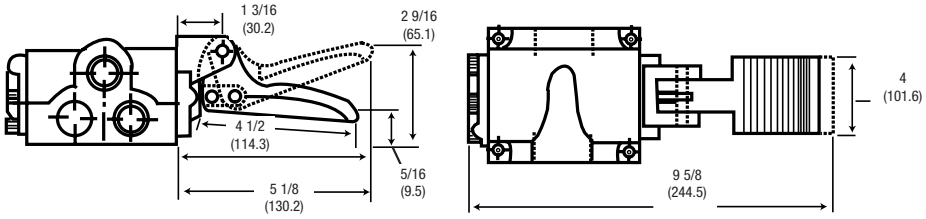
Hand Lever



K2XXLM
K3XXLM
K5XXLM
K6XXLM
K7XXLM
K2XXLS

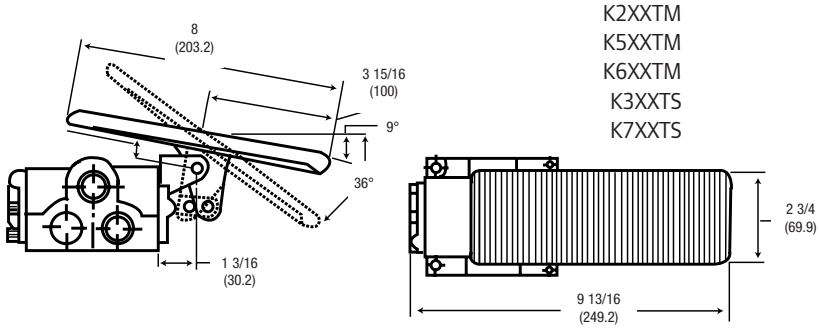
Top Dimension = 3/8″ and 1/2″ Ports
Bottom Dimensions = 3/4″ and 1″ Ports

Pedal



K2XXFS
K2XXFP

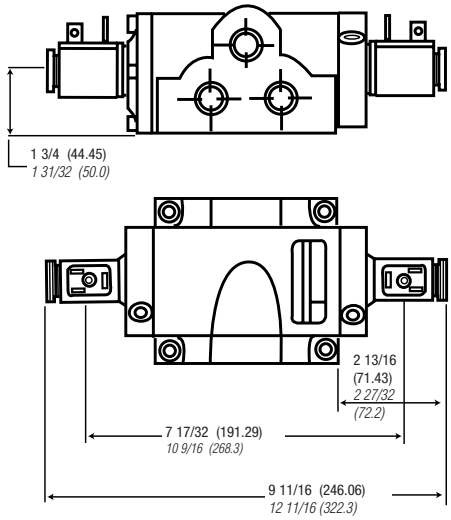
Treadle



K2XXTM
K5XXTM
K6XXTM
K3XXTS
K7XXTS

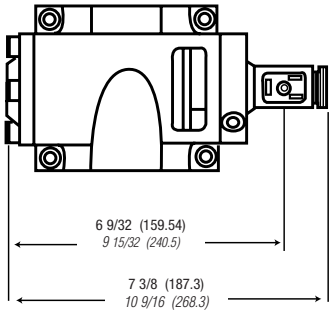
Solenoid

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

H Series

Features

Several Styles and Options

- H-Series Valves feature high-flow and fast response.
- 3-Way and 4-Way 2-position Poppet Valves
- Override is not available with "H" Series Valves

Numerous Actuator Styles

Electric	Pneumatic
3-Way Solenoid	3-Way Pilot
4-Way Solenoid	4-Way Pilot
	4-Way Pilot Bleed
	4-Way Manual Bleed

Comprehensive Valve Design

Durable Valve Body

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

Superior Performance

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

Superior Design

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





3-Way Pilot



3-Way Solenoid



4-Way Solenoid



Manual Bleed



Pilot Bleed



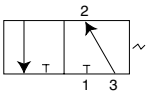
4-Way Pilot

H Series

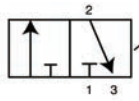
Ordering

Position	1	2	3	4	5		6		7
Example:	H	2	X	X	XX	-	XXX	-	X

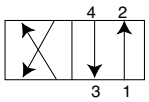
Position 1 Body Style	Position 2 Valve Type	Positon 3 Body Style	Positon 4 Port Size	Positon 5 Actuation/Return	Positon 6 Coil Volage	Positon 7 Current Type
H H Series	**2** 2 Position	**1** 4 Way Side Ported **5** 3 Way Side Ported	**2** 1/4″ NPT **3** 3/8″ NPT **4** 1/2″ NPT	**3-Way Valves** **PS** Pilot/Spring **SS** Solenoid/Spring **4-Way Valves** **BD** Manual Bleed/Manual Bleed **PA** Pilot/Internal Pilot **PD** Pilot/Pilot **SA** Solenoid/Internal Pilot **SD** Solenoid/Solenoid Numbering ends here if a Non-Solenoid valve is being selected.	**000** No coil **012** 12V AC or DC **024** 24V AC or DC **120** 120V AC or DC **240** 240V AC only Required only when ordering Solenoid Valves.	**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. 69 for coil & connector information.



3-Way, 2-Position N.O.



3-Way, 2-Position N.C.



4-Way, 2-Position

Performance Specifications

Valve Performance Data

Actuator	Return	Pressure Range PSI (bar)	Minimum Pilot Pressure PSI (bar)
3-Way Valves			
Pilot	Spring	30-150 (2.1-10.4)	30 (2.1)
Solenoid	Spring	30-150 (2.1-10.4)	
4-Way Valves			
Pilot	Internal Pilot	20-150 (1.4-10.4)	20 (1.4)
Manual Bleed	Manual Bleed	20-150 (1.4-10.4)	
Pilot Bleed	Pilot Bleed	20-150 (1.4-10.4)	20 (1.4)
Solenoid	Internal Bleed or Solenoid	25-135 (1.7-9.3)	

Flow SCFM

Port Size	Side Ported	Cv Factor
3-Way Valves		
1/4″	55	1.51
3/8″	81	2.27
1/2″	85	2.40
4-Way Valves		
1/4″	50	1.40
3/8″	88	2.38
1/2″	100	2.80

Response Time @ 100 PSI

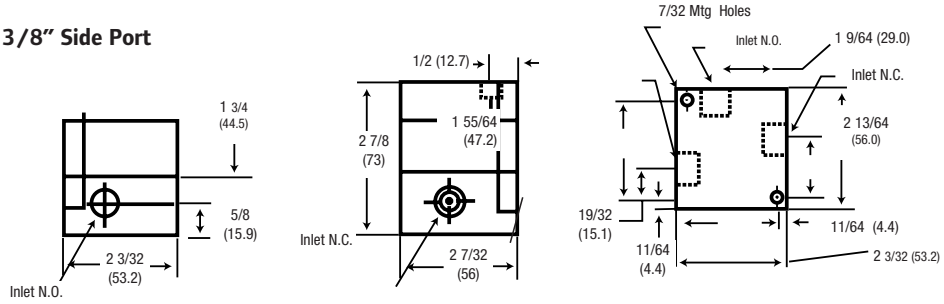
Energized	De-energized
3-Way Valves	
N.O. - 23 ms	20 ms
N.C. - 22 ms	26 ms
4-Way Valves	
44 ms	27 ms

H Series

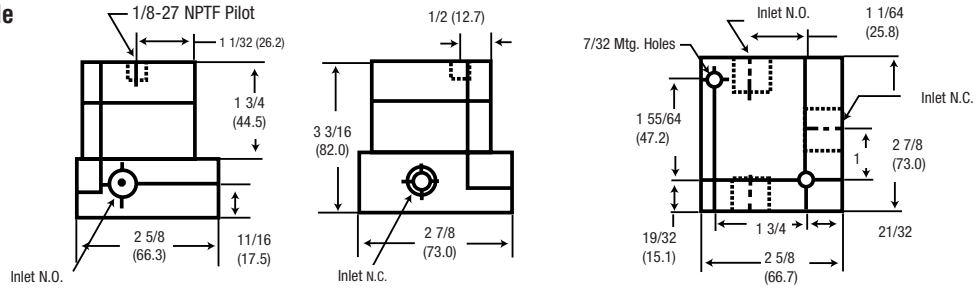
Dimensions Dimensions given in Inches and (Millimeters)

3-Way Basic Valves

1/4" and 3/8" Side Port

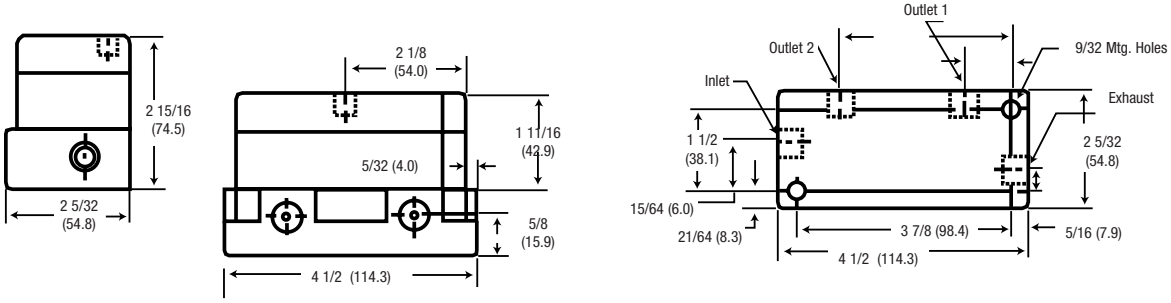


1/2" Side Port

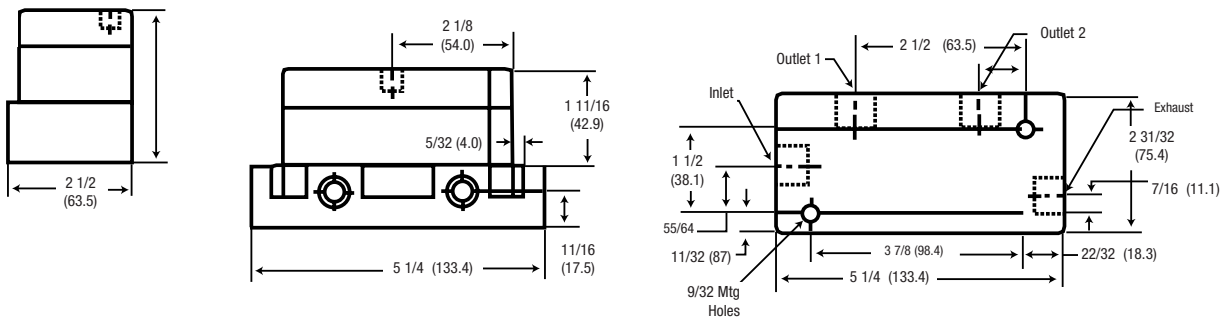


4-Way Basic Valves

1/4" and 3/8" Side Port



1/2" Side Port

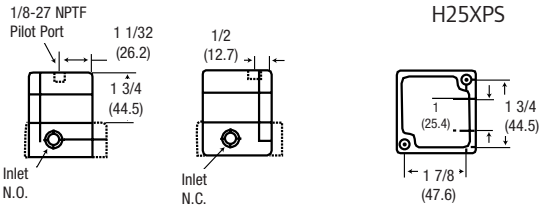


H Series

Dimensions Dimensions given in Inches and (Millimeters)

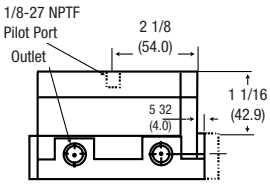
Pilot Valves

3-Way Pilot

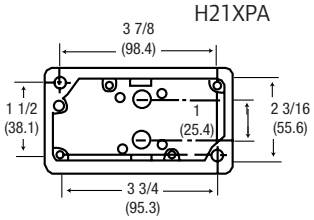


H25XPS

4-Way Pilot

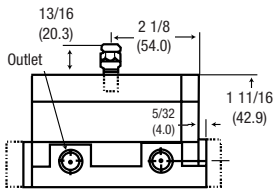


H21XPA

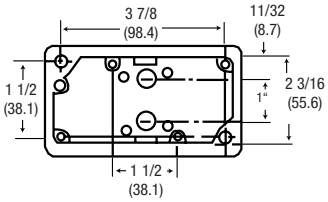


Bleed Valves

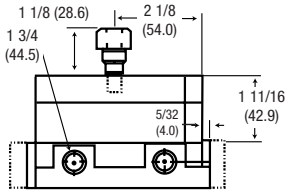
4-Way Manual Bleed



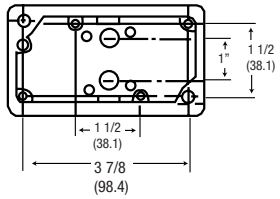
H21XBD



4-Way Pilot Bleed

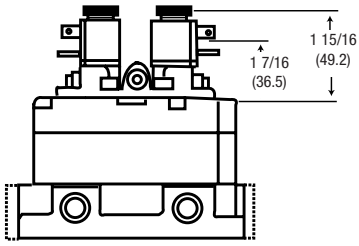


H21XPD

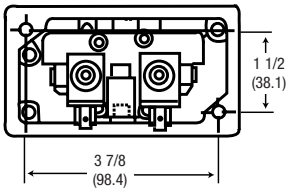


Solenoid Valves

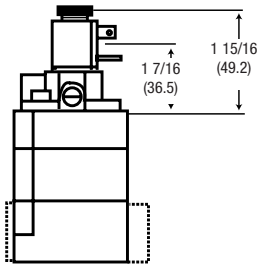
4-Way Double Solenoid



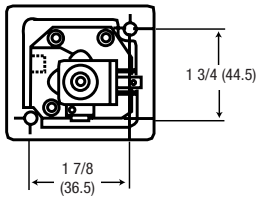
H21XSD-XXX-X



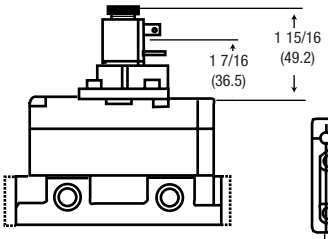
3-Way Single Solenoid



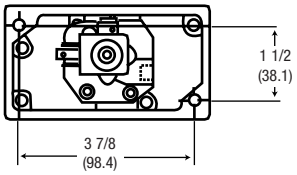
H25XSS-XXX-X



4-Way Single Solenoid



H21XSA-XXX-X



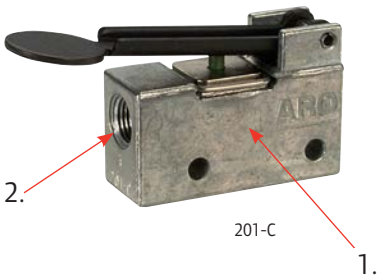
200 Series

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:

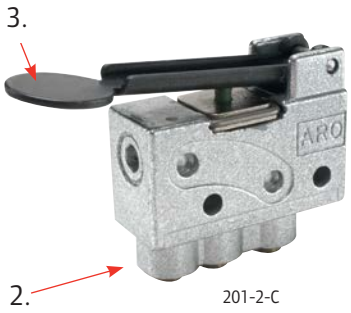
Mechanical		Manual
Short Roller Lever	Short Ball Roller	Plain Lever
Long Roller Lever	Long Ball Roller	Fingertip Lever
One-Way, Short Lever	Straight Plunger	Centering Toggle
One Way, Long Lever	Roller Plunger	Retained Toggle
Pin Plunger	Cross-Roller Plunger	Panel Button



201-C

Comprehensive Valve Design

1. **Durable Valve Body**
   Body is die cast zinc for high wear resistance. Valve also features a stainless steel, PTFE 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.



201-2-C

Performance Specifications

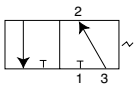
Pressure Range: 30 to 150 PSIG (2.1 to 10.4 bar)
Temperature Range: 32˚ to 160˚ F (0˚ to 71˚ C)
Flow & Cv Factor:
1/8″ Ports: 7.5 SCFM, Cv = .195
5/32″ (4mm) Tube Fittings: 4.0 SCFM, Cv = .104

206-C Minimum Pilot Pressure PSIG (bar)

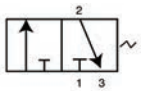
Supply Pressure	25 (1.7)	50 (3.4)	75 (5.1)	100 (6.9)	125 (8.6)	150 (10.4)
Piped IN - N.N.P.	11.5 (.8)	12.0 (.8)	12.5 (.9)	13.0 (.9)	13.5 (.9)	14.0 (1.0)
Piped IN - N.P.	14.5 (1.0)	17.0 (1.2)	19.5 (1.3)	22.0 (1.5)	24.5 (1.7)	27.0 (1.9)

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)



Normally Passing



Normally Non-Passing

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


296 Actuator

212-2 Valve

200 Series

Ordering

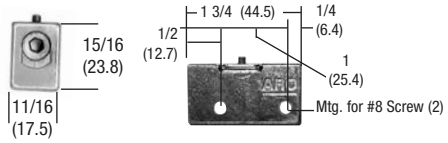
Position	1	2		3
Example:	2	XX	-	X

Position 1 Series	Position 2 Actuator Type		Position 3 Port Type
2 200 Series	**00** Plain Lever	**12** Short Ball Roller	**C** 1/8" NPTF Ports
	01 Fingertip Lever	**13** Long Ball Roller	**2-C** 5/32" Tubing Ports
	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	

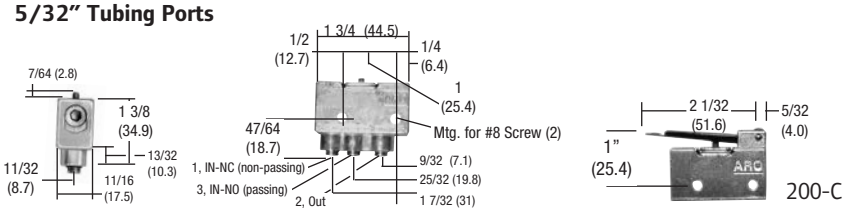
Dimensions Dimensions given in Inches and (Millimeters)

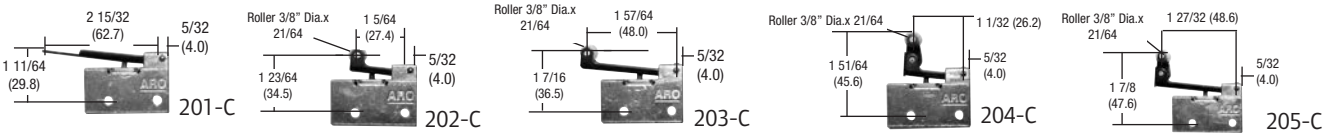
Basic Valves

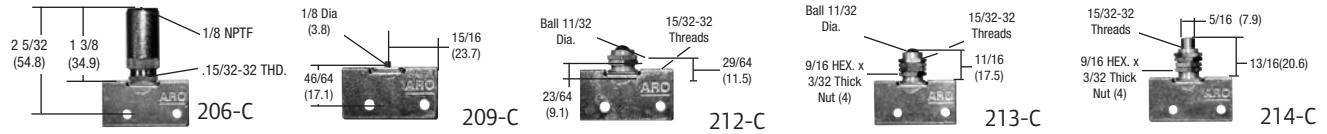
1/8" NPT Ports

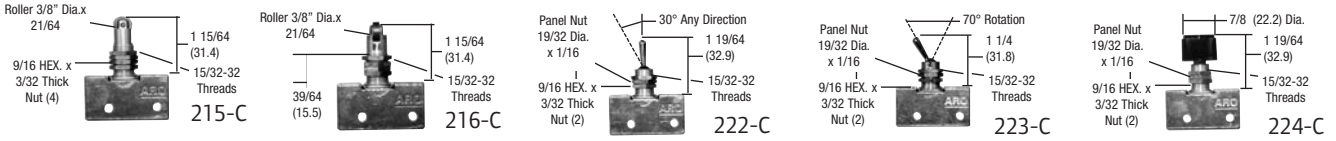


5/32" Tubing Ports







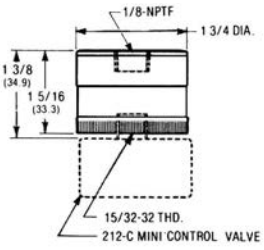


Low-Pressure Pilot Actuator Switch

- 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.



20368



Supply Pressure	Minimum Pilot Pressure PSIG (bar)					
	25 (1.7)	50 (3.5)	75 (5.2)	100 (6.9)	125 (8.6)	150 (10.4)
Piped IN-N.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)

100 Series

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 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.



103-2-A



105-2-A



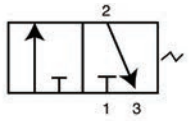
109-2-A

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

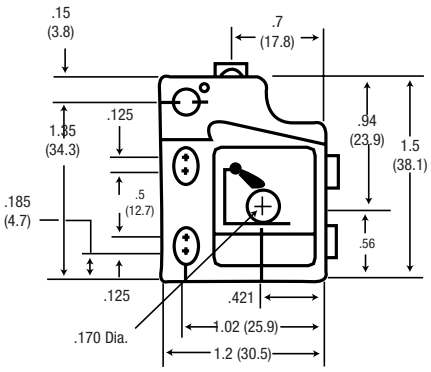
Ordering

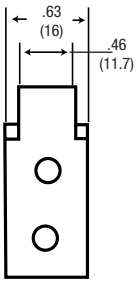
Model No.	Port Size	Actuator Type
103-2-A	5/32″ Tube	Roller Lever
105-2-A	5/32″ Tube	90° Roller Lever
109-2-A	5/32″ Tube	Straight Plunger

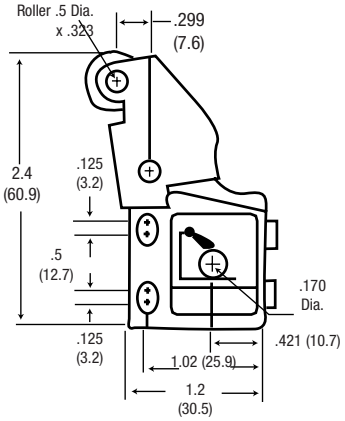


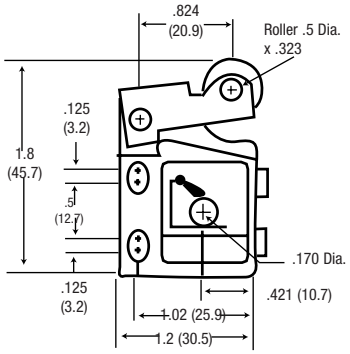
Normally Non-Passing

Dimensions Dimensions given in Inches and (Millimeters)









MaxAir

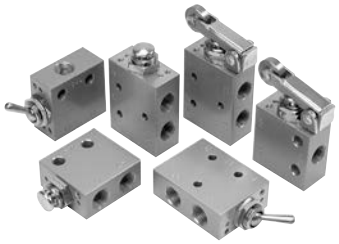
Features

MaxAir 3-Way & 4-Way, 1/8" Manual & 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.



M251PS M211PS



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

Accessories

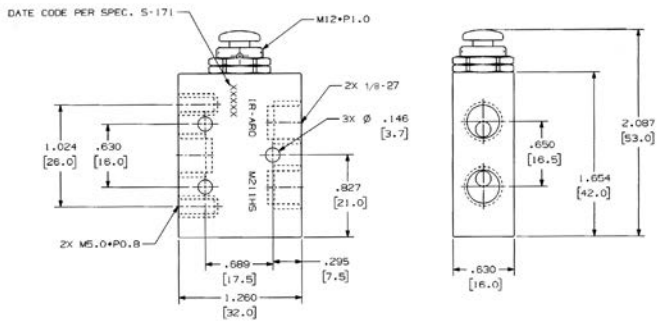
Attachments for use on M251HS & M211HS Valves

104484	One-way roller lever
104485	Ball plunger attachment
104486*	Air pilot attachment
104487	Finger button attachment
M251PS	3-Way
M211PS	4-Way

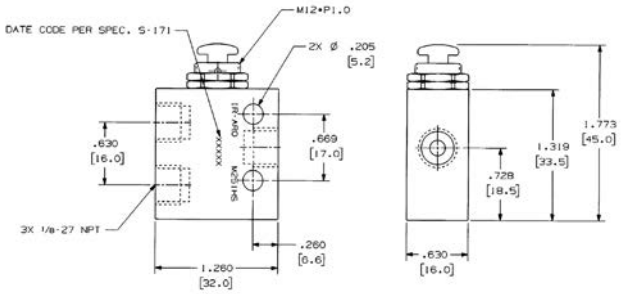
*Air pilot attachment can be ordered with valve

Dimensions Dimensions given in Inches and (Millimeters)

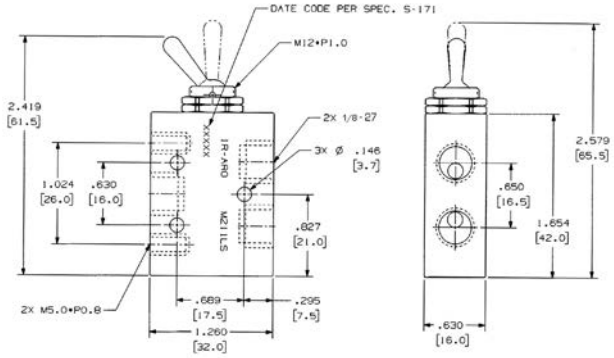
M211HS 4-Way, Push Button, Spring Return**



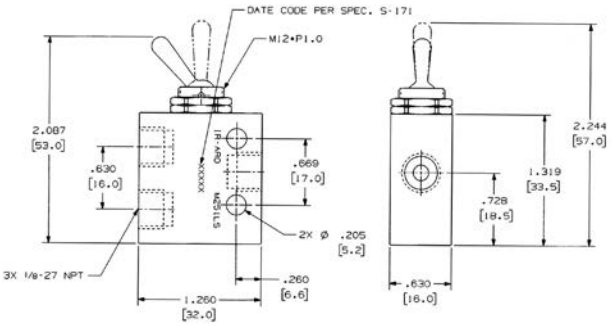
M251HS 3-Way, Push button, Spring Return**



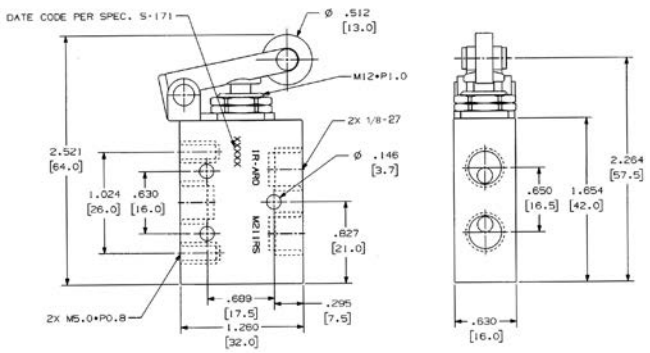
M211LS 4-Way, Toggle, Maintained



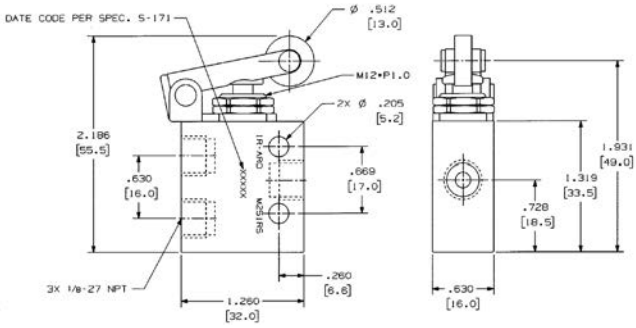
M251LS 3-Way, Toggle, Maintained



M211RS 4-Way, Roller, Spring Return



M251RS 3-Way, Roller, Spring Return



** Accessories can be mounted on push button valves for additional actuating styles

400 Series

Features

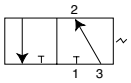
3-Way Limit Valves

- 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 Lever.
  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.

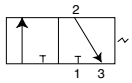


Performance Specifications

Pressure Range: 30 to 150 PSIG (2.1 to 10.4 bar)
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
Actuator Force: 447 - 1.6 lbs.
448 - 1.6 lbs.
449 - 0.5 lbs.
450 - 0.8 lbs.
Actuating Torque: 2.4 in. lbs.
119605 Side Plate Cover-used to cover body cavities.



Normally Passing



Normally Non-Passing

Ordering

Valves

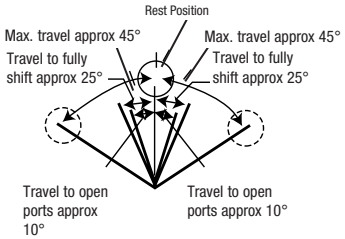
1/8″ Ports	Tube Fittings	Valve Action
400-A	**400-1-A**	One Way, Clockwise
401-A	**401-1-A**	One Way, Counterclockwise
402-A	**402-1-A**	Clockwise & Counterclockwise

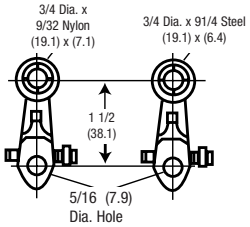
Actuators

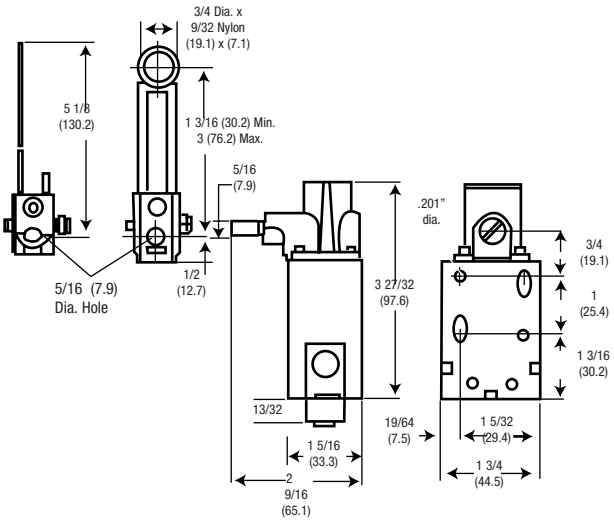
Code	Description
447	Nylon Roller
448	Steel Roller
449	Rod Lever
450	Adjustable Roller

Dimensions Dimensions given in Inches and (Millimeters)

400 Series







460 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″ NPTF 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.



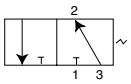
460-X



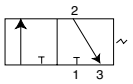
461-X with 20975 Guard



461-5 with 119244 Button



Normally Passing



Normally Non-Passing

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
Actuator Force:	3 lbs.	

Ordering

Position	1	2		3
Example:	46	X	-	X

Position 1 Series	Position 2 Port Typee	Position 3 Button Color
46 460 Series	**0** 1/8″ NPT **1** 5/32″ Tubing	**1** Black **2** Red **3** Green **4** Yellow **5** Valve W/O Button (Order button for 7/16″-20 TH'd separately)

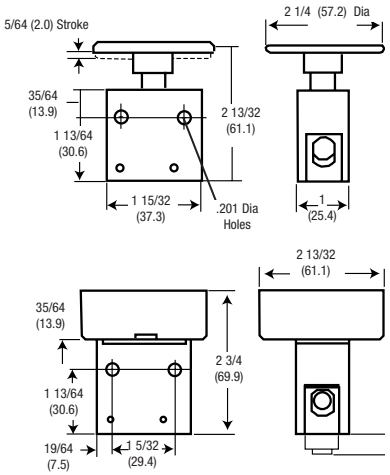
Accessories

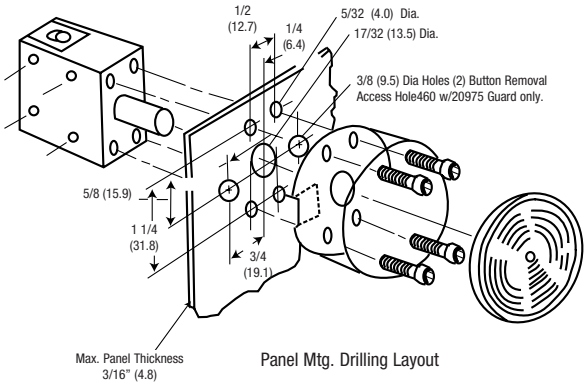
20975 Button Guard	**† 13111**	Plastic, Black
***20973-1 Black Button**	**†119243**	Metal, Plain
***20973-2 Red Button**	**†119244**	Metal, Red
***20973-3 Green Button**	**†119245**	Metal, Green
***20973-4 Yellow Button**	**†MP3651-7**	Plastic, Red

* Tolerance ring 20972 must be ordered with accessory buttons. (Replacement buttons for -1, -2, -3, -4 options only.)
† (Buttons for -5 models only)

Dimensions Dimensions given in Inches and (Millimeters)

460 Series





Panel Mtg. Drilling Layout

Bleeder, Quick Exhaust, Relay Valves

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)


24130


24135

Pilot Bleeder Valve - 9600

- 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)


9600

Quick Exhaust Valves

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


EV30-A

Single Pulse Relay Valve - PR10

- 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.


PR10

Performance Specifications and Ordering

Button Bleeders

Model Number	Description
24130	1/2″ (12.7) Dia. Head
24135	1 1/8″ (28.6) Dia. Head

Quick Exhaust Valves

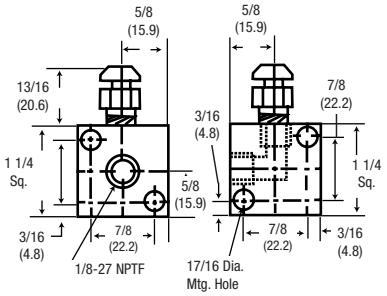
Model Number	Inlet Port	Cyl. Port	Exh Port	Pres Range PSI (bar)
EV 125	1/8"	1/8"	1/4"	1-125 (.07-8.6)
EV 250	1/4"	1/4"	3/8"	1-125 (.07-8.6)
EV 375	3/8"	3/8"	3/8"	1-125 (.07-8.6)
EV 30-A	1/2"	1/2"	3/4"	5-125 (.35-8.6)
EV 35-A	3/4"	3/4"	3/4"	5-125 (.35-8.6)

Single Pulse Relay Valve - PR10

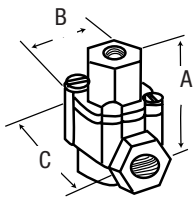
Supply PSIG Press. (bar)	Pulse Duration	Reset Time
50 (3.5)	125ms	300 ms
75 (5.2)	110ms	300 ms
100 (6.9)	105ms	300 ms
125 (8.6)	100ms	300 ms

Dimensions Dimensions given in Inches and (Millimeters)

Button Bleeders

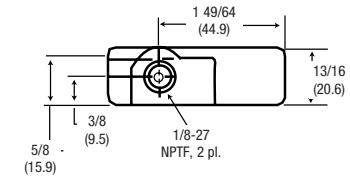


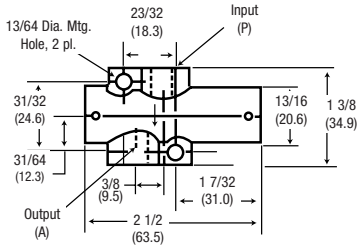
Quick Exhaust Valves



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 - PR10





Circuitry Valves

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.



SV20-C

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

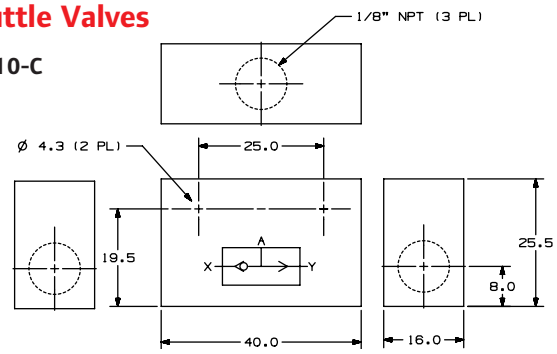


20467

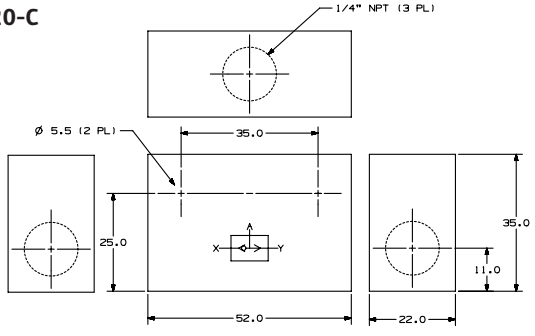
Dimensions Dimensions given in Inches and (Millimeters)

Shuttle Valves

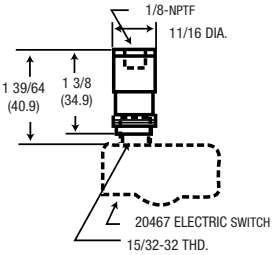
SV-10-C

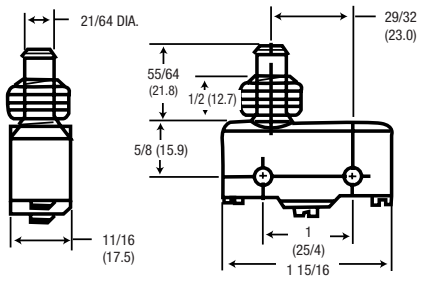


SV-20-C



Microswitch





Circuitry Valves

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.
- 300 PSI Max.



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

Circuitry Valves

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

Performance Specifications and Ordering

Maximum Pressure: 200 PSI (13.8 bar)

Temperature 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

Flow Controls

Features

- 360° swivel eases tube alignment. Preapplied thread sealant.
- 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.

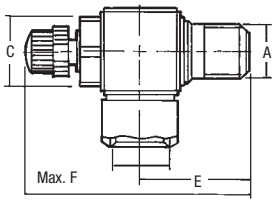


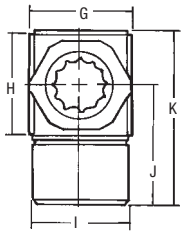
119307-375 119307-250 119309-125 119309-103 119308-125

Ordering

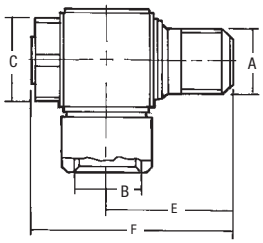
Slotted Adjust		Knob Adjust	
119307-XXX Male x Female thd	**119309-XXX** Male thd x fitting	**119308-XXX** Male x Female thd	**119310-XXX** Male thd x fitting
XXX Male x Female	XXX Male x Tubing	XXX Male x Female	XXX Male x Tubing
103 10-32x10-32	**103** 10-32 x 5/32″	**125** 1/8″ x 1/8″ NPT	**120** 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″		

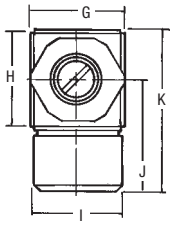
KNOB ADJUST

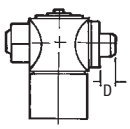




SLOTTED ADJUST

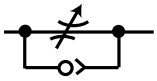


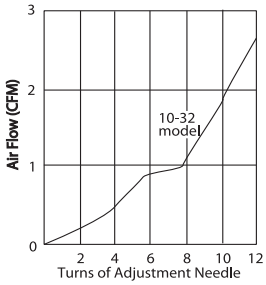


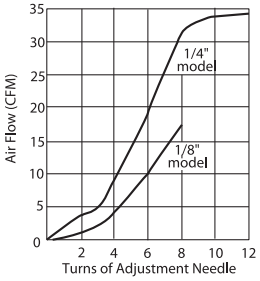


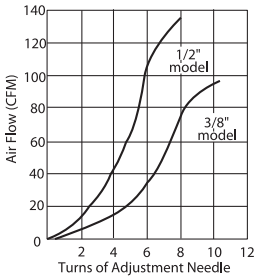
Performance Specifications

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









Dimensions Dimensions given in Inches and (Millimeters)

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

Flow Controls

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.

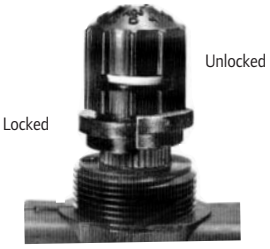


Ordering

Position	1		2	3
Example:	104104	-	X	XX

Position 1 Series	Position 2 Valve Type	Position 3 Port Size
104104	**C** Check Valve **F** Flow Control **N** Needle Valve	**01** 1/8-27 NPTF **02** 1/4-18 NPTF **03** 3/8-18 NPTF **04** 1/2-14 NPTF **06** 3/4-14 NPTF *** S2** 1/4-18 NPTF Stainless Steel inserts & stem * Available on needle valve only.

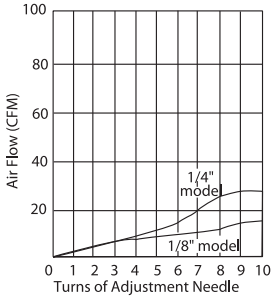
Panel Mounting Nuts	Port Size
104096	1/8" & 1/4"
104094	3/8", 1/2" & 3/4"

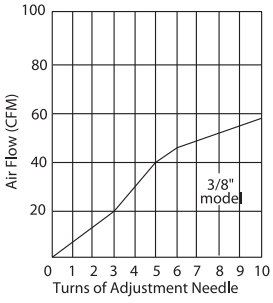


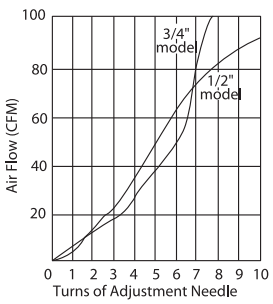
Tamper Resistant Lock Ring

Performance Specifications

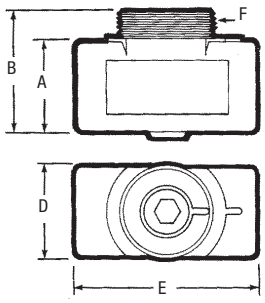
Operating Pressure: 200 PSI (13.8 bar)
Operating Temperature: 0° - 200°F (-18° - 93°C)
Flow: 100 PSI Inlet



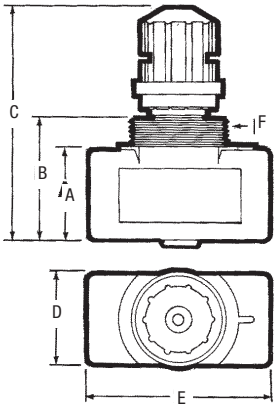




Check Valve



Flow and Needle Valve



Dimensions Dimensions given in Inches and (Millimeters)

Model	Port* NPT(F)	A inches (mm)	B inches (mm)	C inches Min.	C inches 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

Flow Controls

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 and plugs are machined from brass stock.
- Cracking Pressure
  CP10 - 1-1/2 PSI
  CP20 - 1-1/2 PSI


F20-BK


CP20-B


N10-BK

Ordering

In-Line, Brass

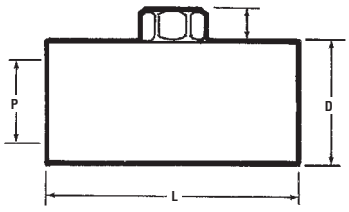
Replace the "XX" with valve number corresponding to port size desired.
Example: F10-BK
Flow Control Valve
1/8" Ports

Model	Valve No. (XX)	NPTF Port	PD Hex	E	L	G
FXX-BK NXX-BK CPXX-B*	**10**	1/8	11/16	1-1/4	1-1/2	9/32
	20	1/4	7/8	1-1/4	2	5/16
	25	3/8	1-1/16	1-3/8	2-1/4	11/32
	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

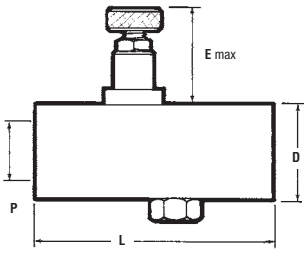
* available in 1/8" and 1/4" only

Dimensions Dimensions given in Inches and (Millimeters)

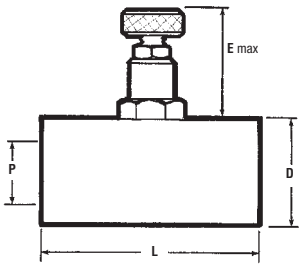
In-Line, Brass



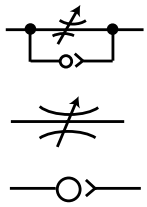
CPXX-B



FXX-BK



NXX-BK



Solenoid Accessories

Features

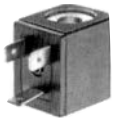
Coils

- 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	Code / Voltage
31 = 12V AC	38 = 24V AC or 12V DC (22mm Coils only)
33 = 120V AC	39 = 24V DC
35 = 240V AC	


115046-XX


115064-XX


116218-XX


116647-XX


119690-XX


119416 Side exhaust coil nut.


117345-XX ATEX

Connectors

- Protect electrical connections from humidity and moisture. Meet NEMA 4 classifications
- Each is it's 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 (30mm wide)


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.
12 and 24V DC only. Used only on valves ordered as low wattage.

116218-XX Standard Coil cURus listed (NEMA 4, 22mm)
AC or DC DIN coil for use with 3-prong connectors.

116647-XX Coil with Molded Leads cURus listed (NEMA 4, 22mm)
AC or DC lead wire coil with 18" molded leads. No solenoid connector needed.

***119690-XX Oversize (NEMA 4, 30 mm)**
High Flow Cat Valve and 2-way Valve coil.
Available in -32, -33, -35, -38 and -39 voltages

117345-XX ATEX
- NEC/CEC: Class I & II, Div 1 & 2, Group A-D
- ATEX: Zone 1&2, 21&22

* NOTE: -38 option is 12 VDC only on 30mm coils. 24 VAC is not available
See Page 70 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 & intrinsically safe Genesis Valves

CDW-30	Connector with wire.
CSN-30	Connector, strain relief.
CHW-30	Connector, molded cable.

Voltage XXX)	
012 = 12V AC/DC	**120** = 120V AC
024 = 24V AC/DC	**240** = 240V AC/DC

Solenoid Accessories

Performance Specifications

Coils

Voltage Operating Ranges

Coil Voltage Ratings	Operating Range ±10% AC	DC
12	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
12 DC	0.38	4.8
24 DC	0.20	4.8
120 DC	0.04	4.8
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) Inrush	Holding	50/60 Hz Volt-Amps, 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

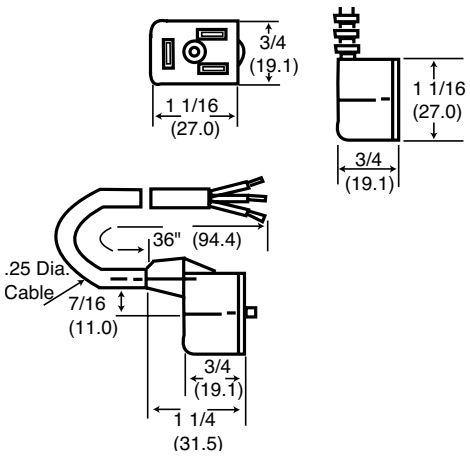
30 mm Coil Voltage Ratings

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

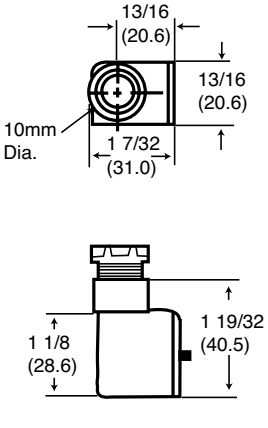
Dimensions Dimensions given in Inches and (Millimeters)

Connectors

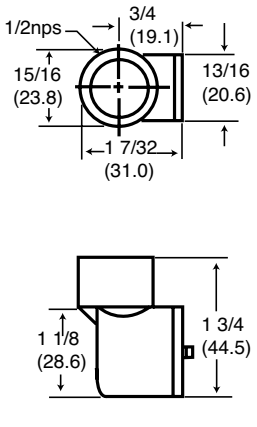
Straight Connectors



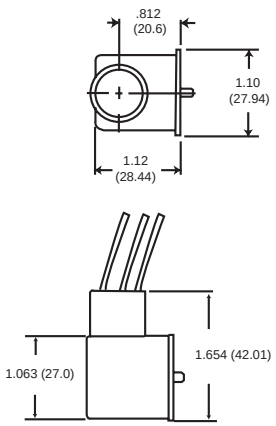
CSN 22 mm Strain Relief



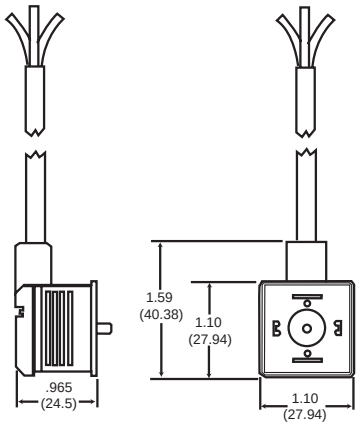
1/2″ Conduit Connector



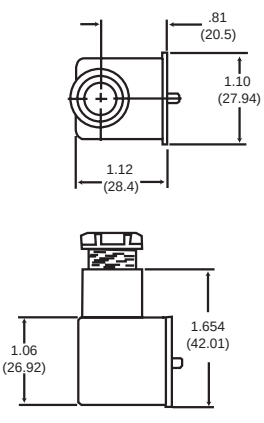
CDW-30



CHW-30



CSN-30 30 mm Strain Relief



Repair Kits

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**

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**

MaxAir Valves

Model	Repair Kit
M212LM	**RKM212-LM**
M212-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**

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**	**Solenoid Operator**	
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**

Repair Kits

Ordering

H-Series

Model	Repair Kit	Model	Repair Kit	Model	Repair Kit	Model	Repair Kit
H212BD	**7103**	H214PD	**7103**	H243SD-XXX-X	**7103**	**SOLENOID OPERATOR**	
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	**SOLENOID OPERATOR CONT.**	
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	K246PD	7010	K346PD	7010	K734PD	7006	K248SS-XXX-X	116579
K214FS	7006	K234SD-XXX-X	7006	K246PS	7010	K346SD-XXX-X	7010	K734LS	7006	K313SD-XXX-X	116578
K214LM	7006	K234SS-XXX-X	7006	K246RS	7012	K348PD	7010	K734SD-XXX-X	7006	K314SD-XXX-X	116578
K214LS	7006	K234TM	7006	K246SD-XXX-X	7010	K348SD-XXX-X	7010	K734TS	7006	K316SD-XXX-X	116579
K214PS	7006	K236BD	7010	K246SS-XXX-X	7010	K513LM	7007	K736PD	7010	K318SD-XXX-X	116579
K214PD	7006	K236BS	7010	K248BD	7010	K513TM	7007	K736SD-XXX-X	7010	K333SD-XXX-X	116578
K214RS	7008	K236PD	7010	K248BS	7010	K514LM	7007	K738PD	7010	K334SD-XXX-X	116578
K214SD-XXX-X	7006	K236PS	7010	K248PD	7010	K514TM	7007	K738SD-XXX-X	7010	K336SD-XXX-X	116579
K214SS-XXX-X	7006	K236RS	7012	K248PS	7010	K533LM	7007	K743LS	7006	K338SD-XXX-X	116579
K214TM	7006	K236SD-XXX-X	7010	K248RS	7012	K533TM	7007	K743SD-XXX-X	7006	K343SD-XXX-X	116578
K216BD	7010	K236SS-XXX-X	7010	K248SD-XXX-X	7010	K534LM	7007	K743TS	7006	K344SD-XXX-X	116578
K216BS	7010	K238BS	7010	K248SS-XXX-X	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	**SOLENOID OPERATOR**		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		

APLC

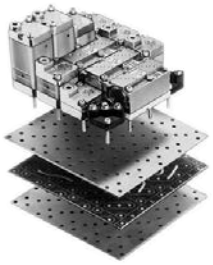
Features

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.



Individual Elements



Circuit Board Construction

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

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

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.

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: 30-125 PSI (2-9 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.

APLC - 2 Hand Anti-Tie-Down

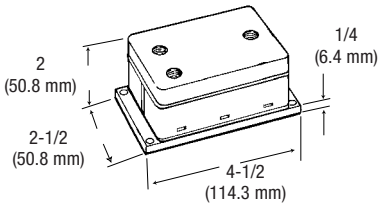
Features

2 Hand Anti-tie down (ATD)

- 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.

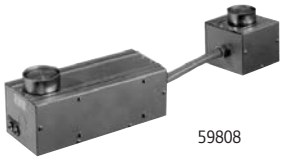




Elements

59191 Base Mounted

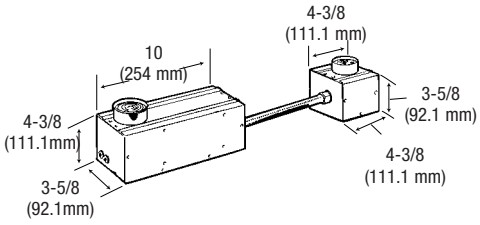
- Element has three 1/8" NPTF ports on top. 2 inputs, 1 output.
- Element is base mounted.
See page 101 for additional information



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.



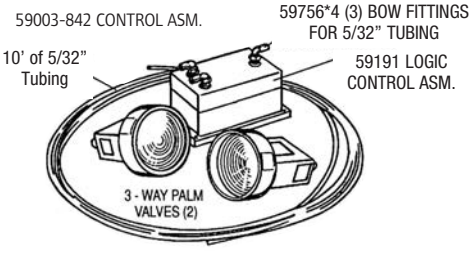
59809

- 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.



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.



APLC - Specialty Circut Blocks*

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 79 for additional information.



59860

59861 Oscillator Circuit

- Use in applications involving cycling and oscillating valves and cylinders for manufacturing and testing; as well as, pumping, sorting and 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 79 for additional information.



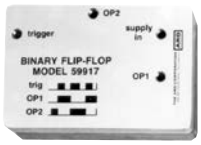
59861

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

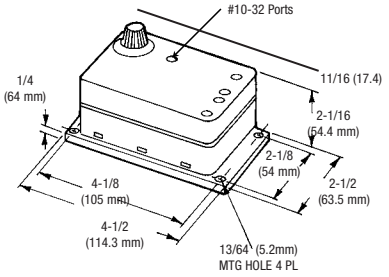
- With supply on, output one or output two will be on and the other off.
- Pressurizing the trigger port switches the outputs between on and off.

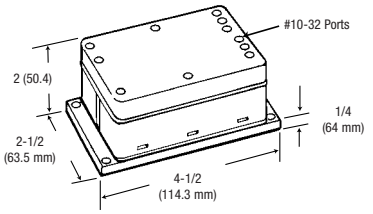
NOTE: All Flex-6 units have 10/32" ports.



59917

Dimensions for Base Mounted Units
Ports are 10/32 Threads





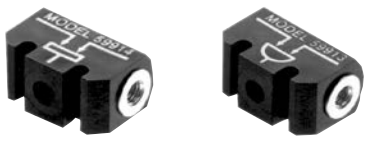
In Line Logic Elements

59914 "OR" Element

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

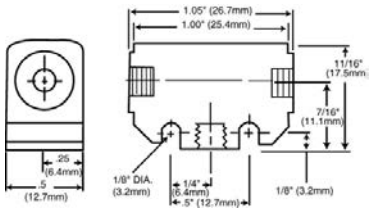
59913 "AND" Element

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



59914 59913

Operating Press: 30-150 PSIG (2-10 bar)
Operating Temp: 32°-160°F (0°-71°C)
Ports: #10-32 threads
Shuttle/Poppet: Buna N
Body Material: Acetal Resin
Inserts: Aluminum
Flow: "OR" = 4 SCFM, "AND" = 3.2 SCFM
Cv: "OR" = .11, "AND" = .09



* See page 79 for sample application circuits

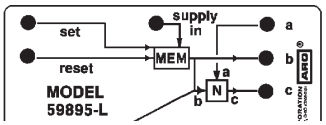
APLC - Flex 6

Features

Flex 6

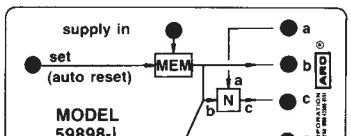
Designed to Control Sequential Type Machines

- 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)



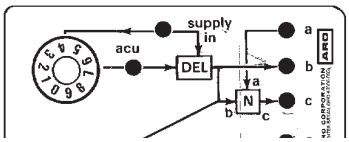
Set/Reset Memory

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

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

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 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.

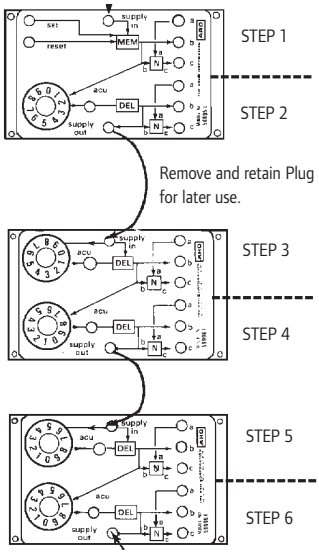
APLC - Flex 6

Set-up

Steps to Connecting Flex-6 Units

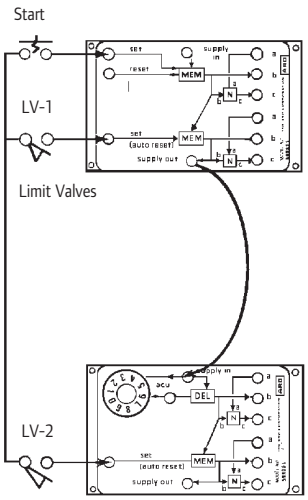
1. Arrange the units in the order and sequence they are used (steps 1 and 2 top, 3 and 4 next, etc.).
2. Connect a maintained supply to the "supply in" port of the first unit. Then connect the "supply out" of the first unit to the "supply in" of the second unit. Connect subsequent units in this manner. The last "supply out" port will remain plugged.

MAINTAINED SUPPLY



LAST SUPPLY OUT PORT REMAINS PLUGGED.

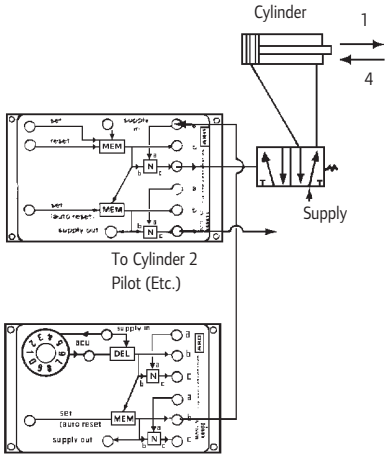
3. Connect the set input signals. The start signal and all other input signals are connected to the set ports of the units they will start.



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.

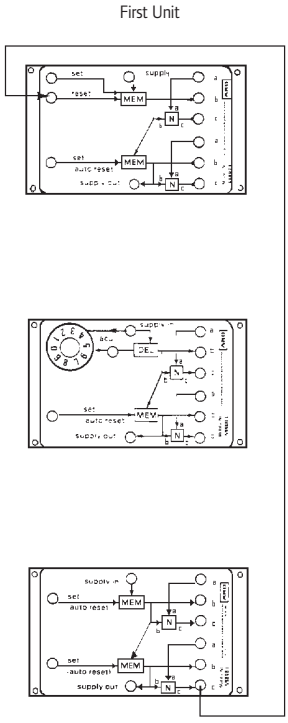
Example: Cylinder 1 extends in step 1 and retracts in step 4. The "C" port of step 1 is connected to a spring return pilot valve which extends the cylinder. The "B" port of step 4 is connected to the "A" port of step 1. This accomplishes the retract function.

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."

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.



The Last Step of the Sequence is to RESET the Circuit

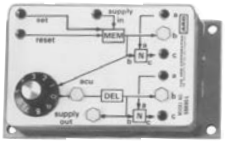
All Ports are 10/32

APLC - Flex 6

Features

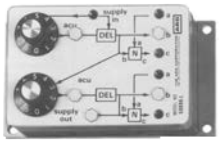
Flex 6 Individual Units

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.



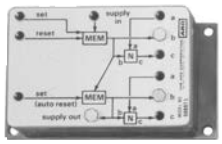
59895

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.



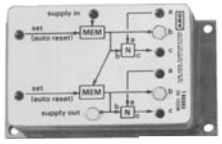
59896

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.



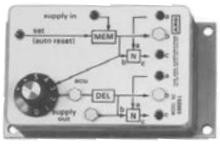
59897

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.



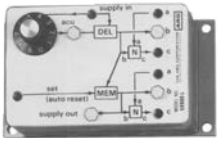
59898

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

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

APLC - Specialty Assemblies

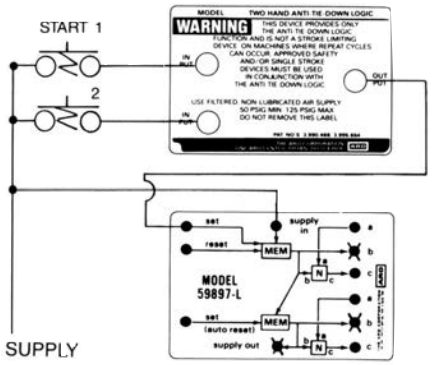
Features

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.

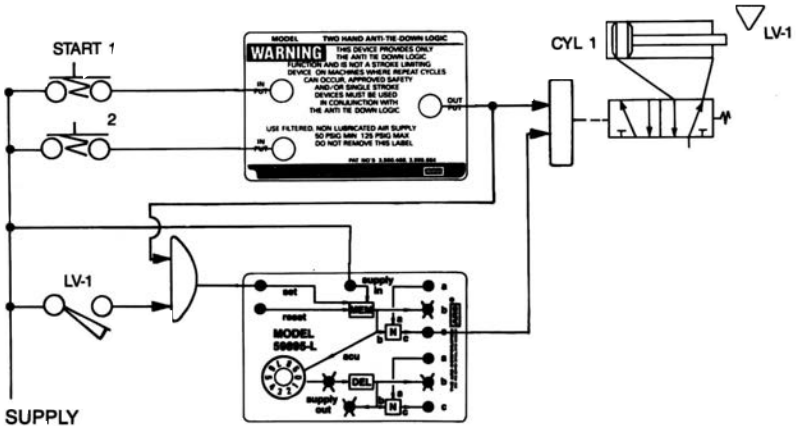
Two-Hand Ant-Tie-Down Model 59191

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 reactuated to start again.



The first drawing shows a two-hand anti-tie-down added to the start of a Flex-6 circuit.

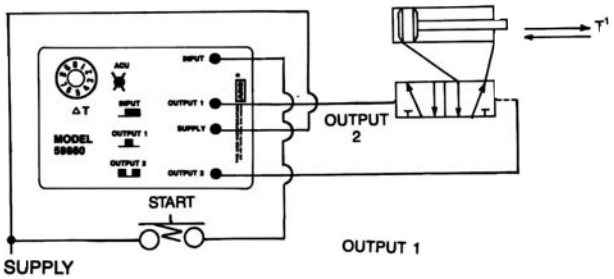
The second drawing shows a more complex circuit which is used to insure that the operator hold both buttons until cylinder 1 is fully extended. Once cylinder 1 is extended and actuates limit valve 1, the push buttons can be released and the machine will continue its automatic cycle.



The Signal Standardizer Model 59860

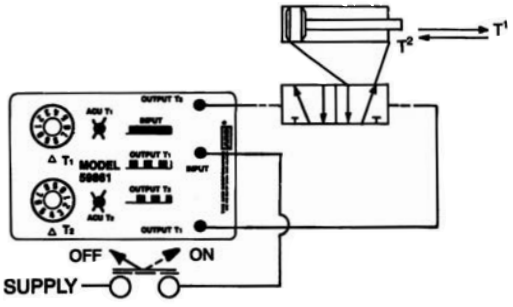
The 59860 signal standardizer (or signal shaper) can be used to convert a signal of any duration to outputs of a predetermined time period.

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^1 will come on. After an adjustable period of time (adjustable at timer T^1 output T^1 will go off and output T^2 will go on.* After another adjustable period of time (adjustable at T^2) output will go off and output T^1 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.

APLC - Specialty Assemblies

Features

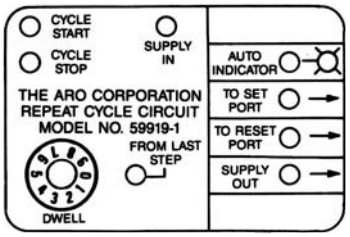
Cycle Repeat Circuit

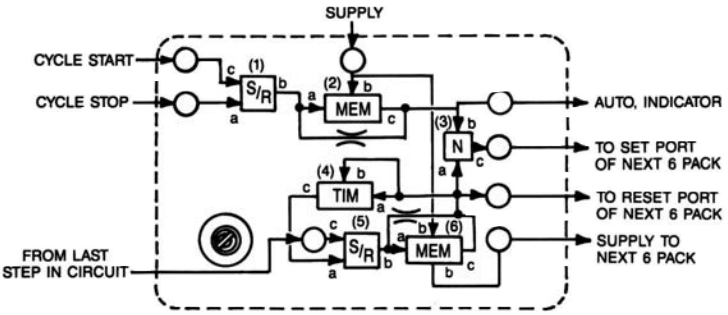
Cycle Repeat Circuit Model 59919-1

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

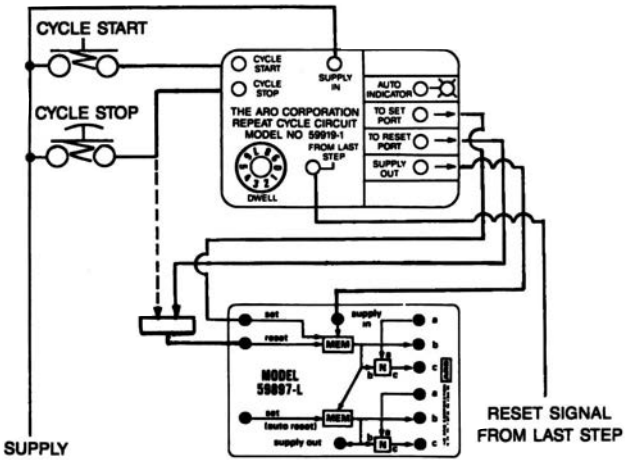
The cycle repeat circuit shown can be added to any Flex-6 circuit so that it will recycle continuously. The circuit contained in this assembly is shown at the right.

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

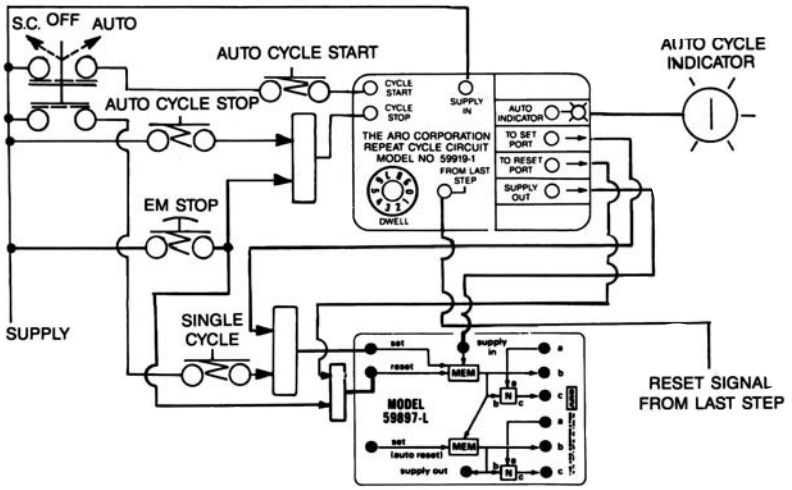




The illustration at right shows a cycle repeat circuit connected in its simplest form. Actuation of the start push button starts the circuit to run in an auto-recycle mode. When the cycle stop push button is actuated the circuit will complete that cycle and will not start the next cycle. If you want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



APLC - Elements

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)

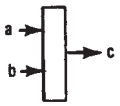
Response Times:

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





59010

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".
- Limit inlet pressures to 60-100 PSI
- Shift occurs when pressures exceed 60% of total and return when pressures fall below 50%.

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

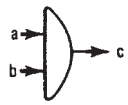
Response Times:

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.
- Limit inlet pressures to 60-100 PSI
- Shift occurs when pressures exceed 60% of total and return when pressures fall below 50%.

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

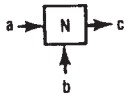
Response Times:

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

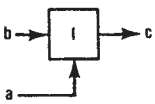
59800 Inhibitor Element
59912 Inhibitor Assembly on 1/8" Base

- 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)

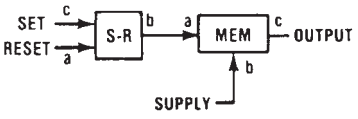
Minimum Time:

Signal	Milliseconds
To SET	17
To RESET	19





59181 59113



APLC - Elements

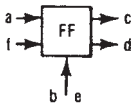
Features

Flip-Flop

59892"FLIP FLOP" Model


59892

- 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
  - **B** Supply
  - **C** Set Output
  - **D** Reset Output
  - **E** Supply
  - **F** Reset Input
- 59892 has two top ports (10-32) for C and 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


59121

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.


59158

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.




59156

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


59166-4

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

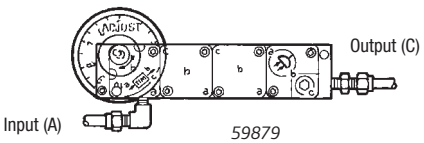
59166-4 Fixed Delays

- Not adjustable. Order model for desired time.

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

Model	Milliseconds
59166-4	445 ± 40





59879

Dimensions for Base Assemblies are on page 87.

APLC - Elements

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.

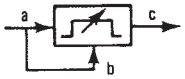
NOTE: Input must be longer than output for full times signal. If not possible, see momentary timers.



59120



59157





59155

Screw Adjustable Pulse Timers

- ±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

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



59165-4

59165-4 Fixed Pulse

- Not adjustable, order model for time desired; ±10% timing accuracy.

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

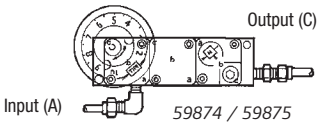
Model	Milliseconds
59165-4	445 ± 40

59114 Differentiator

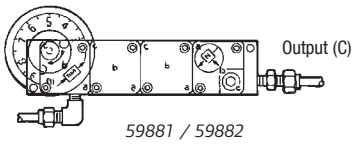
- A non-adjustable pulse element.
- With A blocked, signal at B will produce an output at C of 80 to 130 milliseconds. Output can be lengthened by connecting a 59117 Accumulator to port A.
- Reset time is 110 milliseconds.

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

Dimensions for Base Assemblies are on page 87.



59874 / 59875



59881 / 59882



59114

APLC - Elements

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)


59115

Timer	Number of 59117 Accumulators	Timing Range ±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)


59116

Timer	Number of 59117 Accumulators	Timing Range ±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^3).
  Dimensions: 1 1/4" sq. x 2 1/16" (31.8mm sq. x 52.4mm)


59117



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.


59671-X

Model	Orifice Size Inches (mm)
59671-1	.0135 (.343)

APLC - Elements

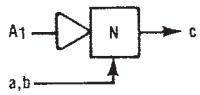
Features

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 A1.
- Input A & B ports must be interconnected externally of element.
- Output C is on only when low pressure at A1 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.



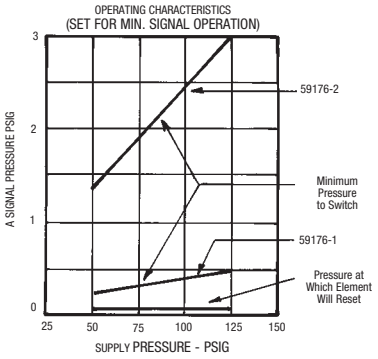


59176-X

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

Individual Element	Approximate Response Time Input to Output	Milliseconds	Adjustable A1 Pressure Range PSIG when A and B = 50 PSIG (3.4bar)
59176-1	A1 on to C off	10	.24 to 1.5 (0.11 to .07)
59176-2	A1 off to C on	10	1.5 to 15 (0.7 to 1.0)

Element on Base Assys.	Approximate Response Time Input to Output	Milliseconds	Adjustable A1 Pressure Range PSIG when A and B = 50 PSIG (3.4bar)
59162-2	A1 off to C on	10	1.5 to 15 (0.7 to 1.0)

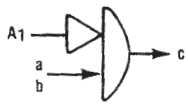


AND Amplifier

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 A1.
- Inputs A & B must be interconnected externally of the element.
- Output C is on only when A1 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.



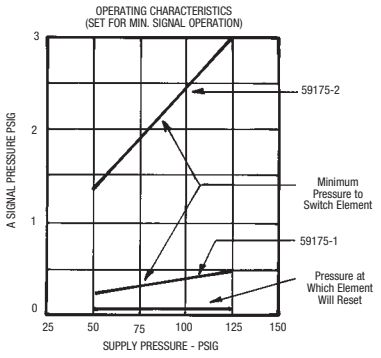


59175-X

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

Individual Element	Approximate Response Time Input to Output	Milliseconds	Adjustable A1 Pressure Range PSIG when A and B = 50 PSIG (3.4bar)
59175-1	A1 on to C on	10	.24 to 1.5 (0.11 to .07)
59175-2	A1 off to C off	10	1.5 to 15 (0.7 to 1.0)

Element on Base Assys.	Approximate Response Time Input to Output	Milliseconds	Adjustable A1 Pressure Range PSIG when A and B = 50 PSIG (3.4bar)
59161-1	A1 on to C on	10	.24 to 1.5 (0.11 to 0.7)
59161-2	A1 off to C off	10	1.5 to 15 (0.7 to 1.0)



Dimensions for Base Assemblies are on page 87.

APLC - Elements

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.

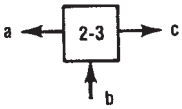
Dimensions: 1 1/4" sq. x 1 21/23" (31.8mm sq. x 42.1mm)



59089

Approximate Response Time

Input to Output	With 6" (152mm) 5/32" (4mm) Tubing to A---Milliseconds	Add Milliseconds for each Foot more Tubing
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



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



59891

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

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.



59109

Dimensions for Base Assemblies are on page 87.

APLC - Accessories

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.

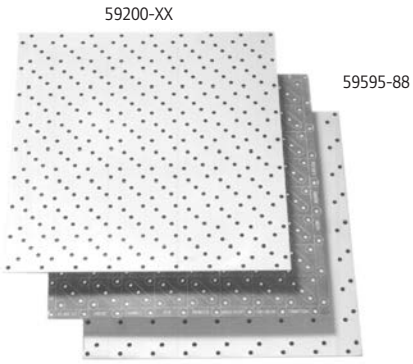
59595-88 Module Gasket

- 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.

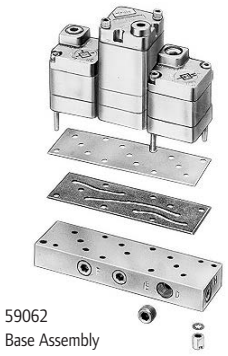
Model	Dimensions in Inches (Millimeters)	Element Coverage
Base Plate		
59200-24	5/64 x 3 21/64 x 5 53/64 (2 x 85 x 148)	2 x 4
59200-44	5/64 x 5 53/64 x 5 53/64 (2 x 148 x 148)	4 x 4
59200-66	5/64 x 8 21/64 x 8 21/64 (2 x 212 x 212)	6 x 6
Module Gasket		
59595-88	1/16 x 10 45/64 x 10 45/64 (2 x 272 x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



Base Assembly Method

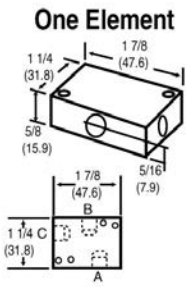
- Simple logic functions requiring up to four elements can be mounted using the function base assembly method.
- Interconnections between elements are made in a module below the elements. External connections are made via the 1/8″ NPTF ports on the porting blocks.

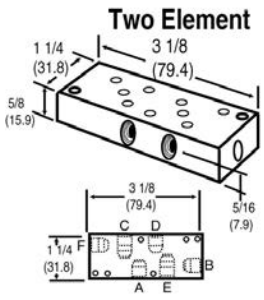
Model	Base Assembly	# of Ports	Components
59387	1-Element	3	Base, Washer & nuts.
59061	2-Elements	6	Base, Cover plate,
59062	3-Elements	8	module, pipe plugs,
59063	4-Elements	10	nuts and washers.

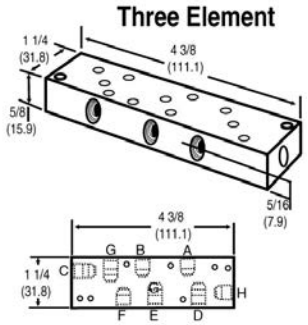

59062
Base Assembly

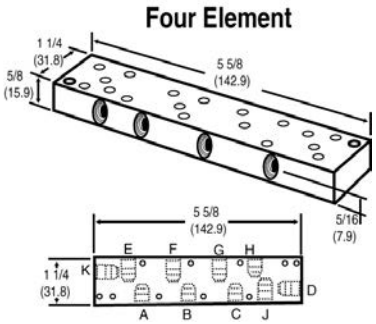

58023 Split Bit
1/4″ Hex Shank Bit used to build function base assemblies

Dimensions Dimensions given in Inches and (Millimeters)









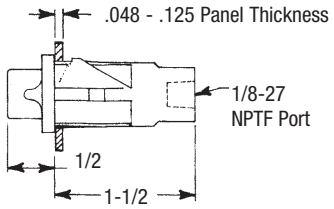
APLC

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.


59812-X


24130

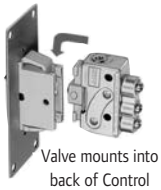


Panel Mounted Miniature Control Valves

- 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 Models	Tube Fittings Models	Actuation Type	Port Designation
59804	**59804-1**	Rocker (Maintained)	3-in, Passing 2-Output


Valve mounts into back of Control unit

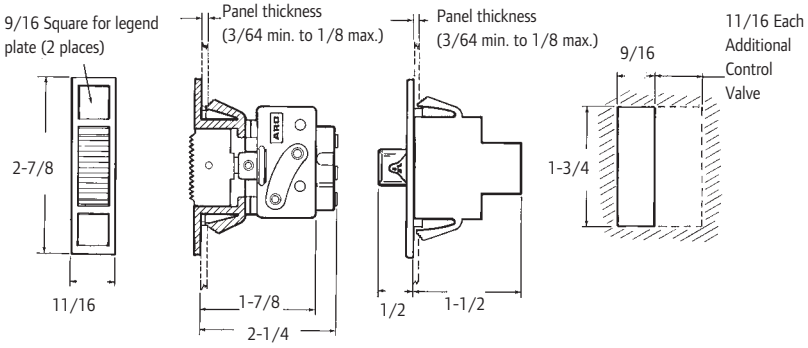

59724-X Legend Sheets

59724-X Legend Sheets

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

Model	Color
59724-1	Black
59724-2	White
59724-3	Green
59724-4	Red

Dimensions and Mounting Information



APLC

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

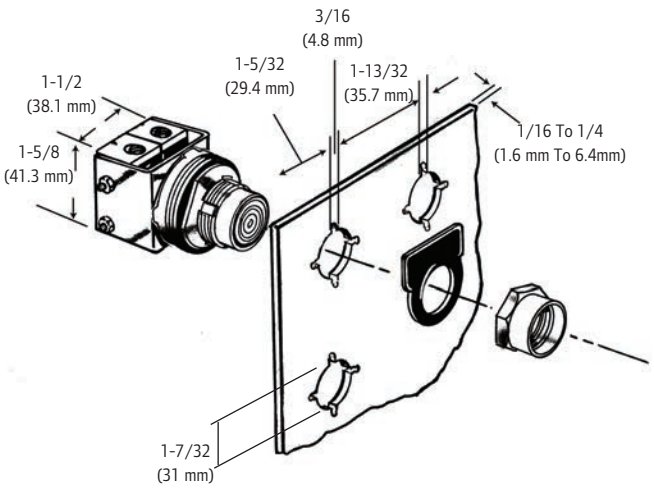
Valve Kits Ordering Menu

1/8″ Ports	Tube Fittings	# of Valves
59064	59064-1	1
59065	59065-1	2

Push Button Operators

Model	Description	Push Button Model	Legend Plates Plate Marking
59067-10	1 3/8″ (35mm) Red Button	**59068-14**	Emergency Stop
59067-11*	Without Guard	**59068-15**	Start
59067-12*	Extended Guard	**59068-30**	Blank
59067-13*	Full Guard	**59068-33**	Down
59067-15	1 3/8″ (35mm) Red Button Push/Pull Action	**59068-34**	Up
		59068-42	Reset
59067-16	2-1/4″ (57mm) Red Button		
59067-17	2-1/4″ (57mm) Green Button		
59067-18	Momentary, universal, dual function push button		

*Inserts included: (Yellow, White, Green Orange, Black, Blue, Red)



Push Button Assembly




59067-10


59067-15


59067-11


59067-16


59067-12


59067-17


59067-13


59067-18

APLC

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

1/8″ Ports	Tube Fittings	# of Valves
59064	59064-1	1
59065	59065-1	2

Selector Operators		Selector Legend Plates	
Model	**Description**	**Model**	**Plate Marking**
2-Position Maintained		**2 Position**	
59066-10	Standard Knob	**59068-22**	Off-On
59066-11	Gloved Hand Knob	**59068-24**	Open-Close
59066-133	Key Operated		
3-Position Maintained		**3 Position**	
59066-16	Standard Knob	**59068-30**	Blank
59066-17	Gloved Hand Knob	**59068-77**	Man-Off-Auto
59066-191	Key Operated		
3-Position Spring Return			
59066-20	Standard Knob		
59066-21	Gloved Hand Knob		



59066-10


59066-11


59066-133

APLC

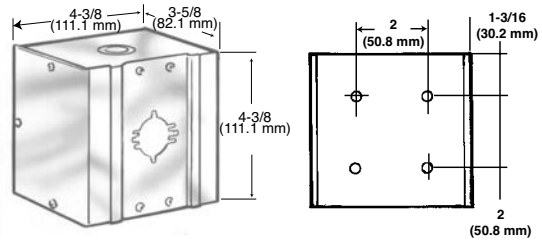
Features

Control Enclosures


58027

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)



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)

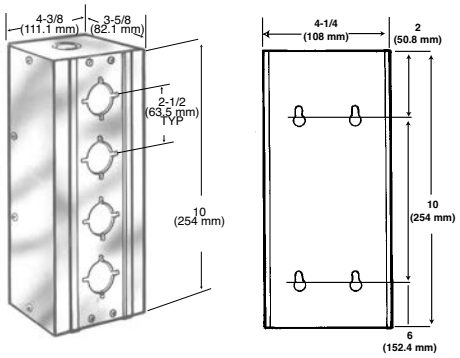

59361

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)




59792


59097-6

APLC

Features

Pneumatic Counters

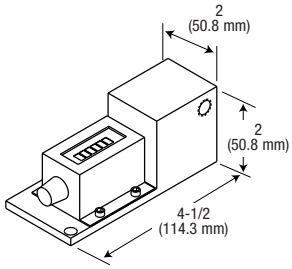
Totalizing Counters/Manual Reset

59095-4 Knob Reset/Base Mount

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



59095-4



Performance Specifications

Operating Pressure: 30 to 125 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″ NPT

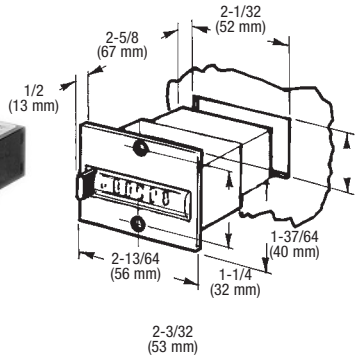
Totalizing Counter/Manual or Pressure Reset

59801 Panel Mount

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



59801



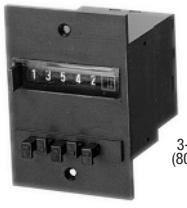
Performance Specifications

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

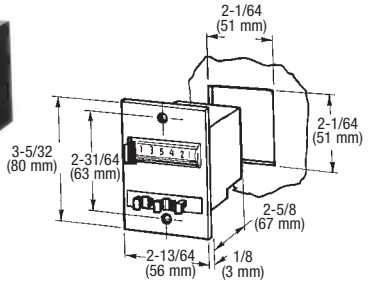
Predetermined Counter/Manual or Pressure Reset

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.



59802



Performance 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 dm^3/s)
Port Designation: P (3) Supply, A (4) Output,
Z (1) Count, Y (2) Reset

APLC

Features

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-X

59916-1 High Level Sensor

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

59916-2 Low Level Sensor

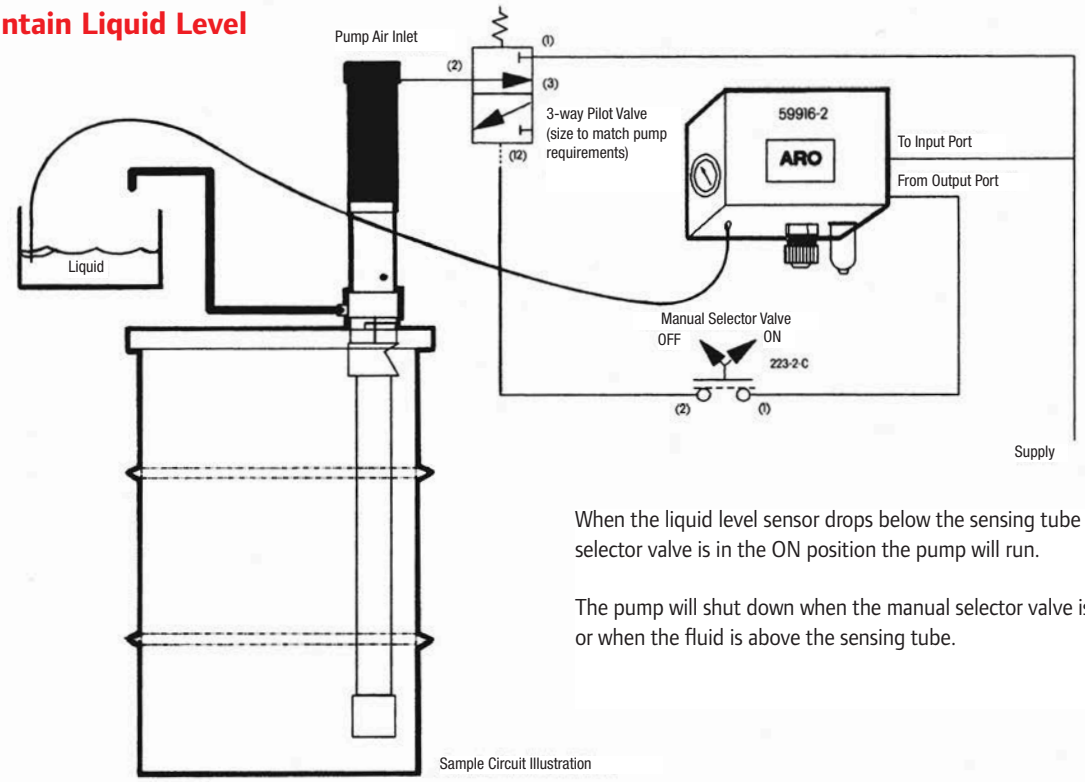
- Provides an output signal when sensing tube is not blocked by a liquid.

How to set-up your Liquid Level Sensor

Liquid level sensors are supplied with a 25′ length of ¼″ diameter flexible nylon tubing. This tubing attaches to the sensing port (a ¼″ tubing bulk-head fitting located in the bottom of the panel near the regulator adjustment). This is a quick disconnect type fitting; simply push the tubing firmly into the fitting until it locks.

Next, cut the tubing to length and/or attach to the final sensing probe. Install the sensor probe with the open end pointing downward and located at or just below (0 to 2½″, depending on type of liquid and design of probe) the level where the operating signal should occur. In some cases, you may use the flexible tubing itself as the sensing probe. In other cases, you may want to use a length of pipe or rigid tubing as a final sensing probe so that it is easier to mount and adjust to the proper depth. The sensor probe will vary with the nature of the fluid being sensed. In all cases, it will need to be chemically and temperature compatible. For water fluids, the open end of the supplied tubing is adequate. For fluids of greater viscosity, you may want to increase the diameter of the opening for greater sensitivity.

Maintain Liquid Level



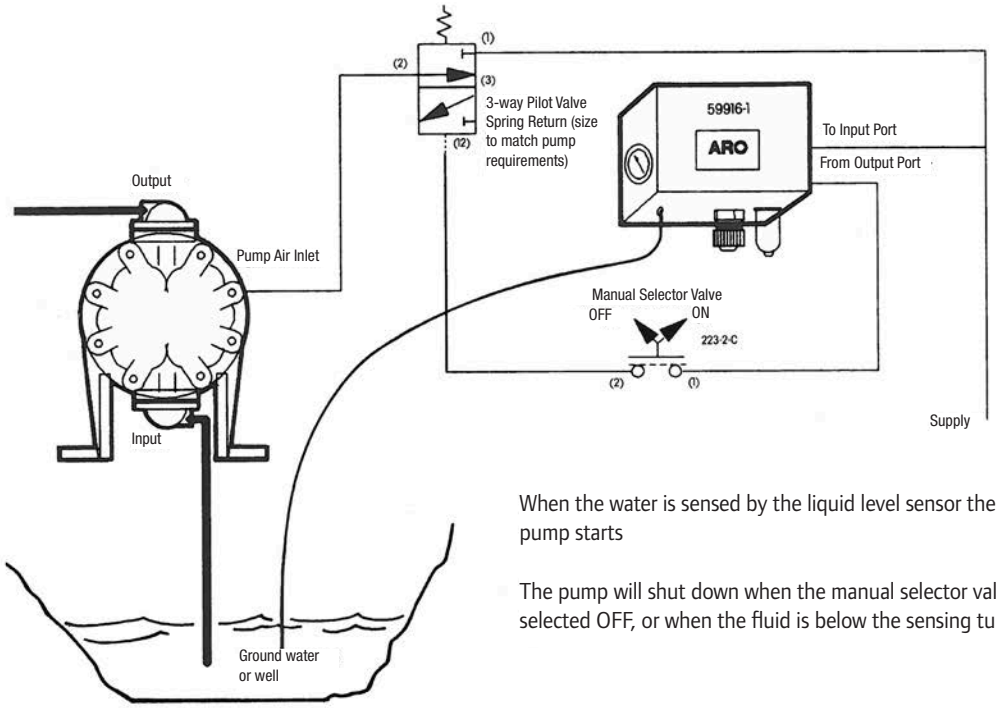
Sample Circuit Illustration

When the liquid level sensor drops below the sensing tube and the manual selector valve is in the ON position the pump will run.

The pump will shut down when the manual selector valve is selected OFF, or when the fluid is above the sensing tube.

APLC

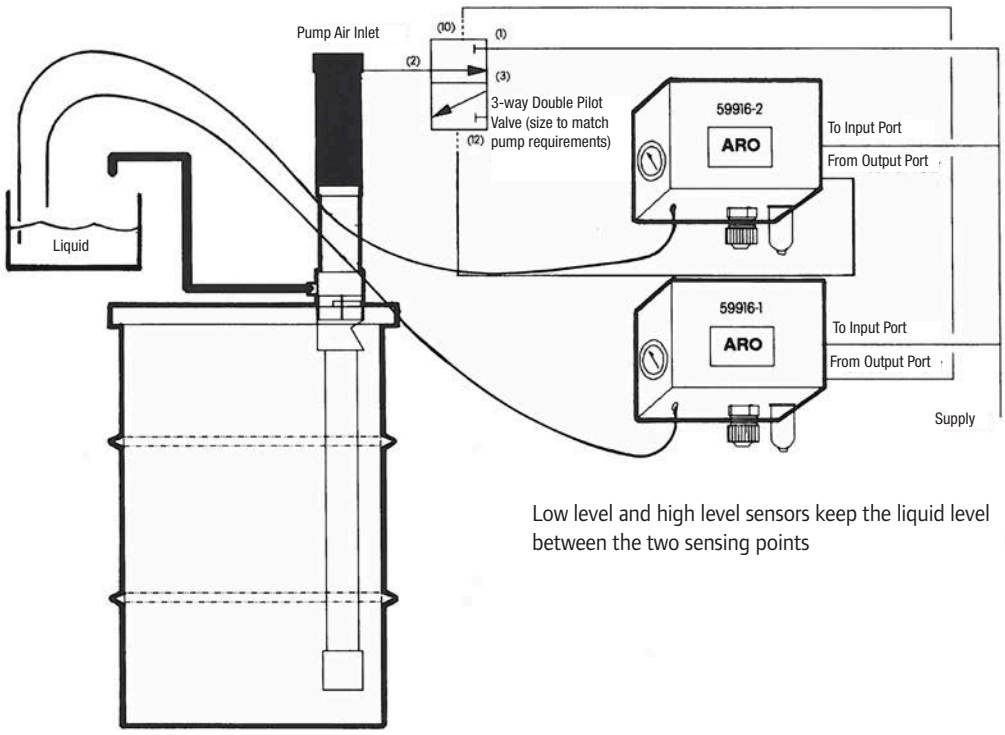
Removal of Ground Water



When the water is sensed by the liquid level sensor the pump starts

The pump will shut down when the manual selector valve is selected OFF, or when the fluid is below the sensing tube.

Low and High Sensors



Low level and high level sensors keep the liquid level between the two sensing points

APLC

Features

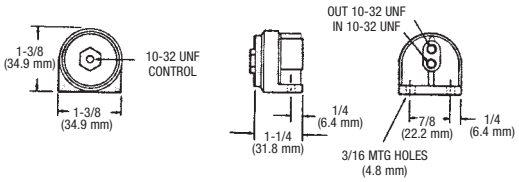
Pneumatic Sensing Components

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

Y-Connector	Tube Size
59482	5/32

Male Connector	Tube Size	NPT
59474-4	5/32	1/8
59474-56	1/4	1/8
59474-156	1/4	1/4
59474-256	1/4	3/8



Tubing (100′ rolls)	Tube Size
59690-4	5/32



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



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



Plug	Tube Size
59463-4	5/32
59463-56	1/4



Union	Tube Size
59759-4	5/32
59759-56	1/4



Union Elbow	Tube Size
59760-4	5/32
59760-56	1/4



Union Tee	Tube Size
59761-4	5/32
59761-56	1/4



Union Bulkhead	Tube Size
59762-4	5/32
59762-56	1/4



Expander Tube Male	Tube Size	NPT
59765-4	5/32	1/4



Reducer Tube Male	Tube Size	NPT
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

Air Systems Components

Features

By utilizing a modular lockout valve the user can close off the downstream air supply for maintenance and pressure isolation. Units are threaded for direct plumbing or can be installed in the modular arrangement.

Optional filter life indicator works off of pressure differential to show a visible alert when the filter needs replacement.

A T-bracket wall mount is standard on all combo units.

The settable gauge fan is a visual reference that allows the user to display the specific pressure range that is needed for their application.



Use of modular threaded pipe adapters allow for ease of service by allowing a unit to be quickly removed from the air line. Adapters can be used to pipe different thread sizes in the plumbing setup.

The ARO soft-start valve allows system pressure to build gradually, protecting downstream equipment and creating a safer start-up condition.

A panel nut is standard on all individual ARO-Flo regulators and piggybacks. Must be ordered separately on combination units.

Spares and Accessories

See our accessories catalog or go to our Web site for the complete selection of accessories for your application.



Refurb kits
104302



Mounting brackets
104409



Replacement parts
104338



Pressure switch
104415

The pressure switch is typically threaded into a manifold port block, and allows the sensing of high or low pressure thresholds set by the user.

The oil drip rate is controlled by adjusting the sight dome adjustment screw in a clockwise or counter-clockwise direction.

The auto-fill option is standard on all ARO-Flo lubricators. Lubricating oil can be added while lubricators are under pressure.



The ARO-Flo check valve is typically installed downstream of the regulator. It is used to help prevent downstream pressure from moving upstream of the valve in the event of upstream pressure loss.

The positive locking thumb switch engages with an audible click, and visually aligns to the locking symbols.

Optional tamper kit installs in seconds and prevents adjustment of the regulated pressure.

The installation of a manifold port block enables design flexibility by allowing clean, regulated air to be diverted to other applications.



Gauges
104334



Manifold block kit
104413-3-2



Lubricating oil
29665

1000 Series



1000 Series
1/8" and 1/4" Ports

Max flow: 59 scfm
Series size: Miniature

1500 Series



1500 Series
1/4" and 3/8" Ports

Max flow: 113 scfm
Series size: Compact

2000 Series



2000 Series
3/8", 1/2", and 3/4" Ports

Max flow: 222 scfm
Series size: Standard

3000 Series



3000 Series
3/4" and 1" Ports

Max flow: 368 scfm
Series size: Heavy-Duty

Super-Duty Series



Super-Duty Series
1", 1-1/4", 1-1/2", 2" and 3" Ports

Max flow: 1,770 scfm
Series size: Super-Duty

Specialty Items



Specialty Items
1/8", 1/4", 3/8", 1/2", and 3/4" Ports

Specialty line

Air Systems Components

Overview

Filters

ARO-Flo compressed air filters are designed to remove airborne solid and liquid contaminants. Filters can be ordered with different elements, including coalescing models which are capable of removing oil aerosols and particles down to 0.3 micron. Standard filters are sold with 5-micron elements; 40-micron elements can be purchased and installed separately.



Regulators

Air line regulators provide controlled, consistent air pressure as required for specific pneumatic equipment connected to the air system. All ARO-Flo regulators are offered with a standard adjustment range of 0 – 140 psig (0 – 9.6 barg). Alternative spring ranges are offered for easy conversion to suit different requirements. Non-relieving regulators are offered for applications where the venting of downstream overpressure is undesirable.



Lubricators

ARO-Flo mist-type lubricators help ensure that pneumatic devices receive the required lubrication to maintain peak performance, reduce wear, and prolong service life. They are designed to provide the correct amount of oil required for most general applications in a pneumatic system, delivering a constant ratio of oil to air flow. Precise oil feed adjustment sets the proper oil drip rate. Lubricators should be installed close to the downstream application to ensure effective distribution of oil.



Piggyback Filters / Regulators

Filter-regulators, or "piggybacks," combine the functions of both a filter and regulator. Piggybacks are compact and most effective when space is a constraint. Piggybacks can be ordered with different filter elements and can be modified with different springs, depending on the filtration and air regulating requirements.



Combinations

Filters, regulators, lubricators, and piggybacks can be combined together to form combinations. They are typically strung together in the F+R+L arrangement (three-piece combo) and F/R+L (two-piece combo) arrangement, although other configurations are also used depending on application needs. ARO-Flo combination FRLs are easily assembled using modular spacer kits. Panel nuts not included with units. Must be ordered separately.





Air Systems Components

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. ARO Filters, Regulators and Lubricators are designed to flow in excess of that indicated in the maximum recommended flow table shown below. This table gives recommended flows for pipe sizes at listed pressures and should be used as a guide in sizing piping and equipment for compressed air systems.

Maximum recommended air flow (scfm) thru ANSI standard weight Schedule 40 pipe

Applied Pressure PSIG	Nominal Standard Pipe Size — Inches										
	1/8"	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"
5	0.5	1.2	2.7	4.9	6.6	13	27	40	80	135	240
10	0.8	1.7	3.9	7.7	11.0	21	44	64	125	200	370
20	1.3	3.0	6.6	13.0	18.5	35	75	110	215	350	600
40	2.5	5.5	12.0	23.0	34.0	62	135	200	385	640	1100
60	3.5	8.0	18.0	34.0	50.0	93	195	290	560	900	1600
80	4.7	10.5	23.0	44.0	65.0	120	255	380	720	1200	2100
100	5.8	13.0	29.0	54.0	80.0	150	315	470	900	1450	2600
150	8.6	20.0	41.0	80.0	115	220	460	680	1350	2200	3900
200	11.5	26.0	58.0	108.0	155.0	290	620	910	1750	2800	5000
250	14.5	33.0	73.0	135.0	200	370	770	1150	2200	3500	6100

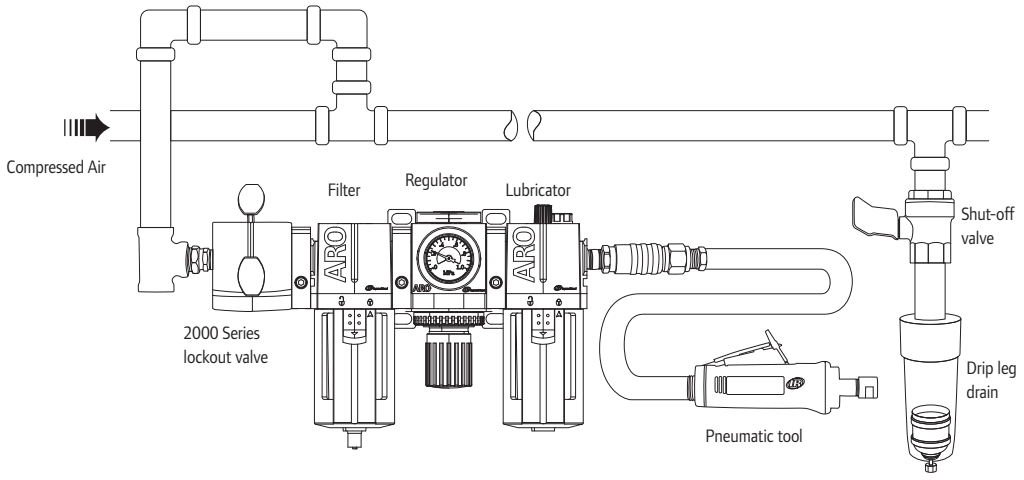
The flow values in the chart above are based upon a pressure drop (ΔP) as set forth in the following schedule:

Pressure Drop (ΔP) per 100 ft. of Pipe	Pipe Size — Inches
10% of Applied Pressure	1/8, 1/4, 3/8, 1/2
5% of Applied Pressure	3/4, 1, 1-1/4, 1-1/2, 2, 2-1/2, 3

Installation

The filter, regulator and lubricator should be installed in the order shown in the illustration below.
If a coalescing filter is required, it should be installed downstream from a standard filter. Individual take-off lines to the FRL and air tool or equipment should be from the top of the compressed air line. Make sure that air flow markings are followed for proper flow direction through the FRL units.

To trap and expel water, sludge and other contaninants which may collect on the bottom of the air line, a drip leg drain should be used. Drip leg drains should be installed at low points in the piping system and at the far end of the distribution



Warnings and General Information

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.

CAUTION: Compounded oils containing graphite and fillers are not recommended for use with cylinders.

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)
Hougton & Co. Oil No. 1120, No. 1130, No. 1055	Sears Regular Motor Oil	Some Loctite Compounds
Houtosafe 1000	Sinclair Oil "Lily White" Skydrol	Stillman No. SR269-75 (Polyurethane)
Kano Kroil	Tenneco Anderol No. 495	Stillman No. SR513-70 (Neoprene)
Keyston Penetrating Oil No. 2 & No. 500 Oils		
Marvel Mystery Oil		

Air & Lubrication Requirement

AIR PRESSURE: Limited to 200 psig (14 bar) FILTRATION: 40 Micron. Proper moisture removal and filtration of contaminates 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 an 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.

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 through understanding of the operation and application of all valves being used in a particular system and how they interact with the other components of the system.

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.

Operator's Manual	Part Number
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

Warranty

5 Year Warranty



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Numerical Index

Number	Page
103-X	58
105-X	58
109-X	58
2XX-X	57
400-X	60
401-X	60
402-X	60
447	60
448	60
449	60
450	60
46X-X	61
600-X	65
5030-XX	32
5040-XX	32
7000	71
7006	72
7007	72
7008	72
7010	72
7012	72
7102	72
7103	72
9600	62
13111	33, 43, 61
20308-X	64
20311-X	64
20312-X	64
20313-X	64
20368	57
20370	63
20467	63
20965-X	43, 49
20973-X	61
20975	61
24130	62, 88
24135	62
58023	87
58027	91
59010	81
59023	81
59003-842	74
59061	87
59062	87
59063	87
59064-X	89, 90
59065-X	89, 90
59066-XX	90
59067-XX	89
59068-XX	89, 90
59089	86
59095-1	92
59097-6	91
59109	86
59111	81
59112	81
59114	83
59115	84
59116	84
59117	84
59124	81
59120	83
59121	82
59125	81
59155	83
59156	82
59157	83
59158	82
59159	83
59160	82
59161-X	85
59162-2	85
59165-4	83
59166-4	82
59175-X	85
59176-X	85
59181	81
59185	81
59191	74, 79
59200-X	87
59201-X	87
59361	91
59387	87
59463-X	95
59474-XXX	95
59482	95
59595-88	87
59629	95
5963X-100	95
59632-1	25, 95
59634	95
59636	95
59671-1	84
59690-4	95
59724-X	88
59756-XXX	95
59757-XXX	95
59759-XX	95
59760-XX	95
59761-XX	95
59762-XX	95
59764-4	95
59765-XX	95
59792	91
59800	81
59801	92
59802	92
59804-X	88
59807	95
59808	74
59809	74
59812-X	88
59860	75, 79
59861	75, 79
59866	86
59875	83
59879	82
59890	86
59891	86
59892	82
59895	78
59896	78
59897	78
59898	78
59899	78
59900	78
59903	95
59905	95
59906	95
59908	95
59912	81
59913	75
59914	75
59916-X	93
59917	75
59919-1	78
104094	67
104096	67
104104-XXX	67
104484	59
104485	59
104486	59
104487	59
114155	11
114417	39
114418	36
114419	36
114420	36
114421	36
114597-XX	41
114598-XX	41
114599	41
114803	11
114806	28
114807	28
114808	11
114822	36
114138-XX	11
114153-XX	11
114645	39, 71
114772-XX	69
115046-XX	69
115064-XX	69
115455-1	21
116153	47
116218-XX	69
116345-X	25
116464	21, 64
116572	72
116573	71
116574	72
116575	71
116578	72
116579	72
116647-XX	69
116702	71
116710	20
116772	71
116773	71
116808	20
116899-1	21
116916-1	21
116926-1	21
117345-XX	69
117987	20
118597-XX	71
118598-XX	71
11860X-X	21
118612	21
118618	21
119243	33, 43, 61
119244	33, 43, 61
119245	33, 43, 61
119306	19, 21
119307-XXX	66
119308-XXX	66
119309-XXX	66
119310-XXX	66
119350	9
119351	9
119367	6
119638	6
119375	9
119376	9
119416	69
119690-XX	26, 69
119698-X	26
119892-XX	5, 6
119893-XX	5, 6
AXXXXX-XXX-X	19
CATXXX-XXX-X	24-27
CBW	14, 69
CDN	14, 69
CDL-XXX	14, 69
CDW	14, 69
CDW-30	26, 69
CHL-XXX	14, 69
CHL6-XXX	11
CHW	14, 69
CHW6	11
CHW-30	26, 69
CPXX-B	68
CSL-XXX	14, 69
CSL6-XXX	11
CSN	14, 69
CSN6	11
CSN-30	26, 69
CSN-MICRO	28
EXXXXX-XXX-X	42
EV 30-A	62
EV 35-A	62
EV 125	62
EV 250	62
EV 375	62
FXX-BK	68
HXXXXX-XXX-X	52
KXXXXX-XXX-X	48
MKN	20
MKP	20
M11XLR	39
M2XXXX	36, 39, 41, 59
M21XXX-XXX-X	13
M211PS	59
M251PS	59
M26M02-XX	14
M30M03-XX	14
M34M04-XX	14
M51XLR	39
M81XXX-XXX-X	11
MP3651-7	33, 43, 61
MQ3620	71
MXXMB	14
MXXX-XX-XXX-X	13
NXX-BK	68
P114400	28
P2X1-XXX-X	28
PEN	20
PPN	20
PTN	20
PR10	62
RKM21X-XX	71
RKM31X-XX	71
RKM81X-XX	71
S5XSMX-1	5
S5XX9X-1	6
SML51N-XX	5
SMH51N-XX	6
SMH81N-XX	11
SML81N-XX	11
SV10-C	63
SV20-C	63
TBXXX-XXX-X	30-31
TSXXXX-XXX-XX	30
SK-T0XXB	31
SK-T1XXB	31

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