

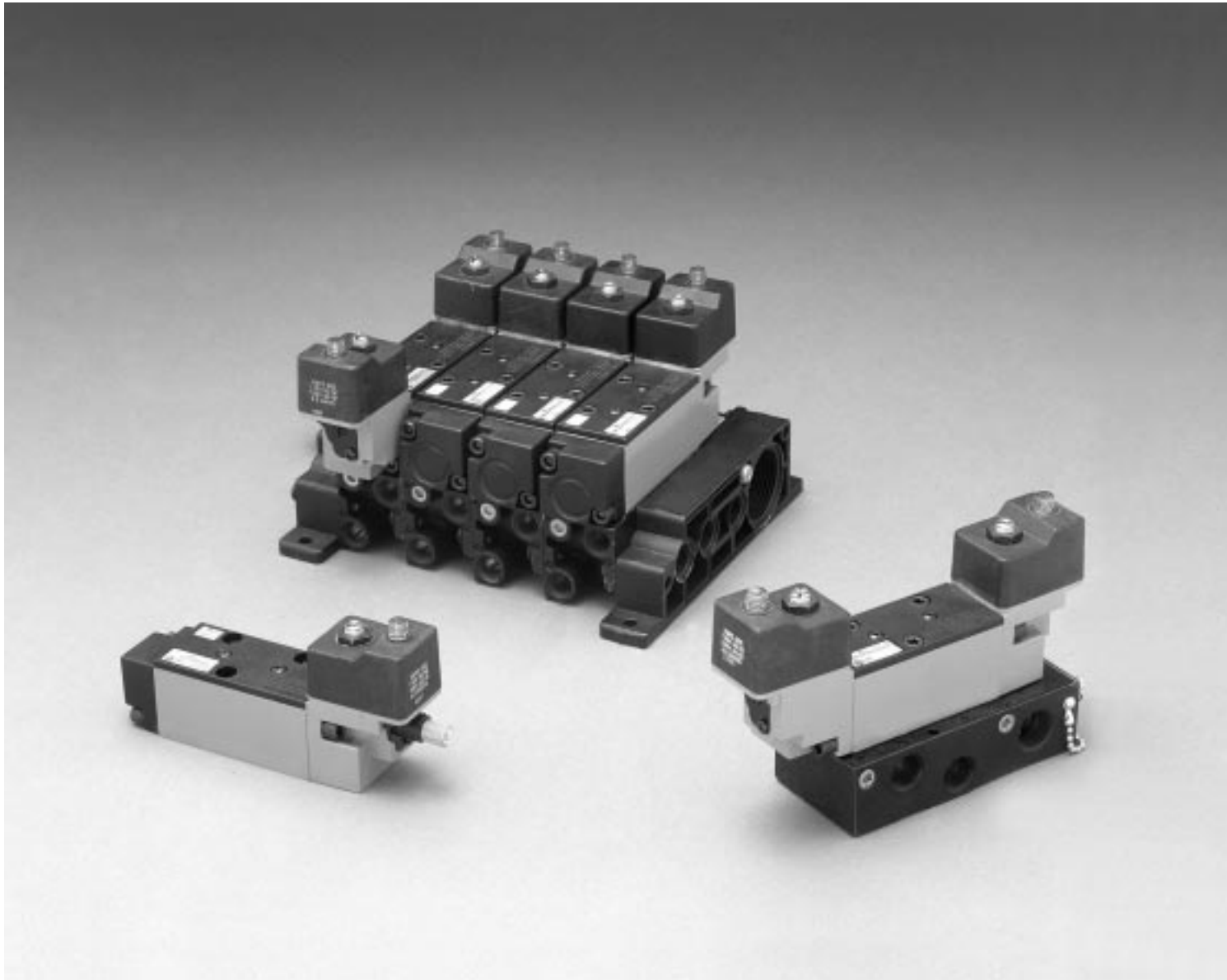


"AL" Series

Air Control Valves

4-Way, 5-Port, 2 & 3-Position

Catalog 0670-2/USA
July, 1998



 **WARNING**

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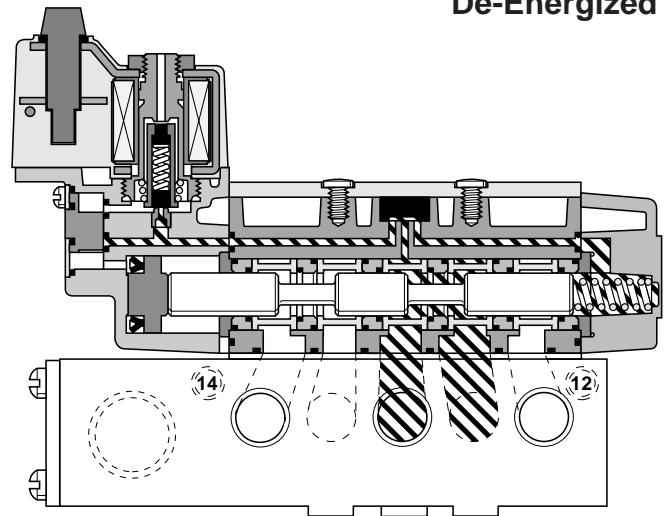
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Offer of Sale

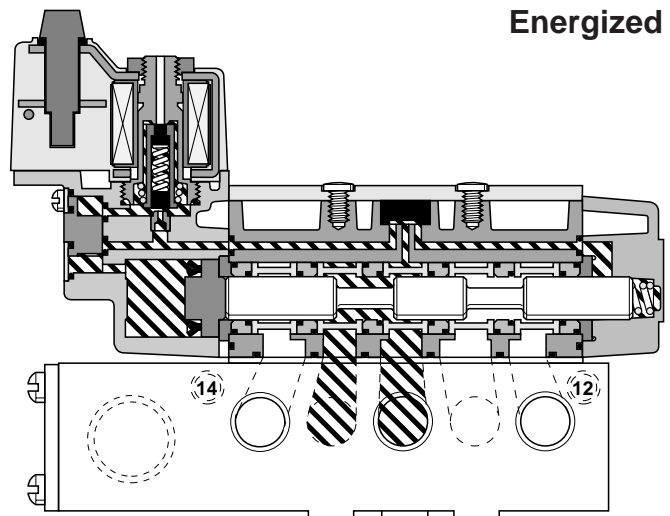
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- Plug-In Subbase and Manifold Mountings, simplify installation and reduce down time.
- Optional Solenoid Conduit Connection models available.
- High Flow (Nominal $C_V = 1.5$).
- Fast Response.
- 1/4 or 3/8 Inch NPT Ports.
- Large 1-1/4 Inch Wireway on manifolds.
- Versatile, compact modular 5-Port design.
- Epoxy Encapsulated Coils (Class ‘B’ rated) are designed for low power consumption and maximum life, even under continuous duty service.
- Indicator Lights are Standard on 120VAC models, optional on 24VDC models.
- Locking Manual Overrides are Standard. Non-Locking Manual Overrides are Optional.
- Field Convertible to external pilot supply or low pressure, vacuum or dual pressure service.
- Remote Air Pilot Operators.
- Suitable for Lubricated or Non-Lubricated Service.
- Synthetic Rubber O-Ring Seals are specially compounded for minimum compression and friction for excellent wear and abrasion resistance.
- Precision Ground Pre-Lubed Spool “floats” on O-ring seals. Closed center crossover design saves air.
- Accessories such as “sandwich” flow controls, port isolators and blank station covers are available.
- Approved to be CE marked
- CSA.

De-Energized

 **Pressure**  **Exhaust**

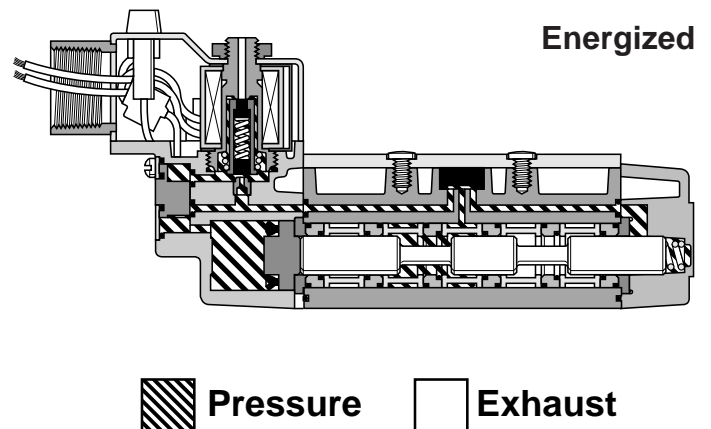
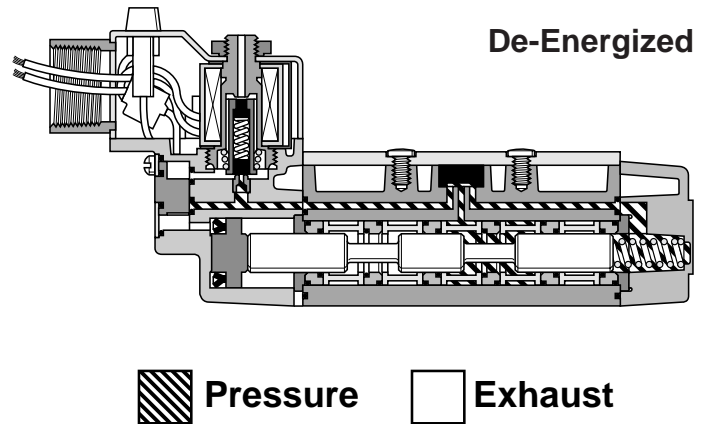
Energized

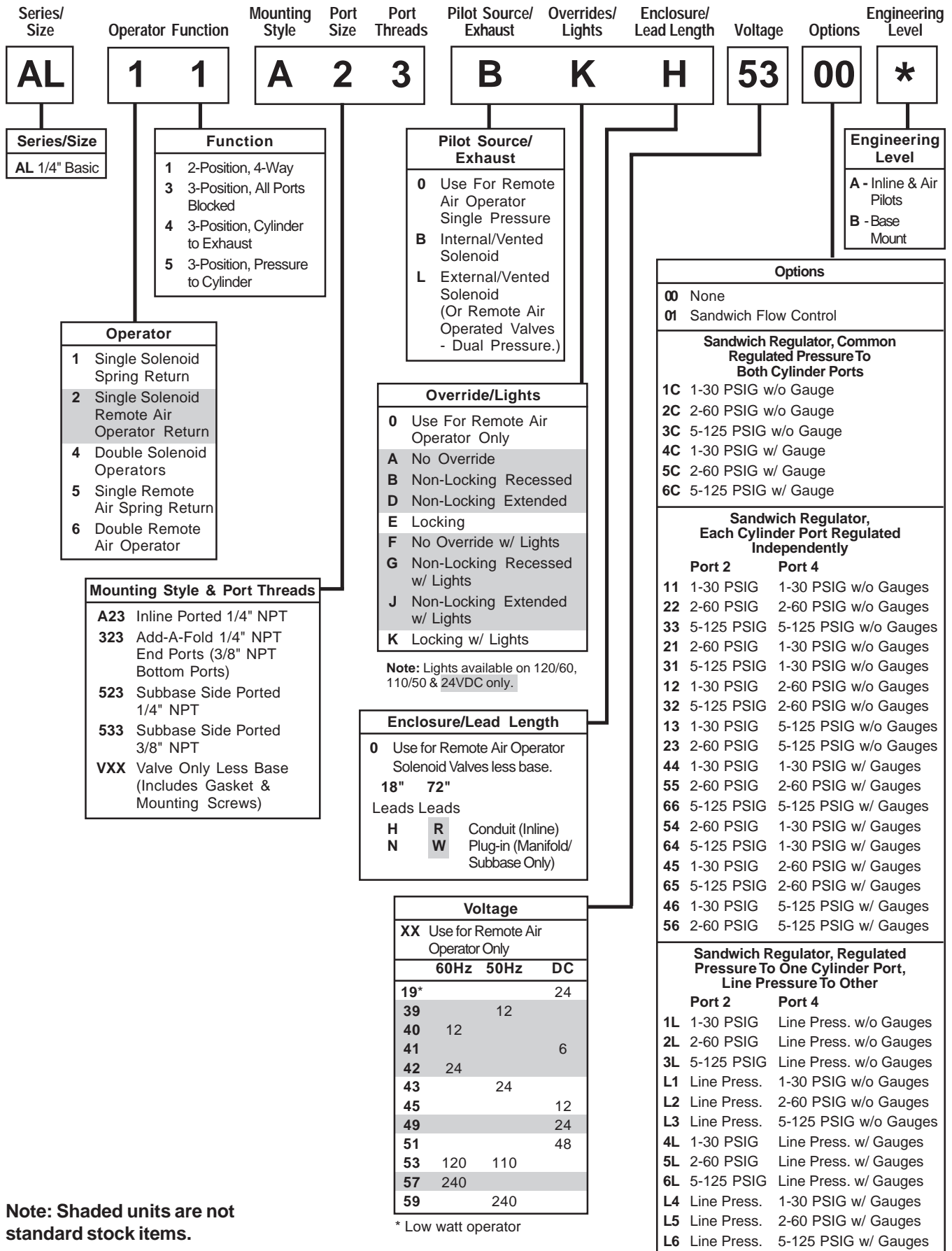
 **Pressure**  **Exhaust**

Basic Valve Features

**“AL” Series Valves
Direct Pipe Ported**

- Direct Pipe Ported, inline mounted design for economy and performance.
- Direct Conduit Access to solenoid.
- High Flow (Nominal $C_v = 1.5$).
- Fast Response.
- 1/4 Inch NPT Ports.
- Versatile, compact modular 5-Port design.
- Epoxy Encapsulated Coils (Class ‘B’ rated) are designed for low power consumption and maximum life, even under continuous duty service.
- Indicator Lights are Standard on 120VAC models, optional on 24VDC models.
- Locking Manual Overrides are Standard. Non-Locking Manual Overrides are Optional.
- Field Convertible to external pilot supply for low pressure, vacuum or dual pressure service.
- Remote Air Pilot Operators.
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- Synthetic Rubber O-Ring Seals are specially compounded for minimum compression and friction for excellent wear and abrasion resistance.
- Precision Ground Pre-Lubed Spool “floats” on O-ring seals. Closed center crossover design saves air.
- Approved to be CE marked
- CSA.





Note: Shaded units are not standard stock items.

* Low watt operator



Single Solenoid

Application

These valves may be used to actuate double acting cylinders. A “maintained” electrical signal shifts the valve. When this signal is removed the valve returns to its normal condition. May be used for dual pressure service.

Mounting

These valves are designed for subbase or modular manifold mountings. Electrical connection from valve to base is automatic. Air & electrical connections remain undisturbed if valve is removed. Select from chart below.

Operation

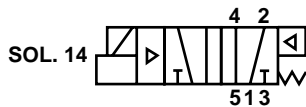
Single Pressure At Inlet Port 1:

De-energized Position – Solenoid operator #14 de-energized. Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Energized Position – Solenoid operator #14 energized. Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1. An External Pilot Signal may be applied to port X, 12, or 14.

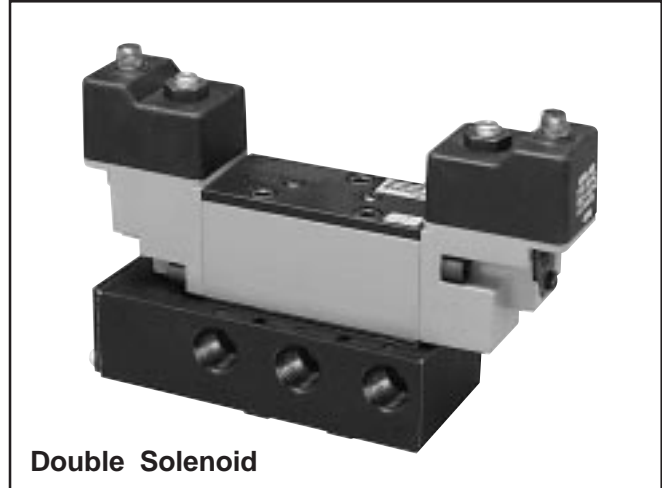


Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size	Valve/Subbase	Model Number
	Valve Only (Includes Gasket)	AL11VXXBK05300B
1/4" NPT	Valve w/ Side Ported Subbase	AL11523BKN5300B
3/8" NPT	Valve w/ Side Ported Subbase	AL11533BKN5300B
1/4" NPT	Valve w/ Add-A-Fold Base End Ported	AL11323BKN5300B

If different voltages or options are required, consult the valve model number system chart.



Double Solenoid

Application

These valves may be used to actuate double acting cylinders. A “momentary” electrical signal (exceeding .20 seconds) applied to one of the solenoids shifts the valve. It will remain in this position until a “momentary” signal is applied to the other solenoid. May be used for dual pressure service.

Mounting

These valves are designed for subbase or manifold mountings. Electrical connection from valve to base is automatic. Air & electrical connections remain undisturbed if valve is removed. Axis of main valve spool to be in horizontal plane. Select from chart below.

Operation

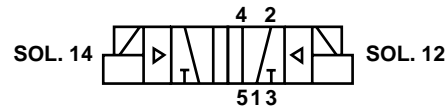
Single Pressure At Inlet Port 1:

Solenoid Operator #12 having been energized last – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Solenoid operator #14 having been energized last – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1. An External Pilot Signal may be applied to port X, 12, or 14.

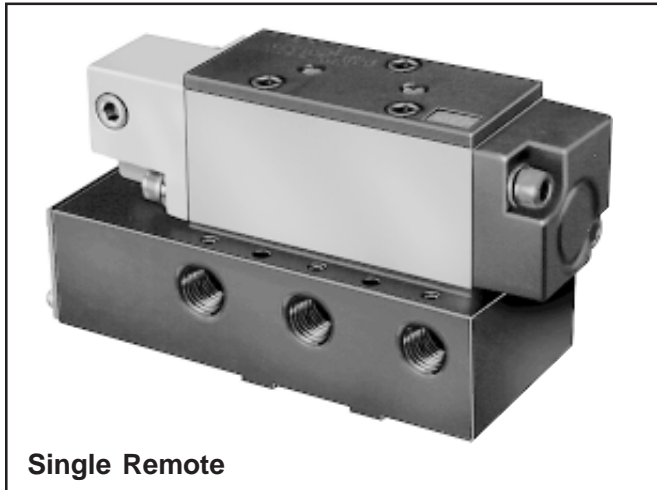


Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size	Valve/Subbase	Model Number
	Valve Only (Includes Gasket)	AL41VXXBK05300B
1/4" NPT	Valve w/ Side Ported Subbase	AL41523BKN5300B
3/8" NPT	Valve w/ Side Ported Subbase	AL41533BKN5300B
1/4" NPT	Valve w/ Add-A-Fold Base End Ported	AL41323BKN5300B

If different voltages or options are required, consult the valve model number system chart.



Single Remote



Double Remote

Application

These valves may be used to actuate double acting cylinders. A “maintained” pressure signal to the pilot port activates the valve. When this signal is removed, the valve returns to its normal condition.

Mounting

These valves are designed for subbase or modular manifold mountings. Select from chart below.

Operation (Using a 3-Way N.C. Pilot Signal)

Single Pressure At Inlet Port 1:

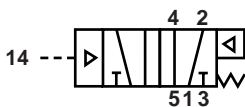
No pilot pressure applied – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Pilot signal applied to port #14 – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

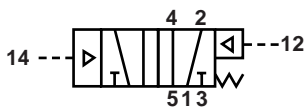
Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (change the 8th character in the Valve Model No. from 0 to L, for example: AL51VXX000XX00A, becomes AL51VXXL00XX00A) – Exhaust at port 1.

Note: The Pilot Signal applied to port 14 must be greater than or equal to the External Pilot (Return) Signal applied to port 12.



Single Pressure



Dual Pressure

Application

These valves may be used to actuate double acting cylinders. A “momentary” pressure signal applied alternately to each of the pilot ports shifts the valve.

Mounting

These valves are designed for subbase or modular manifold mountings. Axis of main valve spool to be in horizontal plane. Select from chart below.

Operation (Using a 3-Way N.C. Pilot Signal)

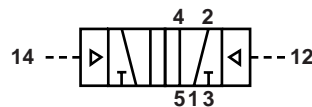
Single Pressure At Inlet Port 1:

Pilot port #12 having been pressurized last – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Pilot port #14 having been pressurized last – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5. Exhaust at port 1.



Model Selection Information

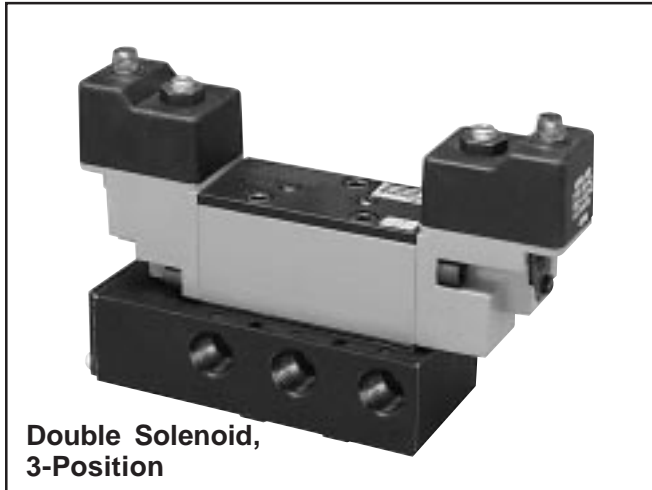
For single pressure applications.

Port Size	Valve/Subbase	Model Number
	Valve Only (Includes Gasket)	AL51VXX000XX00A
1/4" NPT	Valve w/ Side Ported Subbase	AL51523000XX00A
3/8" NPT	Valve w/ Side Ported Subbase	AL51533000XX00A
1/4" NPT	Valve w/ Add-A-Fold Base End Ported	AL51323000XX00A

Model Selection Information

For single pressure applications.

Port Size	Valve/Subbase	Model Number
	Valve Only (Includes Gasket)	AL61VXX000XX00A
1/4" NPT	Valve w/ Side Ported Subbase	AL61523000XX00A
3/8" NPT	Valve w/ Side Ported Subbase	AL61533000XX00A
1/4" NPT	Valve w/ Add-A-Fold Base End Ported	AL61323000XX00A



Application

These valves may be used to actuate double acting cylinders, when “inching” or incremental rod movement is desired. A “momentary” (exceeding .20 seconds) or “maintained” electrical signal applied to one of the solenoids shifts the valve, the valve returns to the “center” condition when the electrical signal is removed. Conversion to external pilot permits the valve to be used for dual pressure service.

Mounting

These valves are designed for subbase or modular manifold mountings. Electrical connection from valve to base is automatic. Air & electrical connections remain undisturbed if valve is removed. Select from chart below.

Operation

Single Pressure At Port 1:

Both Solenoids De-energized –

Function 3, All ports blocked.

Function 4, Port 1 is blocked. Port 4 is connected to port 5. Port 2 is connected to port 3.

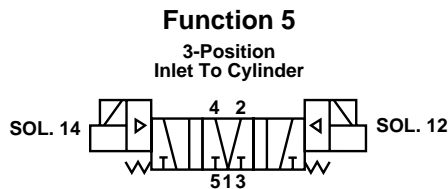
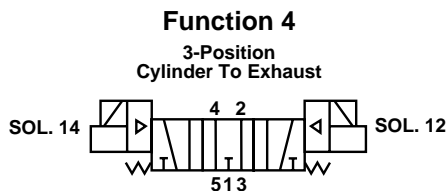
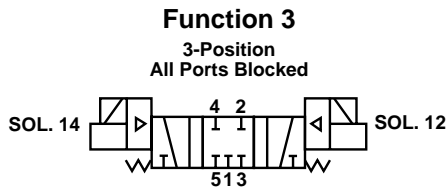
Function 5, Port 1 is connected to ports 2 & 4. Ports 5 & 3 are blocked.

Energize Solenoid Operator #12 – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Energize Solenoid Operator #14 – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1. An External Pilot Signal may be applied to port X, 12 or 14.



Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size	Valve/Subbase	Model Number		
		Function 3 (All Ports Blocked)	Function 4 (Cyl. Ports Open to Exh.)	Function 5 (Cyl. Ports Open to Inlet)
1/4" NPT	Valve Only (Includes Gasket)	AL43VXXBK05300B	AL44VXXBK05300B	AL45VXXBK05300B
3/8" NPT	Valve w/ Side Ported Subbase	AL43523BKN5300B	AL44523BKN5300B	AL45523BKN5300B
1/4" NPT	Valve w/ Side Ported Subbase	AL43533BKN5300B	AL44533BKN5300B	AL45533BKN5300B
1/4" NPT	Valve w/ Add-A-Fold Base End Ported	AL43323BKN5300B	AL44323BKN5300B	AL45323BKN5300B

If different voltages or options are required, consult the valve model number system chart.



Application

These valves may be used to actuate double acting cylinders. A "maintained" electrical signal shifts the valve. When this signal is removed the valve returns to its normal condition. May be used for dual pressure service.

Mounting

Valve may be mounted in any position.

Operation

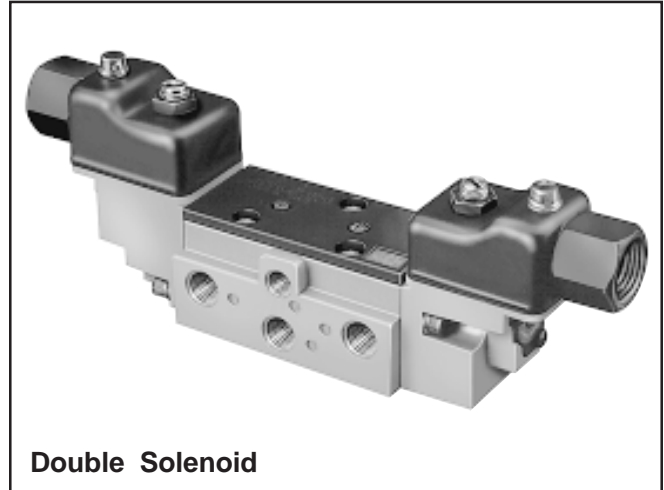
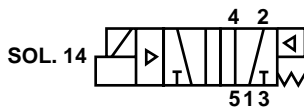
Single Pressure At Inlet Port 1:

De-energized Position – Solenoid operator #14 de-energized. Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Energized Position – Solenoid operator #14 energized. Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1.



Application

These valves may be used to actuate double acting cylinders. A "momentary" electrical signal (exceeding .20 seconds) applied to one of the solenoids shifts the valve. It will remain in this position until a "momentary" signal is applied to the other solenoid. May be used for dual pressure service.

Mounting

Axis of main valve spool to be in horizontal plane.

Operation

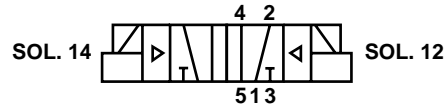
Single Pressure At Inlet Port 1:

Solenoid Operator #12 having been energized last – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Solenoid Operator #14 having been energized last – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1.



Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size	Model Number
1/4" Inline	AL11A23BKH5300A

If different voltages or options are required, consult the valve model number system chart.

Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size	Model Number
1/4" Inline	AL41A23BKH5300A

If different voltages or options are required, consult the valve model number system chart.



Single Remote

Application

These valves may be used to actuate double acting cylinders. A “maintained” pressure signal to the pilot port activates the valve. When this signal is removed, the valve returns to its normal condition.

Mounting

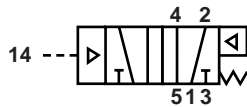
Valve may be mounted in any position.

Operation (Using a 3-Way N.C. Pilot Signal)

Single Pressure At Inlet Port 1:

No pilot pressure applied - Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Pilot signal applied to port #14 – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.



Double Remote

Application

These valves may be used to actuate double acting cylinders. A “momentary” pressure signal applied alternately to each of the pilot ports shifts the valve.

Mounting

Axis of main valve spool to be in horizontal plane.

Operation (Using a 3-Way N.C. Pilot Signal)

Single Pressure At Inlet Port 1:

Pilot port #12 having been pressurized last –

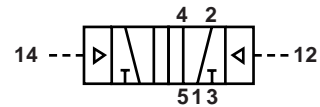
Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Pilot port #14 having been pressurized last –

Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5. Exhaust at port 1.



Model Selection Information

For single pressure applications.

Port Size

1/4" Inline

Model Number

AL51A23000XX00A

Model Selection Information

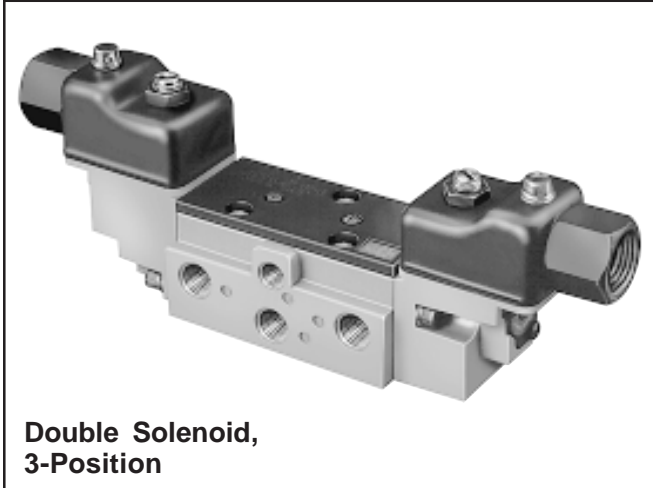
For single pressure applications.

Port Size

1/4" Inline

Model Number

AL61A23000XX00A



Application

These valves may be used to actuate double acting cylinders, when “inching” or incremental rod movement is desired. A “momentary” (exceeding .20 seconds) or maintained electrical signal applied to one of the solenoids shifts the valve, the valve returns to the “center” condition when the electrical signal is removed. Conversion to external pilot permits the valve to be used for dual pressure service.

Mounting

Valve may be mounted in any position.

Operation

Single Pressure At Port 1:

Both Solenoids De-energized —

Function 3, All ports blocked.

Function 4, Port 1 is blocked. Port 4 is connected to port 5. Port 2 is connected to port 3.

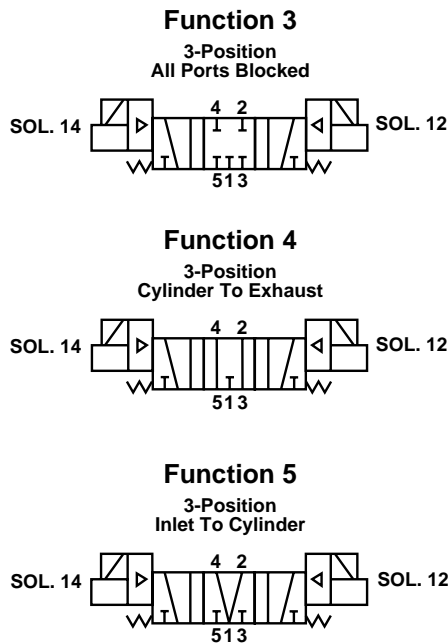
Function 5, Port 1 is connected to ports 2 & 4. Ports 5 & 3 are blocked.

Energize solenoid operator #12 – Port 1 is connected to port 2. Port 4 is connected to port 5. Port 3 is blocked.

Energize solenoid operator #14 – Port 1 is connected to port 4. Port 2 is connected to port 3. Port 5 is blocked.

Dual Pressure:

May be used for dual pressure service with pressure at ports 3 & 5 (external pilot must be used). – Exhaust at port 1.



Model Selection Information

For single pressure applications with internal pilot supply, 120V/60Hz (110V/50Hz).

Port Size

Model Number

	Function 3 (All Ports Blocked)	Function 4 (Cyl. Ports Open to Exh.)	Function 5 (Cyl. Ports Open to Inlet)
1/4" Inline	AL43A23BKH5300A	AL44A23BKH5300A	AL45A23BKH5300A

If different voltages or options are required, consult the valve model number system chart.

Materials

Valve Bodies & Bases: Precision die-cast zinc alloy
 Spool: File hard, coated aluminum
 Valve Spacers & Seal Retainers: Brass
 Air Pistons & End Bushings: Acetal Resin
 Dynamic Seals: Polyurethane
 Static Seals: Nitrile
 Coils: Class 'B', Epoxy encapsulated

Valve Selection

Safety factors are designed into each valve. However, it is important that the application requirements do not exceed the limits stated for pressure and temperature.

Life Expectancy

Normal multi-million cycle life expectancy of these valves is based on the use of properly filtered and lubricated air at room temperature. These valves are also designed to operate under non-lubricated conditions and will yield millions of maintenance free cycles.

Factory Pre-Lubrication


All valves are pre-lubricated at assembly with Sunaplex 781 or equivalent (Petroleum Base-Lithium Content) grease.

In-Service Lubrication

In-Service Lubrication is not required. However, if lubrication is to be used, F442 oil is recommended. This oil is specially formulated to provide peak performance and maximum service life from all air operated equipment.

Other Recommended Lubricant Specifications

Use a straight Paraffin Base Mineral Oil of viscosity 100-200 SSU @ 100°F and an aniline point range greater than 200°F.

 **CAUTION:** Do not use synthetic, reconstituted, or oils with an alcohol content.


Installation

Valves should be installed with reasonable accessibility for service whenever possible. Keep pipe lengths to a minimum. Pipe should be clean, free of dirt and chips. Pipe joint compound should be used sparingly and applied only to the male pipe, never in the valve body. Care must be taken to avoid undue strain on the valve.

Mounting surfaces should be flat, clean and free of weld spatter.

Protect the valve from exposure to extreme temperatures, dirt and moisture to maximize life.

Air applied to the valve must be filtered to realize maximum component life.

 **CAUTION:** It is recommended that double solenoid and double remote air pilot operated 2-Position valves be mounted so that the axis of the main valve spool is in the horizontal plane. The valve may be rotated 360° around the axis, for mounting convenience.

 **CAUTION:** ALWAYS REMOVE AIR PRESSURE AND

ELECTRICITY FROM CIRCUIT BEFORE SERVICING OR CONVERTING ANY VALVE.

Internal/External Pilot Conversion

Solenoid operated valves are field convertible to an external pilot supply, for applications where pressure applied to the valve inlet is lower than the specified service limitations.

External pilots are commonly required when the valve is to be applied for **dual pressure or vacuum service**.

Conversion Procedure (For Solenoid Valves Only)

1. Remove two recessed phillips-head screws securing valve cover.
2. Lift cover off valve.
3. Remove the rubber selector and reposition with the number “2” aligned with the pointer on the valve body.
4. Replace cover on valve and tighten screws to approximately 10-12 in.-lbs.
5. Connect pressure signal (between 35 and 150 PSIG) to port “X”, “12” or “14” on valve body or base. (This step is not necessary when converting valve for use with sandwich regulators.)

Pilot Selector Code

Pointer Position 1 - Internal pilot supply.

Pointer Position 2 - External pilot supply, and all solenoid operated valves used with sandwich regulators.

Pointer Position 3 -

- Single remote air pilot operated valves with internal air and spring assist return. (35 PSIG minimum pressure)
- Connect remote pilot signal to port “14” on valve body or base.

Pointer Position 4 -

- Double remote air pilot operated valves. Connect remote pilot signals to ports “12” and “14” on valve body or base.
- Single remote air pilot operated valves used with common port sandwich regulators below a 35 PSIG inlet pressure, or used with single port or independent port sandwich regulators (apply a 35 PSIG min. pressure to port “12” for air return function).

Wiring Instructions**Plug-In Valves**

Single Solenoid – Use wires marked 2 & 3 on subbase or manifold. Wires are not polarity sensitive other than for valves using 24VDC indicator light. (Polarity is 2(+), 3(-).) Wires 1 & 4 are not used.

Double Solenoid – Use wires marked 1 & 2 for solenoid “12”. Use wires marked 3 & 4 for solenoid “14”. Wires are not polarity sensitive other than for valves using 24VDC indicator light. (Polarity is 1(+), 2(-), 3(-), 4(+).)

Conduit Style Valves with “Flying Lead” Coils – Wires are not polarity sensitive other than for valves using 24VDC indicator light. These are polarity sensitive. **Coil lead wires are color coded; Red (+), Black (-). 24VDC indicator light lead wires are color coded; Red (+), White (-).**

Pressure Range

Medium		Internal Pilot Supply	External Pilot Supply
Air	Main Valve	35-150 PSIG	0-150 PSIG
	Pilot		35-150 PSIG
Vacuum	Main Valve	Do Not Use	28" Hg. Vacuum
	Pilot		35-150 PSIG
Other		Consult Supplier	

⚠ CAUTION: When Low Watt Voltage Code 19 is specified, Max Pilot Pressure is **90 PSIG**.

Ambient Temperature Range (°F)

All Valves	
*Minimum	Maximum
20	140

⚠ CAUTION: If it is possible that the ambient temperature may fall below freezing, the medium must be moisture free to prevent internal damage or unpredictable behavior.

Quick Change Coils for Model Numbers Ending with “B”

Voltage Code **	Voltage			Coil Number		Power Consumption (Watts)	AC		DC
	60 Hz	50 Hz	DC	With Indicator Light	Unlighted		Inrush (Amps)	Hold (Amps)	Hold (Amps)
b9* (Blue)	—	—	24	K593 314	K593 312	2.5†	—	—	.105
19*	—	—	24	K593 307	K593 298	2.5†	—	—	.105
41	—	—	6	—	K593 286	6.0	—	—	.83
42	24	—	—	—	K593 288	6.0	.60	.41	—
45	—	24	12	—	K593 289	6.0	.57	.40	.47
49	—	—	24	K593 303	K593 290	6.0	—	—	.23
53	120	110	—	K593 302	K593 285	6.0	.12	.10	—
57	240	—	—	—	K593 294	6.0	.07	.045	—

† With Indicator Light, 3.1 Watts.
 * Max. Pressure: 90 PSIG, 2.8 Watts, 3.4 Watts with indicator lights.

Coils for Model Numbers Not Ending with “B”

Voltage Code **	Voltage			Coil Number		AC		DC
	60 Hz	50 Hz	DC	Plug-In	19" Leads	Inrush (Amps)	Hold (Amps)	Hold (Amps)
19*	—	—	24	K593 283	K593 281	—	—	.105
41	—	—	6	K593 207	K593 167	—	—	1.30
42	24	—	—	K593 211	K593 169	.60	.40	—
45	—	—	12	K593 213	K593 170	—	—	.60
49	—	—	24	K593 215	K593 171	—	—	.34
53	120	110	—	K593 205	K593 166	.12	.08	—
57	240	—	—	K593 248	K593 175	.07	.04	—

Notes: 1. Shaded area's indicate extended delivery times should be expected; consult supplier for availability.
 2. Indicator lights are available for 120V/60Hz (110V/50Hz) & 24VDC coils.
 3. Nominal power consumption is 6 watts.
 4. Other voltages are available. Consult supplier.
 * Max. Pressure: 90 PSIG, 2.8 Watts, 3.4 Watts with indicator lights.

⚠ CAUTION: Low Watt operator derated to 90 PSIG Max.

Listing Agency

“AL” Series Solenoid Operated Valves with the following voltage codes are **CANADIAN STANDARDS ASSOCIATION** approved for General Purpose Applications under file No. 18763 “Electrically Operated Valves”:

- | | | |
|-----------------------|---------------|----------------------------|
| 19 = 24VDC (Low Watt) | 42 = 24V 60Hz | 49 = 12VDC |
| 41 = 6VDC | 45 = 12VDC | 53 = 120V 60Hz (110V 50Hz) |
| | | 57 = 240V 60Hz |

Response Data

2-Position Double Solenoid Average Response Time: (Seconds)*

Port Size (NPT) & Type	12 Cu. In. Test Chamber		100 Cu. In. Test Chamber	
	Fill	Exhaust	Fill	Exhaust
1/4" Direct Pipe (Inline Mtd.)	.061	.066	.246	.377
1/4" Subbase	.061	.068	.249	.394
1/4" Manifold	.062	.063	.234	.350
3/8" Subbase	.061	.067	.236	.390
†3/8" Manifold	.059	.068	.224	.350

†Measured through bottom ports.

* With 90 PSIG supply, time required to fill from 0 to 81 PSIG and exhaust from 90 to 9 PSIG is measured from instant of energizing, or de-energizing 120V/60Hz. Times shown are average.

The capacity curves shown in the chart are for theoretical valve having a C_V - 1.0 for air at standard conditions -temperature 68°F, 36% relative humidity and 14.7 PSI absolute pressure.

To estimate the SCFM capacity of a valve, if the supply or initial pressure is known, proceed as follows:

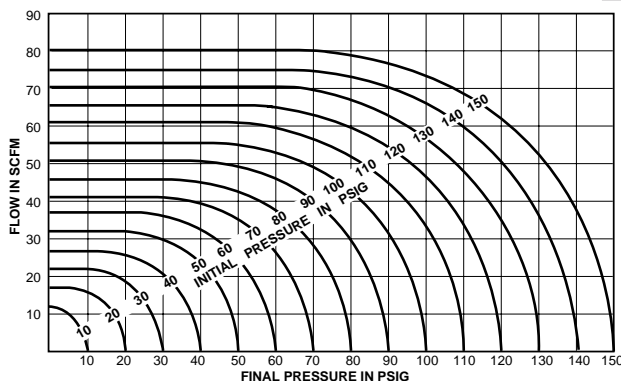
Assuming initial pressure to 100 PSIG, select the 100 PSI initial pressure curve and follow it upward and to the left edge of the chart. Read the flow in SCFM (in this example flow is approximately 56 SCFM). Multiply the SCFM flow obtained in the chart by the C_V for valve and flow path desired shown in the accompanying table.

To estimate valve size for a known required flow and initial pressure, divide the required SCFM flow by the SCFM obtained from the flow chart. Select the required valve size from the valves listed in the table which have a C_V that slightly exceeds the quotient.

For example: Assuming 80 SCFM required flow, 100 PSIG initial pressure, divide 80 SCFM by 56 SCFM (max. flow from chart). The quotient is 1.42 (80/56 = 1.42). Valves with a C_V of 1.42 or greater selected from the table will provide the required flow.

To estimate flow capacity at a specific "final pressure," locate the desired final pressure on the bottom scale of the chart. Follow a vertical line upward until it intersects the initial pressure curve. Then follow a horizontal line from that point to the left edge of the chart. Read SCFM flow. Multiply SCFM obtained in chart by C_V of selected valve for flow.

C_V Method



Data at Std. Conditions
 68°F Temperature
 14.7 PSI Abs. Pressure
 36% Relative Humidity

G = Specific Gravity of fluid related to air = 1 @ 14.7 psia, 68°F, 36% Relative Humidity

P_2 = Downstream Pressure (psia)
 ΔP_c = Component pressure drop

$$Q = 22.48 C_V \sqrt{\frac{(\Delta P_c) \times (P_2)}{(T_1) \times (G)}}$$

Q = Flow Rate (scfm) at 14.7 psia, 68°F, 36% Relative Humidity

T_1 = Upstream Temperature °R (°R = °F + 460)

C_V = Flow Coefficient

Flow Rating determined in accordance with NFPA recommended Standard NFPA/T3.21.3-1972.

Flow Rating (2-Position Valves)

Valve Mounting	C_V			
	Flow Path			
	Port 1 to 2	Port 1 to 4	Port 2 to 3	Port 4 to 5
On 1/4" Base	1.41	1.44	1.41	1.44
On 3/8" Base	1.38	1.42	1.48	1.44
On Manifold	1.41	1.35	1.59	1.52
†On Manifold	1.56	1.43	1.72	1.47
On Manifold w/Flow Control	1.22	1.24	1.32	1.30
Direct Pipe (Inline Mounted)	1.39	1.44	1.50	1.45

Flow Rating (*3-Position Valves)

Valve Mounting	C_V			
	Flow Path			
	Port 1 to 2	Port 1 to 4	Port 2 to 3	Port 4 to 5
On 1/4" Base	1.41	1.36	1.41	1.44
On 3/8" Base	1.37	1.39	1.48	1.39
On Manifold	1.32	1.21	1.59	1.40
†On Manifold	1.54	1.45	1.71	1.50
On Manifold w/Flow Control	1.32	1.25	1.42	1.32

† - Flow through bottom cylinder ports.

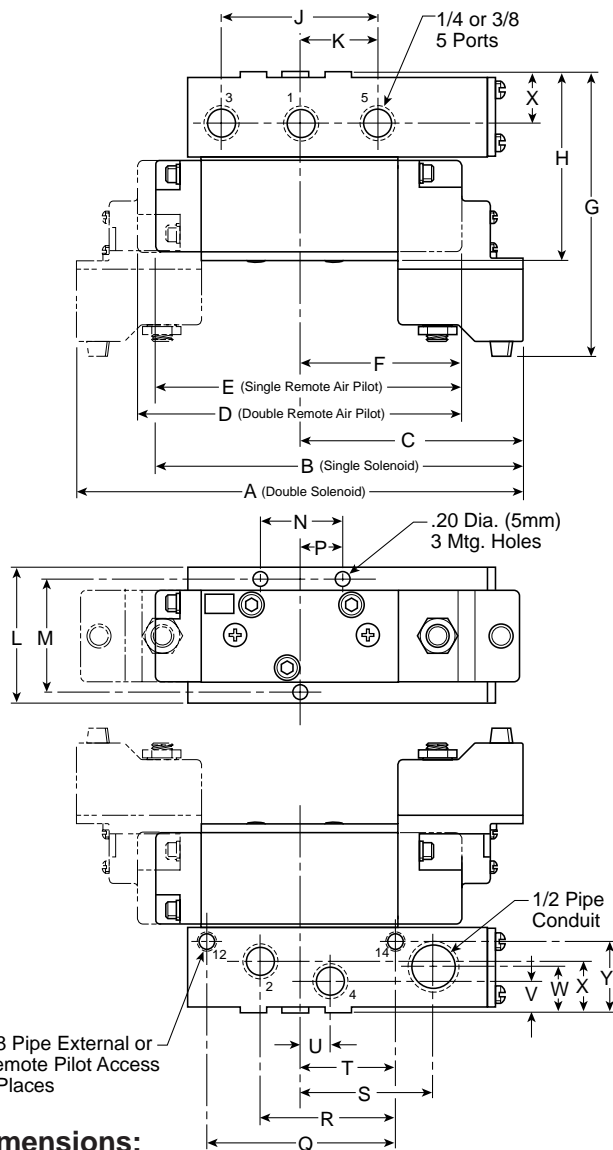
* - All ports blocked in neutral spool configuration (Function 1).

Technical Information

Function	Diagram	Pilot Selector Setting			Operating Requirements
		Solenoid	Single Remote	Double Remote	
4-Way Directional with Speed Control		1	—	—	Pressure @ Port 1 must be 35-150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1 may be vacuum to 150 PSIG.
4-Way Dual Pressure		2	4*	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Ports 3 & 5 may be vacuum to 150 PSIG. Port 1 may be vacuum or exhaust.* On base mounted valves, rotate selector to Position 4 and apply a pilot signal (between 35-150 PSIG) to Port “12”, but do not exceed pressure applied to Port “14”.
3-Way Normally Closed		1	—	—	Pressure @ Port 1 must be 35-150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1 may be vacuum to 150 PSIG.
3-Way Normally Open		1	—	—	Pressure @ Port 1 must be 35-150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1 may be vacuum to 150 PSIG.
Selector or Diverter		1	—	—	Pressure @ Port 1 must be 35-150 PSIG, and supplied constantly. Port 3 may be vacuum to 150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1, 2 and 3 may be vacuum to 150 PSIG.
2-Way Normally Closed		1	—	—	Pressure @ Port 1 must be 35-150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1 may be vacuum to 150 PSIG.
2-Way Normally Open		1	—	—	Pressure @ Port 1 must be 35-150 PSIG.
		2	3	4	Pressure @ Port X (12 or 14) must be 35-150 PSIG. Port 1 may be vacuum to 150 PSIG.

- Notes:**
1. See Pilot Selector Conversion procedure.
 2. 3-Position valves are not illustrated, but they can be used for optional functions in similar fashion to the 2-Position functions shown.
 3. **CAUTION:** Always remove air pressure from valve circuit before converting valve (changing pilot selector setting) for optional function.

**2 & 3-Position
Subbase Mounted Valves**

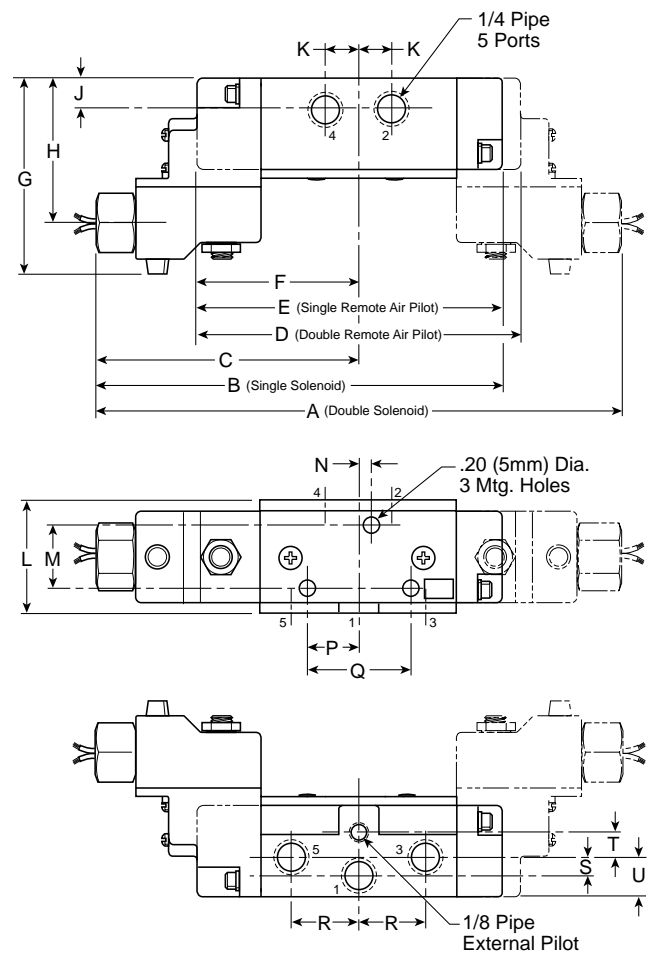


Dimensions:

	inches	mm
A	7.27	185
B	6.03	153
C	3.66	92
D	5.84	148
E	5.29	134
F	2.92	74
G	4.81	122
H	3.27	83
J	2.56	65
K	1.28	32
L	2.25	57
M	1.90	48

	inches	mm
N	1.28	32
P	.64	16
Q	3.10	79
R	2.22	56
S	2.25	57
T	1.55	39
U	.50	13
V	.47	12
W	.75	19
X	.94	24
Y	1.14	29

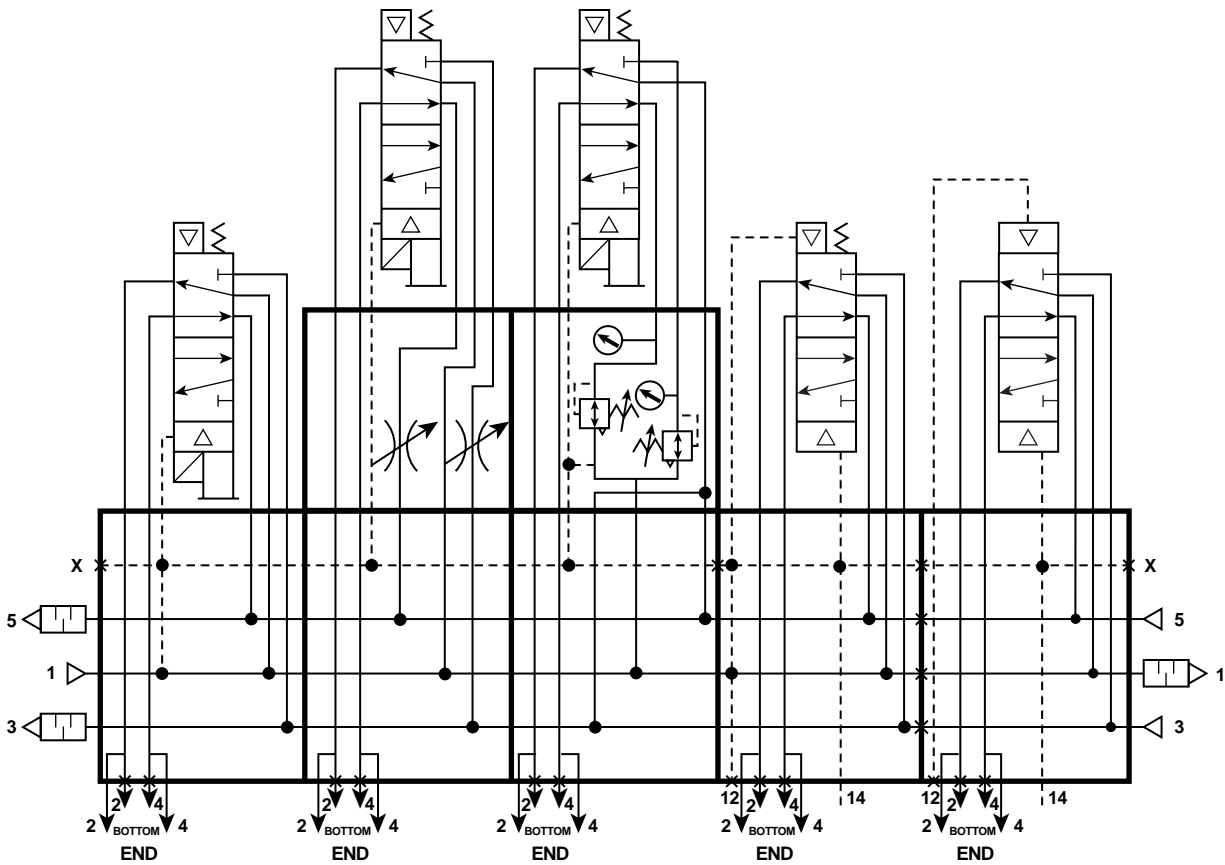
**2 & 3-Position
Direct Pipe Ported Valves**



Dimensions:

	inches	mm
A	8.70	221
B	6.75	172
C	4.35	110
D	5.82	148
E	5.31	135
F	2.91	74
G	3.31	84
H	2.37	60
J	.56	14
K	.60	15
L	2.00	84
M	1.03	20

	inches	mm
N	.19	5
P	.98	25
Q	1.56	40
R	1.20	30
S	.31	8
T	.44	11
U	.69	18



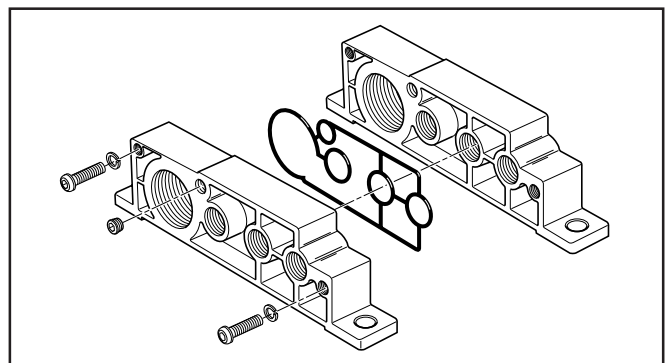
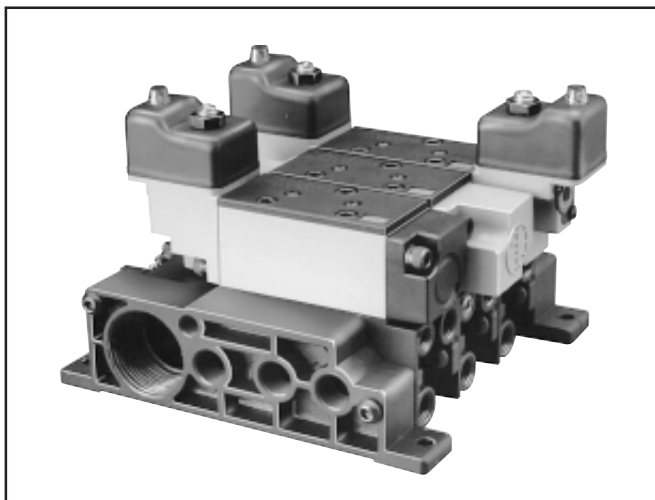
Suggested Representation of Typical Schematic

Manifold Arrangements

Valves may be gang manifolded up to 10 stations. More stations may be added if sufficient up-stream volume permits or if sequence of operation is considered, to insure adequate working pressure at the last station in the manifold gang. Providing dual inlets or conversion to an external pilot will also permit larger manifold arrangements. Larger manifold assemblies may require supports. For port isolation order K333 016.

Remote Air Pilot Operated Valves on Manifolds

Require use of K402 005 isolator disc installed in manifold "X" gallery. This part comes with the valve assembly.



Add-A-Fold Side Plate Kit

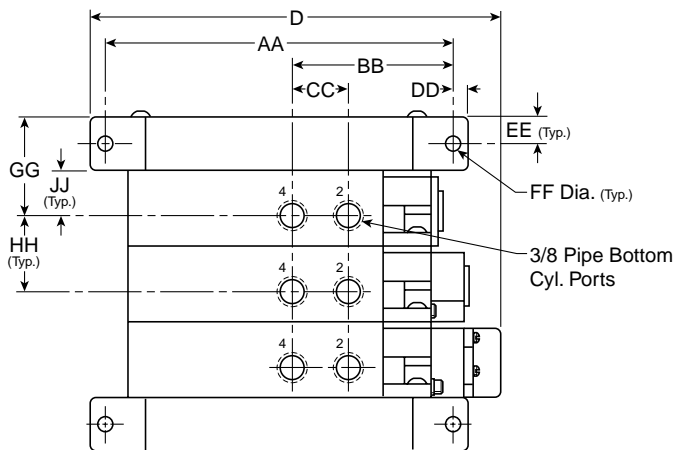
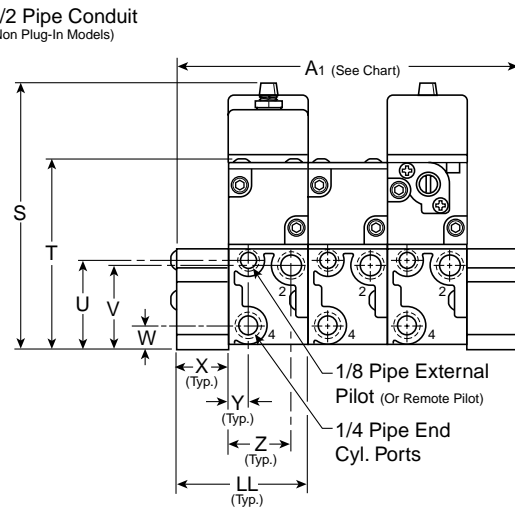
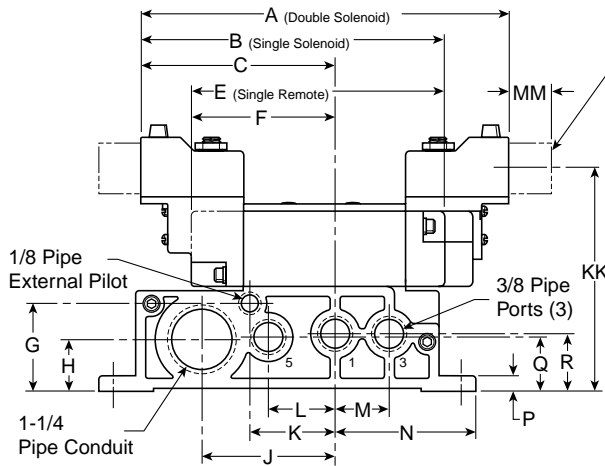
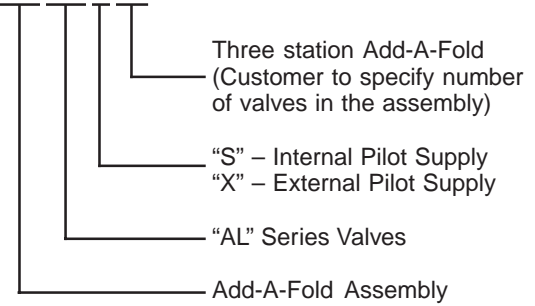
Model No. K122 022 (included in Add-A-Fold Assembly Kit, see next page) kit contains (2) side plates, (1) gasket, (2) screws, (2) washers and (2) 1/8" NPT pipe plugs.

When Ordering Add-A-Fold Stack Assemblies:

- List valves by complete model number in order from left to right viewing the cylinder port 2 and 4 of the assembly. Consult individual valve specification sheet for complete model number.
- Include proper Add-A-Fold Assembly Kit number AA ALS** (this includes assembling the stack in the order listed with one Side Plate Kit). Place the number of stations in place of the asterisks such as:
 2 station Add-A-Fold – AA ALS 02,
 10 station Add-A-Fold – AA ALS 10, etc....
- Example:** A three station Add-A-Fold (120V/60Hz).
 Station 1 AL11323BKN5300A (Single solenoid)
 Station 2 AL61323000XX00A (Double air operated)
 Station 3 AL41323BKN5300A (Double solenoid)

Add-A-Fold Assembly

AA ALS 03

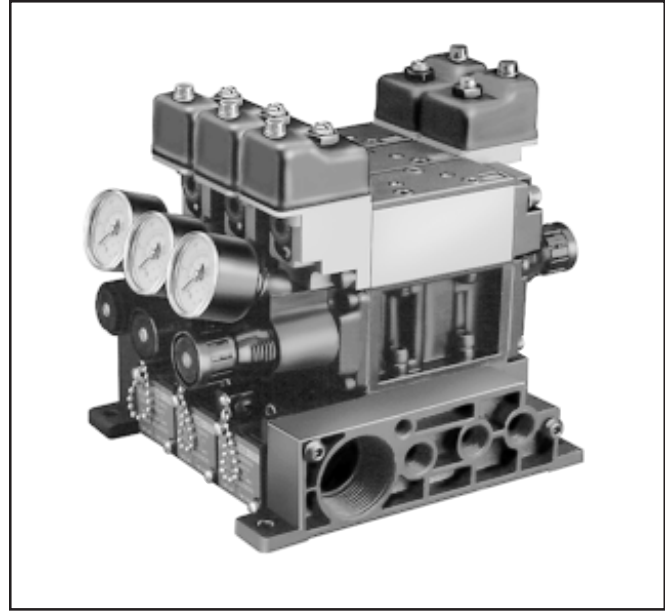


No. of Stations	"A ₁ " Dimension	mm
2	5.26	133
3	6.85	174
4	8.44	214
5	10.03	255
6	11.62	295
7	13.21	336
8	14.80	376
9	16.40	417
10	17.98	457

	A	A ₁	B	C	D	E	F	G	H	J	K	L	M
inches	7.27	See Chart	6.03	3.63	8.31	5.29	2.92	1.75	1.02	2.65	1.68	1.30	1.00
mm	185		153	92	211	134	74	44	26	67	43	33	25
	N	P	Q	R	S	T	U	V	W	X	Y	Z	AA
inches	2.83	.31	1.06	1.13	5.28	3.75	1.75	1.66	.46	1.04	.36	1.24	6.84
mm	72	8	27	29	134	95	44	42	12	26	9	32	174
	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM		
inches	3.10	1.10	.33	.52	.28	2.03	1.59	.99	4.35	2.63	.75		
mm	79	28	8	13	7	52	40	25	110	67	19		

Features

- Common regulation to both cylinder ports.
- Single regulation of one cylinder port.
- Dual regulation of each cylinder port independently.
- Operating Pressure (Primary) 35-150 PSIG.
- Three adjustment ranges available:
1-30 PSIG 2-60 PSIG 5-125 PSIG
- Locking, non-rising knobs.
- Gauges available as standard option.
- Transfer primary air to valve pilots.
- Electrical bridge plug, wire harness, and no-plug option available.
- Consolidates and simplifies pneumatic circuitry.
- Allows for several downstream pressures from one manifold assembly.
- Compact, modular design.



Flow Characteristics (Cv)

Mode of Regulation	Flow Path			
	Port 1 to 2	Port 1 to 4	Port 2 to 3	Port 4 to 5
Common Port	.70	.67	1.70	1.32
Single Port (#4)	1.08	.83	1.58	1.47
Single Port (#2)	.87	.99	1.58	1.47
Independent Port	.80	.74	1.58	1.47

Common Port Regulation

This modular air pressure regulator assembly, installed between the valve body and subbase or manifold station, supplies an adjustable, common regulated pressure to both cylinder ports. Can be used with sandwich flow control.

Single Port Regulation*

This modular air pressure regulator assembly, installed between the valve body and subbase or manifold station, supplies an adjustable regulated pressure to one cylinder port while supplying line pressure to the other cylinder port.

Independent Port Regulation*

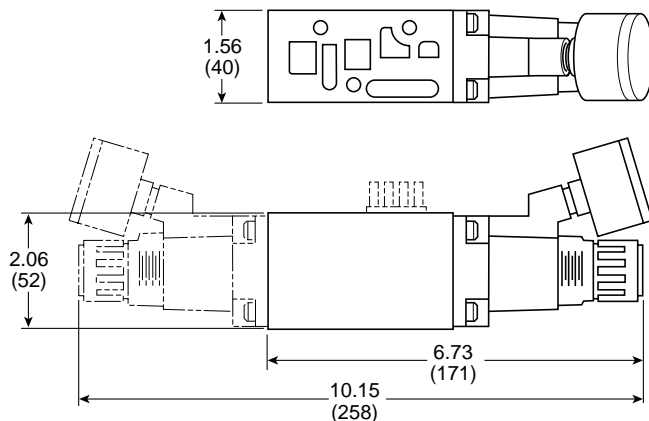
This modular air pressure regulator assembly, installed between the valve body and subbase or manifold station, supplies an adjustable regulated pressure to cylinder port 2, and a separate adjustable regulated pressure to cylinder port 4.

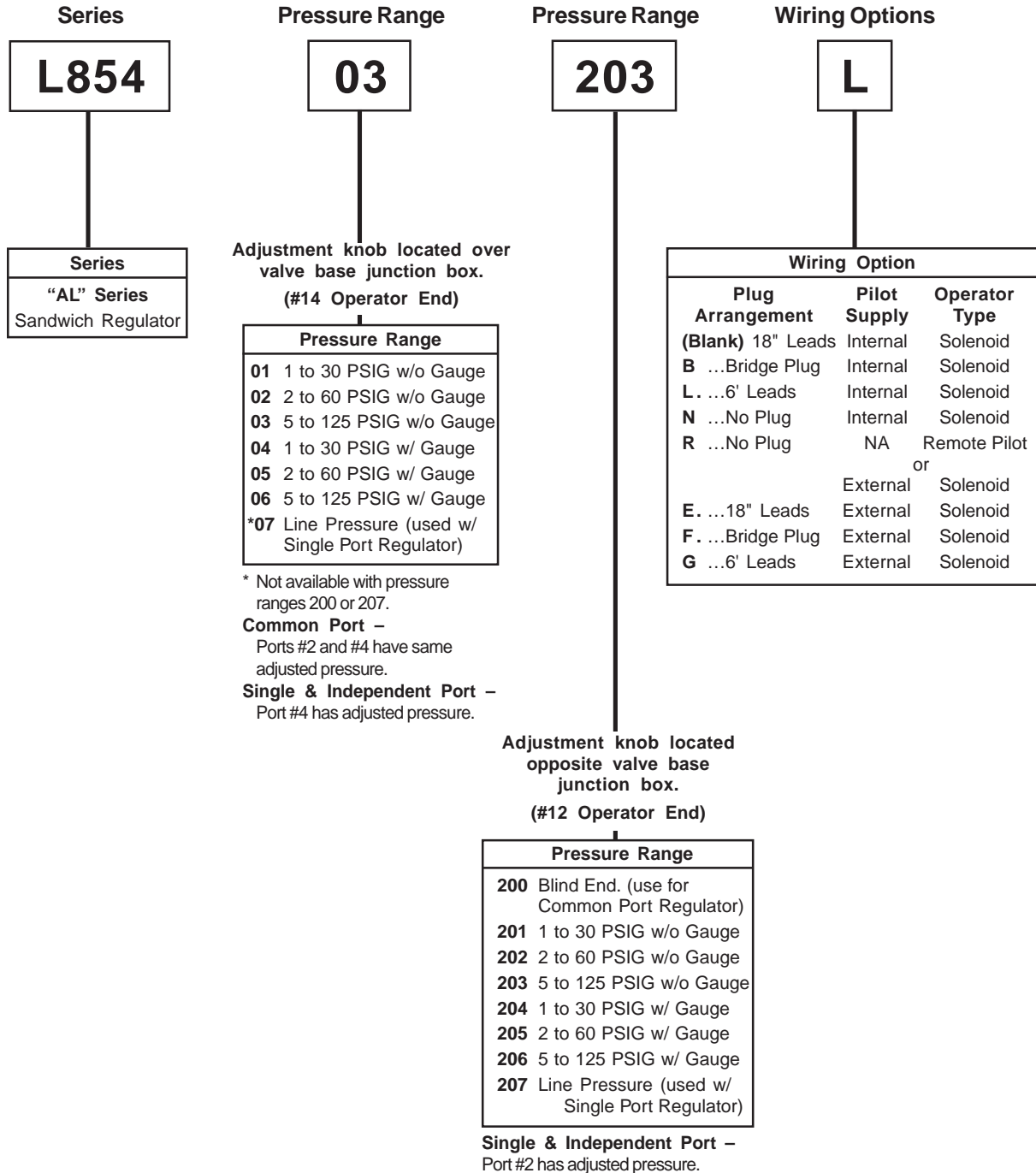
NOTE: When using a Single & Independent port sandwich regulator, cylinder port outlets are reversed. Pilot 12 energizes port 4, pilot 14 energizes port 2.

CAUTION:
For proper operation of solenoid operated valves with a sandwich regulator, valve pilot selector should be set to the #2 position. See technical information for conversion procedure. A 35 PSIG minimum operating pressure must be supplied to solenoid operated valves.

* Cannot be used with sandwich flow control.

Dimensions





Gauge Part Numbers	
0-30 PSIG	H03272
0-60 PSIG	H03273
0-160 PSIG	H03274

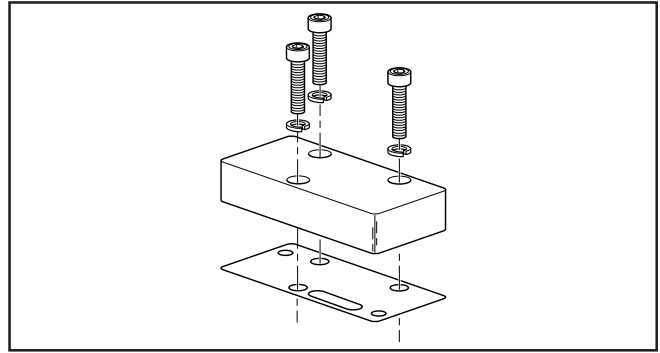
These are narrower than Parker gauges furnished with FRL's. These gauges must be used when manifolding valves.

Blank Station Plate

Allows Valve To Be Added For Future Needs

Model No. K342 005

- Allows customizing of Add-A-Fold assemblies.
- May be used with either Plug-In or Non-Plug-In Manifolds.
- Includes mounting screws & gasket.



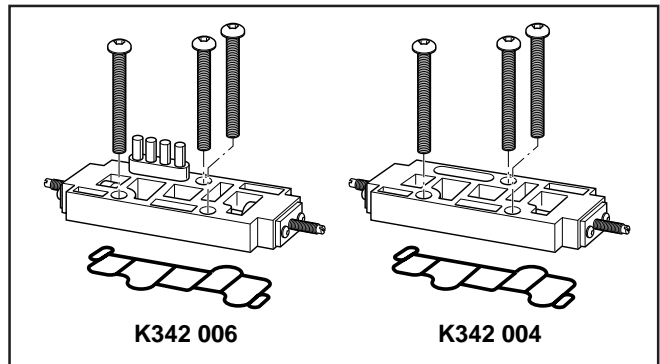
Flow Control “Sandwich”

Meters Cylinder Exhaust Through Valve

Plug-In – Model No. K342 006

Non Plug-In – Model No. K342 004

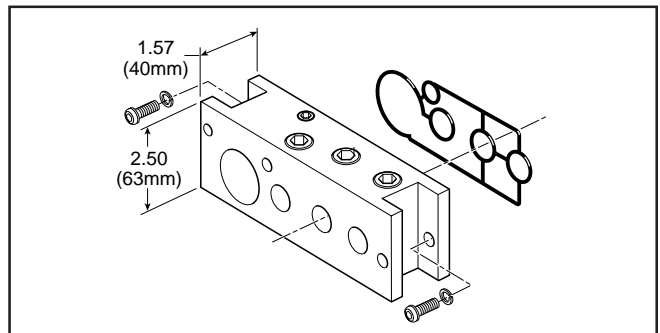
- May be used with either Subbase or Manifold Mounted Valves.
- May be ordered in kit form shown or factory assembled.
- Models shown include mounting screws & gasket.
- “Sandwich” is 1/2" thick.



Manifold Auxiliary Port Base

Model No. K142 176

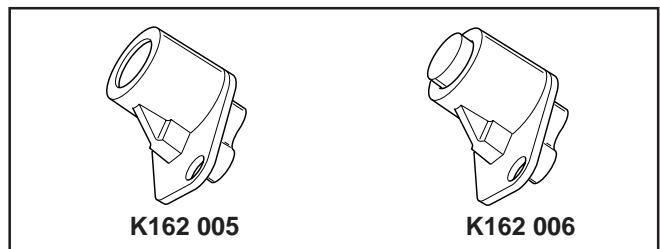
- Installs in Add-A-Fold system.
- Provides top & bottom access to internal galleries for additional inlet or exhaust capacity.



Non-Locking Overrides

Part No. K162 005 & K162 006

- Flush or extended push-button.
- May be ordered in kit form or factory assembled in valve.
- Easily retrofits to AL Series Valves.



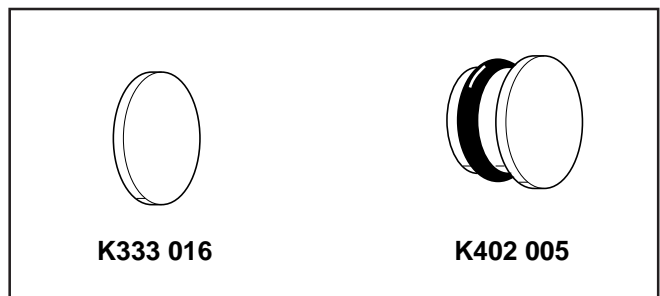
Isolator Plugs

Port Isolator Plug – Part No. K333 016

- Plug separates the supply and/or exhaust ports.
- Permits multiple pressures in a manifold.
- Order (1) plug for each internal gallery to be isolated.

‘X’-Port Isolator Plug – Part No. K402 005

- Plug assembly isolates external pilot galleries.
- Use with K333 016 Port Isolator Plug.



Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors, are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such item, when communicated to Parker Hannifin Corporation, its subsidiaries or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGN OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitations, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.



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