DIRECTIONAL CONTROL VALVES

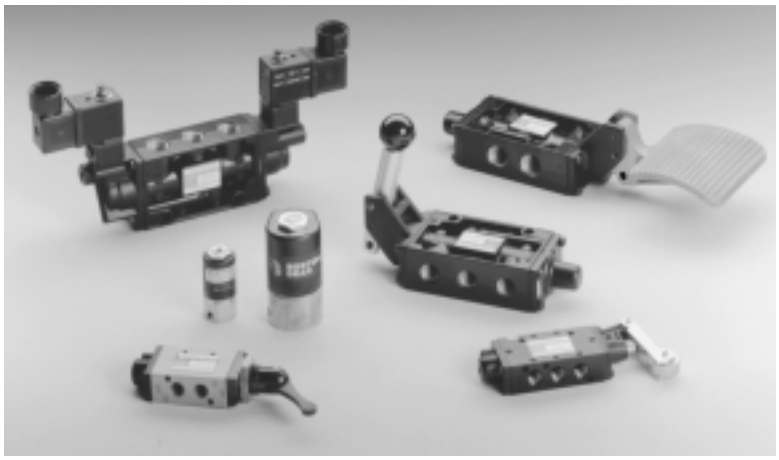


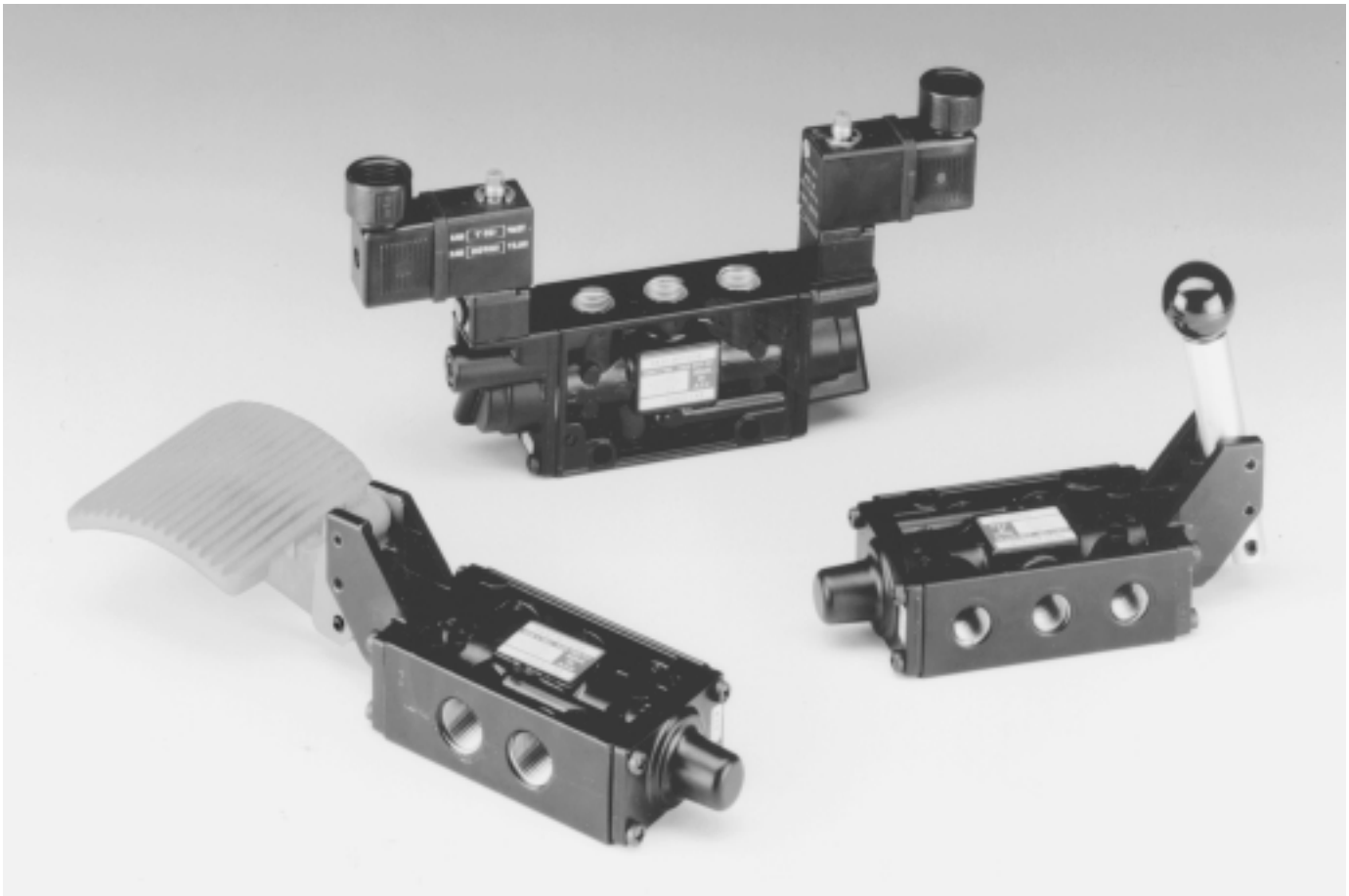
TABLE OF CONTENTS

	Page
EK SERIES	66-82
SOLENOID OPERATORS	70-71
AIR OPERATORS	72-73
MANUAL OPERATORS	74-79
MECHANICAL OPERATORS	80-81
REPAIR PARTS	68
AIR VALVE SIZING	82-83

VALVE SELECTION CHART

SERIES	PORTS	FUNCTIONS	OPERATORS	BODY	TYPE	CV RANGE
EK	1/4, 3/8 & 1/2 PTF	3 Way / 2 Position 4 Way / 2 Position 4 Way / 3 Position	Solenoid, Air, Manual, Mechanical	Inline	Spool	1.4–1.7

EK SERIES



1. RUGGED SOLENOID, AIR, MANUAL OR MECHANICAL OPERATORS

Bodies and operators are made of precision machined aluminum or zinc. Designed to last for millions of cycles.

2. LIGHTWEIGHT, ONE PIECE ALUMINUM SPOOL AND SEAL ASSEMBLY

Shifting forces are minimized because of the low inertial spool made from high strength anodized aluminum. The one-piece spool and seal assembly is easily serviced, resulting in cost savings in maintenance and down time.

3. LOW FRICTION ELASTOMER LIP SEALS

Highly durable low friction lip seals are designed to operate with lubricated or non-lubricated air.

4. SEGMENTED LATCH TYPE DETENT

The spool is held securely in place by a unique segmented detent which engages a lip on the piston.

5. SHOCK ABSORBENT BUMPERS

Valve life is extended because of substantial bumpers which absorb the shock and vibration of the rapidly shifting spool and piston.

6. POSITIVE PORT IDENTIFICATION

Connections made easy because the ports are marked with numerals. Operator end identification shows which ports are connected when the operator is activated.

7. SOLENOID PILOT OPERATORS

Low inrush and holding current provide low power consumption. Manual override (locking and non-locking) provides manual operation.

8. EPOXY COATED

External surfaces of the valve body and operators are protected by a corrosion and chip resistant epoxy paint.

9. INLINE VALVES

Valves mount directly to the air line and are available with the following features:

- 1/4", 3/8", or 1/2" PTF ports.
- 3-Way / 2-Position, 3-Port
- 4-Way / 2-Position, 5-Port
- 4-Way / 3-Position, 5-Port

The 3-way/2-position configuration is not available with 1/2" ports

Specifications

Fluids: Filtered and lubricated or non-lubricated compressed air or air at vacuum pressures.

Inlet Pressure Range:

Solenoid Operated Valves:

With Internal Pilot Supply: 15 to 150 PSIG*
With External Pilot Supply: 10" Hg vacuum to 150 PSIG
Air, Manual, or Mechanical Operated Valves: 10" Hg vacuum to 150 PSIG*

Temperature Range (Ambient/Inlet):

Solenoid Operated Valves: –20° to 120°F**
Air, Manual & Mechanical Operated Valves: –20° to 160°F**

Operator Pilot Pressures:

Maximum Pilot Pressure: 150 PSIG

Minimum Pilot Pressure at 150 PSIG.
Main valve inlet pressures are given in the following table:

*Minimum Inlet Pressure is dependent on the type of operator and return used. See Operator Pilot Pressure specifications in Operating Specifications.

**With the dewpoint of supply air less than air temperature below 35°F.

Minimum Pilot Pressure

Operator	Return	Non-Detent PSIG	Detented PSIG	Spring Centered PSIG
Air	Air	15	25	45
Solenoid	Solenoid	15	25	45
Air	Spring	35	—	—
Solenoid	Spring	35	—	—

Air Operator Signal Duration: Air operated 2-position detented or non-detented valves can be shifted with a momentary air signal. Minimum signal duration is 17 milliseconds.

Valve Materials

Body: Aluminum
Spool: Anodized aluminum
Elastomers: Nitrile and special nitrile-based low friction elastomers.
Solenoid Operator Base: PPS Plastic
Solenoid Operator Plunger and Spring: Stainless steel

Seal Compatibility

EK Series Valve seals are compatible with the following lubricants:

DC BR-2+ grease (Dow Corning)
DC44 grease (Dow Corning)
Non-detergent mineral based oil such as Mobil DTE light oil

EK seals are not compatible with WD-40 or commonly used de-icer fluids. Consult factory to verify compatibility of lubricants or fluids not listed above.

Minimum Operating Forces — Manual & Mech. Operators

Operator Number	Description	Force to Operate lbs.
KB0	Palm Button—Spring Return	18.0
KB3	Palm Button — Detent	9.0
KK0	Knob — Spring Return	18.0
KK1	Knob — Detent	9.0
KL0	Lever — Spring Return	9.0
KL1	Lever — Detent, 2-Position	7.0
KL2	Lever — Spring Centered	7.0
KL3	Lever — Detent, 3-Position	7.0
KT0	Treadle — Spring Return	13.0
KT1	Treadle — Detent, 2-Position	9.0
KT2	Treadle — Spring Centered	9.0
KP0	Tappet — Spring Return	18.0
KF0	Foot Pedal — Spring Return	11.0
KR2	Lever Roller — Spring Return	11.0
KR5	One-Way Trip Roller—Spring Return	11.0

Average Flow Factors (Cv)*

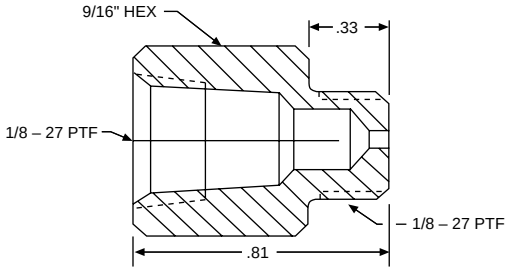
Valve	Port Size	Flow Path: Port 1 to 2 1 to 4	Flow Path: Port 2 to 3 4 to 5
3-Way Inline	1/4"	1.6	1.7
	3/8"	1.6	1.7
4-Way, Inline	1/4"	1.6	1.7
	3/8"	1.6	1.7
	1/2"	1.6	1.7

*Flow Rating determined in accordance with NFPA/T3.21.3, Pneumatic fluid power—Flow test procedure and reporting method—For fixed orifice components.

WARNING

When a solenoid or air operator is used as a return for a manual or mechanical operator, the pilot pressure applied to the return operator must not exceed 40 PSIG. Pilot pressures greater than 40 PSIG for a solenoid or air return will cause structural damage to the manual or mechanical operator and can also result in injury to the user. If the available pilot pressure exceeds 40 PSIG, an external pilot supply only must be used and a restrictor, part number E54872-02 (73045), must be installed in the pilot port of the return operator to reduce the return force to an acceptable level. Pilot pressure to the restrictor must not exceed 150 PSIG.

E54872-02



Port Size PTF Standard

Inline Valves: 1/4", 3/8", or 1/2". Valves with 1/2" ports are not available in the 3-way/2-position configuration.

EK SERIES

Solenoid Operator Specifications

Voltages Available and Power Requirements:

Standard: 120V/60Hz–110V/50Hz: 7W

Optional: 12V/50/60Hz: 7W
24V/50/60Hz: 7W
48V/50/60Hz: 7W
240V/60Hz:7W
220V/50Hz:7W
12 VDC: 6W
24 VDC; 6W

Duty: Continuous at 90 to 105% of rated voltage

Coil Type: Class H. Molded with three-pin plug-in connector

Enclosure Classification: NEMA 4, per DIN 40050 — IP 65

Connector Plug: Rotatable 1/2" Conduit Connector

Override: Manual, locking

Pilot Supply: Internal – standard, External – optional

External Pilot Supply Port: 1/8" PTF

Minimum Electrical Signal Duration: Solenoid operated 2-position detented or nondetented valves can be shifted with a momentary electrical signal. Minimum signal duration is 13 milliseconds for single solenoid operated spring return valves. Double solenoid operated valves minimum signal duration is 20 milliseconds.

Electrical connector spades on the operator coil are 3-pin with 11 mm spacing.

Repair Kits

Repair kits are universal and may contain parts not used in your operator. Replace used parts with identical parts from the kit. Discard unused parts. Kits include O-rings and other elastomeric parts, bumpers and bushings.

Item	Catalog Number	Item Code
Air Operator Repair Kit	E54344-16	76844
Solenoid Operator Repair Kit	E54344-17	76845
Spool Assemblies (Includes Spool & Seals)		
3-Way	E54237-59	76846
4-Way (2- and 3-position, all ports blocked in center position)	E54237-56	76847
4-Way (inlet open to cylinder in center position)	E54237-57	76848
4-Way (exhaust open to cylinder in center position)	E54237-58	76849

Replacement Coils

Voltages			Operator Coil Only	Item Code
60 Hz	50 Hz	DC		
120	110	—	E54452-01	71422
240	220	—	E54452-07	71423
12	12	—	E54452-04	—
24	24	—	E54452-05	71411
48	48	—	E54452-06	—
—	—	12	E54452-02	71421
—	—	24	E54452-03	71419

Port and Operator Identification

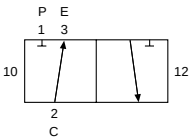
Each of the valve ports is identified by a permanent number adjacent to the port in the valve body. See Graphic Symbols below. In addition, a two-digit number at each end of the body indicates the ports connected when the operator at that end is actuated. The numbers 1 2 (read as “one, two”) indicate that Ports 1 and 2 are connected when the operator on the 1 2 end is actuated (the valve spool pushed toward the opposite end of the body). The numbers 1 0 or 1 4 at the other end of the body indicate, respectively, that Port 1 is blocked (3-way valves), or that Ports 1 and 4 (4-way valves) are connected when the operator on the 1 0 or 1 4 end is actuated.

Graphic Symbols

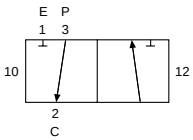
C = Outlet E = Exhaust P = Inlet X = Port Plugged

3-WAY 2-POSITION VALVES

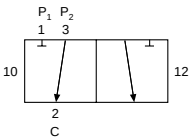
3-Way N.C.



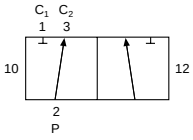
3-Way N.O.*



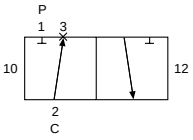
Selector (Dual Pressure)



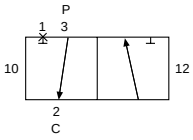
Distributor* (Two Position)



2-Way N.C.

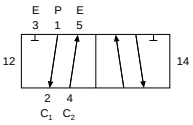


2-Way N.O.*

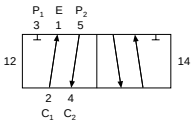


4-WAY 2-POSITION VALVES

Single Pressure



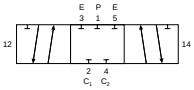
Dual Pressure*

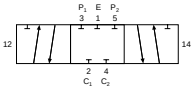


4-WAY 3-POSITION VALVES

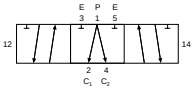
Single Pressure **Dual Pressure***

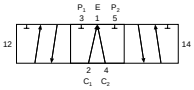
All Ports Blocked Center



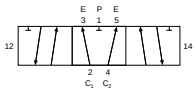


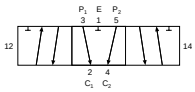
Inlet Open to Cylinder Ports Center





Exhaust Open to Cylinder Ports Center

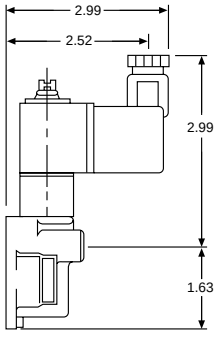


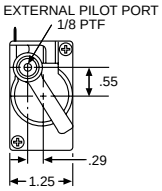


*These operating variations require an external pilot supply if solenoid operators are used.

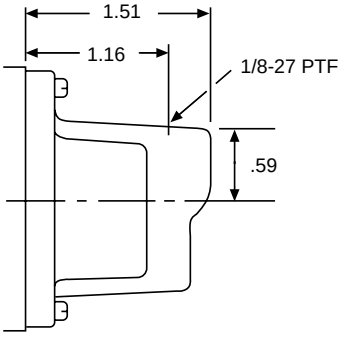
BOSTON GEAR®

Solenoid-K30/K32/K3L

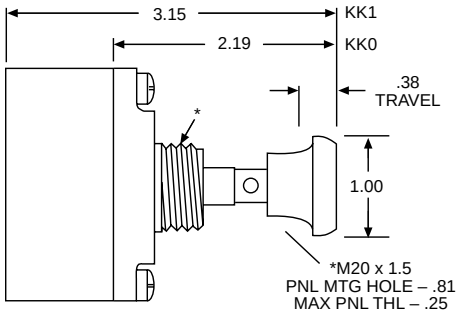




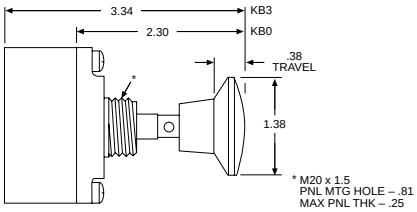
Air-KA2/KAC



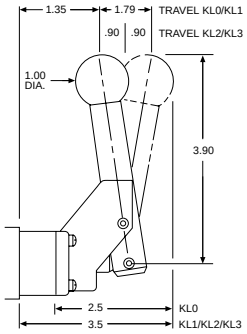
Knob-KK0/KK1



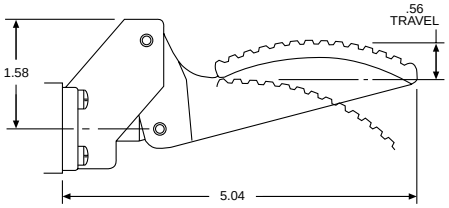
Palm Button-KB0/KB3



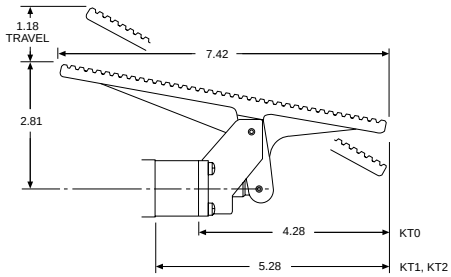
Lever-KL0/KL1/KL2/KL3



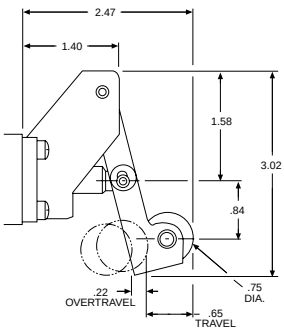
Foot Pedal-KF0



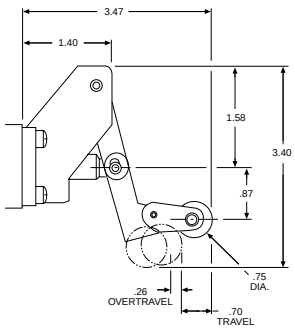
Treadle-KT0/KT1/KT2



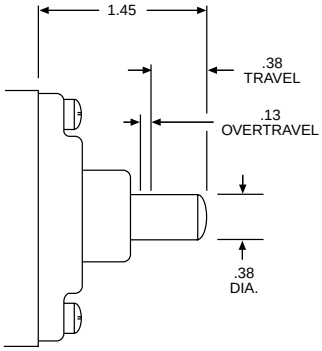
Lever-Roller-KR2



One-Way Roller-KR5

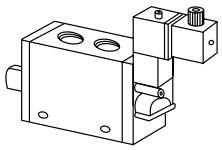


Tappet-KP0



3-WAY / 2-POSITION, 3-PORT

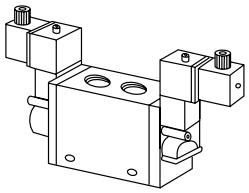
SINGLE SOLENOID SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-K32	74095
3/8	EK41EA00-KS1-K32	74096

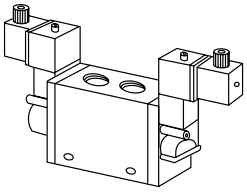
DOUBLE SOLENOID NON-DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-K32-K32	—
3/8	EK41EA00-K32-K32	—

DOUBLE SOLENOID DETENT

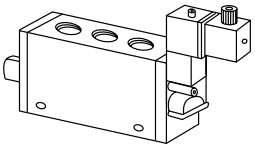


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-K3L-K3L	—
3/8	EK41EA00-K3L-K3L	—

4-WAY / 2-POSITION, 5-PORT

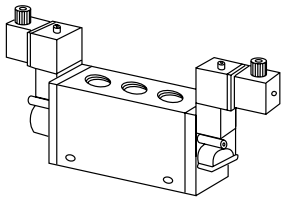
SINGLE SOLENOID SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS6-K32	74099
3/8	EK71EA00-KS6-K32	74102
1/2	EK71FA00-KS6-K32	79030

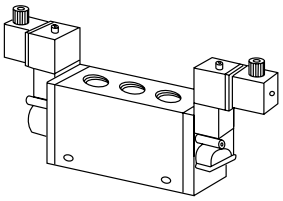
DOUBLE SOLENOID NON-DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-K32-K32	74097
3/8	EK71EA00-K32-K32	74100
1/2	EK71FA00-K32-K32	79017

DOUBLE SOLENOID DETENT

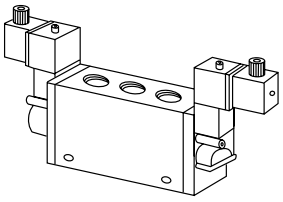


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-K3L-K3L	74098
3/8	EK71EA00-K3L-K3L	74101
1/2	EK71FA00-K3L-K3L	79018

4-WAY / 3-POSITION, 5-PORT

DOUBLE SOLENOID SPRING CENTER ALL PORTS BLOCKED



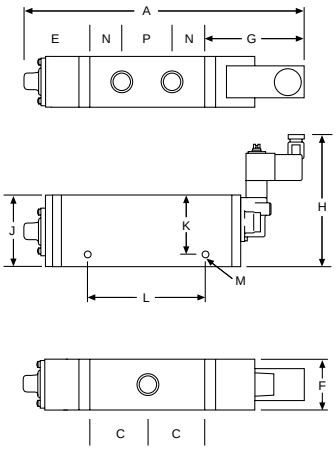
ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK81DA00-K30-K30	74115
3/8	EK81EA00-K30-K30	74116
1/2	EK81FA00-K30-K30	79038

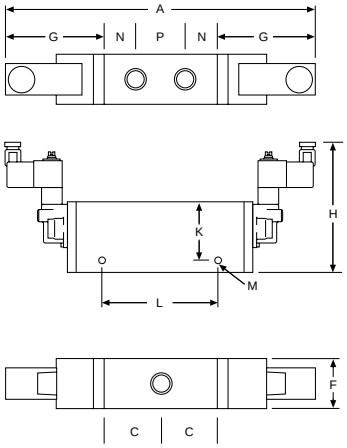
NOTE: For 4-Way / 3-Position, 5-Port Valves other spool configuration are available. Change catalog number position 7 and 8 from 00 to XX for different spools as shown below
05 - Inlet open to cylinder ports
06 - Exhaust open to cylinder ports.

3-PORT

SINGLE SOLENOID

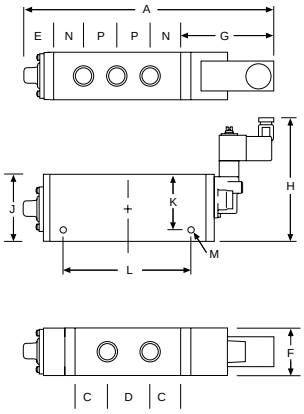


DOUBLE SOLENOID

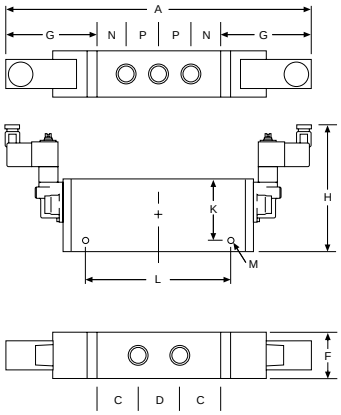


5-PORT

SINGLE SOLENOID



DOUBLE SOLENOID

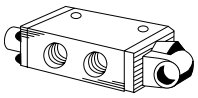


DIMENSIONS — VALVE WITH SOLENOID OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	C	D	E	F	G	H	J	K	L	M	N	P
3-Port / 2-Position — Non-Detent														
Single Solenoid	1/4 & 3/8	6.57	1.24	—	1.10	1.26	2.99	4.62	2.16	1.92	1.38	0.26	0.68	1.12
Double Solenoid	1/4 & 3/8	8.46	1.24	—	—	1.26	2.99	4.62	2.16	1.92	1.38	0.26	0.68	1.12
3-Port / 2-Position — Detent														
Double Solenoid	1/4 & 3/8	8.46	1.24	—	—	1.26	2.99	4.62	2.16	1.92	1.38	0.26	0.68	1.12
5-Port / 2-Position — Non-Detent														
Single Solenoid	1/4 & 3/8	7.63	1.22	1.10	1.10	1.26	2.99	4.62	2.16	1.92	2.20	0.26	0.68	1.09
Spring Return	1/2	7.63	1.22	1.10	1.10	1.26	2.99	4.62	2.64	2.16	2.38	0.26	0.68	1.09
Double Solenoid	1/4 & 3/8	9.52	1.22	1.10	—	1.26	2.99	4.62	2.16	1.92	2.20	0.26	0.68	1.09
	1/2	9.52	1.22	1.10	—	1.26	2.99	4.62	2.64	2.16	2.38	0.26	0.68	1.09
5-Port / 2-Position — Detent														
Double Solenoid	1/4 & 3/8	9.52	1.22	1.10	—	1.26	2.99	4.62	2.16	1.92	2.20	0.26	0.68	1.09
	1/2	9.52	1.22	1.10	—	1.26	2.99	4.62	2.64	2.16	2.38	0.26	0.68	1.09
5-Port / 3-Position														
Double Solenoid	1/4 & 3/8	9.52	1.22	1.10	—	1.26	2.99	4.62	2.16	1.92	2.20	0.26	0.68	1.09
Spring Center	1/2	9.52	1.22	1.10	—	1.26	2.99	4.62	2.64	2.16	2.38	0.26	0.68	1.09

3-WAY / 2-POSITION, 3-PORT

SINGLE AIR
SPRING RETURN

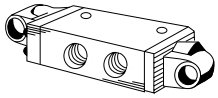


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size*	Catalog Number	Item Code
1/4	EK41DA00-KS1-KA2	74180
3/8	EK41EA00-KS1-KA2	74181

*Port in Air Operator is tapped 1/8" PTF

DOUBLE AIR
NON-DETENT



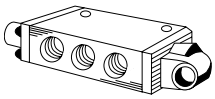
ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size*	Catalog Number	Item Code
1/4	EK41DA00-KA2-KA2	74182
3/8	EK41EA00-KA2-KA2	75351

*Port in Air Operator is tapped 1/8" PTF

4-WAY / 2-POSITION, 5-PORT

SINGLE AIR
SPRING RETURN

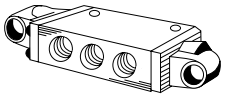


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size*	Catalog Number	Item Code
1/4	EK71DA00-KS6-KA2	74184
3/8	EK71EA00-KS6-KA2	74185
1/2	EK71FA00-KS6-KA2	79032

*Port in Air Operator is tapped 1/8" PTF

DOUBLE AIR
NON-DETENT



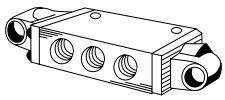
ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size*	Catalog Number	Item Code
1/4	EK71DA00-KA2-KA2	74270
3/8	EK71EA00-KA2-KA2	74589
1/2	EK71FA00-KA2-KA2	79019

*Port in Air Operator is tapped 1/8" PTF

4-WAY / 3-POSITION, 5-PORT

DOUBLE AIR
SPRING CENTER
ALL PORTS BLOCKED



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size*	Catalog Number	Item Code
1/4	EK81DA00-KAC-KAC	74188
3/8	EK81EA00-KAC-KAC	74189
1/2	EK81FA00-KAC-KAC	79039

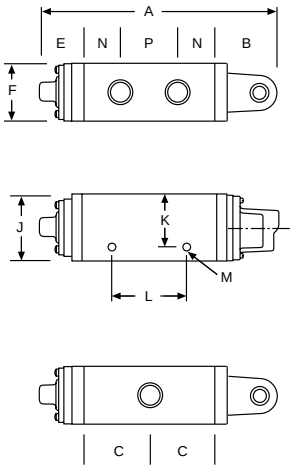
*Port in Air Operator is tapped 1/8" PTF

NOTE: For 4-Way / 3-Position, 5-Port Valves other spool configuration are available. Change catalog number position 7 and 8 from 00 to XX for different spools as shown below
05 - Inlet open to cylinder ports
06 - Exhaust open to cylinder ports.

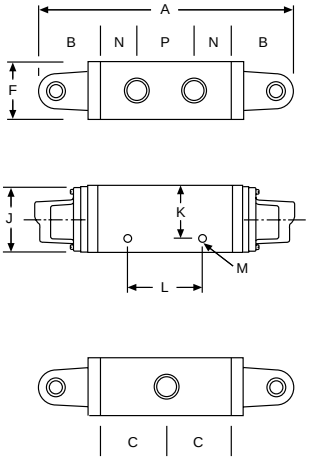
DIMENSIONS

3-PORT

SINGLE AIR

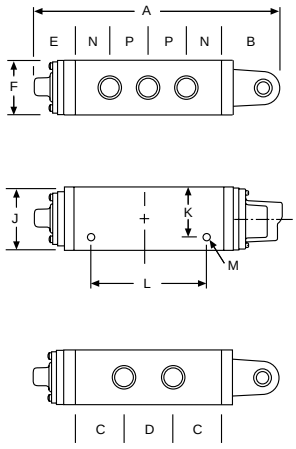


DOUBLE AIR

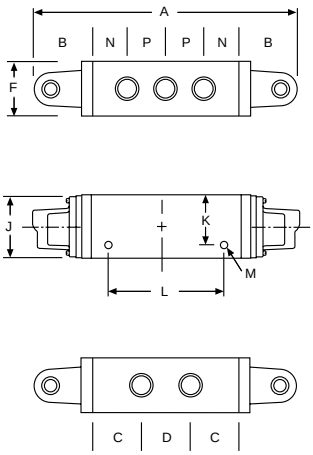


5-PORT

SINGLE AIR



DOUBLE AIR



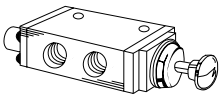
DIMENSIONS — VALVE WITH AIR OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	B	C	D	E	F	J	K	L	M	N	P
3 Port / 2 Position — Non-Detent													
Single Air	1/4 & 3/8	5.09	1.51	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12
Double Air	1/4 & 3/8	5.50	1.51	1.24	—	—	1.26	2.16	1.92	1.38	0.26	0.68	1.12
5 Port / 2 Position — Non-Detent													
Single Air	1/4 & 3/8	6.15	1.51	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09
Spring Return	1/2	6.15	1.51	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09
Double Air	1/4 & 3/8	6.56	1.51	1.22	1.10	—	1.26	2.16	1.92	2.20	0.26	0.68	1.09
	1/2	6.56	1.51	1.22	1.10	—	1.26	2.64	2.16	2.38	0.26	0.68	1.09
5 Port / 3 Position													
Double Air	1/4 & 3/8	6.56	1.51	1.22	1.10	—	1.26	2.16	1.92	2.20	0.26	0.68	1.09
Spring Center	1/2	6.56	1.51	1.22	1.10	—	1.26	2.64	2.16	2.38	0.26	0.68	1.09

MANUAL OPERATORS – KNOB / PALM BUTTON *EK SERIES*

3-WAY / 2-POSITION, 3-PORT

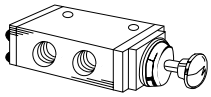
BLACK KNOB SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KK0	74190
3/3	EK41EA00-KS1-KK0	74191

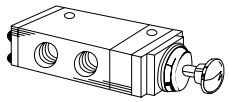
BLACK KNOB NON-DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KK0	74152
3/8	EK41EA00-KC0-KK0	75365

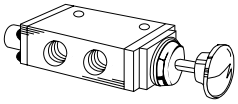
BLACK KNOB DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KK1	74192
3/8	EK41EA00-KC0-KK1	74226

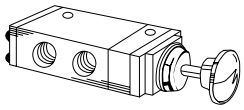
BLACK PALM BUTTON SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KB0	74258
3/8	EK41EA00-KS1-KB0	74262

BLACK PALM BUTTON DETENT

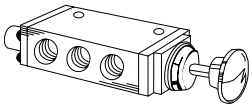


ORDER BY CATALOG NUMBER OR ITEM CODE

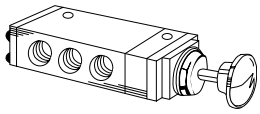
Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KB3	76816
3/8	EK41EA00-KC0-KB3	76817

4-WAY / 2-POSITION, 5-PORT

BLACK KNOB / PALM BUTTON SPRING RETURN



BLACK KNOB / PALM BUTTON DETENT

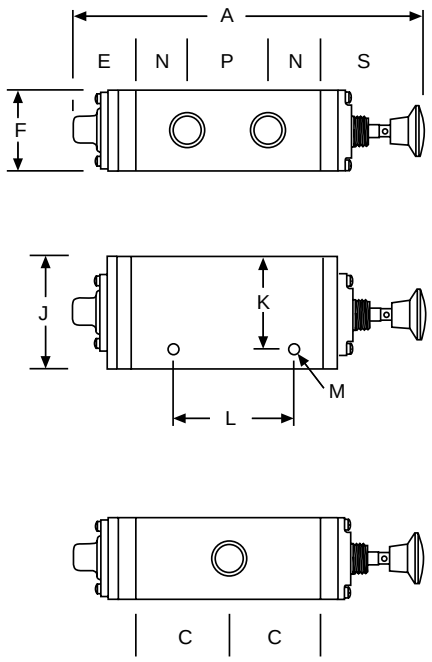


Port Size	Spring Return				Detented			
	Knob		Palm Button		Knob		Palm Button	
	Catalog Number	Item Code	Catalog Number	Item Code	Catalog Number	Item Code	Catalog Number	Item Code
1/4	EK71DA00-KS1-KK0	74237	EK71DA00-KS1-KB0	74386	EK71DA00-KC0-KK1	74250	EK71DA00-KC0-KB3	76820
3/8	EK71EA00-KS1-KK0	74240	EK71EA00-KS1-KB0	74387	EK71EA00-KC0-KK1	74252	EK71EA00-KC0-KB3	76821
1/2	EK71FA00-KS1-KK0	79028	EK71FA00-KS1-KB0	79027	EK71FA00-KC0-KK1	79022	EK71FA00-KC0-KB3	79021

Panel Nut for use with these valves — E616-10 (78398)

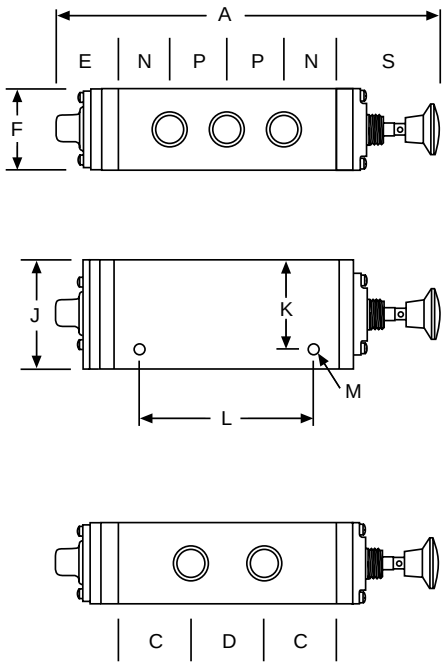
3-PORT

NON DETENT



5-PORT

NON DETENT

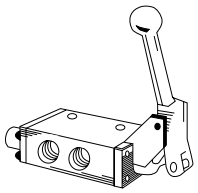


DIMENSIONS — VALVE WITH MANUAL OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	C	D	E	F	J	K	L	M	N	P	S
3-Port / 2-Position — Non-Detent													
Knob Spring Return	1/4 & 3/8	5.77	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.19
Palm Button Spring Return	1/4 & 3/8	5.88	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.30
Knob End Cap	1/4 & 3/8	5.19	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.19
3-Port / 2-Position — Detent													
Knob End Cap	1/4 & 3/8	6.15	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	3.15
Palm Button End Cap	1/4 & 3/8	6.34	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	3.34
5-Port / 2-Position — Non-Detent													
Knob	1/4 & 3/8	6.83	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	2.19
Spring Return	1/2	6.83	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	2.19
Palm Button	1/4 & 3/8	6.94	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	2.30
Spring Return	1/2	6.94	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	2.30
5-Port / 2-Position — Detent													
Knob	1/4 & 3/8	7.21	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.15
End Cap	1/2	7.21	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.15
Palm Button	1/4 & 3/8	7.40	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.34
End Cap	1/2	7.40	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.34

3-WAY / 2-POSITION, 3-PORT

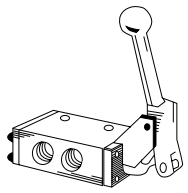
SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KL0	74801
3/8	EK41EA00-KS1-KL0	74822

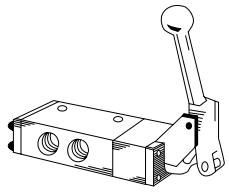
NON-DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KL0	74183
3/8	EK41EA00-KC0-KL0	75352

DETENT

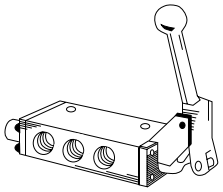


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KL1	74828
3/8	EK41EA00-KC0-KL1	74832

4-WAY / 2-POSITION, 5-PORT

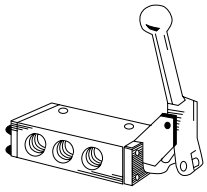
SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS1-KL0	74857
3/8	EK71EA00-KS1-KL0	74858
1/2	EK71FA00-KS1-KL0	79029

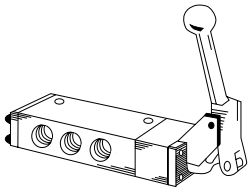
NON-DETENT



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KC0-KL0	74361
3/8	EK71EA00-KC0-KL0	74788
1/2	EK71FA00-KC0-KL0	79023

DETENT

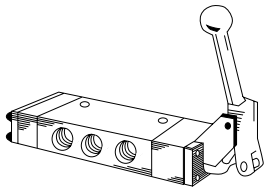


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KC0-KL1	74859
3/8	EK71EA00-KC0-KL1	74860
1/2	EK71FA00-KC0-KL1	79024

4-WAY / 3-POSITION, 5-PORT

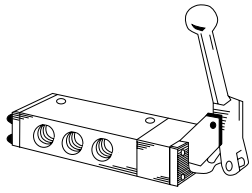
SPRING CENTER ALL PORTS BLOCKED



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK81DA00-KC0-KL2	74978
3/8	EK81EA00-KC0-KL2	74980
1/2	EK81FA00-KC0-KL2	79040

DETENT ALL PORTS BLOCKED



ORDER BY CATALOG NUMBER OR ITEM CODE

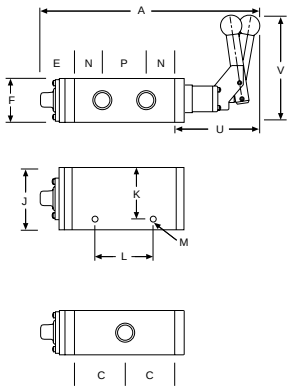
Port Size	Catalog Number	Item Code
1/4	EK81DA00-KC0-KL3	74861
3/8	EK81EA00-KC0-KL3	74977
1/2	EK81FA00-KC0-KL3	79041

NOTE: For 4-Way / 3-Position, 5-Port Valves other spool configuration are available. Change catalog number position 7 and 8 from 00 to XX for different spools as shown below
05 - Inlet open to cylinder ports
06 - Exhaust open to cylinder ports.

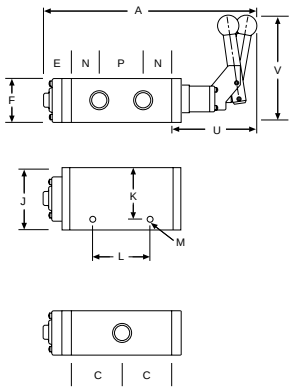
DIMENSIONS

3-PORT

SPRING RETURN

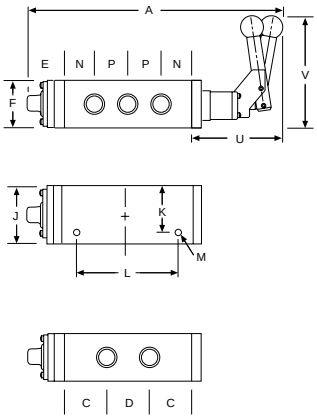


END CAP

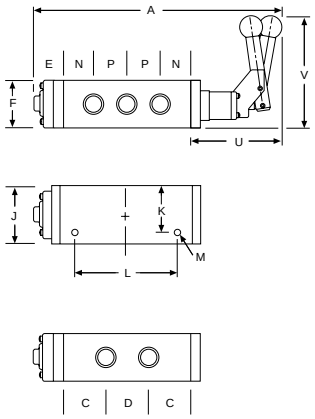


5-PORT

SPRING RETURN



END CAP

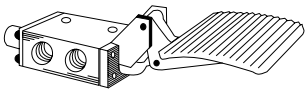


DIMENSIONS — VALVE WITH MANUAL OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	C	D	E	F	J	K	L	M	N	P	U	V
3-Port / 2-Position — Non-Detent														
Spring Return	1/4 & 3/8	6.08	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.50	4.53
End Cap	1/4 & 3/8	5.50	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.50	4.53
3-Port / 2-Position — Detent														
End Cap	1/4 & 3/8	6.50	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	3.50	4.53
5-Port / 2-Position — Non-Detent														
Spring Return	1/4 & 3/8	7.14	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	2.50	4.53
	1/2	7.14	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	2.50	4.53
End Cap	1/4 & 3/8	6.56	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	2.50	4.53
	1/2	6.56	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	2.50	4.53
5-Port / 2-Position — Detent														
End Cap	1/4 & 3/8	7.56	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.50	4.53
	1/2	7.56	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.50	4.53
5-Port / 3-Position														
Spring Center	1/4 & 3/8	8.56	1.22	1.10	1.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.50	4.53
	1/2	8.56	1.22	1.10	1.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.50	4.53
Detent	1/4 & 3/8	7.56	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.50	4.53
	1/2	7.56	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.50	4.53

3-WAY / 2-POSITION, 3-PORT

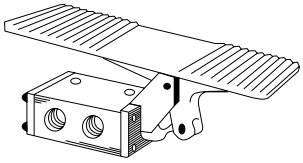
FOOT PEDAL
SPRING RETURN



ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KF0	74982
3/8	EK41EA00-KS1-KF0	74985

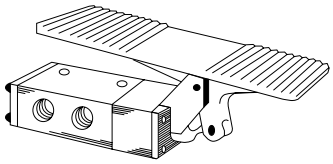
TREADLE
NON-DETENT



ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KT0	74157
3/8	EK41EA00-KC0-KT0	75373

TREADLE
DETENT



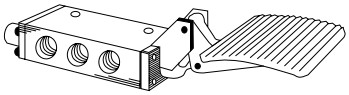
ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KC0-KT1	74989
3/8	EK41EA00-KC0-KT1	74993

Foot pedal valves should be ordered with foot guard to meet OSHA requirements. See below for ordering information.

4-WAY / 2-POSITION, 5-PORT

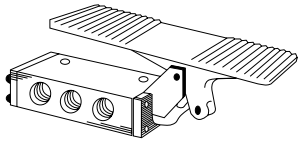
FOOT PEDAL
SPRING RETURN



ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS6-KF0	75065
3/8	EK71EA00-KS6-KF0	75066
1/2	EK71FA00-KS6-KF0	79034

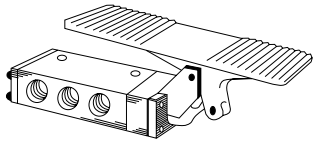
TREADLE
NON-DETENT



ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KC0-KT0	74365
3/8	EK71EA00-KC0-KT0	78614
1/2	EK71FA00-KC0-KT0	79025

TREADLE
DETENT



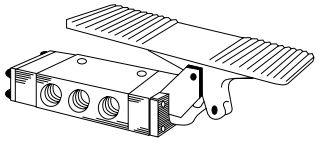
ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KC0-KT1	75067
3/8	EK71EA00-KC0-KT1	75068
1/2	EK71FA00-KC0-KT1	79026

Foot pedal valves should be ordered with foot guard to meet OSHA requirements. See below for ordering information.

4-WAY / 3-POSITION, 5-PORT

TREADLE
SPRING CENTER
ALL PORTS BLOCKED

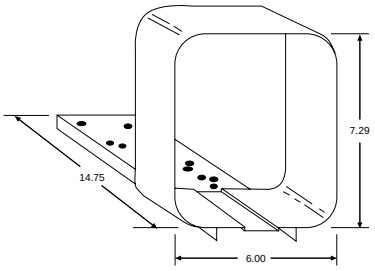


ORDER BY CATALOG NUMBER
OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK81DA00-KC0-KT2	75069
3/8	EK81EA00-KC0-KT2	75070
1/2	EK81FA00-KC0-KT2	79042

NOTE: For 4-Way / 3-Position, 5-Port Valves other spool configuration are available. Change catalog number position 7 and 8 from 00 to XX for different spools as shown below
05 - Inlet open to cylinder ports
06 - Exhaust open to cylinder ports.

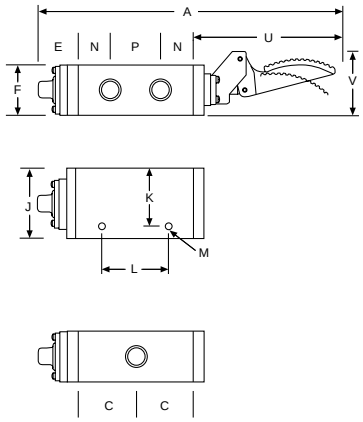
FOOTGUARD
ORDER NO. E54842-66 (74634)



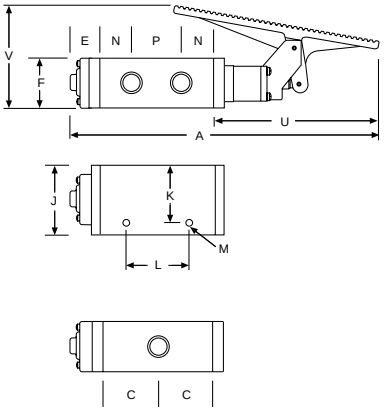
DIMENSIONS

3-PORT

FOOT PEDAL

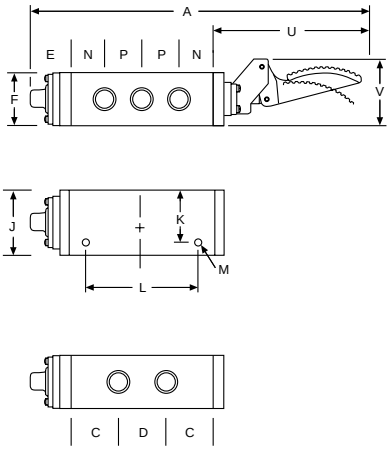


TREADLE

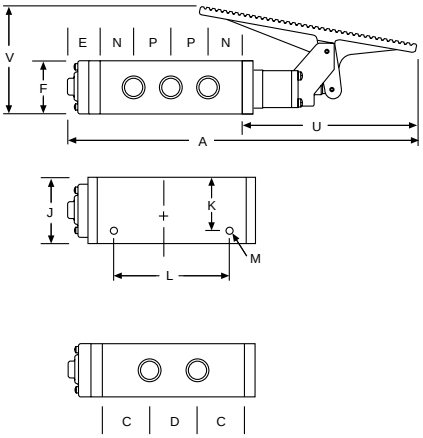


5-PORT

FOOT PEDAL



TREADLE

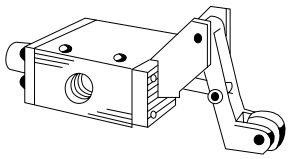


DIMENSIONS — VALVE WITH MANUAL OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	C	D	E	F	J	K	L	M	N	P	U	V
3-Port / 2-Position — Non-Detent														
Foot Pedal	1/4 & 3/8	8.62	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	5.04	2.21
Treadle	1/4 & 3/8	7.28	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	4.28	3.44
3-Port / 2-Position — Detent														
Treadle	1/4 & 3/8	8.28	1.24	—	.52	1.26	2.16	1.92	1.38	0.26	0.68	1.12	5.28	3.44
5-Port / 2-Position — Non-Detent														
Foot Pedal	1/4 & 3/8	9.68	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	5.04	2.21
Spring Return	1/2	9.68	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	5.04	2.21
Treadle	1/4 & 3/8	8.34	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	4.28	3.44
End Cap	1/2	8.34	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	4.28	3.44
5-Port / 2-Position — Detent														
Treadle	1/4 & 3/8	9.34	1.22	1.10	.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	5.28	3.44
End Cap	1/2	9.34	1.22	1.10	.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	5.28	3.44
5-Port / 3-Position														
Treadle	1/4 & 3/8	10.34	1.22	1.10	1.52	1.26	2.16	1.92	2.20	0.26	0.68	1.09	5.28	3.44
Spring Center	1/2	10.34	1.22	1.10	1.52	1.26	2.64	2.16	2.38	0.26	0.68	1.09	5.28	3.44

3-WAY / 2-POSITION, 3-PORT

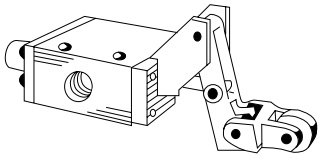
LEVER ROLLER SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KR2	75071
3/8	EK41EA00-KS1-KR2	75183

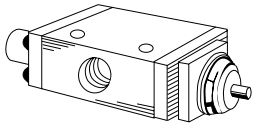
ONE-WAY LEVER ROLLER SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KR5	75185
3/8	EK41EA00-KS1-KR5	75186

TAPPET SPRING RETURN

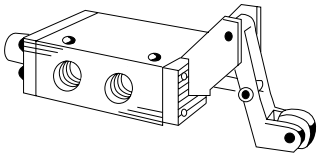


ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK41DA00-KS1-KP0	75355
3/8	EK41EA00-KS1-KP0	75374

4-WAY / 2-POSITION, 5-PORT

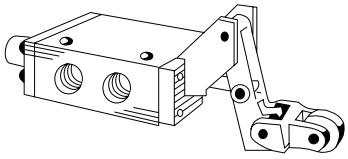
LEVER ROLLER SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS6-KR2	75205
3/8	EK71EA00-KS6-KR2	75206
1/2	EK71FA00-KS6-KR2	79036

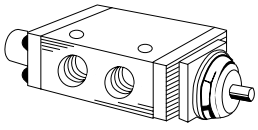
ONE-WAY LEVER ROLLER SPRING RETURN



ORDER BY CATALOG NUMBER OR ITEM CODE

Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS6-KR5	75207
3/8	EK71EA00-KS6-KR5	75208
1/2	EK71FA00-KS6-KR5	79037

TAPPET SPRING RETURN

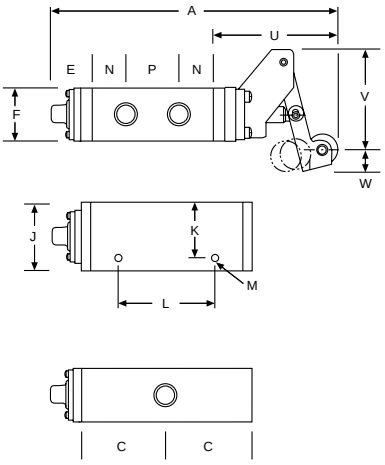


ORDER BY CATALOG NUMBER OR ITEM CODE

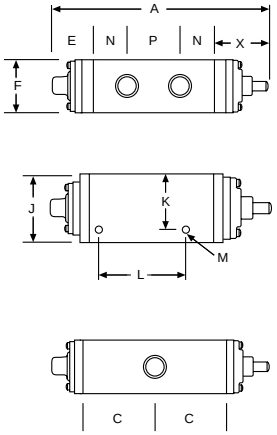
Port Size	Catalog Number	Item Code
1/4	EK71DA00-KS6-KP0	74588
3/8	EK71EA00-KS6-KP0	78558
1/2	EK71FA00-KS6-KP0	79035

3-PORT

LEVER ROLLER/ONE-WAY LEVER ROLLER

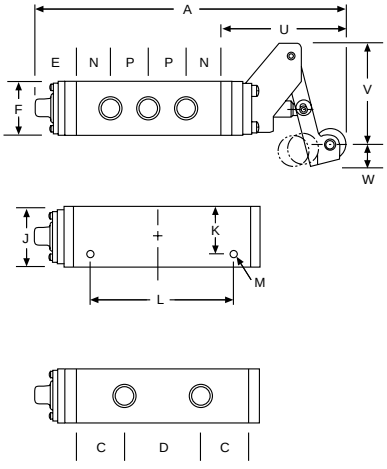


TAPPET

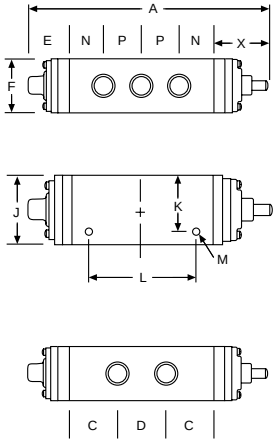


5-PORT

LEVER ROLLER/ONE-WAY LEVER ROLLER



TAPPET



DIMENSIONS — VALVE WITH MANUAL OPERATOR — ALL DIMENSIONS IN INCHES

Operators	Port Size (PTF)	A	C	D	E	F	J	K	L	M	N	P	U	V	W	X
3-Port / 2-Position — Spring Return																
Lever Roller	1/4 & 3/8	6.05	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	2.47	2.42	.60	—
One-Way L.R.	1/4 & 3/8	7.05	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	3.47	2.45	.95	—
Tappet	1/4 & 3/8	5.03	1.24	—	1.10	1.26	2.16	1.92	1.38	0.26	0.68	1.12	—	—	—	1.45
5-Port / 2-Position — Spring Return																
Lever Roller	1/4 & 3/8	7.11	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	2.47	2.42	.60	—
	1/2	7.11	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	2.47	2.42	.60	—
One-Way L.R.	1/4 & 3/8	8.11	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	3.47	2.45	.95	—
	1/2	8.11	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	3.47	2.45	.95	—
Tappet	1/4 & 3/8	6.09	1.22	1.10	1.10	1.26	2.16	1.92	2.20	0.26	0.68	1.09	—	—	—	1.45
	1/2	6.09	1.22	1.10	1.10	1.26	2.64	2.16	2.38	0.26	0.68	1.09	—	—	—	1.45

AIR VALVE SIZING

Most manufacturers catalogs give flow rating C_v for the valve which was established using NFPA standard T3.21.3. The following tables and formulas will enable you to quickly size a valve properly. The traditional, often used, approach of using the valve size equivalent to the port in the cylinder can be very costly. Cylinder speed, not port size, should be the determining factor!

The following C_v calculations are based upon simplified formulas which yield results with acceptable accuracy under the following standard condition:

Air at a temperature of 68°F

Absolute downstream or secondary pressure must be 53% of absolute inlet or primary pressure or greater. Below 53%, the air velocity may become sonic and the C_v formula does not apply. To calculate air flow to atmosphere, enter outlet pressure p_2 as 53% of absolute inlet pressure p_1. Pressure drop Δp would be 47% of absolute inlet pressure. These valves have been calculated for a C_v = 1 in Table 3.

Nomenclature:

B	Pressure drop factor	
C	Compression factor	
C_v	Flow factor	
D	Cylinder Diameter	(IN)
F	Cylinder Area	(SQ IN)
L	Cylinder Stroke	(IN)
P_1	Inlet or Primary Pressure	(PSIG)
P_2	Outlet or Secondary Pressure	(PSIG)
Δp	Pressure differential ($p_1 - p_2$)	(PSID)
q	Air flow at actual condition	(CFM)
Q	Air flow of free air	(SCFM)
t	Time to complete one cylinder stroke	(SEC)
T	Absolute temperature at operating pressure. Deg R = Deg F + 460	(°R)

VALVE SIZING FOR CYLINDER ACTUATION— DIRECT FORMULA

$$C_v = \frac{\text{cylinder area (SQ IN) (see Table 1)} \; \mathbf{F\ x} \; \text{cylinder stroke (IN)} \; \mathbf{L\ x} \; \text{compression factor (see Table 2)} \; \mathbf{C}}{\text{pressure drop factor (See Table 2)} \; \mathbf{B\ x} \; \text{time to complete cylinder stroke (SEC)} \; \mathbf{t\ x\ 29}}$$

Example: Cylinder size 4" Dia. x 10" stroke.Time to extend: 2 seconds. Inlet pressure 90 PSIG. Allowable pressure drop 5 PSID. Determine C_v.

Solution: Table 1 F = 12.57 SQ IN.
Table 2 C = 7.1
B = 21.6

$$C_v = \frac{12.57 \times 10 \times 7.1}{21.6 \times 2 \times 29} = .7$$

Select a valve that has a C_v factor of .7 or higher. In most cases a 1/4" valve would be sufficient. See Page 67 for C_v ratings of Boston valves.
It is considered good engineering practice to limit the pressure drop Δp to approximately 10% of primary pressure p_1. The smaller the allowable pressure drop, the larger the required valve will become.

After the minimum required C_v has been calculated, the proper size valve can be selected from the catalog.

TABLE 1: CYLINDER PUSH BORE AREA F FOR COMMON SIZES OF CYLINDERS

Bore Size D (In.)	Push Bore* F (Sq. In.)	Bore Size D (In.)	Push Bore* F (Sq. In.)
7/16	.15	2-1/2	4.91
9/16	.25	3-1/4	8.30
3/4	.44	4	12.57
1-1/16	.89	5	19.64
1-1/4	1.23	6	28.27
1-1/2	1.77	8	50.27
2	3.14		

*See page 74 for pull bore areas.

TABLE 2: COMPRESSION FACTOR C AND PRESSURE DROP FACTOR B.

Inlet Pressure (PSIG)	Compression Factor C	Pressure Drop Factor B For Various Pressure Drops Δp				
		2 PSID	5 PSID	10 PSID	15 PSID	20 PSID
10	1.7	6.5				
20	2.4	7.8	11.8			
30	3.0	8.9	13.6	18.0		
40	3.7	9.9	15.3	20.5	23.6	
50	4.4	10.8	16.7	22.6	26.4	29.0
60	5.1	11.7	18.1	24.6	29.0	32.0
70	5.8	12.5	19.3	26.5	31.3	34.8
80	6.4	13.2	20.5	28.2	33.5	37.4
90	7.1	13.9	21.6	29.8	35.5	39.9
100	7.8	14.5	22.7	31.3	37.4	42.1
110	8.5	15.2	23.7	32.8	39.3	44.3
120	9.2	15.8	24.7	34.2	41.0	46.4
130	9.8	16.4	25.6	35.5	42.7	48.4
140	10.5	16.9	26.5	36.8	44.3	50.3
150	11.2	17.5	27.4	38.1	45.9	52.1
160	11.9	18.0	28.2	39.3	47.4	53.9
170	12.6	18.5	29.0	40.5	48.9	55.6
180	13.2	19.0	29.8	41.6	50.3	57.2
190	13.9	19.5	30.6	42.7	51.7	58.9
200	14.6	20.0	31.4	43.8	53.0	60.4
210	15.3	20.4	32.1	44.9	54.3	62.0
220	16.0	20.9	32.8	45.9	55.6	63.5
230	16.7	21.3	33.5	46.9	56.8	64.9
240	17.3	21.8	34.2	47.9	58.1	66.3
250	18.0	22.2	34.9	48.9	59.3	67.7

VALVE SIZING WITH C_v = 1 TABLE

(For nomenclature see previous page)
This method can be used if the required air flow is known or has been calculated with the formulas as shown below.

1. $$Q = .0273 \frac{D^2L}{t} \times \frac{P_2 + 14.7}{14.7}$$ (SCFM)

Conversion of CFM to SCFM

2. $$Q = q \times \frac{P_2 + 14.7}{14.7} \times \frac{528}{T}$$ (SCFM)

Flow Factor C_v (standard conditions)

3. $$C_v = = \frac{1.024 \times Q}{\Delta p \times (p_2 + 14.7)}$$ NFPA Standard T3.21.3

Maximum pressure drop Δp across the valve should be less than 10% of inlet pressure p_1.

TABLE 3: AIR FLOW Q (SCFM) FOR Cv =1.

Inlet Pressure (PSIG)	Air Flow Q (SCFM) For Various Pressure Drops Δp At A Cv=1					Air Flow Q (SCFM) To Atmosphere
	2 PSID	5 PSID	10 PSID	15 PSID	20 PSID	
10	6.7					12.0
20	7.9	11.9				16.9
30	9.0	13.8	18.2			21.8
40	9.9	15.4	20.6	23.8		26.6
50	10.8	16.9	22.8	26.7	29.2	31.5
60	11.6	18.2	24.8	29.2	32.3	36.4
70	12.3	19.5	26.7	31.6	35.1	41.2
80	13.0	20.7	28.4	33.8	37.7	46.1
90	13.7	21.8	30.0	35.8	40.2	51.0
100	14.4	22.9	31.6	37.8	42.5	55.9
110	15.0	23.9	33.1	39.6	44.7	60.7
120	15.6	24.9	34.5	41.4	46.8	65.6
130	16.1	25.8	35.8	43.1	48.8	70.5
140	16.7	26.7	37.1	44.7	50.7	75.3
150	17.2	27.6	38.4	46.3	52.5	80.2
160	17.7	28.4	39.6	47.8	54.3	85.1
170	18.2	29.3	40.8	49.3	56.0	90.0
180	18.7	30.1	42.0	50.7	57.7	94.8
190	19.2	30.9	43.1	52.1	59.4	99.7
200	19.6	31.6	44.2	53.4	60.9	104.6
210	20.1	32.4	45.2	54.8	62.5	109.4
220	20.5	33.1	46.3	56.1	64.0	114.3
230	21.0	33.8	47.3	57.3	65.5	119.2
240	21.4	34.5	48.3	58.6	66.9	124.0
250	21.8	35.2	49.3	59.8	68.3	128.9

EXAMPLE 1: Find air flow Q(SCFM) if C_v is known. C_v (from valve catalog) = 1.8
Primary pressure P_1 = 90 PSIG
Pressure drop across valve Δp = 5 PSID
Flow through valve from Table 3 (C_v = 1) = 21.8 SCFM

$Q = C_v$ of valve x air fiow at C_v = 1 (SCFM)

Q = 1.8 x 21.8 = 39.2 SCFM

EXAMPLE 2: Find C_v if air flow Q(SCFM) is given.
Primary pressure P_1 = 90 PSIG
Pressure drop Δp = 10 PSID
Air flow Q = 60 SCFM
Flow through valve from Table 3 (C_v = 1) = 30.0 SCFM

$$C_v = \frac{\text{Air Flow Q(SCFM)}}{\text{Air Flow at } C_v = 1 \text{ (SCFM)}}$$

$$C_v = \frac{60 \text{ SCFM}}{30} = 2.0$$

A valve with a minimum C_v of 2 should be selected.

EXAMPLE 3: Find C_v if air flow Q(SCFM) to atmosphere is given (from catalog).
Primary pressure P_1 = 90 PSIG
Air flow to atmosphere Q = 100 SCFM
Flow to atmosphere through valve from Table 3 (C_v = 1) = 51.0 SCFM

$$C_v = \frac{\text{Air Flow to atmosphere Q(SCFM)}}{\text{Air Flow to atmosphere at } C_v = 1 \text{ (SCFM)}}$$

$$\mathbf{C_v} = \frac{100}{51} = \mathbf{2.0}$$

Flow given in catalog is equivalent to a valve with C_v = 2. This conversion is often necessary to size a valve properly, since some manufacturers do not show the standard C_v to allow a comparison.

EXAMPLE 4: Find C_v if cylinder size and stroke speed is known using the formulas 1 and 3.
Primary pressure = 90 PSIG
Pressure drop across valve 5 PSID
Cylinder size 4" DIA. x 10" Stroke
Time to complete stroke 2 sec.

$$Q = .0273 \frac{4^2 \times 10}{2} \times \frac{85 + 14.7}{14.7} = 14.81 \text{ SCFM}$$

$$C_v = = \frac{1.024 \times 14.81}{5 \times (85 + 14.7)} = \mathbf{.7}$$