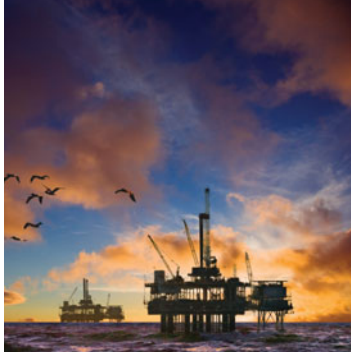
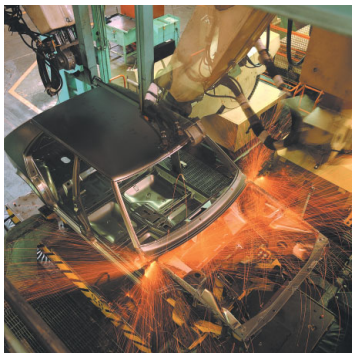
(Revised 05-03-19)





Viking Valve Series

Air Control Valves & Accessories

Catalog 0697P-2

Parker

ENGINEERING YOUR SUCCESS.

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Pneumatic Division
Richland, Michigan
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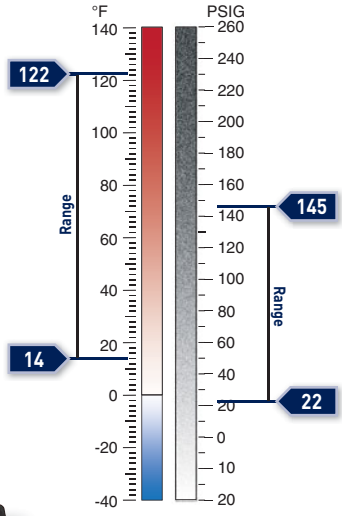
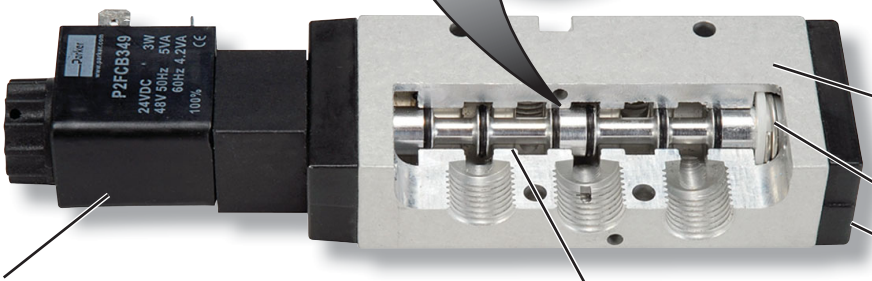
Viking Lite Valves

The Viking Lite Series pneumatic valve range is a robust, versatile valve which combines high performance with compact installation dimensions. Large flow capacity, short change-over times and low change-over pressure are important characteristics of the valve range.

WCS

- Maximum Performance
  - Low friction - fast response - less wear
- Long Cycle Life
  - Under pressure, radial expansion of the seal occurs to maintain sealing contact with the valve bore
- Non-Lube Service
  - No lubrication required for continuous valve shifting
- Bi-Directional Spool Seals
  - Common spool used for any pressure





- Solenoid operated, IP65, RoHS, CE
- 90° rotation

The bore is polished to a very high surface finish for maximum flow capacity and long life.

Robust anodized aluminum valve body

Stainless steel spring return

Diecast end covers with zinc plated screws.

Valve options: Viking Lite

- 3-way, 2-position
- Single solenoid
- Spring return
- Double solenoid

- 4-way, 2-position
- Single solenoid
- Spring return
- Double solenoid

- 4-way, 3-position
  - Center exhaust
  - Pressure center
  - Blocked center

Valve port options

- 1/8, 1/4 & 3/8 inch NPT & BSPP threads.

Solenoid options

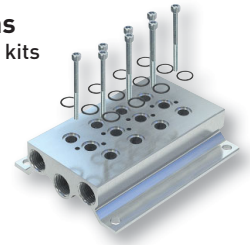
- 22-pin, DIN

Remote Pilot options

- 4mm (5/32) OD tube

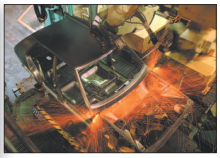
Manifold options

- IEM bar manifold kits



Lite Markets


Industrial


Automotive


Food Processing


Industrial


Industrial


Industrial

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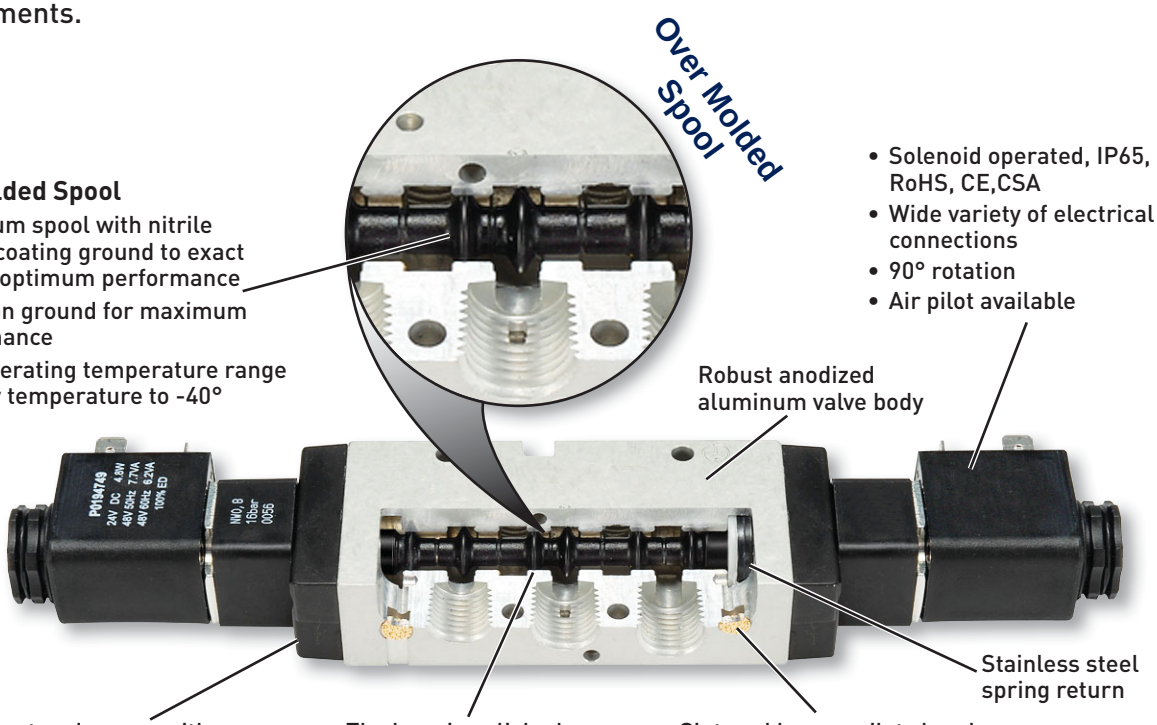
Viking Xtreme Valve

The Viking Xtreme Valve Series is robust and versatile. Incorporating stainless steel fasteners and over molded spool for large flow capacity, short change-over times and low change-over pressures.

Viking Xtreme Valve Series has 2 different valve operating ranges: XTREME and NORMAL pressure and temperature ranges. These valves have *standard* and *unique* features which enables the designer to choose the best valve for the varying applications ranging from General Industrial to the more rugged environments.



Over molded Spool
- Aluminum spool with nitrile rubber coating ground to exact size for optimum performance
- Precision ground for maximum performance
- Wide operating temperature range
  - Low temperature to -40°

- Solenoid operated, IP65, RoHS, CE,CSA
- Wide variety of electrical connections
- 90° rotation
- Air pilot available

Diecast end covers with stainless steel screws to resist aggressive environments.

The bore is polished to a very high surface finish for maximum flow capacity and long life.

Sintered bronze pilot chamber breathers provide increased protection against ingress of dust and dirt.

Standard Features

Valve options: Xtreme & Normal versions

- 3-way, 2-position
- Single & double solenoid

- 4-way, 2-position
- Single & double solenoid
- 4-way, 2-position

- 4-way, 3-position
  - Center exhaust
  - Pressure center
  - Blocked center

Valve port options

- 1/8, 1/4, 3/8 & 1/2 inch NPT & BSPP threads
- NAMUR mount

Solenoid options: a wide variety of voltages including mobile rated coils with tolerance ranges for mobile applications

- 22-pin, DIN
- Grommet
- M12
- 1/2" Conduit
- 15mm

Manifold options

- IEM bar manifold kits

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Viking Xtreme Valve

Unique Features

In addition to the common features, the unique features in the Xtreme and Normal Valves enable the designer to fit these valves into applications where standard valves will not meet the specifications.

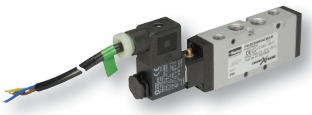
Viking Xtreme Valve: Normal Pressure / Temperature

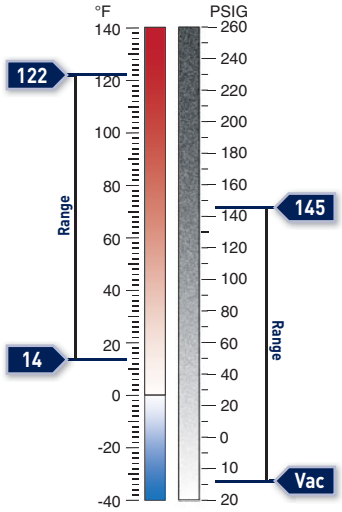
- **Temperature range: 14°F to 122°F (-10°C to 50°C)**
- **Pressure range: Vacuum to 145 PSIG (10 bar)**
- **Override options**
  - No-override
  - Flush - locking
  - Extended - non-locking

- **Standard solenoid armature**
- **Unique solenoids:**
  - Hazardous duty
    Class I; Groups A, B, C & D
    Class II; Groups E, F, & G
    Class III; Div. I

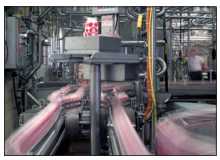
  - 24VDC Intrinsically safe
    Class I; Groups A, B, C & D
    Class II; Groups E, F, & G
    Class III; Div. I

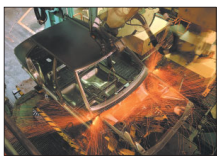
  - **24VDC ATEX approved solenoids**





General Markets


Industrial


Automotive


Food Processing


Road

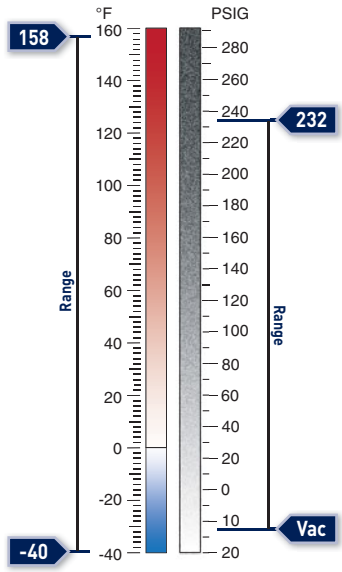

Industrial


Industrial

Viking Xtreme Valve: Xtreme Pressure / Temperature

- **Wider temperature range: -40°F to 158°F (-40°C to 70°C)**
- **Wider pressure range: Vacuum to 232 PSIG (16 bar)**
- **Tested to +5g shock & vibration**
- **Passed 500 hour salt spray test**
- **Override options**
  - No-override
  - Extended - non-locking

- **Stainless steel solenoid armature**
  - Improved corrosion resistance for harsh environments
  - Extends operating temperature and pressure range
- **Unique valve configuration: Remote Air Pilot**
  - 3-way & 4-way valves



Xtreme Markets


Rail


Agri-Food


Road


Road

Transportation


Oil & Gas

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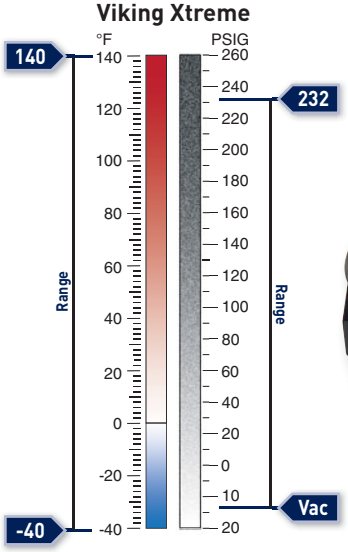
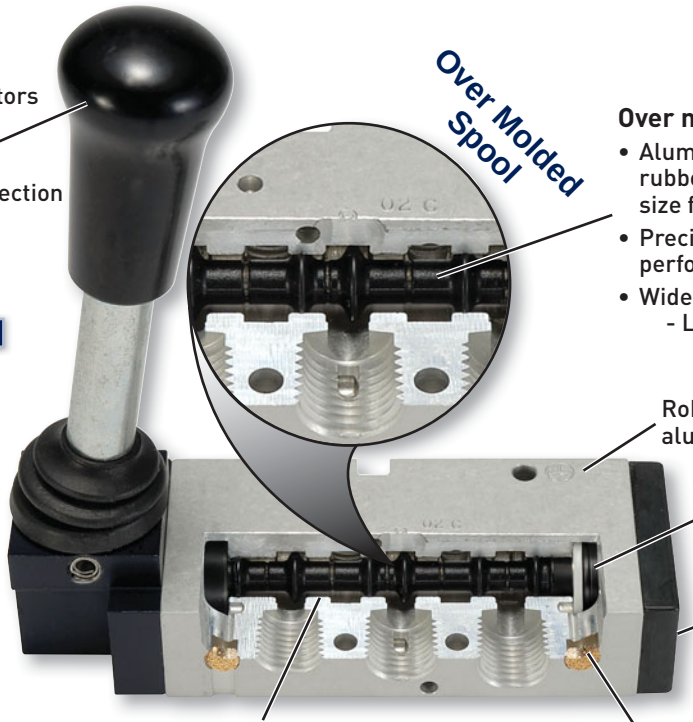
Viking Xtreme Manual Valve

Viking Xtreme Manual Valves have all the features of the Viking Xtreme Valves including temperature and pressure range while incorporating a rugged lever actuator which has been specifically designed for gloved hands to suit mobile applications in the most arduous of environments.

- Wide variety of manual actuators
- Robust Knobs
- Stainless steel available
- Handle boots for ingress protection





Over molded Spool

- Aluminum spool with nitrile rubber coating ground to exact size for optimum performance
- Precision ground for maximum performance
- Wide operating temperature range
  - Low temperature to -40°

Robust anodized aluminum valve body

Stainless steel spring return

Diecast end covers with stainless steel screws to resist aggressive environments.

The bore is polished to a very high surface finish for maximum flow capacity and long life.

Sintered bronze pilot chamber breathers provide increased protection against ingress of dust and dirt.

Valve options

- 3-way, 2-position valves
  - Spring return
  - Detent

- 4-way, 2-position valves
  - Spring return
  - Detent

- 4-way, 3-position valves
  - Center exhaust
  - Pressure center
  - Blocked center

Valve port options

- 1/8, 1/4, 3/8 & 1/2 inch NPT & BSPP threads.

Handle Options

- Light Weight, Low Profile Lever
  1/8" valve size, 5/2 & 5/3 only

- Twist Knob with Panel Nut
  1/4" body, 4-way, 2-position only

- Rugged, Stainless Steel Shafted Handle Valve

Xtreme Markets


Rail


Agri-Food


Forestry


Road


Industrial


Oil & Gas

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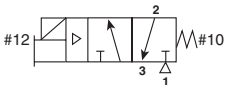
Single solenoid

3-Way, 2-Position NC (NNP)



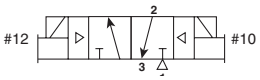
Normally Closed:

De-energized position – Solenoid #12 de-energized. Pressure at inlet port 1 blocked, outlet port 2 connected to exhaust port 3.

Energized position – Solenoid #12 energized. Pressure at inlet port 1 connected to outlet port 2, exhaust port 3 is blocked.

Double solenoid

3-Way, 2-Position

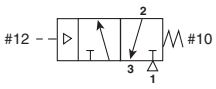


Solenoid operator #12 energized last. Pressure at inlet port 1 connected to outlet port 2, exhaust port 3 is blocked.

Solenoid operator #10 energized last. Pressure at inlet port 1 blocked, outlet port 2 connected to exhaust port 3.

Single remote air pilot

3-Way, 2-Position NC (NNP)



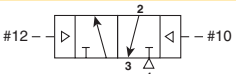
Normally Closed:

Normal position – Pressure at inlet port 1 blocked, outlet port 2 connected to exhaust port 3.

Operated position – Maintained air signal at port 12. Pressure at inlet port 1 connected to outlet port 2, exhaust port 3 is blocked.

Double remote air pilot

3-Way, 2-Position



Momentary air signal at port 12 last. Pressure at inlet port 1 connected to outlet port 2, exhaust port 3 is blocked.

Momentary air signal at port 10 last. Pressure at inlet port 1 blocked, outlet port 2 connected to exhaust port 3.

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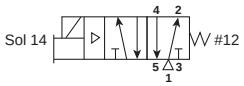
Basic Valve Functions

Single solenoid

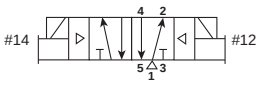
Single pressure at inlet port 1:



De-energized position – Solenoid operator #14 de-energized. Pressure at inlet port 1 connected to outlet port 2. Outlet port 4 connected to exhaust port 5.
Energized position – Solenoid operator #14 energized. Pressure at inlet port 1 connected to outlet port 4. Outlet port 2 connected to exhaust port 3.

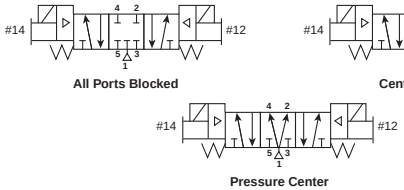
Double solenoid

Single pressure at inlet port 1:



Solenoid operator #14 energized last. Pressure at inlet port 1 connected to outlet port 4. Outlet port 2 connected to exhaust port 3.
Solenoid operator #12 energized last. Pressure at inlet port 1 connected to outlet port 2. Outlet port 4 connected to exhaust port 5.

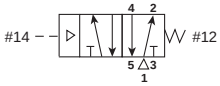
Double solenoid 3-position



With #12 operator energized – inlet port 1 connected to cylinder port 2, cylinder port 4 connected to exhaust port 5.
With #14 operator energized – inlet port 1 connected to cylinder port 4, cylinder port 2 connected to exhaust port 3.
All Ports Blocked
All ports blocked in the center position.
Center Exhaust
Cylinder ports 2 and 4 connected to exhaust ports 3 and 5 in center position. Port 1 is blocked.
Pressure Center
Pressure port 1 connected to cylinder ports 2 and 4, and exhaust ports 3 and 5 blocked in center position.

Single remote air pilot

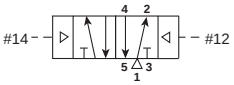
Single pressure at inlet port 1:



Normal position – Pressure at inlet port 1 connected to outlet port 2. Outlet port 4 connected to exhaust port 5.
Operated position – Maintained air signal at port 14. Pressure at inlet port 1 connected to outlet port 4. Outlet port 2 connected to exhaust port 3.

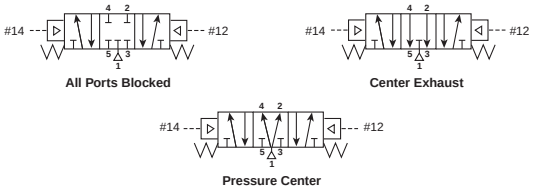
Double remote air pilot

Single pressure at inlet port 1:



Momentary air signal at port 14 last. Pressure at inlet port 1 connected to outlet port 4. Outlet port 2 connected to exhaust port 3.
Momentary air signal at port 12 last. Pressure at inlet port 1 connected to outlet port 2. Outlet port 4 connected to exhaust port 5.

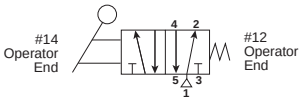
Double remote air pilot 3-position



With #12 operator signaled – inlet port 1 connected to cylinder port 2, cylinder port 4 connected to exhaust port 5.
With #14 operator signaled – inlet port 1 connected to cylinder port 4, cylinder port 2 connected to exhaust port 3.
All Ports Blocked
All ports blocked in the center position.
Center Exhaust
Cylinder ports 2 and 4 connected to exhaust ports 3 and 5 in center position. Port 1 is blocked.
Pressure Center
Pressure port 1 connected to cylinder ports 2 and 4, and exhaust ports 3 and 5 blocked in center position.

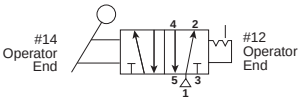
Lever Valves

2-position, spring return



Single pressure at Port #1 – The Hand Lever alternately pressurizes port 2 or 4 while exhausting at port 3 or 5. When actuating Hand Lever, port 4 is pressurized; when releasing Hand Lever, spring returns the spool, pressurizing port 2.
Dual pressure – Pressure at port 3 & 5 alternately pressurizes port 2 or 4 while exhausting at port 1. When actuating Hand Lever, port 2 is pressurized; when releasing Hand Lever, spring returns the spool, pressurizing port 4. (Must be ordered as dual pressure)

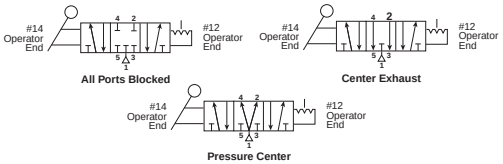
2-position, detent



Single pressure at Port #1 – The Hand Lever alternately pressurizes port 2 or 4 while exhausting at port 3 or 5. When pulling Hand Lever, port 4 is pressurized; when pushing Hand Lever, port 2 is pressurized. Spool stays in last actuated position.

Dual pressure – Pressure at port 3 & 5 alternately pressurizes port 2 or 4 while exhausting at port 1. When pulling Hand Lever, port 2 is pressurized; when pushing Hand Lever, port 4 is pressurized. Spool stays in last actuated position. (Must be ordered as dual pressure.)

3-position, detent



Single pressure at Port #1 – The Hand Lever alternately pressurizes port 2 or 4 while exhausting at port 3 or 5.
When pulling Hand Lever, port 4 is pressurized; when pushing Hand Lever, port 2 is pressurized. When Hand Lever is vertical, it is in the center position - either APB or CE. Spool stays in last actuated position.

Center functions

All ports blocked, detent & spring center
Center exhaust, detent & spring center
Pressure center, detent & spring center

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The Viking Lite valve range is robust, versatile and combines a large flow capacity with short change-over times, designer may choose 1/8, 1/4 or 3/8 port sizes along with 24VDC and 120VAC voltage options. Viking Lite valves are fitted with dynamic bi-directional spool seals suitable for pressures up to 10 bar and ambient temperatures between -10°C to + 50°C. When in service, radial expansion of the spool seal occurs to maintain sealing contact with the valve bore. This sealing method reduces friction and produces a lower required pilot pressure. Valves do not require lubrication in operation but they can also be installed in systems that are lubricated.

Ports
- P2LAZ: 1/8 inch NPT & BSPP, Cv = 0.6
- P2LBZ: 1/4 inch NPT & BSPP, Cv = 1.5
- P2LCZ: 3/8 inch NPT & BSPP, Cv = 2.5

Mounting
- Inline
- IEM aluminum bar

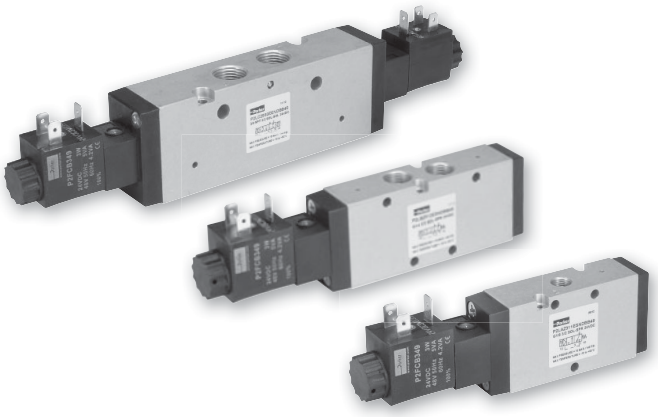
Solenoids
2.5 watts
- 22mm, 3-pin (DIN 43650)

24VDC and 120VAC

Certification / approval
- IP65 Rated, RoHS, CE

Materials

Valve body	Anodized aluminium
End covers	Anodized aluminium
Spool	Aluminium
Piston	Acetal plastic / Anodized aluminium
End cover seals	Nitrile rubber
End cover screws	Zinc plated steel
Springs	Stainless steel
Mounting screws for solenoid	Stainless steel
Spool seals	Nitrile



Operating information

Operating pressure:	145 PSIG (10 bar)
Minimum:	See chart
Operating temperature:	14°F to 122°F (-10°C to 50°C)

Minimum operating pressure, PSIG (bar)

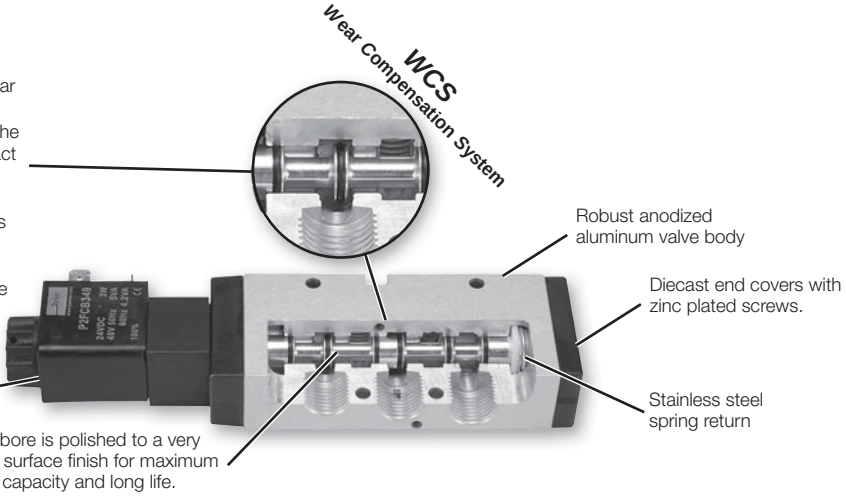
Valve type - Internal pilot	P2LAZ	P2LBZ	P2LCZ
Single solenoid - spring return	43.5 (3.0)	43.5 (3.0)	43.5 (3.0)
Single remote pilot - spring return	43.5 (3.0)	43.5 (3.0)	43.5 (3.0)
Double solenoid - 2-position	22 (1.5)	22 (1.5)	22 (1.5)
Double remote pilot - 2-position	22 (1.5)	22 (1.5)	22 (1.5)
Double solenoid - 3-position (APB, PC, CE)	43.5 (3.0)	43.5 (3.0)	43.5 (3.0)
Double remote pilot - 3-position (APB, PC, CE)	43.5 (3.0)	43.5 (3.0)	43.5 (3.0)

Recommended air quality for valves

For best possible service life and trouble free operation, ISO 8573-1 quality class 3.4.3 should be used. This means 5µm filter (standard filter) dew point +3°C for indoor operation (a lower dew point should be selected for outdoor operation) and oil concentration 1.0 mg oil/m^3, which is what a standard compressor with a standard filter gives.

Features

WCS
- Maximum Performance
  - Low friction - fast response - less wear
- Long Cycle Life
  - Under pressure, radial expansion of the seal occurs to maintain sealing contact with the valve bore
- Non-Lube Service
  - No lubrication required for continuous valve shifting
- Bi-Directional Spool Seals
  - Common spool used for any pressure



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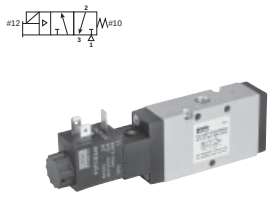
3/2 - 2-Position Single Solenoid, Non-locking Manual Override



P2LAZ Shown

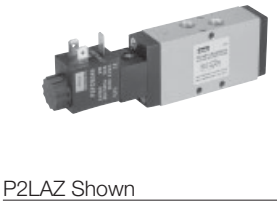
Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	15 / 35	0.35 (0.16)	24VDC	**P2LAZ391ESNDBB49**	**P2LAZ311ESNDBB49**
				120VAC	**P2LAZ391ESNDBB53**	**P2LAZ311ESNDBB53**
1/4	1.5	18 / 45	0.35 (0.16)	24VDC	**P2LBZ392ESNDBB49**	**P2LBZ312ESNDBB49**
				120VAC	**P2LBZ392ESNDBB53**	**P2LBZ312ESNDBB53**
3/8	2.5	27 / 45	0.77 (0.35)	24VDC	**P2LCZ393ESNDBB49**	**P2LCZ313ESNDBB49**
				120VAC	**P2LCZ393ESNDBB53**	**P2LCZ313ESNDBB53**

3/2 - 2-Position Double Solenoid, Non-locking Manual Override

P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	10 / 10	0.40 (0.18)	24VDC	**P2LAZ391EENDBB49**	**P2LAZ311EENDBB49**
				120VAC	**P2LAZ391EENDBB53**	**P2LAZ311EENDBB53**
1/4	1.5	12 / 12	0.40 (0.18)	24VDC	**P2LBZ392EENDBB49**	**P2LBZ312EENDBB49**
				120VAC	**P2LBZ392EENDBB53**	**P2LBZ312EENDBB53**
3/8	2.5	17 / 17	0.80 (0.36)	24VDC	**P2LCZ393EENDBB49**	**P2LCZ313EENDBB49**
				120VAC	**P2LCZ393EENDBB53**	**P2LCZ313EENDBB53**

5/2 - 2-Position Single Solenoid, Non-locking Manual Override



P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	15 / 35	.037 (0.17)	24VDC	**P2LAZ591ESNDBB49**	**P2LAZ511ESNDBB49**
				120VAC	**P2LAZ591ESNDBB53**	**P2LAZ511ESNDBB53**
1/4	1.5	18 / 45	0.44 (0.20)	24VDC	**P2LBZ592ESNDBB49**	**P2LBZ512ESNDBB49**
				120VAC	**P2LBZ592ESNDBB53**	**P2LBZ512ESNDBB53**
3/8	2.5	27 / 45	0.95 (0.43)	24VDC	**P2LCZ593ESNDBB49**	**P2LCZ513ESNDBB49**
				120VAC	**P2LCZ593ESNDBB53**	**P2LCZ513ESNDBB53**

5/2 - 2-Position Double Solenoid, Non-locking Manual Override

P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	10 / 10	.042 (0.19)	24VDC	**P2LAZ591EENDBB49**	**P2LAZ511EENDBB49**
				120VAC	**P2LAZ591EENDBB53**	**P2LAZ511EENDBB53**
1/4	1.5	12 / 12	0.46 (0.21)	24VDC	**P2LBZ592EENDBB49**	**P2LBZ512EENDBB49**
				120VAC	**P2LBZ592EENDBB53**	**P2LBZ512EENDBB53**
3/8	2.5	17 / 17	0.97 (0.44)	24VDC	**P2LCZ593EENDBB49**	**P2LCZ513EENDBB49**
				120VAC	**P2LCZ593EENDBB53**	**P2LCZ513EENDBB53**

5/3 - 3-Position, All Ports Blocked, Non-locking Manual Override

P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	18 / 40	0.57 (0.26)	24VDC	**P2LAZ691EENDBB49**	**P2LAZ611EENDBB49**
				120VAC	**P2LAZ691EENDBB53**	**P2LAZ611EENDBB53**
1/4	1.5	22 / 55	0.62 (0.28)	24VDC	**P2LBZ692EENDBB49**	**P2LBZ612EENDBB49**
				120VAC	**P2LBZ692EENDBB53**	**P2LBZ612EENDBB53**
3/8	2.5	30 / 90	1.32 (0.60)	24VDC	**P2LCZ693EENDBB49**	**P2LCZ613EENDBB49**
				120VAC	**P2LCZ693EENDBB53**	**P2LCZ613EENDBB53**

Most popular. **Notes:** Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C)

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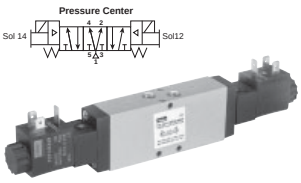
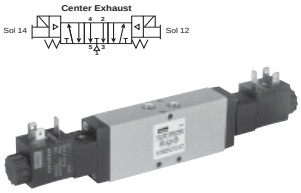
5/3 - 3-Position, Pressure Center, Non-locking Manual Override



P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	18 / 40	0.57 (0.26)	24VDC	**P2LAZ791EENDBB49**	**P2LAZ711EENDBB49**
				120VAC	**P2LAZ791EENDBB53**	**P2LAZ711EENDBB53**
1/4	1.5	22 / 55	0.62 (0.28)	24VDC	**P2LBZ792EENDBB49**	**P2LBZ712EENDBB49**
				120VAC	**P2LBZ792EENDBB53**	**P2LBZ712EENDBB53**
3/8	2.5	30 / 90	1.32 (0.60)	24VDC	**P2LCZ793EENDBB49**	**P2LCZ713EENDBB49**
				120VAC	**P2LCZ793EENDCB53**	**P2LCZ713EENDBB53**

5/3 - 3-Position, Center Exhaust



P2LAZ Shown

Port size	Cv	Response time (msec)	Weight lb (kg)	Voltage	Part number (NPT)	Part number (BSPP)
1/8	0.6	18 / 40	0.57 (0.26)	24VDC	**P2LAZ891EENDBB49**	**P2LAZ811EENDBB49**
				120VAC	**P2LAZ891EENDBB53**	**P2LAZ811EENDBB53**
1/4	1.5	22 / 55	0.62 (0.28)	24VDC	**P2LBZ892EENDBB49**	**P2LBZ812EENDBB49**
				120VAC	**P2LBZ892EENDBB53**	**P2LBZ812EENDBB53**
3/8	2.5	30 / 90	1.32 (0.60)	24VDC	**P2LCZ893EENDBB49**	**P2LCZ813EENDBB49**
				120VAC	**P2LCZ893EENDBB53**	**P2LCZ813EENDBB53**

Notes: Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C)

Viking Lite Single & Double Solenoid Operated Valves

P2L A Z 5 91 ES N D C B 49

Valve size	
1/8"	A
1/4"	B
3/8"	C

Series	
Viking Lite	Z

Valve type / function	
Internal pilot supply to solenoid	
3/2 NC - 2-position	3
5/2 2-position	5
5/3 3-position, APB	6
5/3 3-position, PC	7
5/3 3-position, CE	8

Main port thread	
G1/8 (P2LA)	11
G1/4 (P2LB)	12
G3/8 (P2LC)	13
1/8" NPT (P2LA)	91
1/4" NPT (P2LB)	92
3/8" NPT (P2LC)	93

12 End operator	
EE	Double solenoid
ES*	Single solenoid, spring return

* Not available with 3-position valves.

Valve type	
N	14°F to 122°F (-10°C to 50°C)

Solenoid pilot type	
D	Pilot exhaust vented

Overrides	
C	Extended - locking
B	Flush - non-locking

Enclosures / lead length	
B	22mm rectangular 3-pin – type B industrial (male only)
N	Valve less coil

Voltage / frequency	
49	24VDC
53	120VAC
Blank	Valve less coil

Most popular.

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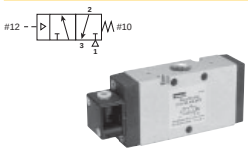
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

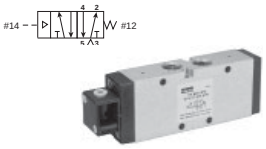
Single Remote Air Pilot, 3-way, 2-position



P2LBZ Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	15 / 45	0.25 (0.11)	P2LAX	**P2LAZ391PS**
1/4"	1.3	25 / 65	0.25 (0.11)	P2LBX	**P2LBZ392PS**
3/8"	2.5	25 / 65	0.67 (0.30)	P2LCX	**P2LCZ393PS**

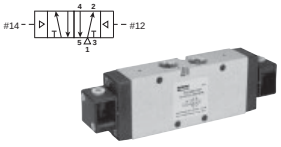
Single Remote Air Pilot, 4-way, 2-position



P2LBZ Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	15 / 45	0.27 (0.12)	P2LAX	**P2LAZ591PS**
1/4"	1.3	20 / 55	0.27 (0.12)	P2LBX	**P2LBZ592PS**
3/8"	2.5	25 / 85	0.85 (0.35)	P2LCX	**P2LCZ593PS**

Double Remote Air Pilot, 4-way, 2-position



P2LBZ Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	11 / 11	0.22 (0.10)	P2LAX	**P2LAZ591PP**
1/4"	1.3	13 / 13	0.26 (0.12)	P2LBX	**P2LBZ592PP**
3/8"	2.5	18 / 18	0.77 (0.35)	P2LCX	**P2LCZ593PP**

Notes: Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Viking Lite Remote Air Pilot Operated Valves

P2L A Z 5 91 PS

Valve size	
1/8"	A
1/4"	B
3/8"	C

Valve type / function	
Internal pilot supply to solenoid	
3/2 NC - 2-position	**3**
5/2 2-position	**5**
5/3 3-position, APB	6
5/3 3-position, PC	7
5/3 3-position, CE	8

Main port thread	
11	G1/8 (P2LA)
12	G1/4 (P2LB)
13	G3/8 (P2LC)
91	**1/8" NPT (P2LA)**
92	**1/4" NPT (P2LB)**
93	**3/8" NPT (P2LC)**

Operators / return	
PP	Double remote pilot, 5/32" (4mm) tube
PS*	Single remote pilot, spring return, 5/32" (4mm) tube

* Not available with 3-position valves.

Most popular.

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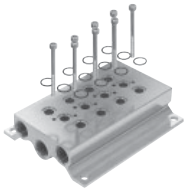
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

IEM Bar Manifold, Inline Valve Only*

Valve series	Valve function	# of Stations	Weight lb (kg)	Manifold only (NPT)	Manifold only (BSPP)
P2LAZ / P2LBZ	3-way	2	0.84 (0.38)	**91213202SXZN**	**91213202SXZ**
P2LAZ / P2LBZ	3-way	4	1.41 (0.64)	**91213204SXZN**	**91213204SXZ**
P2LAZ / P2LBZ	3-way	6	1.96 (0.89)	**91213206SXZN**	**91213206SXZ**
P2LAZ / P2LBZ	3-way	8	2.54 (1.15)	**91213208SXZN**	**91213208SXZ**
P2LAZ / P2LBZ	3-way	10	3.09 (1.40)	**91213210SXZN**	**91213210SXZ**

Kits include: Manifold, valve hold down bolts, gaskets.



Valve series	Valve function	# of Stations	Weight lb (kg)	Manifold only (NPT)	Manifold only (BSPP)
P2LAZ	4-way	2	0.68 (0.31)	**9121658068N**	**9121658068**
P2LAZ	4-way	4	1.06 (0.48)	**9121658075N**	**9121658075**
P2LAZ	4-way	6	1.39 (0.63)	**9121658076N**	**9121658076**
P2LAZ	4-way	8	1.76 (0.80)	**9121658077N**	**9121658077**
P2LAZ	4-way	10	2.16 (0.98)	**9121658078N**	**9121658078**

Kits include: Manifold, valve hold down bolts, gaskets.

Valve series	Valve function	# of Stations	Weight lb (kg)	Manifold only (NPT)	Manifold only (BSPP)
P2LBZ	4-way	2	1.53 (0.69)	**9121594805XN**	**9121594805X**
P2LBZ	4-way	4	2.49 (1.13)	**9121594806XN**	**9121594806X**
P2LBZ	4-way	6	3.44 (1.56)	**9121594807XN**	**9121594807X**
P2LBZ	4-way	8	4.41 (2.00)	**9121594808XN**	**9121594808X**
P2LBZ	4-way	10	5.40 (2.45)	**9121594812XN**	**9121594812X**

Kits include: Manifold, valve hold down bolts, gaskets.
* For odd number of stations, consider Viking Xtreme bar manifold.

IEM Bar Manifold, Inline Valve Only

Valve series	Valve function	# of Stations	Manifold only (NPT & BSPP)
P2LCZ	4-way	Use Viking Xtreme IEM bar manifold	

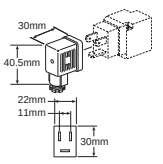
Note: Only 4-way Viking Lite will mount on Viking Xtreme manifold. If 3-way desired, use 4-way and plug part #2 for N.C. valve function.

Manifold Accessories / Parts

Valve series	Description	Weight lb (kg)	Kit number
P2LAZ / P2LBZ *	3-way: Blanking kit with mounting screws (2)	0.22 (0.10)	**912132BPSXZ**
P2LAZ *	4-way: Blanking kit with mounting screws (2)	0.11 (0.05)	**9121658063**
P2LBZ *	4-way: Blanking kit with mounting screws (2)	0.04 (0.02)	**9121594809X**

***Note:** O-ring for blanking kit included with manifold. For replacement o-rings or fastener bolts, use Viking Xtreme Kits.

22mm Rectangular 3-Pin – Type B Industrial
(Use with Enclosure "B")



Description	Connector with 6' (2m) cord	Connector
Unlighted	**PS2429JBP**	**PS2429BP**
Light – 24VDC	**PS2430J79BP***	**PS243079BP**
Light – 120V/60Hz	**PS2430J83BP***	**PS243083BP**

* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

Engineering data:
conductors: 2 poles plus ground; cable range (connector only): 6 to 8mm (0.24 To 0.31 Inch); contact spacing: 11mm

Most popular.

Replacement Parts

Description	Part number
24VDC solenoid coil kit	**P2FCB449**
110VAC solenoid coil kit	**P2FCB453**

Description	Part number
Remote pilot kit	**P2FP1P**

*Includes adaptor, gasket, screws

Description	Part number
Solenoid nut, diffuser	**PS1556**

Description	Part number
Solenoid nut, vented	**PS2892P**

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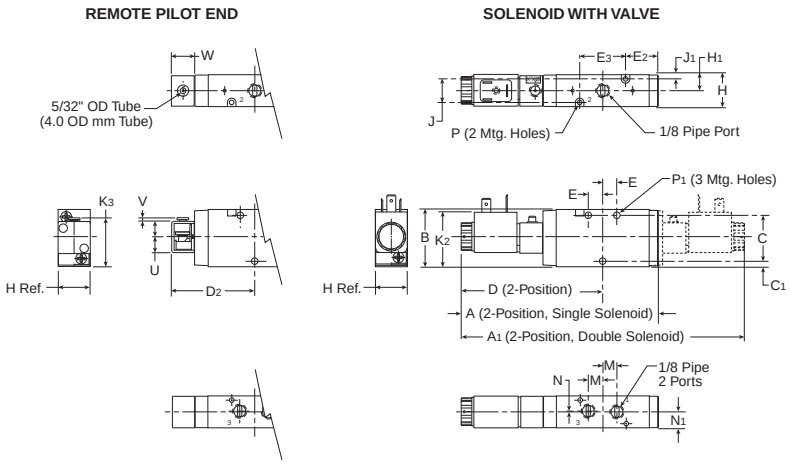
P2LAZ 3/2 Single & Double Operators – Solenoid & Remote Air Pilot

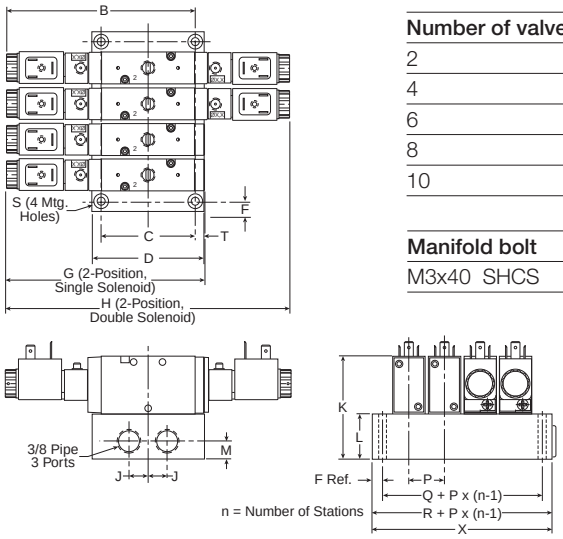


P2LAZ 3/2
Solenoid & remote air pilot

A	A1	B	C	C1	D
5.35 (136)	7.68 (195)	1.57 (40)	1.26 (32)	.16 (4)	3.84 (97.5)
D2	**E**	**E2**	**E3**	**H**	**H1**
2.28 (58)	.39 (10)	.91 (23)	1.26 (32)	.87 (22)	.43 (11)
J	**J1**	**K2**	**K3**	**M**	**N**
.65 (16.5)	.11 (2.75)	1.50 (38)	1.31 (33.2)	.39 (10)	.02 (.5)
N1	**P**	**P1**	**U**	**V**	**W**
.43 (11)	Ø .12 Ø (3.1)	Ø .17 Ø (4.3)	0.43 (11)	0.087 (2.2)	0.59 (15.2)

Inches (mm)

P2LAZ 3/2 Single & Double Operators – IEM Aluminum Bar Manifold



Number of valves	X
2	2.91 (74)
4	4.80 (122)
6	6.69 (170)
8	8.58 (218)
10	10.47 (266)

Inches (mm)

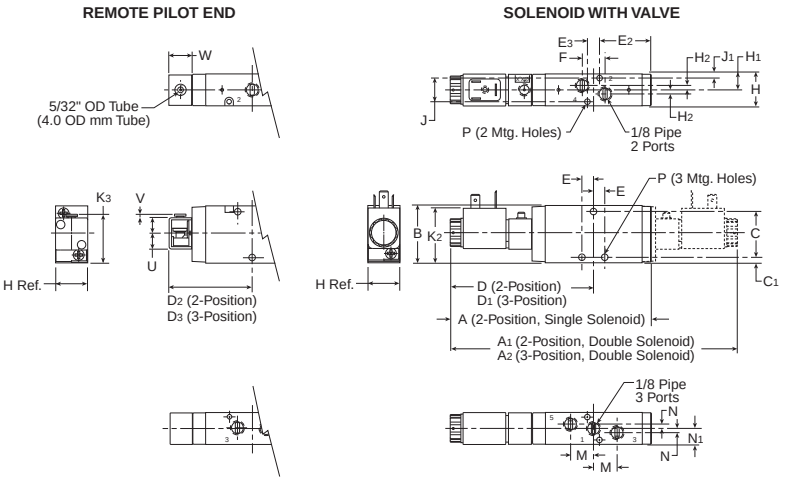
Manifold bolt	Torque value
M3x40 SHCS	4 in.lb (0.45 Nm)

P2LAZ 3/2
IEM Aluminum bar manifold

B	C	D	F	G
5.06 (128.5)	2.44 (62)	2.99 (76)	.28 (7)	5.35 (136)
H	**J**	**K**	**L**	**M**
7.68 (195)	.51 (13)	2.78 (70.5)	1.20 (30.5)	.47 (12)
P	**Q**	**R**	**S**	**T**
.94 (24)	1.42 (36)	1.97 (50)	Ø .22 Ø (5.5)	.88 (7)

Inches (mm)

P2LAZ 5/2 & 5/3 Single & Double Operators – Solenoid & Remote Air Pilot



P2LAZ 5/2 & 5/3
Solenoid & remote air pilot

A	A1	A2	B	C	C1
5.47 (139)	7.76 (197)	8.70 (221)	1.57 (40)	1.30 (33)	.14 (3.5)
D	**D1**	**D2**	**D3**	**E**	**E2**
3.88 (98.5)	4.35 (110.5)	2.33 (59.3)	2.80 (71)	.31 (8)	1.86 (47.3)
E3	**F**	**H**	**H1**	**H2**	**J**
.33 (8.5)	.63 (16)	.87 (22)	.43 (11)	.12 (3)	.63 (16)
J1	**K2**	**K3**	**M**	**N**	**N1**
.12 (3)	1.50 (38)	1.31 (33.2)	.63 (16)	.12 (3)	.43 (11)
P	**U**	**V**	**W**		
Ø .16 Ø (4.1)	0.43 (11)	0.087 (2.2)	0.59 (15.2)		

Inches (mm)

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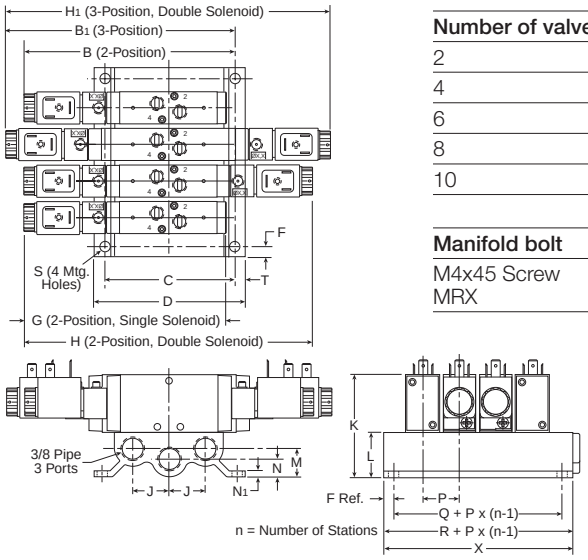
P2LAZ 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold



Number of valves	X
2	3.07 (78)
4	4.96 (126)
6	6.85 (174)
8	8.74 (222)
10	10.63 (270)

Inches (mm)

Manifold bolt	Torque value
M4x45 Screw MRX	9 in.lb (0.75 Nm)

P2LAZ 5/2 & 5/3
IEM Aluminum bar manifold

B	B1	C	D	F
5.10 (149.5)	6.36 (161.5)	3.46 (88)	4.02 (102)	.28 (7)

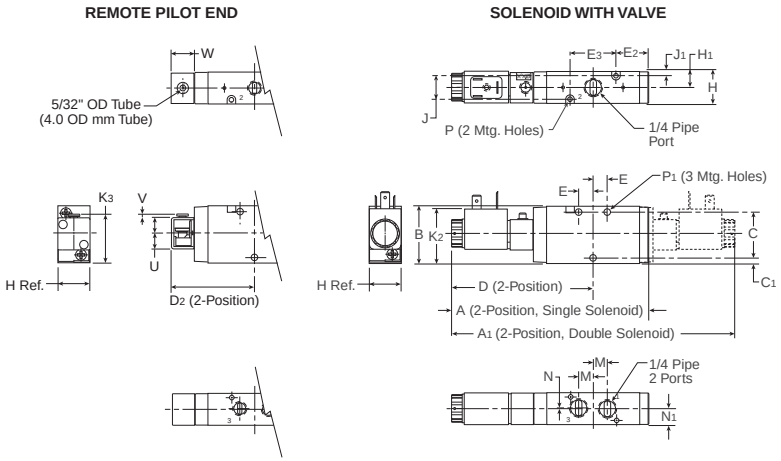
G	H	H1	J	K
5.47 (139)	7.76 (197)	8.70 (221)	.96 (24.5)	2.76 (70)

L	M	N	N1	P
1.18 (30)	.75 (19)	.47 (12)	.16 (4)	.94 (24)

Q	R	S	T
1.57 (40)	2.13 (54)	Ø .28 Ø (7)	.28 (7)

Inches (mm)

P2LBZ 3/2 Single & Double Operators – Solenoid & Remote Air Pilot



P2LBZ 3/2
Solenoid & remote air pilot

A	A1	B	C	C1	D
5.35 (136)	7.68 (195)	1.57 (40)	1.26 (32)	.16 (4)	3.84 (97.5)

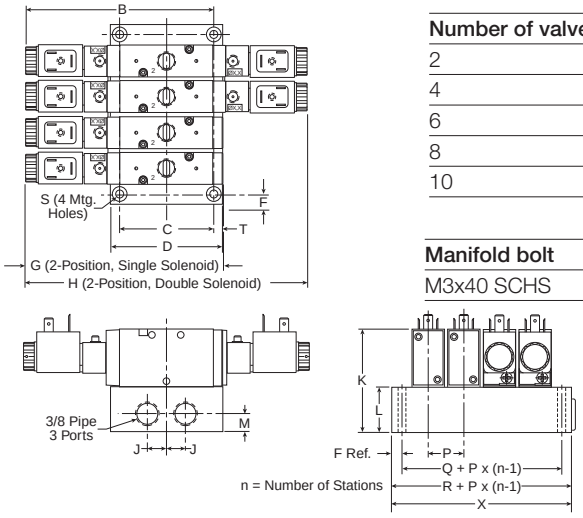
D2	E	E2	E3	H	H1
2.28 (58)	.39 (10)	.91 (23)	1.26 (32)	.87 (22)	.43 (11)

J	J1	K2	K3	M	N
.65 (16.5)	.11 (2.75)	1.50 (38)	1.31 (33.2)	.39 (10)	.02 (.5)

N1	P	P1	U	V	W
.43 (11)	Ø .12 Ø (3.1)	Ø .17 Ø (4.3)	0.43 (11)	0.087 (2.2)	0.59 (15.2)

Inches (mm)

P2LBZ 3/2 Single & Double Operators – IEM Aluminum Bar Manifold



Number of valves	X
2	2.91 (74)
4	4.80 (122)
6	6.69 (170)
8	8.58 (218)
10	10.47 (266)

Inches (mm)

Manifold bolt	Torque value
M3x40 SCHS	4 in.lb (0.45 Nm)

P2LBZ 3/2
IEM Aluminum bar manifold

B	C	D	F	G
5.06 (128.5)	2.44 (62)	2.99 (76)	.28 (7)	5.35 (136)

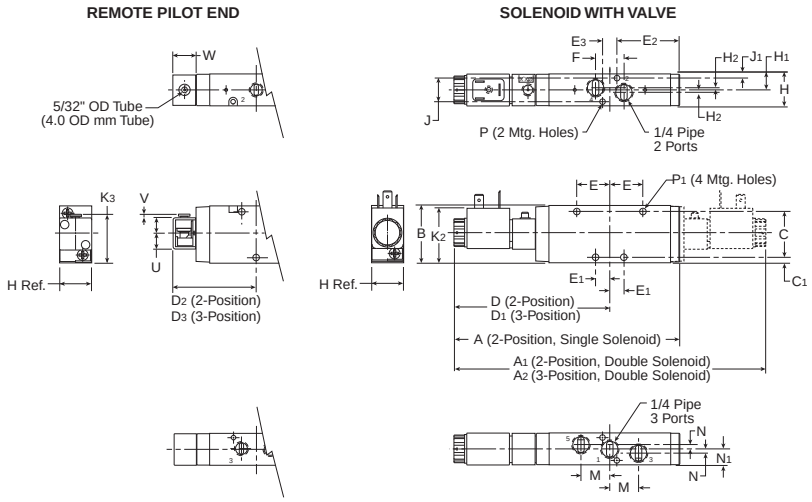
H	J	K	L	M
7.68 (195)	.51 (13)	2.78 (70.5)	1.20 (30.5)	.47 (12)

P	Q	R	S	T
.94 (24)	1.42 (36)	1.97 (50)	Ø .22 Ø (5.5)	.88 (7)

Inches (mm)

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

P2LBZ 5/2 & 5/3 Single & Double Operators – Solenoid & Remote Air Pilot



P2LBZ 5/2 & 5/3
Solenoid & remote air pilot

A	A1	A2	B	C	C1
6.14 (156)	8.46 (215)	9.29 (236)	1.57 (40)	1.26 (32)	.16 (4)

D	D1	D2	D3	E	E1
4.23 (107.5)	4.65 (118)	2.68 (68)	3.09 (78.5)	.91 (23)	.39 (10)

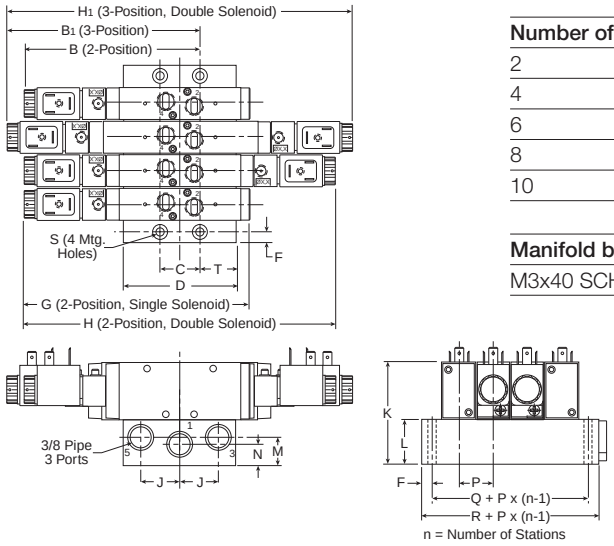
E2	E3	F	H	H1	H2
1.14 (29)	.39 (10)	.79 (20)	.87 (22)	.43 (11)	.06 (1.5)

J	J 1	K2	K3	M	N
.65 (16.5)	.11 (2.8)	1.50 (38)	1.31 (33.2)	.79 (20)	.08 (2)

N1	P	P1	U	V	W
.43 (11)	Ø .12 Ø (3.1)	Ø .17 Ø (4.3)	0.43 (11)	0.087 (2.2)	0.59 (15.2)

Inches (mm)

P2LBZ 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold



Number of valves	X
2	2.91 (74)
4	4.80 (122)
6	6.69 (170)
8	8.58 (218)
10	10.47 (266)

Inches (mm)

Manifold bolt	Torque value
M3x40 SCHS	9 in.lb (0.75 Nm)

P2LBZ 5/2 & 5/3
IEM Aluminum bar manifold

B	B1	C	D	F
4.43 (112.5)	4.84 (123)	1.04 (26.5)	2.99 (76)	.28 (7)

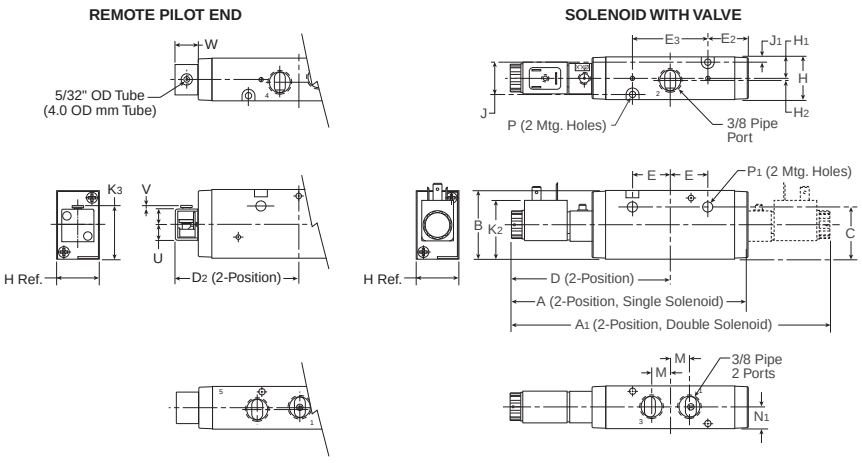
G	H	H1	J	K
6.14 (156)	8.46 (215)	9.29 (236)	1.02 (26)	2.781 (70.5)

L	M	N	P	Q
1.20 (30.5)	.75 (19)	.57 (14.5)	.94 (24)	1.57 (40)

R	S	T
1.97 (50)	Ø .22 Ø (5.5)	.97 (25)

Inches (mm)

P2LCZ 3/2 Single & Double Operators – Solenoid & Remote Pilot



P2LCZ 3/2
Solenoid & remote air pilot

A	A1	B	C	D	D2
6.50 (165)	8.66 (220)	1.89 (48)	1.46 (37)	4.33 (110)	2.78 (70.5)

E	E2	E3	H	H1	H2
1.04 (26.5)	1.10 (28)	2.09 (53)	1.18 (30)	.59 (15)	.06 (1.55)

J	J1	K2	K3	M	N1
.91 (23)	.14 (3.5)	1.50 (38)	1.46 (37.2)	.53 (13.5)	.59 (15)

P	P1	U	V	W
Ø .17 Ø (4.4)	Ø .27 Ø (6.9)	0.43 (11)	0.087 (2.2)	0.59 (15.2)

Inches (mm)

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Pneumatic Division
Richland, Michigan
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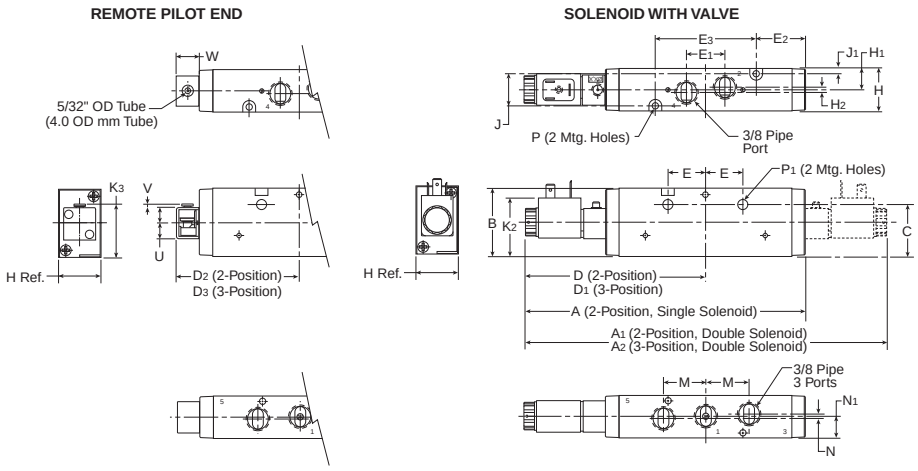
P2LCZ 5/2 & 5/3 Single & Double Operators – Solenoid & Remote Air Pilot

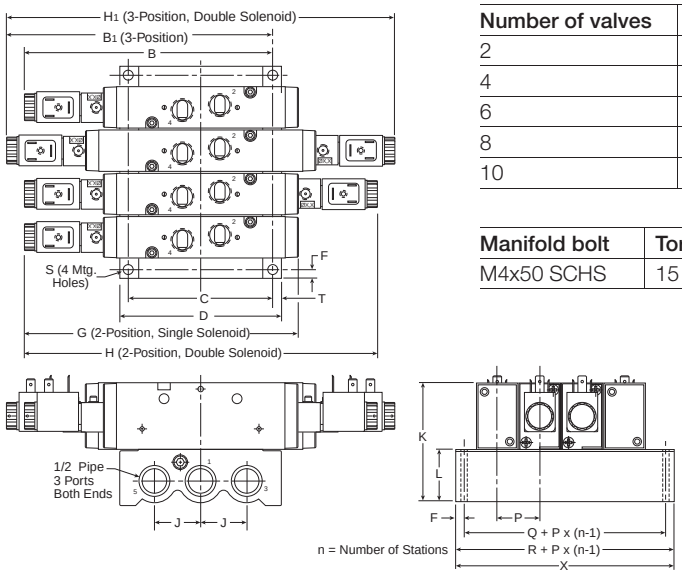


P2LBZ 5/2 & 5/3
Solenoid & remote air pilot

A	A1	A2	B	C
7.68	9.88	10.70	1.89	1.46
(195)	(251)	(272)	(48)	(37)
D	**D1**	**D2**	**D3**	**E**
4.94	5.35	3.39	3.80	1.04
(125.5)	(136)	(86)	(96.5)	(26.5)
E1	**E2**	**E3**	**H**	**H1**
1.06	1.71	2.80	1.18	.59
(27)	(43.5)	(71)	(30)	(15)
H2	**J**	**J1**	**K2**	**K3**
.12	.91	.14	1.50	1.48
(.3)	(23)	(3.5)	(38)	(37.5)
M	**N**	**N1**	**P**	**P1**
1.18	.08	.59	Ø .17	Ø .27
(30)	(2)	(15)	Ø (4.4)	Ø (6.9)
U	**V**	**W**		
0.43	0.087	0.59		
(11)	(2.2)	(15.2)		

Inches (mm)

P2LCZ 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold



Number of valves	X
2	3.29 (84)
4	5.96 (152)
6	8.44 (215)
8	10.93 (278)
10	13.41 (341)

Inches (mm)

Manifold bolt	Torque value
M4x50 SCHS	15 in.lb (2.0 Nm)

P2LCZ 5/2 & 5/3
IEM Aluminum bar manifold

C	D	F	G	H
3.97	4.41	.24	7.68	9.88
(101)	(112)	(6)	(195)	(251)
H1	**J**	**K**	**L**	**P**
10.70	1.26	3.43	1.54	1.24
(272)	(32)	(87)	(39)	(31.5)
Q	**R**	**S**	**T**	
1.77	2.24	Ø .26	.24	
(45)	(57)	Ø (6.5)	(6)	

Inches (mm)

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

The Viking Xtreme valve range is robust, versatile and combines high performance with compact installation dimensions. Large flow capacity, short change-over times and low change-over pressure are important characteristics of this valve range.

Ports
- P2LAX: 1/8 inch NPT & BSPP
- P2LBX: 1/4 inch NPT & BSPP
- P2LCX: 3/8 inch NPT & BSPP
- P2LDX: 1/2 inch NPT & BSPP

Mounting
- Inline
- IEM aluminum bar

Solenoids

1.2 watts to 7.3 watts
- 22mm (Type B) & 30mm 3-pin (DIN 43650)
- 15mm 3-pin (EN 17530-803)
- M12, 4-pin, surge suppression
- Grommet, surge suppression
- Conduit
- Deutsche Connectors, surge suppression

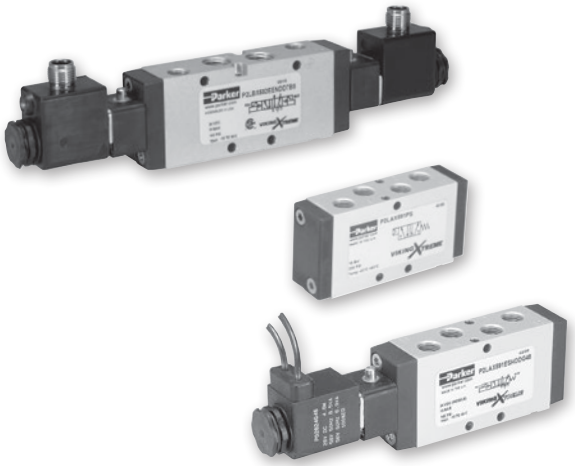
12VDC to 240VAC

Certification / approval
- IP65 Rated, RoHS, CE
- cCSAus Approved to 145 PSIG (10 bar)
- Canada Registration Number available (CRN)
- ATEX option available

Mobile applications
- Viking Xtreme tested to +5g shock and vibration
- Solenoids operate with wide voltage tolerance bands
- Corrosion resistant design
- Passed 500 hour salt spray test

Material specifications

Body	Anodized aluminum
End caps	Anodized aluminum
Coils	Thermoplastic
Fasteners	Stainless steel
Spool	Aluminum and nitrile rubber
Springs	Stainless steel



Operating information

Operating pressure:
- Normal: Vacuum to 145 PSIG (Vacuum to 10 bar)
- Xtreme: (P2LAX & P2LBX) Vacuum to 232 PSIG (Vacuum to 16 bar)
- (P2LCX & P2LDX) Vacuum to 174 PSIG (Vacuum to 12 bar)
- Minimum: See chart

Operating temperature:
- Normal: 14°F to 122°F (-10°C to 50°C)
- Xtreme: -40°F to 158°F (-40°C to 70°C)

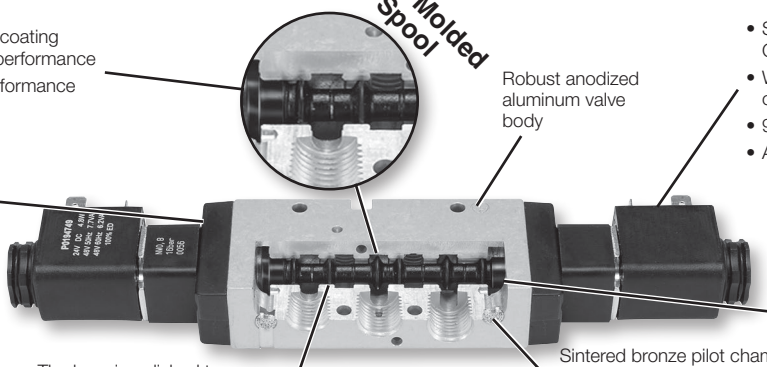
Minimum operating pressure, PSIG (bar)

Valve type - Internal pilot	P2LAX	P2LBX	P2LCX	P2LDX
Single solenoid - spring return	46 (3.2)	51 (3.5)	51 (3.5)	51 (3.5)
Single remote pilot - spring return	46 (3.2)	51 (3.5)	51 (3.5)	51 (3.5)
Double solenoid - 2-position	22 (1.5)	22 (1.5)	22 (1.5)	22 (1.5)
Double remote pilot - 2-position	22 (1.5)	22 (1.5)	22 (1.5)	22 (1.5)
Double solenoid - 3-position (APB, PC, CE)	51 (3.5)	51 (3.5)	51 (3.5)	51 (3.5)
Double remote pilot - 3-position (APB, PC, CE)	51 (3.5)	51 (3.5)	51 (3.5)	51 (3.5)

Features

Over Molded Spool
- Aluminum spool with nitrile rubber coating ground to exact size for optimum performance
- Precision ground for maximum performance
- Wide operating temperature range - Low temperature to -40°

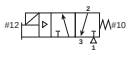
Diecast end covers with stainless steel screws to resist aggressive environments.



- Solenoid operated, IP65, RoHS, CE, CSA
- Wide variety of electrical connections
- 90° rotation
- Air pilot available

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Single Solenoid, 3-way, 2-position, Normal Operating Pressure / Temperature, Non-locking Manual Override

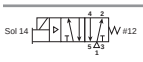
	Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
		1/8"	0.7	P2LAX	18 / 40	0.84 (0.38)	24VDC	**P2LAX391ESNDDB49**
							120VAC	**P2LAX391ESNDDB53**
	22mm DIN	1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX392ESNDDB49**
							120VAC	**P2LBX392ESNDDB53**
		3/8"	2.5	P2LCX	25 / 75	1.72 (0.78)	24VDC	**P2LCX393ESNDDB49**
							120VAC	**P2LCX393ESNDDB53**
		1/2"	2.7	P2LDX	25 / 75	1.72 (0.78)	24VDC	**P2LDX394ESNDDB49**
P2LAX 22mm DIN Shown							120VAC	**P2LDX394ESNDDB53**
		1/8"	0.7	P2LAX	18 / 40	0.84 (0.38)	24VDC	**P2LAX391ESNDDG49**
							120VAC	**P2LAX391ESNDDG53**
	18" Grommet	1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX392ESNDDG49**
							120VAC	**P2LBX392ESNDDG53**
		3/8"	2.5	P2LCX	25 / 75	1.72 (0.78)	24VDC	**P2LCX393ESNDDG49**
							120VAC	**P2LCX393ESNDDG53**
		1/2"	2.7	P2LDX	25 / 75	1.72 (0.78)	24VDC	**P2LDX394ESNDDG49**
P2LAX 18" Grommet Shown							120VAC	**P2LDX394ESNDDG53**
		1/8"	0.7	P2LAX	18 / 40	0.84 (0.38)	24VDC	**P2LAX391ESNDD7B9**
	M12 Coil with LED	1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX392ESNDD7B9**
		3/8"	2.5	P2LCX	25 / 75	1.72 (0.78)	24VDC	**P2LCX393ESNDD7B9**
		1/2"	2.7	P2LDX	25 / 75	1.72 (0.78)	24VDC	**P2LDX394ESNDD7B9**
P2LAX M12 Coil Shown								
		1/8"	0.7	P2LAX	18 / 40	0.84 (0.38)	24VDC	**P2LAX391ESNXB549**
							120VAC	**P2LAX391ESNXB553**
	15mm DIN	1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX392ESNXB549**
							120VAC	**P2LBX392ESNXB553**
		3/8"	2.5	P2LCX	25 / 75	1.72 (0.78)	24VDC	**P2LCX393ESNXB549**
							120VAC	**P2LCX393ESNXB553**
		1/2"	2.7	P2LDX	25 / 75	1.72 (0.78)	24VDC	**P2LDX394ESNXB549**
P2LAX 15mm DIN Shown							120VAC	**P2LDX394ESNXB553**

Notes: Above valves are rated for an operating temperature from 14°F to 122°F (-10°C to 50°C). See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

☐ Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Single Solenoid, 4-way, 2-position, Normal Operating Pressure / Temperature, Non-locking Manual Override

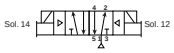
	Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
	22mm DIN	1/8"	0.7	P2LAX	15 / 35	0.49 (0.22)	24VDC	**P2LAX591ESNDDB49**
							120VAC	**P2LAX591ESNDDB53**
		1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX592ESNDDB49**
							120VAC	**P2LBX592ESNDDB53**
		3/8"	2.5	P2LCX	27 / 75	1.68 (0.76)	24VDC	**P2LCX593ESNDDB49**
							120VAC	**P2LCX593ESNDDB53**
		1/2"	2.7	P2LDX	25 / 75	1.68 (0.76)	24VDC	**P2LDX594ESNDDB49**
P2LBX 22mm DIN Shown							120VAC	**P2LDX594ESNDDB53**
	18" Grommet	1/8"	0.7	P2LAX	15 / 35	0.49 (0.22)	24VDC	**P2LAX591ESNDDG49**
							120VAC	**P2LAX591ESNDDG53**
		1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX592ESNDDG49**
							120VAC	**P2LBX592ESNDDG53**
		3/8"	2.5	P2LCX	27 / 75	1.68 (0.76)	24VDC	**P2LCX593ESNDDG49**
							120VAC	**P2LCX593ESNDDG53**
		1/2"	2.7	P2LDX	25 / 75	1.68 (0.76)	24VDC	**P2LDX594ESNDDG49**
P2LAX 18" Grommet Shown							120VAC	**P2LDX594ESNDDG53**
	M12 Coil with LED	1/8"	0.7	P2LAX	15 / 35	0.49 (0.22)	24VDC	**P2LAX591ESNDD7B9**
		1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX592ESNDD7B9**
		3/8"	2.5	P2LCX	27 / 75	1.68 (0.76)	24VDC	**P2LCX593ESNDD7B9**
		1/2"	2.7	P2LDX	25 / 75	1.68 (0.76)	24VDC	**P2LDX594ESNDD7B9**
P2LAX M12 Coil Shown								
	15mm DIN	1/8"	0.7	P2LAX	15 / 35	0.49 (0.22)	24VDC	**P2LAX591ESNXB549**
							120VAC	**P2LAX591ESNXB553**
		1/4"	1.3	P2LBX	18 / 45	0.84 (0.38)	24VDC	**P2LBX592ESNXB549**
							120VAC	**P2LBX592ESNXB553**
		3/8"	2.5	P2LCX	27 / 75	1.68 (0.76)	24VDC	**P2LCX593ESNXB549**
							120VAC	**P2LCX593ESNXB553**
		1/2"	2.7	P2LDX	25 / 75	1.68 (0.76)	24VDC	**P2LDX594ESNXB549**
P2LAX 15mm DIN Shown							120VAC	**P2LDX594ESNXB553**

Notes: Above valves are rated for an operating temperature from 14°F to 122°F (-10°C to 50°C). See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Double Solenoid, 4-way, 2-position, Normal Operating Pressure / Temperature, Non-locking Manual Override

	Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
  P2LBX 22mm DIN Shown	22mm DIN	1/8"	0.7	P2LAX	10 / 10	0.60 (0.27)	24VDC	**P2LAX591EENDDB49**
							120VAC	**P2LAX591EENDDB53**
		1/4"	1.3	P2LBX	12 / 12	0.93 (0.42)	24VDC	**P2LBX592EENDDB49**
							120VAC	**P2LBX592EENDDB53**
		3/8"	2.5	P2LCX	17 / 17	1.78 (0.81)	24VDC	**P2LCX593EENDDB49**
							120VAC	**P2LCX593EENDDB53**
		1/2"	2.7	P2LDX	17 / 17	1.78 (0.81)	24VDC	**P2LDX594EENDDB49**
							120VAC	**P2LDX594EENDDB53**
 P2LAX 18" Grommet Shown	18" Grommet	1/8"	0.7	P2LAX	10 / 10	0.60 (0.27)	24VDC	**P2LAX591EENDDG49**
							120VAC	**P2LAX591EENDDG53**
		1/4"	1.3	P2LBX	12 / 12	0.93 (0.42)	24VDC	**P2LBX592EENDDG49**
							120VAC	**P2LBX592EENDDG53**
		3/8"	2.5	P2LCX	17 / 17	1.78 (0.81)	24VDC	**P2LCX593EENDDG49**
							120VAC	**P2LCX593EENDDG53**
		1/2"	2.7	P2LDX	17 / 17	1.78 (0.81)	24VDC	**P2LDX594EENDDG49**
							120VAC	**P2LDX594EENDDG53**
 P2LBX M12 Coil Shown	M12 Coil with LED	1/8"	0.7	P2LAX	10 / 10	0.60 (0.27)	24VDC	**P2LAX591EENDD7B9**
		1/4"	1.3	P2LBX	12 / 12	0.93 (0.42)	24VDC	**P2LBX592EENDD7B9**
		3/8"	2.5	P2LCX	17 / 17	1.78 (0.81)	24VDC	**P2LCX593EENDD7B9**
		1/2"	2.7	P2LDX	17 / 17	1.78 (0.81)	24VDC	**P2LDX594EENDD7B9**
 P2LAX 15mm DIN Shown	15mm DIN	1/8"	0.7	P2LAX	10 / 10	0.60 (0.27)	24VDC	**P2LAX591EENXB549**
							120VAC	**P2LAX591EENXB553**
		1/4"	1.3	P2LBX	12 / 12	0.93 (0.42)	24VDC	**P2LBX592EENXB549**
							120VAC	**P2LBX592EENXB553**
		3/8"	2.5	P2LCX	17 / 17	1.78 (0.81)	24VDC	**P2LCX593EENXB549**
							120VAC	**P2LCX593EENXB553**
		1/2"	2.7	P2LDX	17 / 17	1.78 (0.81)	24VDC	**P2LDX594EENXB549**
							120VAC	**P2LDX594EENXB553**

Notes: Above valves are rated for an operating temperature from 14°F to 122°F (-10°C to 50°C). See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Double Solenoid, 4-way, 3-position All Ports Blocked, 3-position Center Exhaust, Normal Operating Pressure / Temperature, Non-locking Manual Override

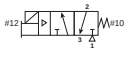
	Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number: All Ports Blocked	Part number: Center Exhaust
 P2LBX 22mm DIN Shown	22mm DIN	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	24VDC	**P2LAX691EENDDB49**	**P2LAX891EENDDB49**
							120VAC	**P2LAX691EENDDB53**	**P2LAX891EENDDB53**
		1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	24VDC	**P2LBX692EENDDB49**	**P2LBX892EENDDB49**
							120VAC	**P2LBX692EENDDB53**	**P2LBX892EENDDB53**
		3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	24VDC	**P2LCX693EENDDB49**	**P2LCX893EENDDB49**
							120VAC	**P2LCX693EENDDB53**	**P2LCX893EENDDB53**
		1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	24VDC	**P2LDX694EENDDB49**	**P2LDX894EENDDB49**
							120VAC	**P2LDX694EENDDB53**	**P2LDX894EENDDB53**
 P2LBX 18" Grommet Shown	18" Grommet	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	24VDC	**P2LAX691EENDDG49**	**P2LAX891EENDDG49**
							120VAC	**P2LAX691EENDDG53**	**P2LAX891EENDDG53**
		1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	24VDC	**P2LBX692EENDDG49**	**P2LBX892EENDDG49**
							120VAC	**P2LBX692EENDDG53**	**P2LBX892EENDDG53**
		3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	24VDC	**P2LCX693EENDDG49**	**P2LCX893EENDDG49**
							120VAC	**P2LCX693EENDDG53**	**P2LCX893EENDDG53**
		1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	24VDC	**P2LDX694EENDDG49**	**P2LDX894EENDDG49**
							120VAC	**P2LDX694EENDDG53**	**P2LDX894EENDDG53**
 P2LBX M12 Coil Shown	M12 Coil with LED	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	24VDC	**P2LAX691EENDD7B9**	**P2LAX891EENDD7B9**
		1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	24VDC	**P2LBX692EENDD7B9**	**P2LBX892EENDD7B9**
		3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	24VDC	**P2LCX693EENDD7B9**	**P2LCX893EENDD7B9**
		1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	24VDC	**P2LDX694EENDD7B9**	**P2LDX894EENDD7B9**
 P2LBX 15mm DIN Shown	15mm DIN	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	24VDC	**P2LAX691EENXB549**	**P2LAX891EENXB549**
							120VAC	**P2LAX691EENXB553**	**P2LAX891EENXB553**
		1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	24VDC	**P2LBX692EENXB549**	**P2LBX892EENXB549**
							120VAC	**P2LBX692EENXB553**	**P2LBX892EENXB553**
		3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	24VDC	**P2LCX693EENXB549**	**P2LCX893EENXB549**
							120VAC	**P2LCX693EENXB553**	**P2LCX893EENXB553**
		1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	24VDC	**P2LDX694EENXB549**	**P2LDX894EENXB549**
							120VAC	**P2LDX694EENXB553**	**P2LDX894EENXB553**

Notes: Above valves are rated for an operating temperature from 14°F to 122°F (-10°C to 50°C). See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Single Solenoid, 3-way, 2-position, Xtreme Operating Pressure / Temperature, Non-locking Manual Override



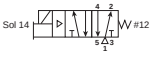
P2LBX 22mm DIN Shown

P2LBX 18" Grommet Shown

Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
22mm DIN	1/8"	0.7	P2LAX	15 / 45	0.84 (0.38)	12VDC	**P2LAX391ESHDDB47**
						24VDC	**P2LAX391ESHDDB48**
	1/4"	1.3	P2LBX	25 / 65	0.84 (0.38)	12VDC	**P2LBX392ESHDDB47**
						24VDC	**P2LBX392ESHDDB48**
	3/8"	2.5	P2LCX	25 / 85	1.01 (0.46)	12VDC	**P2LCX393ESHDDB47**
						24VDC	**P2LCX393ESHDDB48**
	1/2"	2.7	P2LDX	25 / 85	1.01 (0.46)	12VDC	**P2LDX394ESHDDB47**
						24VDC	**P2LDX394ESHDDB48**
18" Grommet	1/8"	0.7	P2LAX	15 / 45	0.84 (0.38)	12VDC	**P2LAX391ESHDDG47**
						24VDC	**P2LAX391ESHDDG48**
	1/4"	1.3	P2LBX	25 / 65	0.84 (0.38)	12VDC	**P2LBX392ESHDDG47**
						24VDC	**P2LBX392ESHDDG48**
	3/8"	2.5	P2LCX	25 / 85	1.01 (0.46)	12VDC	**P2LCX393ESHDDG47**
						24VDC	**P2LCX393ESHDDG48**
	1/2"	2.7	P2LDX	25 / 85	1.01 (0.46)	12VDC	**P2LDX394ESHDDG47**
						24VDC	**P2LDX394ESHDDG48**

Notes: Above valves have Mobile Rated Coils and are rated for an operating temperature from -40°F to 158°F (-40°C to 70°C).
See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Single Solenoid, 4-way, 2-position, Xtreme Operating Pressure / Temperature Non-locking Manual Override



P2LBX 22mm DIN Shown

P2LAX 18" Grommet Shown

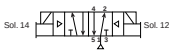
Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
22mm DIN	1/8"	0.7	P2LAX	15 / 45	0.84 (0.38)	12VDC	**P2LAX591ESHDDB47**
						24VDC	**P2LAX591ESHDDB48**
	1/4"	1.3	P2LBX	20 / 55	0.84 (0.38)	12VDC	**P2LBX592ESHDDB47**
						24VDC	**P2LBX592ESHDDB48**
	3/8"	2.5	P2LCX	25 / 85	1.01 (0.46)	12VDC	**P2LCX593ESHDDB47**
						24VDC	**P2LCX593ESHDDB48**
	1/2"	2.7	P2LDX	25 / 85	1.01 (0.46)	12VDC	**P2LDX594ESHDDB47**
						24VDC	**P2LDX594ESHDDB48**
18" Grommet	1/8"	0.7	P2LAX	15 / 45	0.84 (0.38)	12VDC	**P2LAX591ESHDDG47**
						24VDC	**P2LAX591ESHDDG48**
	1/4"	1.3	P2LBX	25 / 65	0.84 (0.38)	12VDC	**P2LBX592ESHDDG47**
						24VDC	**P2LBX592ESHDDG48**
	3/8"	2.5	P2LCX	28 / 85	1.01 (0.46)	12VDC	**P2LCX593ESHDDG47**
						24VDC	**P2LCX593ESHDDG48**
	1/2"	2.7	P2LDX	25 / 85	1.01 (0.46)	12VDC	**P2LDX594ESHDDG47**
						24VDC	**P2LDX594ESHDDG48**

Notes: Above valves have Mobile Rated Coils and are rated for an operating temperature from -40°F to 158°F (-40°C to 70°C).
See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Double Solenoid, 4-way, 2-position, Xtreme Operating Pressure / Temperature, Non-locking Manual Override



P2LBX 22mm DIN Shown

P2LAX 18" Grommet Shown

Solenoid	Port size (NPT)	Cv	Valve type	Response time (msec)	Weight lb (kg)	Voltage	Part number
22mm DIN	1/8"	0.7	P2LAX	11 / 11	0.60 (0.27)	12VDC	**P2LAX591EEHDDB47**
						24VDC	**P2LAX591EEHDDB48**
	1/4"	1.3	P2LBX	13 / 13	0.93 (0.42)	12VDC	**P2LBX592EEHDDB47**
						24VDC	**P2LBX592EEHDDB48**
	3/8"	2.5	P2LCX	18 / 18	1.06 (0.48)	12VDC	**P2LCX593EEHDDB47**
						24VDC	**P2LCX593EEHDDB48**
	1/2"	2.7	P2LDX	18 / 18	1.06 (0.48)	12VDC	**P2LDX594EEHDDB47**
						24VDC	**P2LDX594EEHDDB48**
18" Grommet	1/8"	0.7	P2LAX	11 / 11	0.60 (0.27)	12VDC	**P2LAX591EEHDDG47**
						24VDC	**P2LAX591EEHDDG48**
	1/4"	1.3	P2LBX	13 / 13	0.93 (0.42)	12VDC	**P2LBX592EEHDDG47**
						24VDC	**P2LBX592EEHDDG48**
	3/8"	2.5	P2LCX	18 / 18	1.06 (0.48)	12VDC	**P2LCX593EEHDDG47**
						24VDC	**P2LCX593EEHDDG48**
	1/2"	2.7	P2LDX	18 / 18	1.06 (0.48)	12VDC	**P2LDX594EEHDDG47**
						24VDC	**P2LDX594EEHDDG48**

Notes: Above valves have Mobile Rated Coils and are rated for an operating temperature from -40°F to 158°F (-40°C to 70°C).
See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Double Solenoid, 4-way, 3-position All Ports Blocked, 3-position Center Exhaust, Xtreme Operating Pressure / Temperature Non-locking Manual Override

P2LBX 22mm DIN Shown

P2LBX 18" Grommet Shown

Solenoid	Port size	Cv	Valve type (NPT)	Response time (msec)	Weight lb (kg)	Voltage	Part number: All Ports Blocked	Part number: Center Exhaust
22mm DIN	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	12VDC	**P2LAX691EEHDDB47**	**P2LAX891EEHDDB47**
						24VDC	**P2LAX691EEHDDB48**	**P2LAX891EEHDDB48**
	1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	12VDC	**P2LBX692EEHDDB47**	**P2LBX892EEHDDB47**
						24VDC	**P2LBX692EEHDDB48**	**P2LBX892EEHDDB48**
	3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	12VDC	**P2LCX693EEHDDB47**	**P2LCX893EEHDDB47**
						24VDC	**P2LCX693EEHDDB48**	**P2LCX893EEHDDB48**
	1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	12VDC	**P2LDX694EEHDDB47**	**P2LDX894EEHDDB47**
						24VDC	**P2LDX694EEHDDB48**	**P2LDX894EEHDDB48**
18" Grommet	1/8"	0.5	P2LAX	18 / 40	0.62 (0.28)	12VDC	**P2LAX691EEHDDG47**	**P2LAX891EEHDDG47**
						24VDC	**P2LAX691EEHDDG48**	**P2LAX891EEHDDG48**
	1/4"	0.9	P2LBX	22 / 55	0.97 (0.44)	12VDC	**P2LBX692EEHDDG47**	**P2LBX892EEHDDG47**
						24VDC	**P2LBX692EEHDDG48**	**P2LBX892EEHDDG48**
	3/8"	1.8	P2LCX	30 / 90	2.45 (1.11)	12VDC	**P2LCX693EEHDDG47**	**P2LCX893EEHDDG47**
						24VDC	**P2LCX693EEHDDG48**	**P2LCX893EEHDDG48**
	1/2"	1.9	P2LDX	30 / 90	2.45 (1.11)	12VDC	**P2LDX694EEHDDG47**	**P2LDX894EEHDDG47**
						24VDC	**P2LDX694EEHDDG48**	**P2LDX894EEHDDG48**

Notes: Above valves have Mobile Rated Coils and are rated for an operating temperature from -40°F to 158°F (-40°C to 70°C).
See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Viking Xtreme Single & Double Solenoid Operated Valves

P2L	A	X	5	91	ES	H	D	D	G	49

Valve size

1/8"	A
1/4"	B
3/8"	C
1/2"	D

Series

Viking Xtreme	X

Valve type / function

*Internal pilot supply to solenoid**	
3/2 NC - 2-position	3
5/2 2-position	5
5/3 3-position, APB	6
5/3 3-position, PC	7
5/3 3-position, CE	8
External pilot supply to the solenoids through ports #12 & #14	
3/2 NC - 2-position	L
5/2 2-position	N
5/3 3-position, APB	P
5/3 3-position, PC	Q
5/3 3-position, CE	R

* Size A & B solenoid valves can be field converted from internal to external pilot. See page C25 for details.

Main port thread

G1/8 (P2LA)	11
G1/4 (P2LB)	12
G1/4 (P2LB) NAMUR Mount	1N*
G3/8 (P2LC)	13
G1/2 (P2LD)	14
1/8" NPT (P2LA)	91
1/4" NPT (P2LB)	92
1/4" NPT (P2LB) NAMUR Mount	9N*
3/8" NPT (P2LC)	93
1/2" NPT (P2LD)	94

* NAMUR mount available for 5/2, 2-position only.

Operator return

Double solenoid	EE
Single solenoid, spring return	ES*

* Not available with 3-position valves.

Operator type / operating pressure and temperature

Normal, vacuum to 145 PSIG (10 bar), 14°F to 122°F (-10°C to 50°C), CSA Approved	N
Xtreme, vacuum to 145 PSIG (10 bar), -40°F to 140° F (-40°C to 70°C), CSA Approved	K
Xtreme, vacuum to 232 PSIG (16 bar), -40°F to 140° F (-40°C to 70°C)	H*

* P2LC and P2LD solenoid operated valves have a maximum pressure rating of 175 PSIG (12 bar)

Solenoid pilot type

D**	Vented pilot exhaust
N**	Tapped pilot exhaust
X*	15mm solenoid vented pilot exhaust

* Available enclosure "5", "X" and operator type "N" only.
** Not available on enclosure "5" & "X".

Overrides

A**	No override
B†	Flush - Non-locking
C*	Flush - locking
D	Extended non-locking
E*†	Extended - locking
X†	Valve less 15mm solenoid

* Override for valve type "N" only.
** Not available on enclosure "5", 15mm solenoid. Available solenoid pilot type "D" & "N" only.
† Available solenoid pilot type "X" only.

Enclosures / lead length

5†	15mm, 3-pin DIN 43650C, 8mm pin spacing
7§	M12 4-pin coil with surge suppression & LED
A	30mm square 3-pin – ISO 4400 Form A (male only)
B	22mm rectangular 3-pin – type B industrial (male only)
E*	Intrinsically safe, FM / CSA
F‡	Hazardous duty 1/2" NPT, FM / CSA
G	Grommet - 18" leads
H	1/2" NPT conduit - 18" leads
N**	Valve less "A - V, 7" enclosure
T#	Grommet, single solenoid, 2-pin deutsche connector, surge suppression
V#	Grommet, double solenoid, 4-pin deutsche connector, surge suppression
X†	Valve less 15mm solenoid

* Only available with voltage code "49" & override option "A", valve type "N" Only. Solenoid coil only CSA approved.
** Solenoid pilot type "D" & "N" only.
# Voltage code "46" only.
‡ Valve type "N" Only. Solenoid coil only CSA approved.
† Solenoid pilot type "X" only.
§ Voltage code "B9" only. Valve type "N" only.

Voltage

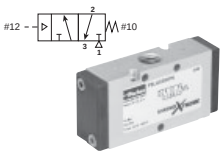
B9‡	24 VDC w/ surge suppression & LED
42	24VAC
45	12VDC
46†	12VDC mobile with surge suppression
47*	12 VDC mobile
48*	24 VDC mobile
49	24VDC
53	120VAC
57	240VAC
Blank	Valve less coil

* Only available with enclosures "A", "B", "G" & "5".
‡ Enclosure "7" only
† Enclosure "G", "T", "V" only.

☐ Most popular.

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

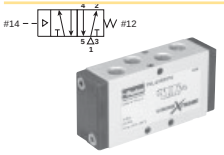
Single Remote Pilot, 3-way, 2-position, Xtreme Operating Pressure / Temperature, Non-locking Manual Override



P2LAX Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	15 / 45	0.68 (0.31)	P2LAX	**P2LAX391PS**
1/4"	1.3	25 / 65	0.68 (0.31)	P2LBX	**P2LBX392PS**
3/8"	2.5	25 / 65	0.88 (0.40)	P2LCX	**P2LCX393PS**
1/2"	2.7	25 / 65	0.88 (0.40)	P2LDX	**P2LDX394PS**

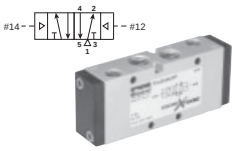
Single Remote Pilot, 4-way, 2-position, Xtreme Operating Pressure / Temperature, Non-locking Manual Override



P2LAX Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	15 / 45	0.33 (0.15)	P2LAX	**P2LAX591PS**
1/4"	1.3	20 / 55	0.68 (0.31)	P2LBX	**P2LBX592PS**
3/8"	2.5	25 / 85	0.90 (0.41)	P2LCX	**P2LCX593PS**
1/2"	2.7	25 / 85	0.90 (0.41)	P2LDX	**P2LDX594PS**

Double Remote Pilot, 4-way, 2-position, Xtreme Operating Pressure / Temperature, Non-locking Manual Override



P2LBX Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number
1/8"	0.7	11 / 11	0.33 (0.15)	P2LAX	**P2LAX591PP**
1/4"	1.3	13 / 13	0.68 (0.31)	P2LBX	**P2LBX592PP**
3/8"	2.5	18 / 18	0.90 (0.41)	P2LCX	**P2LCX593PP**
1/2"	2.7	18 / 18	0.90 (0.41)	P2LDX	**P2LDX594PP**

Double Remote Pilot, 4-way, 3-position All Ports Blocked, 3-position Center Exhaust, Xtreme Operating Pressure / Temperature, Non-locking Manual Override


P2LBX Shown

Port size (NPT)	Cv	Response time (msec)	Weight lb (kg)	Valve type	Part number: All ports blocked	Part number: Center exhaust
1/8"	0.5	18 / 50	0.31 (0.14)	P2LAX	**P2LAX691PP**	**P2LAX891PP**
1/4"	0.9	25 / 65	0.73 (0.33)	P2LBX	**P2LBX692PP**	**P2LBX892PP**
3/8"	1.8	30 / 90	0.93 (0.42)	P2LCX	**P2LCX693PP**	**P2LCX893PP**
1/2"	1.9	30 / 90	0.93 (0.42)	P2LDX	**P2LDX694PP**	**P2LDX894PP**

Notes: Above valves are rated for an operating temperature from -40°F to 158°F (-40°C to 70°C). See model code matrix for additional options.
Response time: Actuate to 90% pressure / return to exhaust to 10% of supply pressure. 93 PSIG (6.3 bar) / temperature 68°F (20°C).

Viking Xtreme Remote Air Pilot Operated Valves

Operating information

Operating pressure:
(P2LAX & P2LBX)
Vacuum to 232 PSIG (Vacuum to 16 bar)
(P2LCX & P2LDX)
Vacuum to 174 PSIG (Vacuum to 12 bar)

Operating temperature:
-40°F to 158°F (-40°C to 70°C)

P2L | A | X | 5 | 91 | PS

Valve size	
1/8"	A
1/4"	B
3/8"	C*
1/2"	D*

* P2LCX and P2LDX manual & remote air pilot valves have a maximum pressure rating of 175 PSIG (12 bar).

Valve type / function	
Internal pilot supply to solenoid	
3/2 NC - 2-position	3
5/2 2-position	5
5/3 3-position, APB	6
5/3 3-position, PC	7
5/3 3-position, CE	8

Operators / return	
PP	Double remote pilot
PS*	Single remote pilot, spring return

* Not available with 3-position valves.

Main port thread	
11	G1/8 (P2LA)
12	G1/4 (P2LB)
1N*	G1/4 NPT (P2LB) NAMUR mount
13	G3/8 (P2LC)
14	G1/2 (P2LD)
91	1/8" NPT (P2LA)
92	1/4" NPT (P2LB)
9N*	1/4 NPT (P2LB) NAMUR mount
93	3/8" NPT (P2LC)
94	1/2" NPT (P2LD)

* 5/2, 2-position valve only.

☐ Most popular.

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ATEX Certified Single & Double Solenoid Operated Valves

Viking ATEX valves meet ATEX directive 94/9/EC with the following classification : CE Ex II 2GD c 135oc. This directive lays down minimum safety requirements for products intended for use in potentially explosive atmospheres. The Directive is commonly referred to as the 'ATEX' Directive ('ATmospheres EXplosibles'), but may also be called the ATEX Equipment Directive or ATEX 95. Both ATEX certified solenoid, remote pilot and manual operated valves, as well as complete solenoid pilot assemblies are available.

ATEX classification details:

CE Ex: fulfils the ATEX directive
II : Group II Equipment Area
2GD : Equipment Category 2. Gas Zone 1,2 and Dust Zone 21,22
c : Safe Design (EN13463-5)
135°C : Real temperature of the surface of product for test

Temperature Class of Solenoid : T4 135°C, ATEX 8-22T

Operating information

Operating pressure:	Vacuum to 145 PSIG (vacuum to 10 bar)
Operating temperature:	14°F to 122°F (-10°C to 50°C)

P2L A X 5 91 ES A D D M 49

Valve size

1/8"	A
1/4"	B
3/8"	C
1/2"	D

Valve type / function

Internal Pilot Supply to Solenoid	
2-position valve	5
3-position valve APB	6
3-position valve PC	7
3-position valve CE	8
External Pilot Supply to Solenoids through Ports #12 & #14	
2-position valve	N
3-position valve APB	P
3-position valve PC	Q
3-position valve CE	R

Main port thread

G1/8 (P2LA)	11
G1/4 (P2LB)	12
G3/8 (P2LC)	13
G1/2 (P2LD)	14
1/8" NPT (P2LA)	91
1/4" NPT (P2LB)	92
3/8" NPT (P2LC)	93
1/2" NPT (P2LD)	94

Operator return

EE	Double solenoid
ES*	Single solenoid, spring return

* Not available with 3-position valves.

Solenoid pilot type

D	Vented pilot exhaust
N	Tapped pilot exhaust (M5)

Overrides

D	Extended non-locking

Enclosures

M	ATEX 8-22T EExm T4 135°C

Voltage

49	24VDC

NOTE:

1. ATEX Valve includes a coil with sealed 3 meter cable.
2. Replacement solenoid kit P2FS13A3DM49 includes coil with sealed 3 meter cable, valve armature, solenoid, solenoid nut, screws and o-rings.

These products are designed for utilization in applications falling under the scope of ATEX Directive 94/9/EC. This coverage could only be referred to as long as operations required for the installation and the maintenance of these products are complying with related standards.

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IEM Bar Manifold, Viking Xtreme Solenoid / Remote Pilot Valves †

Valve series	Valve function	## - Stations	Manifold only (NPT)	Manifold only (BSPP)
P2LAX*	3-way	02 - 12	**P2LAXGAXN##NP**	**P2LAXGAXG##NP**
P2LAX*	4-way	02 - 12	**P2LAXMAXN##NP**	**P2LAXMAXG##NP**
P2LBX*	3-way	02 - 12	**P2LBXGAXN##NP**	**P2LBXGAXG##NP**
P2LBX*	4-way	02 - 12	**P2LBXMAXN##NP**	**P2LBXMAXG##NP**
P2LCX*	3-way / 4-way	02 - 12	**P2LCXMAXN##NP**	**P2LCXMAXG##NP**

Kits include: (1) manifold, valve hold down bolts and o-rings. Replace ## with number of valve stations.
Valve size A, B, C only.

* Enclosure option A,E & F can not be mounted on size A & B manifolds and enclosure F can not be mounted on size C manifolds due to width of solenoid,
Enclosure option A & E can be mounted on size A & B manifolds if valve is a single solenoid valve and if every other valve is mounted in reverse (staggered).

† Consider Viking Lite manifolds for alternative solutions.

IEM Bar Manifold Add-A-Fold Assembly (Viking Xtreme Solenoid / Remote Air Pilot Valves Only)

Valve series	Valve function	## - Stations	Manifold only (NPT)	Manifold only (BSPP)
P2LAX*	3-way	02 - 12	**AAP2LAXGAXN##NP**	**AAP2LAXGAXG##NP**
P2LAX*	4-way	02 - 12	**AAP2LAXMAXN##NP**	**AAP2LAXMAXG##NP**
P2LBX*	3-way	02 - 12	**AAP2LBXGAXN##NP**	**AAP2LBXGAXG##NP**
P2LBX*	4-way	02 - 12	**AAP2LBXMAXN##NP**	**AAP2LBXMAXG##NP**
P2LCX*	3-way / 4-way	02 - 12	**AAP2LCXMAXN##NP**	**AAP2LCXMAXG##NP**

Kits include: (1) manifold, valve hold down bolts, o-rings and assembly. Replace ## with number of valve stations.
Valve size A, B, C only.

* Enclosure option A,E & F can not be mounted on size A & B manifolds and enclosure F can not be mounted on size C manifolds due to width of solenoid,

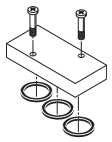
How to Order: 1. List Add-A-Fold assembly part number as line item 1

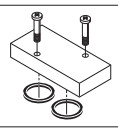
2. List the desired valves series part number in subsequent line items after the Add-A-Fold Assembly part number to complete the ordering code. Include all valves and blanking kits required. The left most station is station # 1 looking at the #12 end of the manifold.

Example: Viking Size B, 2 Station manifold, with 2, 4-way single solenoid valves

Line	Qty	Part number	Comment
1	1	AAP2LBXMAXN02NP	Add-A-Fold Assembly, 2-station IEM bar manifold
2	2	P2LBX592ESHDDB49	4-way, Station 1, 2

Blanking Plate





Type		Kit number
P2LAX	4-way	**9121658063**
P2LBX	4-way	**9121594809X**
P2LCX	3 & 4 way	**P2LCXK20P**
P2LAX	3-way	**912132BPSXZ**
P2LBX	3-way	**912132BPSXZ**

Kit includes: plate, screws, o-rings

Manifold Bolts

Type	Qty.	Kit number
P2LAX	12	**P2LAXK87P**
P2LBX	12	**P2LBXK87P**
P2LCX	12	**P2LCXK87P**

Manifold O-rings

Type	Qty.	Kit number
P2LAX	30	**P2LAXK84P**
P2LBX	18	**P2LBXK84P**
P2LCX	12	**P2LCXK84P**

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Solenoids with Deutsche Connections : Environmentally-Sealed Transportation Connectors

Viking valves with solenoid options “T” & “V” include a grommet lead wire solenoid with internal surge suppression connected to Deutsche DTP Series male connectors. Heat shrunk cover holds the grommet lead wires together between the solenoid and deutsche connector. An environmentally-sealed connector designed specifically for cable to cable applications in harsh environments such as on the engine or transmission, under the hood, on the chassis or in the cab applications. On signal level circuits where even a small degradation in connection may be critical, these connectors will provide the reliability and performance when properly connected to DTP female connector assemblies. Thermoplastic housings with silicone seals are used to allow the connector to withstand conditions of extreme temperature and moisture. Properly wired and mated connection will withstand immersion under three feet of water without loss of electronic qualities or leakage.

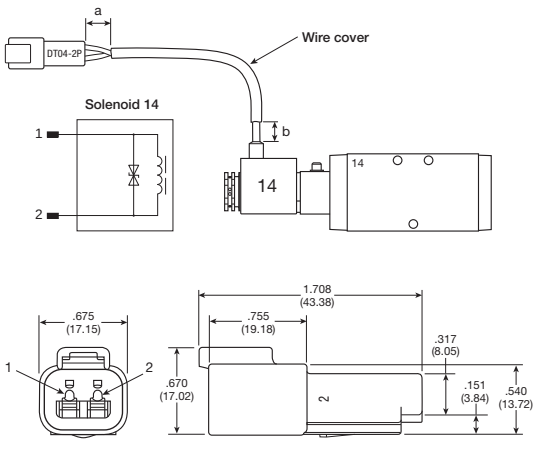
Deutsche Connector & Solenoid Information

		“T” Single Solenoid Option	“V” Double Solenoid Option
Solenoid Kit		**P2FCT446**	**P2FCV446**
Connector Information	Housing material	Thermoplastic	Thermoplastic
	Grommet seal material	Silicone	Silicone
	Connector housing / seal number	DT04-2P*	DT04-4P*
	Contact material	Copper alloy	Copper alloy
	Contact number	0460-202-16141*	0460-202-16141*
	Sealing plug (Wedge) material	Thermoplastic	Thermoplastic
	Wedge number	W2P*	W4P*
	Temperature rating of connector	-67°F (-55°C) to +257°F (+125°C)	-67°F (-55°C) to +257°F (+125°C)
Solenoid	Voltage	12VDC +10%, -30% mobile with bi-directional surge suppression	12VDC +10%, -30% mobile with bi-directional surge suppression
	Number of solenoids	1	2
	Connector pin out	pin 1 & 2	12 solenoid : pin 1 & 2 14 solenoid : pin 3 & 4
	Wire length (Connector to solenoid)	19" (483mm)	12 Solenoid : 19" (482mm) 14 Solenoid : 7.75" (196.5mm)
	Exposed insulated wire (a)	0.25" (6.4mm) - 0.5" (12.7mm)	0.25" (6.4mm) - 0.5" (12.7mm)
	Exposed insulated wire (b)	0.75" (19.1mm) - 1.5" (38.1mm)	0.75" (19.1mm) - 1.5" (38.1mm)
	Wire cover material	Heat shrunk PVC	Heat shrunk PVC

* Deutsche Industrial reference numbers. Male connections provided, mating female components and assemblies can be sourced from qualified Deutsche connector distributors.

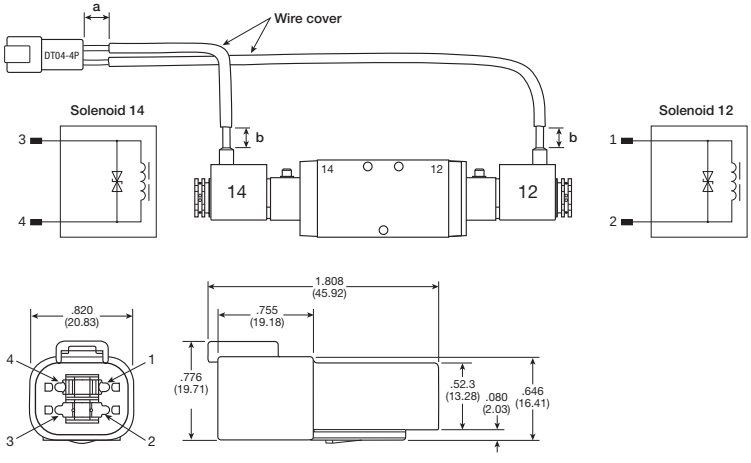
Enclosure / Lead Length - Option “T”

Solenoid Kit P2FCT446 shown



Enclosure / Lead Length - Option “V”

Solenoid Kit P2FCV446 shown



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Pilot Operator Kits

P2FP13 N 4 C

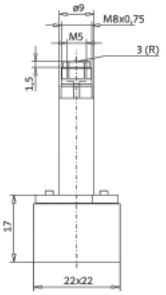
Type	
Pilot operator kit	P2FP13

Pressure / temperature	
145 PSIG (10 bar) 14°F to 122°F (-10°C to 50°C)	N
232 PSIG (16 bar) -40°F to 158°F (-40°C to 70°C)	H

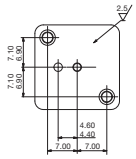
Overrides	
A	No override
C*	Locking (bistable) flush - plastic
D	Non-locking (monostable) extended - brass

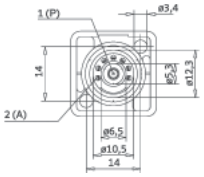
* Only available with "N" Pressure / Temperature option.

Kit includes:
Armature valve (1), solenoid nuts (2), screws (2), o-rings (3)



Operator mounting pattern (mm)





Solenoid Pilot Operators & Coils

Solenoid pilot options

The P2FP13*4* (NC) 3/2 solenoid pilot operators are designed for piloting pneumatic control valves with compressed air or other inert gases.

The P2FP operator is available for Normal operating pressures up to 10 bar or the Xtreme maximum operating pressure of 16 bar and wide band voltage tolerances required for mobile applications.

Corrosion resistant design

The pilot valve body is manufactured in thermoplastic PA6 material and the core tube brass / stainless steel. The plunger / core is made from stainless steel and the valve seats from FKM.

Solenoid pilot exhaust

These operators all exhaust out of the top of the core tube which is tapped M5. The standard solenoid nut (Solenoid pilot type "D") fitted to the core tube is a diffuser nut which allows the exhaust to escape to atmosphere. This nut also minimizes ingress of dirt into the valve through this port. The alternative plastic knurled nut (Solenoid pilot type "N") can be specified (refer to part number system) if the exhaust air needs captured and piped away using the M5 tapped port.

Mobile applications

Viking Xtreme valves are tested to +5g shock and vibration. Solenoid operated valves are designed to operate with wide voltage tolerance bands within the ambient temperature ranges stated in the technical section.

Coils

Coils are wound with enameled copper wire, having a temperature index of 180°C with class F insulation (155°C) and are encapsulated in Thermoplastic resin. When fitted with suitable connector and correct gasket, they give protection to IP65.

Manual override options

The pilot operators can be supplied with locking or non-locking manual override. The standard manual override is the monostable (spring return) extended brass override. Alternatively the bistable (locking) override can be specified as an alternative for the Normal duty 10 bar option.

Spares

Solenoid operators are available as spares complete with mounting screws and seals. Coils and connectors should be ordered separately unless ATEX certified and intrinsically safe is needed. ATEX certified operators and coils must be ordered together.

Transients

Interrupting the current through the solenoid coil produces momentary voltage peaks which, under unfavorable conditions, can amount to several hundred times the rated operating voltage. Normally, these transients do not cause problems, but to achieve the maximum life of relays in the circuit (and particularly of transistors, thyristors and integrated circuits) it is desirable to provide protection by means of voltage-dependent resistors (varistors). All connectors / cable plugs with LEDs include this type of circuit protection.

Materials

Pilot Valve

Body ..... Polyamide

Armature tube:
- Normal pilot operator ..... Brass
- Xtreme pilot operator ..... Stainless steel

Plunger & core ..... Corrosion resistant CR-NI steel

Seals ..... FKM

Screws ..... Stainless steel

Coil

Encapsulation material ..... Thermoplastic

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Solenoid Kits

P2FC B 4 49

Type	
Solenoid Kit	C

Enclosures / lead length	
M12 4-pin coil with surge suppression & LED	7§
30mm square 3-pin – ISO 4400 Form A (male only)	A
22mm rectangular 3-pin – Type B Industrial (male only)	B
Hazardous duty, FM / CSA	F*
Grommet - 18" leads	G
1/2" NPT conduit - 18" leads	H
Grommet, single solenoid, 2-pin duetsche connector, surge suppression	T#
Grommet, double solenoid, 4-pin duetsche connector, surge suppression	V#
Grommet 72" leads	Q
1/2" conduit 72" leads	R

* Only available with voltage codes "45", "49", "53" & "57". Not for use with the Xtreme version (-40°C to 70°C).
# Voltage code 46 only.
§ Voltage code B9 only.

	Voltage
B9‡	24 VDC w/ surge suppression & LED
42	24VAC
45	12VDC
46†	12 VDC mobile w/ surge suppression
47*	12 VDC mobile
48*	24 VDC mobile
49	24VDC
53	120VAC
57	240VAC

* Only available with enclosures "A", "B" & "G". Additional voltages are available upon request. Contact customer support for more information.
‡ Enclosure 7 only
† Enclosure G, T, V only.

Solenoid Enclosures

Option 7
M12, 4-Pin Coil with Surge Suppression

Option A
30mm Square, 3-Pin ISO 4400, DIN 43650A

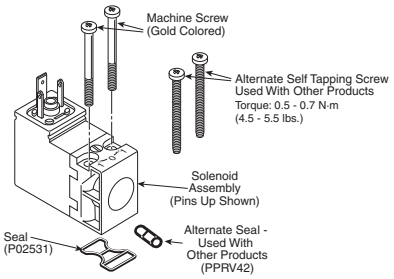
Option B
22mm Rectangular, 3-Pin DIN, Type B Industrial

Option G & Q
Grommet, 18" or 72" Leads

Option H & R
1/2" Conduit, 18" or 72" Leads

Solenoid Kits – 3-Pin, EN175301-803 (Former DIN 43650C), 15mm, 8mm

Standard



PS2982*##P – Enclosure '5'

* Override	## Voltage 42	45	47†	48†	49	53	57
B	O	O	S	S	S	S	O
C	O	O	S	S	S	S	O
D	O	O	O	O	O	O	O
E	O	O	O	O	O	O	O

S - Standard; O - Option
† Mobile voltage
Kit includes: Solenoid, (2) machine screws, (2) self threading screws, (1) gasket, (1) 3-cell gasket.

Solenoid Information (Solenoids are rated for continuous duty.)

Voltage				Enclosure "5"		Enclosure "A"		Enclosure "7", "B" to "R"	
	AC								
Code	60Hz	50Hz	DC	Power consumption	Holding (Amps)	Power consumption	Holding (amps)	Power consumption	Holding (amps)
B9†	—	—	24	—	—	—	—	4.8W	.20
42	24	22		1.6VA	.065	3.9VA	.14	7.3VA	.31
45	—	—	12	1.2W	.098	2.6W	.21	4.6W	.37
46*†	—	—	12	—	—	—	—	5.5W	.46
47*	—	—	12	0.91W	.074	6.2W	.52	5.5W	.46
48*	—	—	24	0.91W	.033	6.8W	.29	6.0W	.25
49	—	—	24	1.2W	.049	2.7W	.11	4.8W	.20
53	120	110	—	1.6W	.013	4.1VA	.04	6.3VA	.05
57	240	230	—	1.6W	.007	3.7VA	.02	6.4VA	.03

* Mobile voltages. † Surge suppression.

Most popular.

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Intrinsically safe solenoid valves ("E" option)

Hazardous location class:

Class I; Groups A, B, C & D

Class II; Groups E, F, & G

Class III; Div. I

For use in low voltage (24VDC) Intrinsically Safe applications. NO OTHER VOLTAGE IS APPROVED.

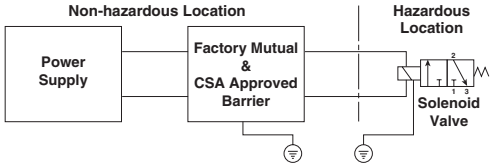
Comes standard with non-lighted solenoid connector.

Coil width: 30mm

Must be connected to an FM approved Barrier.

For dimensions, reference standard solenoid models. Maximum internally piloted valve pressure is 115 PSIG. Pressures to 145 PSIG can be used when external pilot is utilized and pilot pressure is limited to 115 PSIG.

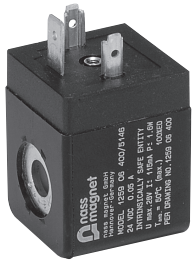
The intrinsically safe coil width (30mm) is wider than the body width of valve type A & B valves. If mounted on a manifold, the valves need to be staggered to fit and must be single solenoid valves only.

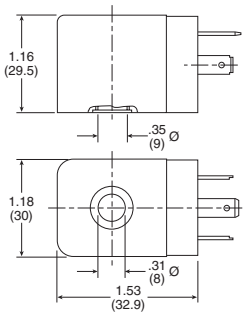


Intrinsically safe solenoid pilot assembly kits

Description	Part number
24VDC	**P2FS13N1AE49**

Kit includes: coil, armature, connector, o-ring & screws





Hazardous duty solenoid valves ("F" option)

Hazardous location class:

Class I; Zone I EX, M, II & T4

Class I; Div. I, Groups A, B, C, & D

Class II & III; Div. I, Groups E, F, & G

Comes standard with 1/2" conduit connection.

Coil width: 36mm

Voltage range = ±10%

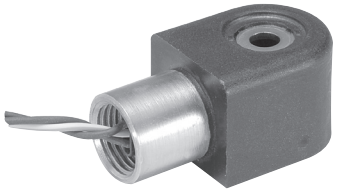
Ambient temperature range = -20°C (-4°F) to 60°C (140°F)

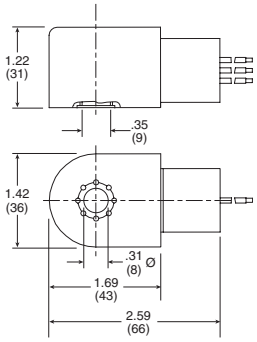
Duty factor = 100%

IP65 Rated (with connected conduit connector)

Notes:

1. Maximum non-hazardous location voltage not to exceed 250V RMS.
2. Factory Mutual requires connections per ISA RP 12.6 instructions.
3. CSA requires "Installation to be in accordance with the Canadian Electrical Code. Part I."
4. The hazardous duty coil width (36mm) is wider than the body width of valve type A, B, C & D valves. Valves can not be mounted to IEM manifolds without installing a blanking plate between valves.

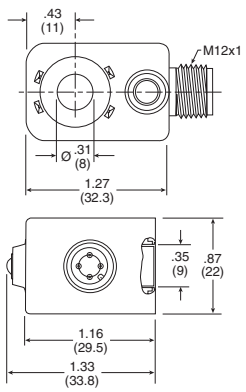


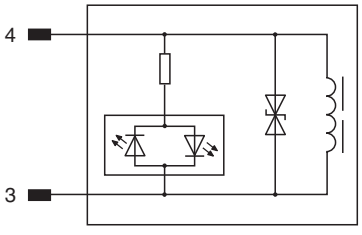


Option F
Hazardous Duty FM / CSA

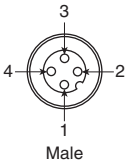
M12, 24VDC solenoid coil ("7" option)

Connection type: M12, metal thread, M12 x 1
DIN EN 60947-5-2 appendix D
LED color: yellow
Bi-directional surge suppression





1. Not Used
2. Not Used
3. +/– (blue)
4. +/– (black)



4-Pin Female Wiring Diagram
(only Pins 4 & 3 are used)
Per ISO 20401

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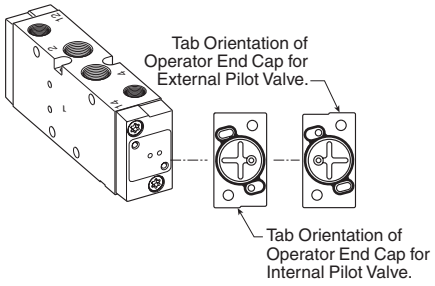
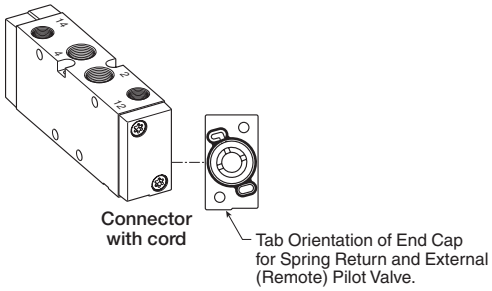
Internal to external pilot conversion (size A & B only)

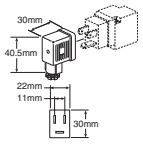
To convert from Internal to External Pilot Valve, simply remove the (2) fasteners that attach the end cap to the valve body. Rotate the end cap 180° and attach back to the valve body. For single solenoid valves, only the 14-End needs to be rotated. For double solenoid valves, both ends must be converted for proper function.

The 12 & 14-Ports are always tapped no matter what Valve Type / Function is selected. For Internal Pilot Function, ports do NOT need to be plugged.





22mm Rectangular 3-Pin – Type B Industrial
(Use with Enclosure "B")



Description	Connector with 6' (2m) cord	Connector
Unlighted	**PS2429JBP**	**PS2429BP**
Light – 24V60Hz. 24VDC	**PS2430J79BP***	**PS243079BP**
Light – 120V/60Hz	**PS2430J83BP***	**PS243083BP**
Light – 240V/60Hz	**N/A**	**PS243087BP**

* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

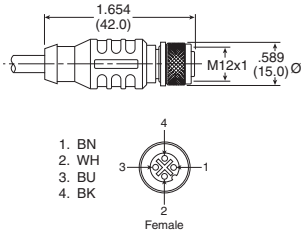
Engineering Data:
Conductors: 2 Poles Plus Ground; Cable Range (Connector Only): 6 to 8mm (0.24 to 0.31 Inch); Contact Spacing: 11mm

M12 A-code Cables

Description	Part number
4-Pin female to flying lead cable, PVC, 2m	**RKC 4.4T-2**

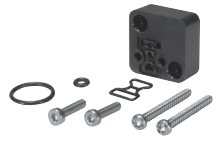
RKC Female Sockets

* Only pins 3 and 4 are used with solenoids Option "7".



4-Pin Female Wiring Diagram

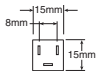
15mm Solenoid Mount

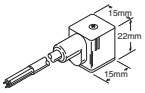


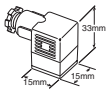
Description	Part number
15mm solenoid mount	**P2FA22-15**

Kit includes: adapter (1), O-rings (2), gasket (1), screws (4)

15mm 3-Pin DIN 43650C
(Use with Enclosure "5")







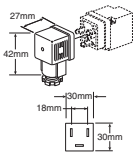
	Cord length	Connector	Connector only Connector with cord
Unlighted	18 Inches	**PS2932BP**	**PS2932HBP**
Unlighted	6 Feet	**PS2932BP**	**PS2932JBP**
Light – 12VAC or DC	6 Feet	**PS294675BP**	**PS2946J75BP***
Light – 24VAC or DC	6 Feet	**PS294679BP**	**PS2946J79BP***
Light – 110/120VAC	6 Feet	**PS294683BP**	**PS2946J83BP***
Light – 240/230VAC		**PS294687BP**	**N/A**

* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

Engineering data:
Conductors: 2 poles plus ground Cable range (connector only): 4 to 6mm (0.16 to 0.24 Inch) Contact spacing: 8mm

30mm Square 3-Pin – ISO 4400, DIN 43650A
(Use with Enclosure "A")



Description	Connector with 6' (2m) cord	Connector
Unlighted	**PS2028JCP**	**PS2028BP**
Light – 6-48V. 50/60Hz. 6-48VDC	**PS2032J79CP***	**PS203279BP**
Light – 120V/60Hz	**PS2032J83CP***	**PS203283BP**

* LED with surge suppression.

Note: Max ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

Engineering data:
Conductors: 2 poles plus ground; cable range (connector only): 8 to 10mm (0.31 To 0.39 Inch); contact spacing: 18mm

Replacement Solenoid Nut

Description	Part number
Solenoid diffuser nut	**PS1556**

Description	Part number
Solenoid vented nut	**PS2892P**

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It is the users responsibility to verify product performance when applied at maximum tolerance ranges of multiple technical specifications simultaneously.

Operating temperature

- **Normal**.....14°F to 122°F (-10°C to 50°C)
- **Xtreme**..... -40°F to 158°F (-40°C to 70°C)

Flow Rating

Valve size	Port size	2-position	3-position
P2LAX	1/8"	0.7	0.5
P2LBX	1/4"	1.3	0.9
P2LCX	3/8"	2.5	1.8
P2LDX	1/2"	2.7	1.9

Operating pressure*

Maximum: Normal.....145 PSIG (10 bar)
Xtreme.....232 PSIG (16 bar)
Minimum:

Valve type - internal pilot	Minimum PSIG (bar)			
	P2LAX	P2LBX	P2LCX	P2LDX
Single solenoid - spring return	46 (3.2)	51 (3.5)	51 (3.5)	51 (3.5)
Single remote pilot - spring return	46 (3.2)	51 (3.5)	51 (3.5)	51 (3.5)
Double solenoid - 2-position	22 (1.5)	22 (1.5)	22 (1.5)	22 (1.5)
Double remote pilot - 2-position	22 (1.5)	22 (1.5)	22 (1.5)	22 (1.5)
Double solenoid - 3-position (APB, PC, CE)	51 (3.5)	51 (3.5)	51 (3.5)	51 (3.5)
Double remote pilot - 3-position (APB, PC, CE)	51 (3.5)	51 (3.5)	51 (3.5)	51 (3.5)

Valve type - External pilot	P2LAX	P2LBX	P2LCX	P2LDX
All Viking series	Vacuum			

* P2LC and P2LD solenoid operated valves have a maximum pressure rating of 175 PSIG (12 bar).

Size A and B solenoid valves can be field converted from internal pilot to external pilot and visa versa. See page 27 for information.

Solenoid voltage characteristics

Non-Mobile Coil -

Voltage Code 42, 45, 49, 53, 57
15mm, DIN 43650C (Enclosure: 5)
+10%, -15%

Mobile Coil -

Voltage Code 47, 48
15mm, Din 43650C (Enclosure: 5)
+25%, -30%

Voltage Code 46
(Enclosure G,T,V)
+10%, -30%

Solenoid voltage characteristics

Non-mobile coils -

Voltage code B9, 42, 45, 49, 53, 57
Enclosure (7, A, B, E, F, G, H)
+10%, -10%

Mobile coils - (valve type N)

22mm 12 & 24VDC - Mobile (47 & 48 voltage code)

Minimum inlet pressure (bar)	Operating temperature		
	-10°C	+10°C	+50°C
3	+30 / -25% VDC	+30 / -20% VDC	+25 / -15% VDC
6	+30 / -30% VDC	+30 / -25% VDC	+25 / -20% VDC
8	+30 / -30% VDC	+30 / -30% VDC	+25 / -25% VDC
10	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC

30mm 12 & 24VDC - Mobile (47 & 48 voltage code)

Minimum inlet pressure (bar)	Operating temperature		
	-10°C	+10°C	+50°C
3	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC
6	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC
8	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC
10	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC

Mobile coils - (valve type K & H)

22mm 12 & 24VDC - Mobile (47 & 48 voltage code)

Minimum inlet pressure (bar)	Operating temperature			
	-40°C	+10°C	+50°C	+70°C
4	+30 / -25% VDC	+30 / -25% VDC	+30 / -10% VDC	+20 / -10% VDC
8	+30 / -30% VDC	+30 / -25% VDC	+30 / -15% VDC	+20 / -15% VDC
12	+30 / -30% VDC	+30 / -30% VDC	+30 / -15% VDC	+20 / -15% VDC
16	+30 / -30% VDC	+30 / -30% VDC	+30 / -20% VDC	+20 / -20% VDC

30mm 12 & 24VDC - Mobile (47 & 48 voltage code)

Minimum inlet pressure (bar)	Operating temperature			
	-40°C	+10°C	+50°C	+70°C
4	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC	+15 / -30% VDC
8	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC	+15 / -30% VDC
12	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC	+15 / -30% VDC
16	+30 / -30% VDC	+30 / -30% VDC	+25 / -30% VDC	+15 / -30% VDC

Note: All table ratings are based on 100% continuous duty and 5G shock vibration. At 50% continuous duty all ratings are +30% / -30% for all Temperatures and Pressures.

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Exhaust Protector

Features

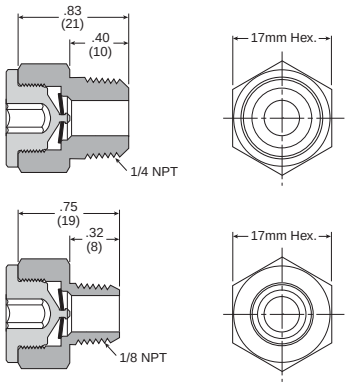
- 1/8 and 1/4 NPT male sizes
- Fitted with a brass pipe adapter and a fluorocarbon membrane
- Resistant to rust, clog, wash down and contamination

Applications

These protectors are intended for mobile applications, quick venting applications and alternative exhaust port breathers that require protection against clogging.

Ideal for valves exposed to harsh environmental conditions (which can cause a “caking up” in the exhaust pipe ports where the bronze mufflers or breather vents are installed).

Particularly suitable for time-sensitive applications such as axle-lift suspensions or pushers or tag axles.



Operating information

Operating pressure:	0 to 150 PSIG (0 to 10 bar)
Operating temperature:	-40°F to 140°F (-40°C to 60°C)

Flow data (SCFM)

Size	60 PSIG Inlet	90 PSIG Inlet	125 PSIG Inlet	Part number
1/8"	40.1	56.5	75.5	**E90016**
1/4"	44.6	62.7	83.5	**E90017**

Material specifications

Body & pipe adapter	Brass
Membrane	Fluorocarbon

Exhaust Mufflers

Pipe thread	Part number
M5	**P6M-PAC5**
1/8" NPT	**EM12**
1/4" NPT	**EM25**
3/8" NPT	**EM37**
1/2" NPT	**EM50**

P6M - Plastic; EM - Sintered bronze

Plastic Silencers

Thread size	A (mm)	B (mm)	Part number NPT	Part number BSPT
M5	.43 (11)	.32 (8)	**AS-5**	**–**
1/8"	1.57 (40)	.63 (16)	**ASN-6**	**AS-6**
1/4"	2.56 (65)	.83 (21)	**ASN-8**	**AS-8**
3/8"	3.35 (85)	.98 (25)	**ASN-10**	**AS-10**
1/2"	3.74 (95)	1.18 (30)	**ASN-15**	**AS-15**

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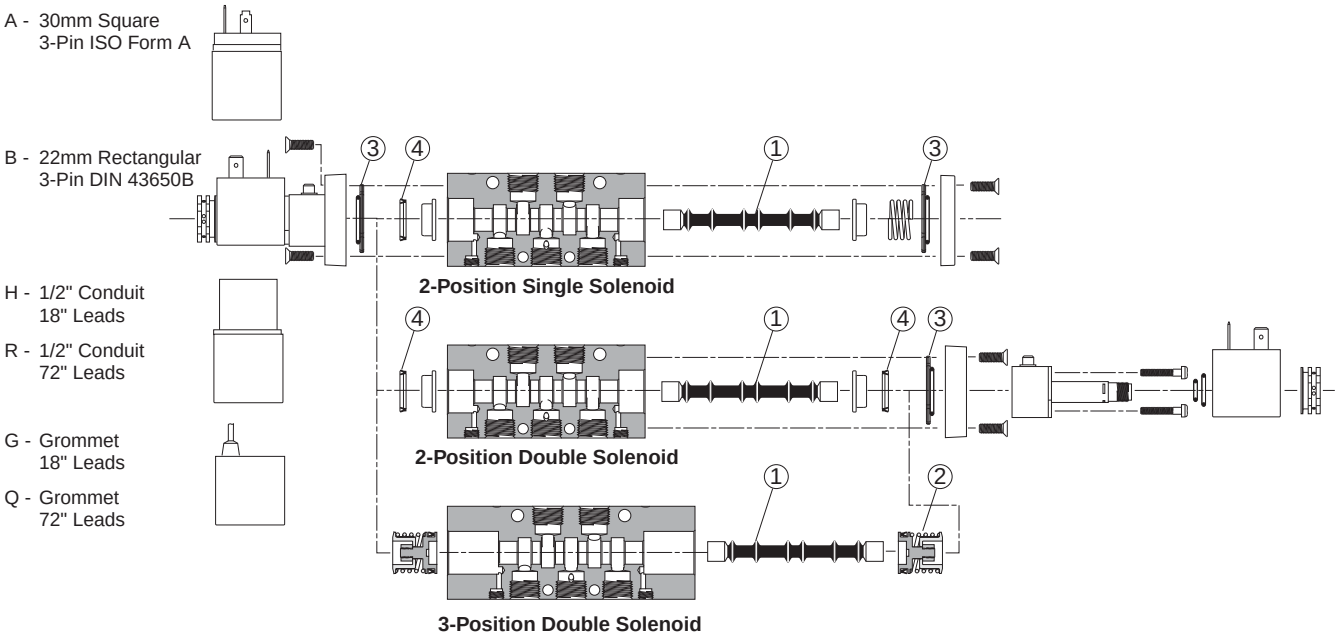
Spool Service Kits

Description	Includes items (qty.)	Part number
Size A, 4-way, 2-position, solenoid & air pilot valves	1 (1), 3 (2), 4 (2)	**P2LAXSK1**
Size A, 4-way, 3-position, solenoid & air pilot valves	1 (1), 2 (2), 3 (2), 4 (2)	**P2LAXSK2**
Size A & Size B, 3-way, 2-position, solenoid & air pilot valves	1 (1), 3 (2), 4 (2)	**P2LAXBXSK1**
Size B, 4-way, 2 & 3-position valves	1 (1), 3 (2), 4 (2)	**P2LBXSK1**
Size C & Size D, 3-way, 2-position valves	1 (1), 3 (2), 4 (2)	**P2LCXDXSK1**
Size C & Size D, 4-way, 2 & 3-position valves	1 (1), 3 (2), 4 (2)	**P2LCXDXSK1**



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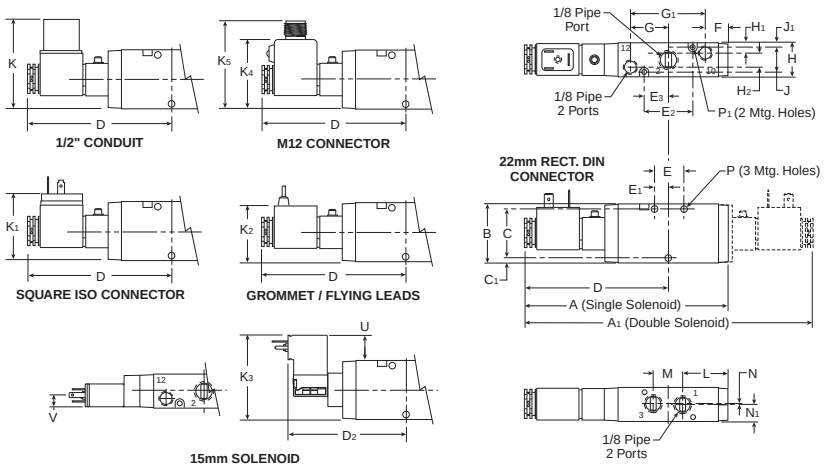
P2LAX 3/2 Single & Double Operators – Solenoid

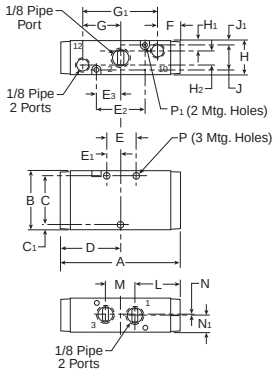


P2LAX 3/2 (solenoid)

A	A1	B	C	C1	D
5.35	7.60	1.57	1.26	.16	3.80
(136)	(193)	(40)	(32)	(4)	(97)
D2	**E**	**E1**	**E2**	**E3**	**F**
3.00	.79	.39	1.26	.63	.55
(76.8)	(20)	(10)	(32)	(16)	(14)
G	**G1**	**H**	**H1**	**H2**	**J**
.98	1.97	.87	.26	.35	.65
(25)	(50)	(22)	(6.6)	(9)	(16.5)
J1	**K**	**K1**	**K2**	**K3**	**K4**
.11	2.36	1.61	1.50	2.24	1.70
(2.9)	(60)	(41)	(38)	(57)	(43.3)
K5	**L**	**M**	**N**	**N1**	**P**
2.10	1.14	.79	.02	.42	Ø .17
(53.3)	(29)	(20)	(0.5)	(11)	Ø (4.3)
P1	**U**	**V**			
Ø .12	0.81	0.29			
Ø (3.1)	(20.5)	(7.5)			

Inches (mm)

P2LAX 3/2 Single & Double Operators – Remote Air Pilot

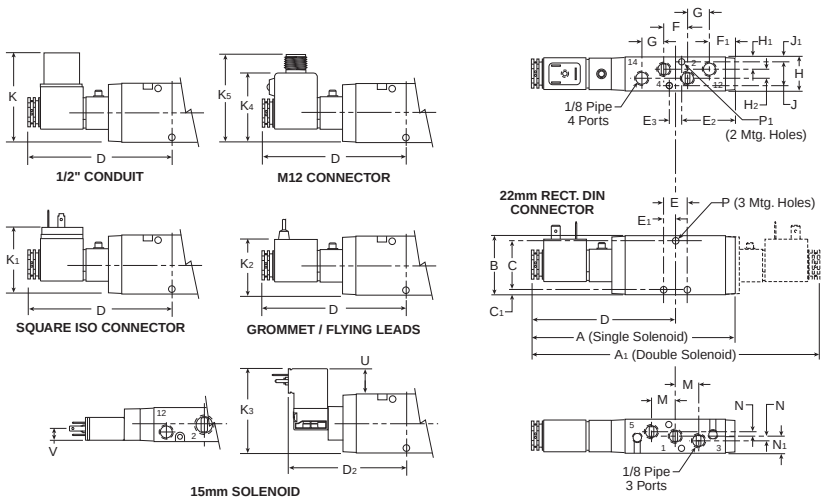


P2LAX 3/2 (remote air pilot)

A	B	C	C1	D	E
3.07	1.57	1.26	.16	1.54	.79
(78)	(40)	(32)	(4)	(39)	(20)
E1	**E2**	**E3**	**F**	**G**	**G1**
.39	1.26	.63	.55	.98	1.97
(10)	(32)	(16)	(14)	(25)	(50)
H	**H1**	**H2**	**J**	**J1**	**L**
.87	.26	.35	.65	.11	1.14
(22)	(6.6)	(9)	(16.5)	(2.9)	(29)
M	**N**	**N1**	**P**	**P1**	
.79	.02	.42	Ø .17	Ø .12	
(20)	(0.5)	(11)	Ø (4.3)	Ø (3.1)	

Inches (mm)

P2LAX 5/2 & 5/3 Single & Double Operators, 4-way



P2LAX 5/2 & 5/3 (solenoid)

A	A1	B	C	C1	D
5.47	7.72	1.57	1.30	.14	3.86
(139)	(196)	(40)	(33)	(3.5)	(98)
D2	**E**	**E1**	**E2**	**E3**	**F**
3.48	.63	.31	1.42	.33	.63
(88.3)	(16)	(8)	(36)	(8.5)	(16)
F1	**G**	**H**	**H1**	**H2**	**J**
.67	.59	.87	.31	.24	.63
(17)	(15)	(22)	(8)	(6)	(16)
J1	**K**	**K1**	**K2**	**K3**	**K4**
.12	2.36	1.61	1.50	2.24	1.63
(39)	(60)	(41)	(38)	(57)	(41.3)
K5	**M**	**N**	**N1**	**P**	**P1**
2.10	.63	.12	.43	Ø .17	Ø .12
(53.3)	(16)	(3)	(11)	Ø (4.3)	Ø (3.1)
U	**V**				
0.81	0.29				
(20.5)	(7.5)				

Inches (mm)

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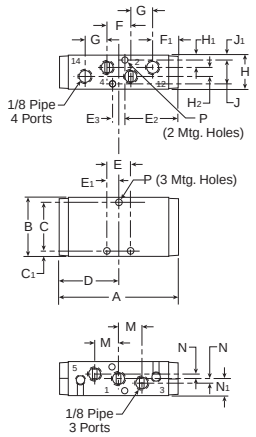
P2LAX 5/2 & 5/3 Single & Double Operators – Remote Pilot

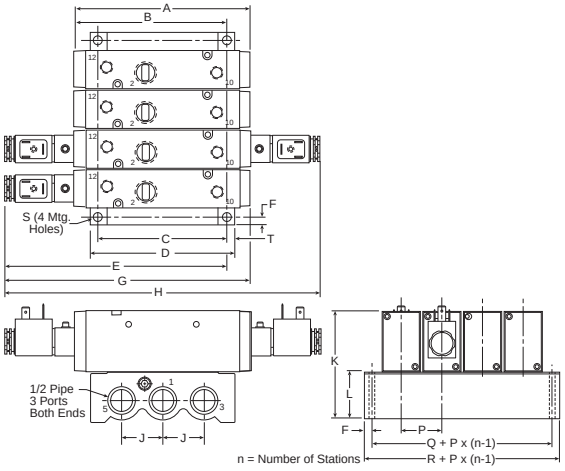


P2LAX 5/2 & 5/3 (remote)

A	B	C	C1	D
3.19	1.57	1.30	.14	1.59
(81)	(40)	(33)	(3.5)	(40.5)
E	**E1**	**E2**	**E3**	**F**
1.47	.31	1.42	.33	.63
(16)	(8)	(36)	(8.5)	(16)
F1	**G**	**H**	**H1**	**H2**
.67	.59	.87	.31	.24
(17)	(15)	(22)	(8)	(6)
J	**J1**	**M**	**N**	**N1**
.63	.12	.63	.12	.43
(16)	(3)	(16)	(3)	(11)
P	**P1**			
Ø .17	Ø .12			
Ø (4.3)	Ø (3.1)			

Inches (mm)

P2LAX 3/2 Single & Double Operators – IEM Aluminum Bar Manifold

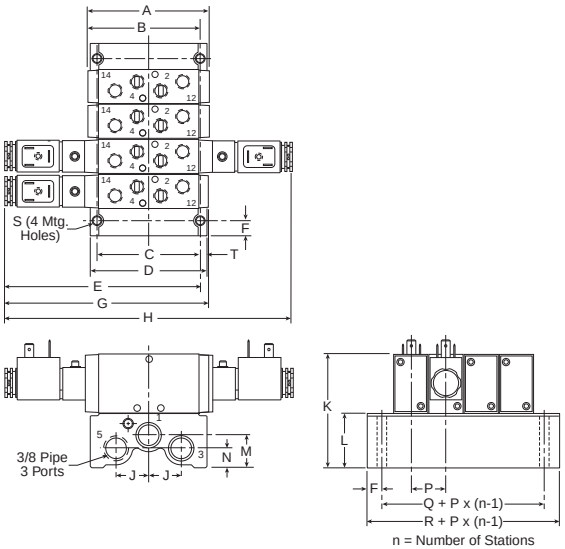


P2LAX 3/2
IEM Aluminum bar manifold

A	B	C	D	E
3.07	2.83	2.76	3.12	5.18
(78)	(72)	(70)	(79)	(132)
F	**G**	**H**	**J**	**K**
41	5.35	7.72	.87	3.11
(10.5)	(136)	(193)	(22)	(79)
L	**M**	**N**	**P**	**Q**
1.54	.87	.52	.93	1.56
(39)	(22)	(13.2)	(23.5)	(39.5)
R	**S**	**T**		
2.36	Ø .22	.18		
(60)	Ø (5.5)	(4.5)		

Inches (mm)

P2LAX 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold



P2LAX 5/2 & 5/3
IEM Aluminum bar manifold

A	B	C	D	E
3.19	2.97	2.76	3.12	5.26
(81)	(76)	(70)	(79)	(134)
F	**G**	**H**	**J**	**K**
41	5.47	7.72	.87	3.11
(10.5)	(139)	(196)	(22)	(79)
L	**M**	**N**	**P**	**Q**
1.54	**.87**	.52	.93	1.56
(39)	**(22)**	(13.2)	(23.5)	(39.5)
R	**S**	**T**		
2.36	Ø .22	.18		
(60)	Ø (5.5)	(4.5)		

Inches (mm)

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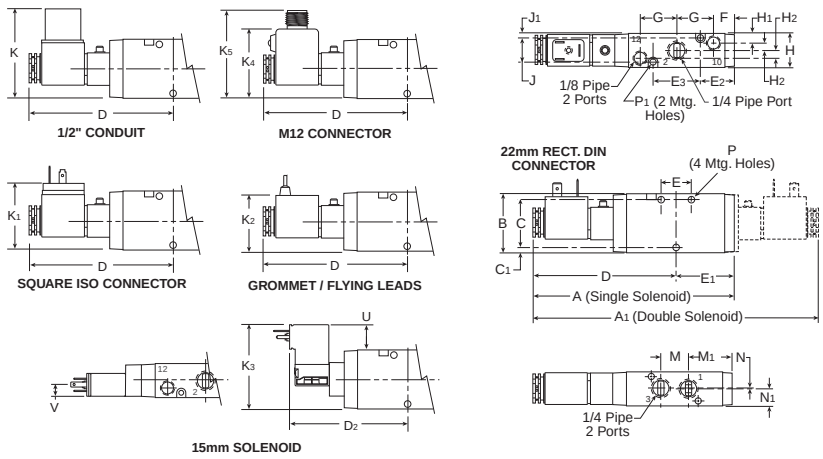
P2LBX 3/2 Single & Double Operators – Solenoid

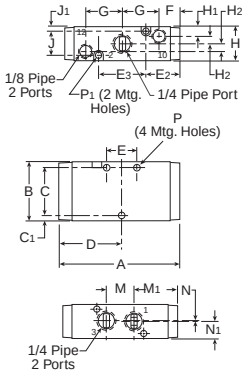


P2LBX 3/2 (solenoid)

A	A1	B	C	C1	D
5.35 (136)	7.60 (193)	1.57 (40)	1.26 (32)	.16 (4)	3.80 (96.5)
D2	**E**	**E1**	**E2**	**E3**	**F**
3.02 (76.8)	.79 (20)	1.54 (39)	.51 (13)	1.26 (32)	.55 (14)
G	**H**	**H1**	**H2**	**J**	**J1**
.98 (25)	.87 (22)	.26 (6.6)	.18 (4.5)	.65 (16.5)	.11 (2.9)
K	**K1**	**K2**	**K3**	**K4**	**K5**
2.36 (60)	1.61 (41)	1.50 (38)	2.24 (57)	1.63 (41.3)	2.10 (53.3)
M	**M1**	**N**	**N1**	**P**	**P1**
.79 (20)	1.14 (29)	.02 (0.5)	.42 (11)	Ø .17 Ø (4.3)	Ø .12 Ø (3.1)
U	**V**				
0.81 (20.5)	0.29 (7.5)				

Inches (mm)

P2LBX 3/2 Single & Double Operators – Remote Air Pilot

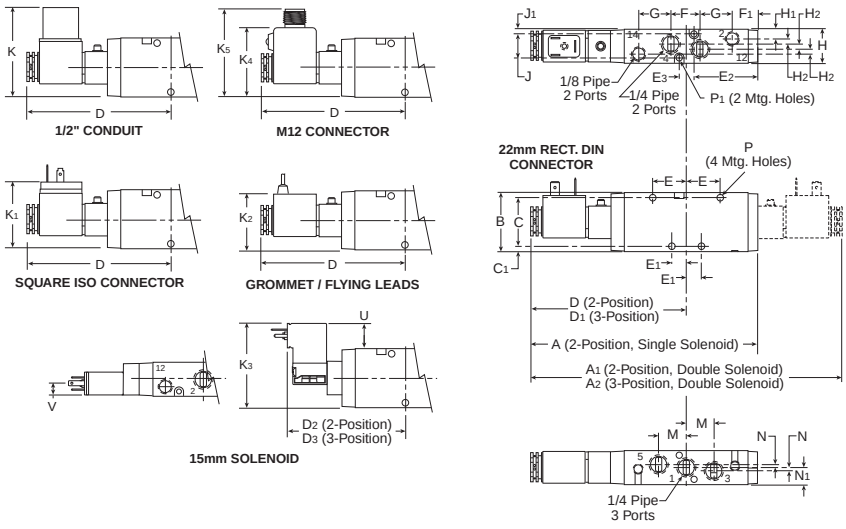


P2LBX 3/2 (remote air pilot)

A	B	C	C1	D	E
3.08 (78)	1.57 (40)	1.26 (32)	.16 (4)	1.54 (39)	.79 (20)
E2	**E3**	**F**	**G**	**H**	**H1**
.51 (13)	1.26 (32)	.55 (14)	.98 (25)	.87 (22)	.26 (6.6)
H2	**J**	**J1**	**M**	**M1**	**N**
.18 (4.5)	.65 (16.5)	.11 (2.9)	.79 (20)	1.14 (29)	.02 (0.5)
N1	**P**	**P1**			
.42 (11)	Ø .17 Ø (4.3)	Ø .12 Ø (3.1)			

Inches (mm)

P2LBX 5/2 & 5/3 Single & Double Operators – Solenoid



P2LBX 5/2 & 5/3 (solenoid)

A	A1	A2	B	C	C1
6.14 (156)	8.39 (213)	9.23 (235)	1.57 (40)	1.26 (32)	.16 (4)
D	**D1**	**D2**	**D3**	**E**	**E1**
4.21 (107)	4.64 (118)	3.48 (88.3)	3.92 (99.6)	.91 (23)	.39 (10)
E2	**E3**	**F**	**F1**	**G**	**H**
1.73 (44)	.39 (10)	.79 (20)	.67 (17)	.87 (22)	.87 (22)
H1	**H2**	**J**	**J1**	**K**	**K1**
.26 (6.6)	.12 (3)	.65 (16.5)	.12 (3)	2.36 (60)	1.61 (41)
K2	**K3**	**K4**	**K5**	**M**	**N**
1.50 (38)	2.24 (57)	1.70 (43.3)	2.10 (53.3)	.79 (20)	.08 (2)
N1	**P**	**P1**	**U**	**V**	
.43 (11)	Ø .17 Ø (4.3)	Ø .12 Ø (3.1)	0.81 (20.5)	0.29 (7.5)	

Inches (mm)

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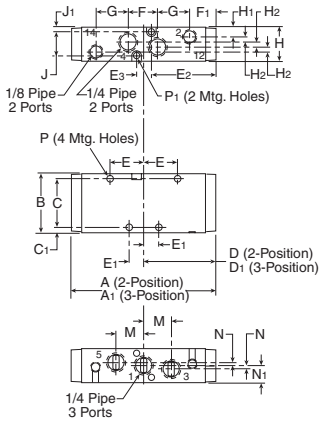
P2LBX 5/2 & 5/3 Single & Double Operators – Remote Air Pilot

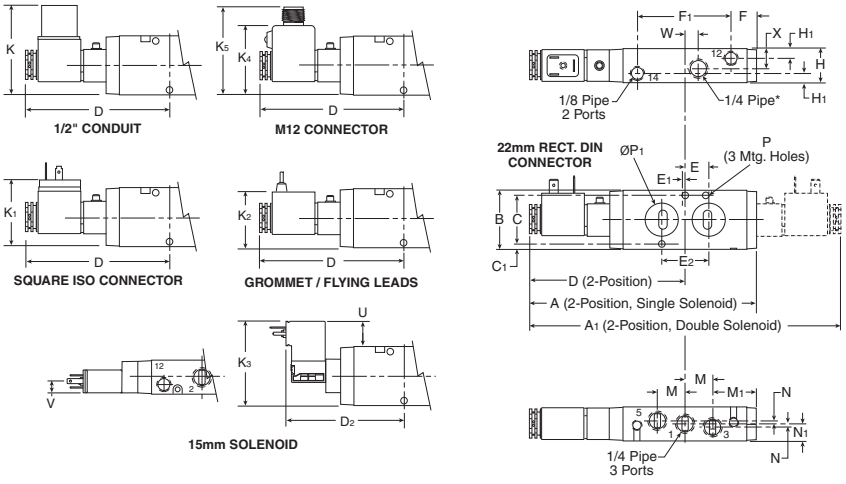


P2LBX 5/2 & 5/3 (remote air pilot)

A	A1	B	C	C1	D
3.95 (100)	4.61 (117)	1.57 (40)	1.26 (32)	.16 (4)	1.93 (49)
D1	**E**	**E1**	**E2**	**E3**	**F**
2.28 (58)	91 (23)	.39 (10)	1.73 (44)	.39 (10)	.79 (20)
F1	**G**	**H**	**H1**	**H2**	**J**
.67 (17)	.87 (22)	.8 (22)	.26 (6.6)	.12 (3)	.65 (16.5)
J1	**K**	**M**	**N**	**N1**	**P**
.11 (2.8)	2.90 (74)	.79 (20)	.08 (2)	.43 (11)	Ø .17 Ø (4.3)
P1					
Ø .12 Ø (3.1)					

Inches (mm)

P2LBX 5/2 Single & Double Operators – Solenoid NAMUR



P2LBX 5/2 (NAMUR)

A	A1	B	C	C1	D
6.15 (156)	8.39 (213)	1.57 (40)	1.26 (32)	.16 (4)	4.21 (107)
D2	**E**	**E1**	**E2**	**F**	**F1**
3.48 (88.3)	.47 (12)	.08 (2)	.94 (24)	.67 (17)	2.52 (64)
K	**K1**	**K2**	**K3**	**K4**	**K5**
2.36 (60)	1.61 (41)	1.50 (38)	2.24 (57)	1.70 (43.3)	2.10 (53.3)
H	**H1**	**M**	**M1**	**N**	**N1**
.87 (22)	.26 (6.6)	.79 (20)	1.14 (29)	.08 (2)	.43 (11)
P	**P1**	**U**	**V**	**W**	**X**
Ø .22 (Ø 5.5)	Ø .76 (Ø 19.4)	0.81 (20.5)	0.29 (7.5)	0.39 (10)	0.50 (12.6)

Inches (mm)

* Valve includes 1/4 pipe plug, orings and mounting bolts.

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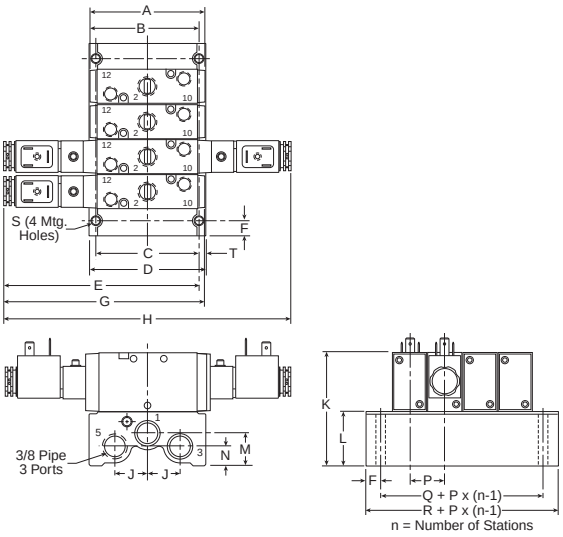
P2LBX 3/2 Single & Double Operators – IEM Aluminum Bar Manifold

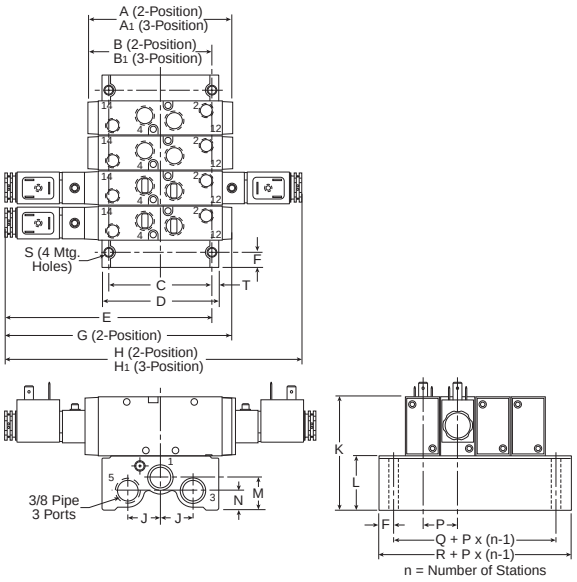


P2LBX 3/2
IEM Aluminum bar manifold

A	B	C	D	E
3.86 (78)	2.91 (74)	2.76 (70)	3.12 (79)	5.17 (131)
F	**G**	**H**	**J**	***K***
.40 (10.2)	5.33 (136)	7.6 (193)	.87 (22)	3.11 (79)
L	**M**	**N**	**P**	**Q**
1.47 (37)	.87 (22)	.52 (13.2)	.93 (23.5)	1.56 (39.6)
R	**S**	**T**		
2.36 (60)	Ø .22 Ø (5.5)	.18 (4.6)		

Inches (mm)

P2LBX 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold



P2LBX 5/2 & 5/3
IEM Aluminum bar manifold

A	A1	B	B1	C
3.86 (98)	4.70 (120)	3.42 (84)	3.73 (95)	2.76 (70)
D	**E**	**F**	**G**	**H**
3.12 (79)	5.59 (142)	.40 (10.2)	6.14 (156)	8.39 (213)
H1	**J**	**K**	**L**	**M**
9.23 (235)	.87 (22)	3.11 (79)	1.47 (37)	.87 (22)
N	**P**	**Q**	**R**	**S**
.52 (13.2)	.93 (23.5)	1.56 (39.6)	2.36 (60)	Ø .22 Ø (5.5)
T				
.18 (4.6)				

Inches (mm)

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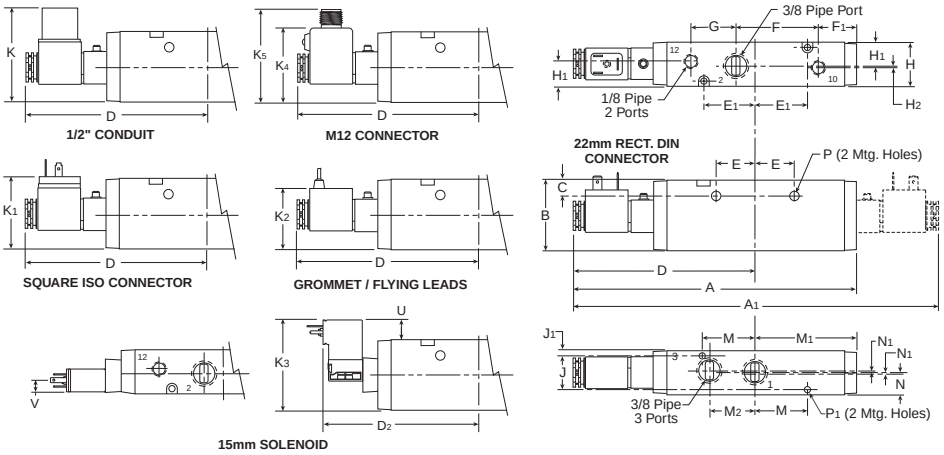
P2LCX 3/2 Single & Double Operators – Solenoid

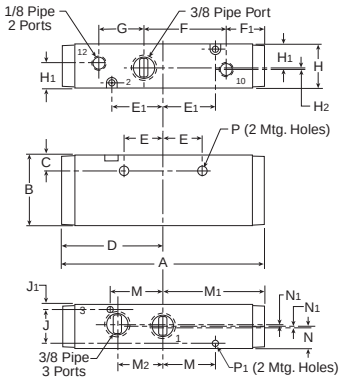


P2LCX 3/2 (solenoid)

A	A1	B	C	D
7.66 (194.5)	9.80 (249)	1.89 (48)	.43 (11)	4.90 (124.5)
D2	**E**	**E1**	**F**	**F1**
4.17 (105.8)	1.04 (26.5)	1.40 (35.5)	2.24 (57)	1.02 (26)
G	**H**	**H1**	**H2**	**J**
1.22 (31)	1.18 (30)	.67 (17)	.02 (0.5)	.91 (23)
J1	**K**	**K1**	**K2**	**K3**
.14 (3.5)	2.52 (64)	1.77 (45)	1.65 (42)	2.41 (61.3)
K4	**K5**	**M**	**M1**	**M2**
1.78 (45.3)	2.26 (57.3)	1.40 (35.5)	2.76 (70)	1.18 (30)
N	**N1**	**P**	**P1**	**U**
.55 (14)	.04 (1)	Ø .27 (Ø 6.9)	Ø .17 (Ø 4.4)	0.52 (13.3)
V				
0.65 (7.5)				

Inches (mm)

P2LCX 3/2 Single & Double Operators – Remote Air Pilot



P2LCX 3/2 (remote air pilot)

A	B	C	D	E
5.51 (140)	1.89 (48)	.43 (11)	2.76 (70)	1.04 (26.5)
E1	**F**	**F1**	**G**	**H**
1.40 (35.5)	2.24 (57)	1.02 (26)	1.22 (31)	1.18 (30)
H1	**H2**	**J**	**J1**	**M**
.67 (17)	.02 (0.5)	.91 (23)	.14 (3.5)	1.40 (35.5)
M1	**M2**	**N**	**N1**	**P**
2.76 (70)	1.18 (30)	.55 (14)	.04 (1)	Ø .27 (Ø 6.9)
P1				
Ø .17 (Ø 4.4)				

Inches (mm)

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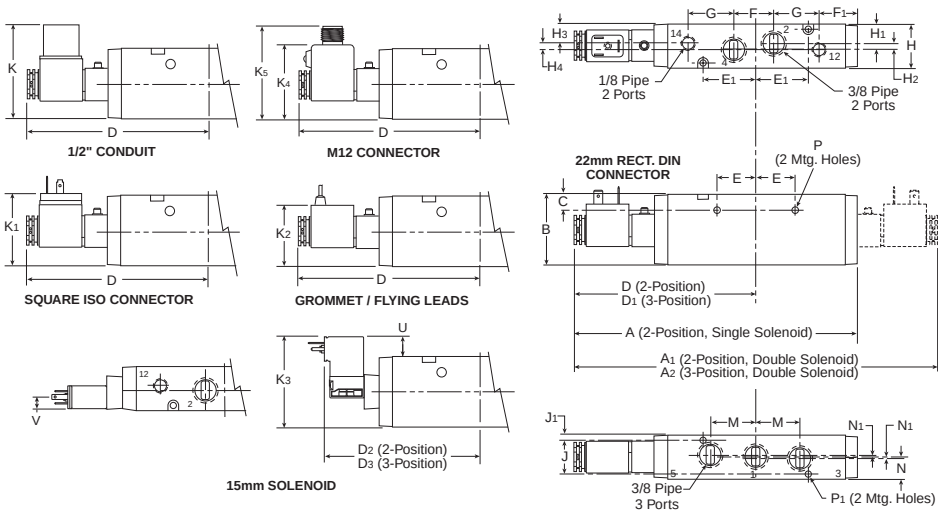
P2LCX 5/2 & 5/3 Single & Double Operators – Solenoid

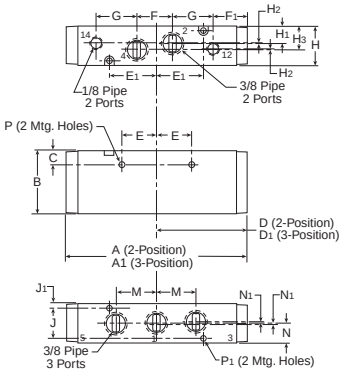


P2LCX 5/2 & 5/3 (solenoid)

A	A1	A2	B	C
7.68 (195)	9.84 (250)	10.71 (272)	1.89 (48)	.43 (11)
D	**D1**	**D2**	**D3**	**E**
4.92 (125)	5.35 (136)	4.17 (105.8)	4.61 (117.2)	1.04 (26.5)
E1	**F**	**F1**	**G**	**H**
1.40 (35.5)	1.06 (27)	1.02 (26)	1.22 (31)	1.18 (30)
H1	**H2**	**H3**	**H4**	**J**
.53 (13.5)	.12 (3)	.51 (13)	.16 (4)	.91 (23)
J1	**K**	**K1**	**K2**	**K3**
.14 (3.5)	2.52 (64)	1.77 (45)	1.65 (42)	2.41 (61.3)
K4	**K5**	**M**	**N**	**N1**
1.78 (45.3)	2.26 (57.3)	1.18 (30)	.55 (14)	.04 (1)
P	**P1**	**U**	**V**	
Ø .27 Ø (6.9)	Ø .17 Ø (4.4)	0.52 (13.3)	0.29 (7.5)	

Inches (mm)

P2LCX 5/2 & 5/3 Single & Double Operators – Remote Air Pilot

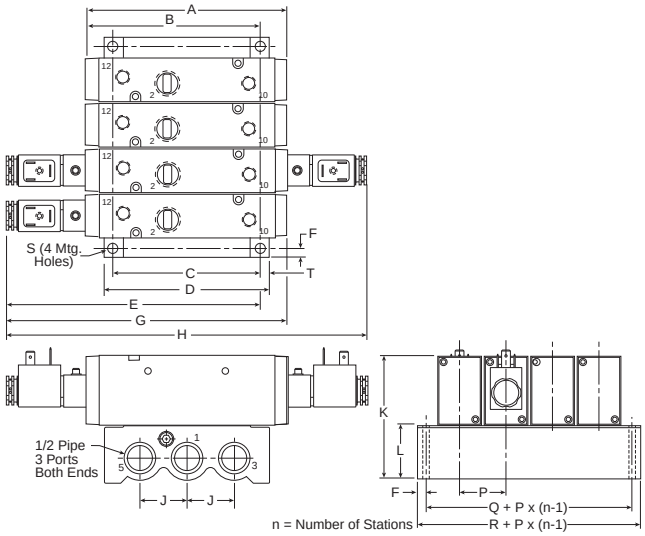


P2LCX 5/2 & 5/3 (remote air pilot)

A	A1	B	C	D	D1
5.51 (140)	6.38 (162)	1.89 (48)	.43 (11)	2.76 (70)	3.18 (81)
E	**E1**	**F**	**F1**	**G**	**H**
1.04 (26.5)	1.40 (35.5)	1.06 (27)	1.02 (26)	1.22 (31)	1.18 (30)
H1	**H2**	**H3**	**J**	**J1**	**M**
.51 (13)	.02 (0.5)	.12 (3)	.91 (23)	.14 (3.5)	1.18 (30)
N	**N1**	**P**	**P1**		
.55 (14)	.04 (1)	Ø .27 Ø (6.9)	Ø .17 Ø (4.4)		

Inches (mm)

P2LCX 3/2 Single & Double Operators – IEM Aluminum Bar Manifold



P2LCX 3/2
IEM Aluminum bar manifold

A	B	C	D	E	F
5.51 (140)	4.96 (126)	3.94 (100)	4.41 (112)	7.11 (180.5)	.24 (6)
G	**H**	**J**	**K**	**L**	**P**
7.66 (194.5)	9.80 (249)	1.26 (32)	3.43 (87)	1.54 (39)	1.24 (31.5)
Q	**R**	**S**	**T**		
1.77 (45)	2.24 (57)	Ø .26 Ø (6.5)	.24 (6)		

Inches (mm)

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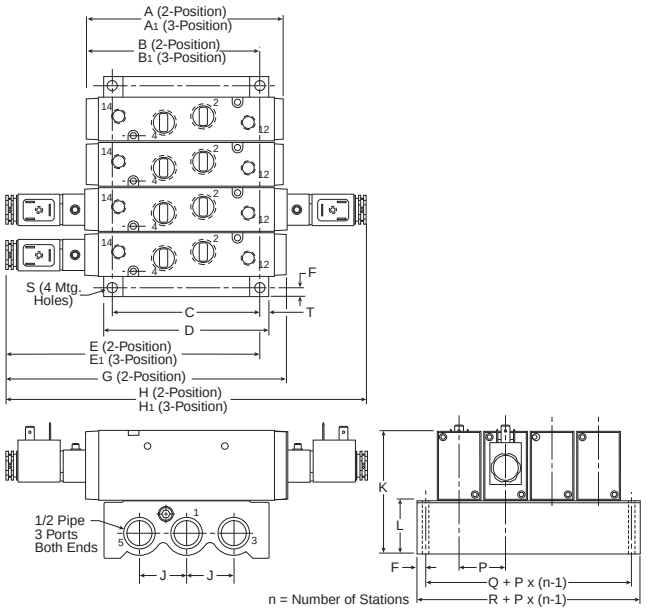
P2LCX 5/2 & 5/3 Single & Double Operators – IEM Aluminum Bar Manifold

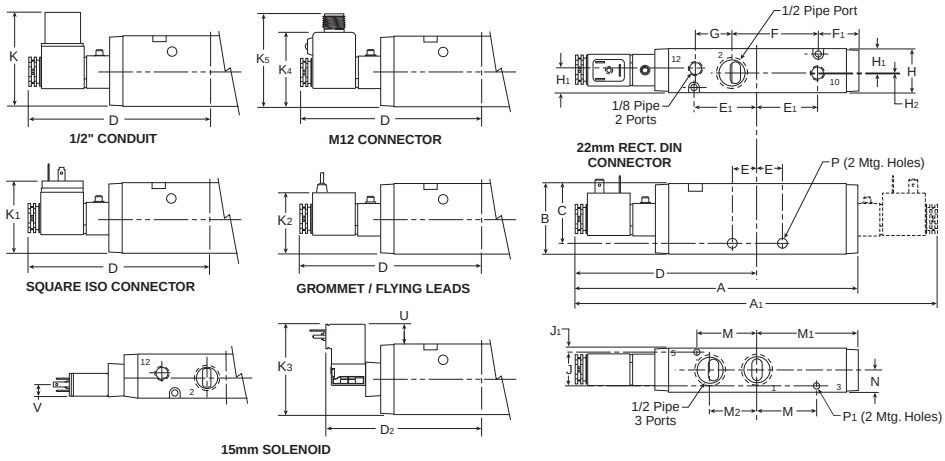


P2PCX 5/2 & 5/3
IEM Aluminum bar manifold

A	A1	B	B1	C
5.51	6.38	4.72	5.16	3.94
(140)	(162)	(120)	(131)	(100)
D	**E**	**E1**	**F**	**G**
4.41	6.89	7.13	.24	7.68
(112)	(170)	(181)	(6)	(195)
H	**H1**	**J**	**K**	**L**
9.84	10.71	1.26	3.43	1.54
(250)	(272)	(32)	(87)	(39)
P	**Q**	**R**	**S**	**T**
1.24	1.77	2.24	Ø .26	.24
(31.5)	(45)	(57)	Ø (6.5)	(6)

Inches (mm)

P2LDX 3/2 Single & Double Operators – Solenoid



P2LDX 3/2 (solenoid)

A	A1	B	C	D
7.66	9.80	1.89	1.59	4.90
(194.5)	(249)	(48)	(40.5)	(124.5)
D2	**E**	**E1**	**F**	**F1**
4.17	.67	1.65	2.36	1.08
(105.8)	(17)	(42)	(60)	(27.5)
G	**H**	**H1**	**H2**	**J**
.98	1.18	.67	.02	.91
(25)	(30)	(17)	(0.5)	(23)
J1	**K**	**K1**	**K2**	**K3**
.14	2.52	1.77	1.65	2.41
(3.5)	(64)	(45)	(42)	(61.3)
K4	**K5**	**M**	**M1**	**M2**
1.78	2.26	1.65	2.76	1.30
(45.3)	(57.3)	(42)	(70)	(33)
N	**P**	**P1**	**U**	**V**
.59	Ø .26	Ø .17	0.65	0.29
(15)	Ø (6.6)	Ø (4.4)	(16.5)	(7.5)

Inches (mm)

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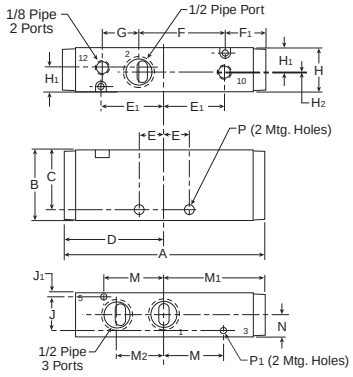
P2LDX 3/2 Single & Double Operators – Remote Air Pilot

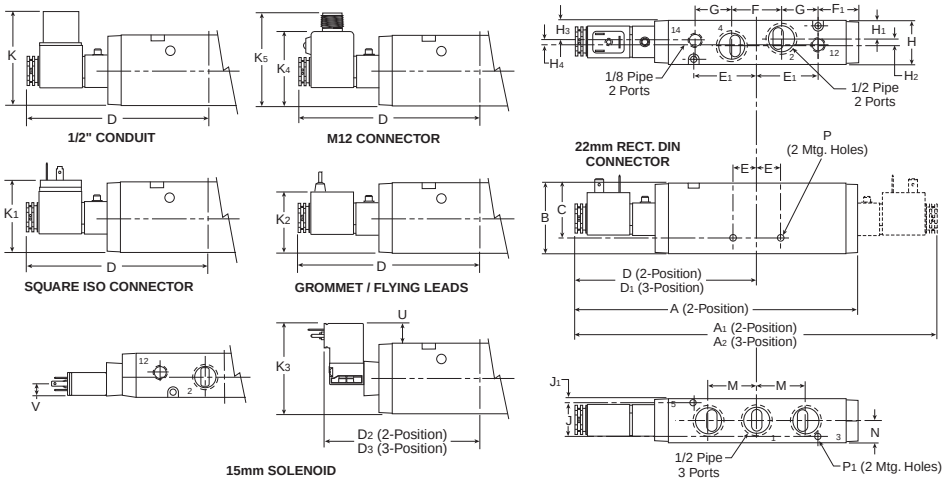


P2LDX 3/2 (remote air pilot)

A	B	C	D	E
5.51	1.89	1.59	2.76	.67
(140)	(48)	(40.5)	(70)	(17)
E1	**F**	**F1**	**G**	**H**
1.65	2.36	1.08	.98	1.18
(42)	(60)	(27.5)	(25)	(30)
H1	**H2**	**J**	**J1**	**M**
.67	.02	.91	.14	1.65
(17)	(0.5)	(23)	(3.5)	(42)
M1	**M2**	**N**	**P**	**P1**
2.76	1.30	.59	Ø .26	Ø .17
(70)	(33)	(15)	Ø (6.6)	Ø (4.4)

Inches (mm)

P2LDX 5/2 & 5/3 Single & Double Operators – Solenoid

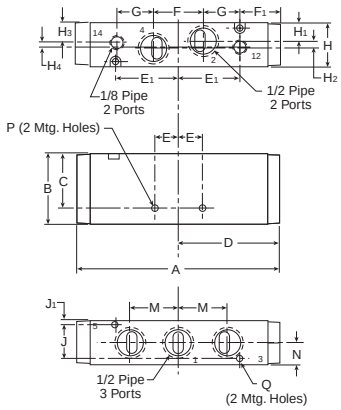


P2LDX 5/2 & 5/3 (solenoid)

A	A1	A2	B	C
7.67	9.84	10.7	1.89	1.59
(195)	(250)	(272)	(48)	(40.5)
D	**D1**	**D2**	**D3**	**E**
4.92	5.79	4.17	4.61	.67
(125)	(147)	(105.3)	(117.2)	(17)
E1	**F**	**F1**	**G**	**H**
1.65	1.34	1.10	.98	1.18
(42)	(34)	(28)	(25)	(30)
H1	**H2**	**H3**	**H4**	**J**
.49	.20	.51	.16	.91
(12.5)	(5)	(13)	(4)	(23)
J1	**K**	**K1**	**K2**	**K3**
.14	2.52	1.77	1.65	2.41
(3.5)	(64)	(45)	(42)	(61.3)
K4	**K5**	**M**	**N**	**P**
1.78	2.26	1.30	.59	Ø .26
(45.3)	(57.3)	(33)	(15)	Ø (6.6)
P1	**U**	**V**		
Ø .17	0.52	0.29		
Ø (4.4)	(13.3)	(7.5)		

Inches (mm)

P2LDX 5/2 & 5/3 Single & Double Operators – Remote Pilot



P2LDX 5/2 & 5/3 (remote)

A	B	C	D	E
5.47	1.89	1.59	2.63	.67
(139)	(48)	(40.5)	(67)	(17)
E1	**F**	**F1**	**G**	**H**
1.65	1.34	1.08	.98	1.18
(42)	(34)	(27.5)	(25)	(30)
H1	**H2**	**H3**	**H4**	**J**
.49	.20	.51	.16	.91
(12.5)	(5)	(13)	(4)	(23)
J1	**P**	**M**	**N**	**Q**
.14	Ø .26	1.29	.59	Ø .17
(3.5)	Ø (6.6)	(32.7)	(15)	Ø (4.4)

Inches (mm)

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The Viking Xtreme Manual valve range is robust, versatile and combines high performance with compact installation dimensions. The valves rugged lever actuator has been specifically designed for gloved hands to suit mobile applications in the most arduous of environments. Available in 3/2, 5/2 and 5/3 functions with either spring return or detented lever. The lever actuated versions are available across the entire range from 1/8 to 1/2 port sizes.

Heavy duty lever

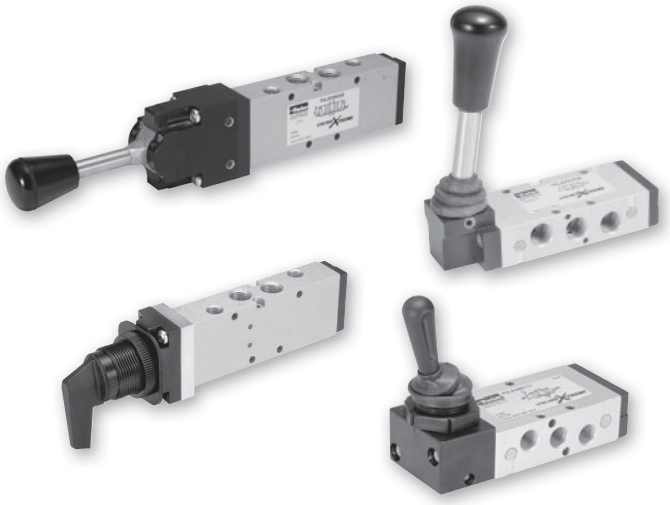
Inline valve
– 1/8", 1/4", 3/8", 1/2" NPT & BSPP

2-position models
– 4-way & 3-way

3-position models
– all ports blocked
– pressure center
– center exhaust

Approval
– Canada Registration Number available (CRN)

Over-moulded single piece aluminium spool
– Reduced product complexity
– Increased flow
– Wide operating temperature range
– Stable seal performance even with high flow / pressure drop across spool.



Operating information

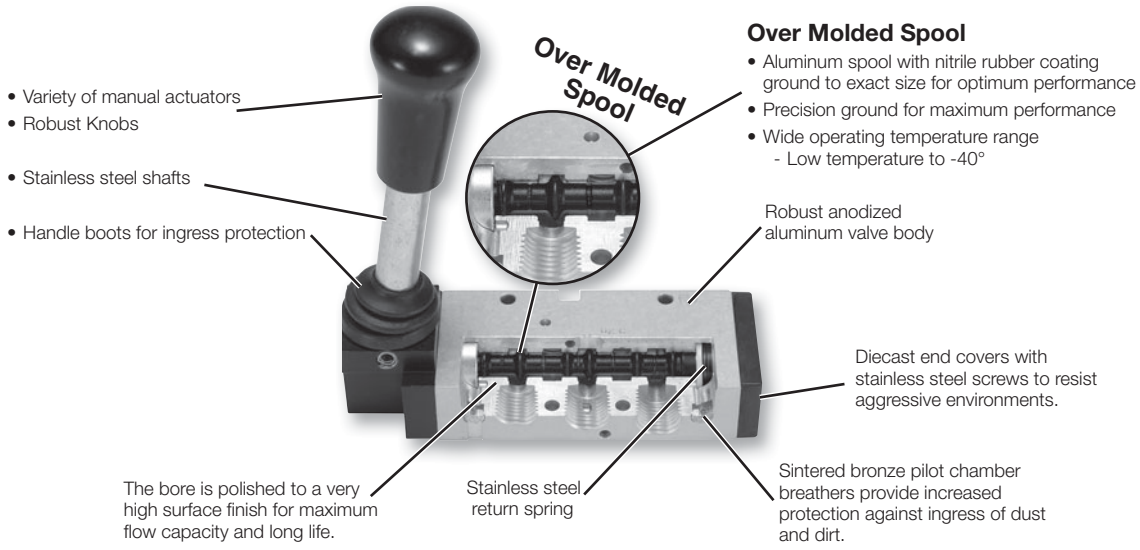
Operating pressure:	Type A & B:	Vacuum to 232 PSIG (Vacuum to 16 bar Max.)
	Type C & D:	Vacuum to 174 PSIG (Vacuum to 12 bar Max.)
Temperature range:	Xtreme:	-40°F to 140°F (-40°C to 60°C)

Material specifications

End covers	Anodized aluminum
Lever	Reinforced polyamide plastic
Lever housing	Acetal plastic
Piston	Acetal plastic / anodized aluminum
Seals	Nitrile rubber
Screws	Stainless steel
Spool	Aluminum & nitrile rubber
Springs	Stainless steel
Valve body	Anodized aluminum

Lever Handle – 1/8" valve size, 5/2 & 5/3 only	Twist Handle – 1/4" valve sizes	Lever Handle – All other valve sizes
		

Features



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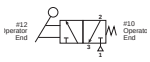
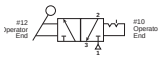
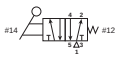
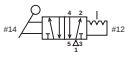
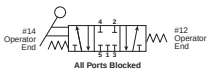
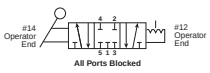
3/2 - 2-position *	Symbol	Valve type	Port size	Cv	Weight lb (kg)	Part number NPT	Part number BSPP
		Lever spring return	1/8	0.6	0.73 (0.33)	**P2LAX391VS**	**P2LAX311VS**
			1/4	1.5	0.73 (0.33)	**P2LBX392VS**	**P2LBX312VS**
			3/8	2.5	0.88 (0.40)	**P2LCX393VS**	**P2LCX313VS**
			1/2	2.7	1.32 (0.60)	**P2LDX394VS**	**P2LDX314VS**
		Lever detent	1/8	0.7	0.73 (0.33)	**P2LAX391VV**	**P2LAX311VV**
			1/4	1.3	0.73 (0.33)	**P2LBX392VV**	**P2LBX312VV**
			3/8	2.5	0.88 (0.40)	**P2LCX393VV**	**P2LCX313VV**
			1/2	2.7	1.32 (0.60)	**P2LDX394VV**	**P2LDX314VV**

5/2 - 2-position *	Symbol	Valve type	Port size	Cv	Weight lb (kg)	Part number NPT	Part number BSPP
		Lever spring return	1/8	0.6	0.40 (0.18)	**P2LAX591VS**	**P2LAX511VS**
			1/4	1.5	0.73 (0.33)	**P2LBX592VS**	**P2LBX512VS**
			3/8	2.5	0.88 (0.40)	**P2LCX593VS**	**P2LCX513VS**
			1/2	2.7	1.32 (0.60)	**P2LDX594VS**	**P2LDX514VS**
		Lever detent	1/8	0.7	0.40 (0.18)	**P2LAX591VV**	**P2LAX511VV**
			1/4	1.3	0.73 (0.33)	**P2LBX592VV**	**P2LBX512VV**
			3/8	2.5	0.88 (0.40)	**P2LCX593VV**	**P2LCX513VV**
Size P2LAX Shown			1/2	2.7	1.32 (0.60)	**P2LDX594VV**	**P2LDX514VV**

5/3 - 3-position,* all ports blocked	Symbol	Valve type	Port size	Cv	Weight lb (kg)	Part number NPT	Part number BSPP
		Lever spring center	1/8	0.6	0.40 (0.18)	**P2LAX69111**	**P2LAX61111**
			1/4	1.5	0.73 (0.33)	**P2LBX69211**	**P2LBX61211**
			3/8	2.5	1.56 (0.71)	**P2LCX69311**	**P2LCX61311**
Size P2LAX Shown			1/2	2.7	1.61 (0.73)	**P2LDX69411**	**P2LDX61411**
		Lever detent	1/8	0.7	0.40 (0.18)	**P2LAX69122**	**P2LAX61122**
			1/4	1.3	0.73 (0.33)	**P2LBX69222**	**P2LBX61222**
			3/8	2.5	1.56 (0.71)	**P2LCX69322**	**P2LCX61322**
			1/2	2.7	1.61 (0.73)	**P2LDX69422**	**P2LDX61422**

5/3 - 3-position,* center exhaust	Symbol	Valve type	Port size	Cv	Weight lb (kg)	Part number NPT	Part number BSPP
		Lever spring center	1/8	0.6	0.40 (0.18)	**P2LAX89111**	**P2LAX81111**
			1/4	1.5	0.73 (0.33)	**P2LBX89211**	**P2LBX81211**
			3/8	2.5	1.56 (0.71)	**P2LCX89311**	**P2LCX81311**
			1/2	2.7	1.61 (0.73)	**P2LDX89411**	**P2LDX81411**
		Lever detent	1/8	0.7	0.40 (0.18)	**P2LAX89122**	**P2LAX81122**
			1/4	1.3	0.73 (0.33)	**P2LBX89222**	**P2LBX81222**
			3/8	2.5	1.56 (0.71)	**P2LCX89322**	**P2LCX81322**
			1/2	2.7	1.61 (0.73)	**P2LDX89422**	**P2LDX81422**

***** Valve lever movement 90° to ports.

Most popular.

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Richland, Michigan
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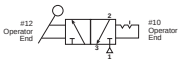
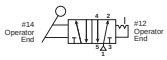
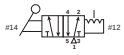
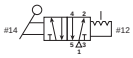
3/2 - 2-position	Symbol	Valve type	Port size	Cv		Part number NPT	Part number BSPP
		Twist handle detent	1/4	1.3	0.73 (0.33)	**P2LBX392JJ**	**P2LBX312JJ**

5/2 - 2-position	Symbol	Valve type	Port size	Cv		Part number NPT	Part number BSPP
		Twist handle detent	1/4	1.3	0.73 (0.33)	**P2LBX592JJ**	**P2LBX512JJ**

5/2 - 2-position *	Symbol	Valve type	Port size	Cv		Part number NPT	Part number BSPP
		Lever spring return	1/4	1.3	0.73 (0.33)	**P2LBX592ZS**	**P2LBX512ZS**
		Lever detent	1/4	1.3	0.73 (0.33)	**P2LBX592ZZ**	**P2LBX512ZZ**

***** Valve lever movement inline to ports.

Viking Xtreme Manual Operated Valves

Vacuum to 232 PSIG (Vacuum to 16 bar) -40°F to 140°F (-40°C to 60°C)

P2L A X 5 91 VS

Valve size	
1/8"	A
1/4"	**B**
3/8"	**C**
1/2"	D

Valve type / function	
3/2 NC - 2-position	**3**
5/2 2-position	**5**
5/3 3-position, APB	**6**
5/3 3-position, PC	7
5/3 3-position, CE	**8**

Actuator / position / lever	
JJ*	**Twist handle detent, 2-position**
VS	**Spring return lever, 2-position, 90° to ports**
VV	**Lever, detent, 2-position, 90° to ports**
ZS**	Spring return lever, 2-position, inline to ports
ZZ**	Lever detent, 2-position, inline to ports
11	Spring centered lever, 3-position, 90° to ports
22	Lever, detent, 3-position, 90° to ports
55**	Spring return lever, 3-position, inline to ports
66**	Lever detent, 3-position, inline to ports

* Not available with 3-position valves. Available Size B only.
** Size B valve only.

Main port thread	
11	G1/8 (P2LA)
12	G1/4 (P2LB)
1N*	G1/4 (P2LB) NAMUR mount
13	G3/8 (P2LC)
14	G1/2 (P2LD)
91	**1/8" NPT (P2LA)**
92	**1/4" NPT (P2LB)**
9N*	**1/4 NPT (P2LB) NAMUR mount**
93	**3/8" NPT (P2LC)**
94	1/2" NPT (P2LD)

* 5/2, 2-position valve only.

Most popular.

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Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

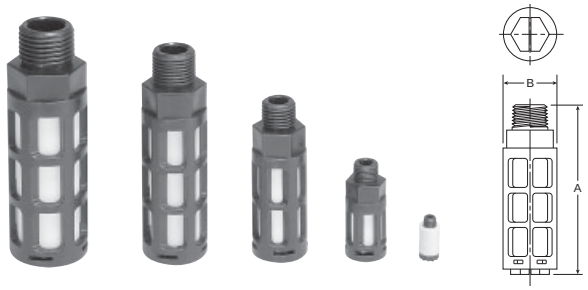
Exhaust Mufflers

Pipe thread	Part number
M5	**P6M-PAC5**
1/8" NPT	**EM12**
1/4" NPT	**EM25**
3/8" NPT	**EM37**
1/2" NPT	**EM50**

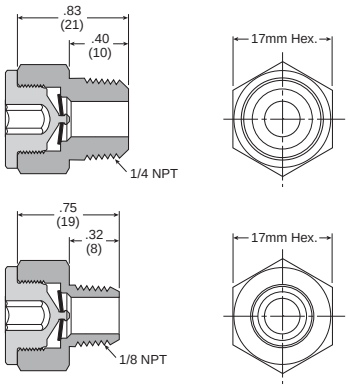
P6M - Plastic; EM - Sintered bronze

Plastic Silencers

Thread size	Part number NPT	Part number BSPT	A (mm)	B (mm)
M5	**AS-5**		.43 (11)	.32 (8)
1/8"	**ASN-6**	**AS-6**	1.57 (40)	.63 (16)
1/4"	**ASN-8**	**AS-8**	2.56 (65)	.83 (21)
3/8"	**ASN-10**	**AS-10**	3.35 (85)	.98 (25)
1/2"	**ASN-15**	**AS-15**	3.74 (95)	1.18 (30)



Exhaust Protector



Features

- 1/8 and 1/4 NPT male sizes
- Fitted with a brass pipe adapter and a fluorocarbon membrane
- Resistant to rust, clog, wash down and contamination

Applications

These protectors are intended for mobile applications, quick venting applications and alternative exhaust port breathers that require protection against clogging.

Ideal for valves exposed to harsh environmental conditions (which can cause a “caking up” in the exhaust pipe ports where the bronze mufflers or breather vents are installed).

Particularly suitable for time-sensitive applications such as axle-lift suspensions or pushers or tag axles.

Specifications

Operating pressure ..... 0 – 150 PSIG
.....(0 to 10 bar, 0 to 1034 kPa)

Operating temperature ..... -40°F to 158°F (-40°C to 70°C)

Material:
Body and pipe adapter ..... Brass
Membrane..... Fluorocarbon

Flow Data (SCFM)

Part number	Size	60 PSIG inlet	90 PSIG inlet	125 PSIG inlet
E90016	1/8"	40.1	56.5	75.5
E90017	1/4"	44.6	62.7	83.5

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Richland, Michigan
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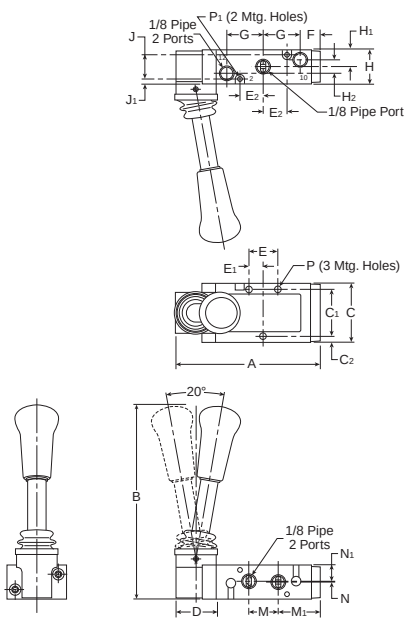
P2LAX 3/2 Hand Lever Operated
Lever operation 90° to ports movement

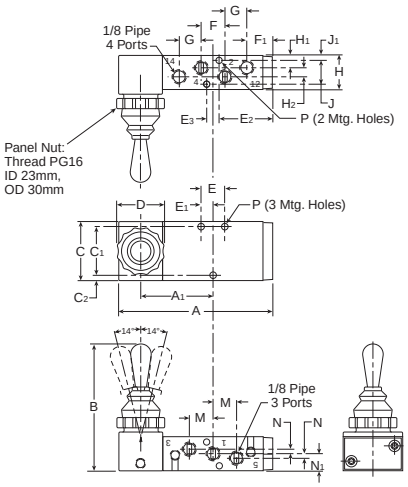


P2LAX 3/2

A	B	C
3.88 (99)	5.23 (133)	1.57 (40)
C1	**C2**	**D**
1.26 (32)	.16 (4)	1.06 (27)
E	**E1**	**E2**
.79 (20)	.39 (10)	.63 (16)
F	**G**	**H**
.55 (14)	.98 (25)	.87 (22)
H1	**H2**	**J**
.42 (10.6)	.02 (0.5)	.65 (16.5)
J1	**M**	**M1**
.11 (2.9)	.79 (20)	1.14 (29)
N	**N1**	**P**
.18 (4.5)	.26 (6.6)	Ø .17 Ø (4.3)
P1		
Ø .12 Ø (3.1)		

Inches (mm)

P2LAX 5/2 & 5/3 Hand Lever Operated
Lever operation 90° to ports movement

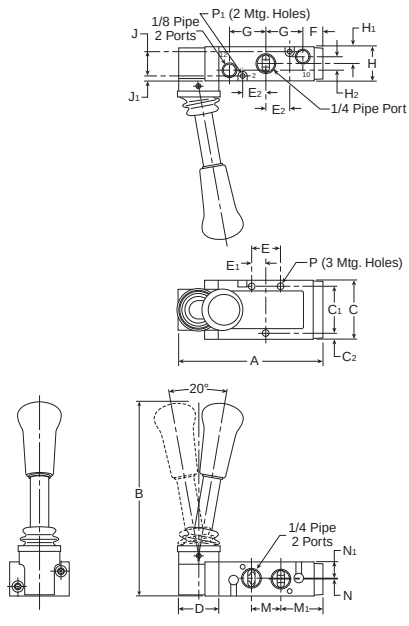


P2LAX 5/2 & 5/3

A	A1	B
4.02 (102)	1.89 (48)	3.23 (82)
C	**C1**	**C2**
1.57 (40)	1.30 (33)	.14 (3.5)
D	**E2**	**E3**
1.18 (30)	1.42 (36)	.33 (8.5)
F	**F1**	**G**
.63 (16)	.67 (17)	.59 (15)
H	**H1**	**H2**
.87 (22)	.31 (8)	.24 (6)
J	**J1**	**M**
.63 (16)	.12 (3)	.63 (16)
N	**N1**	**P**
.12 (3)	.43 (11)	Ø .16 Ø (4.1)

Inches (mm)

P2LBX 3/2 Hand Lever Operated
Lever operation 90° to ports movement

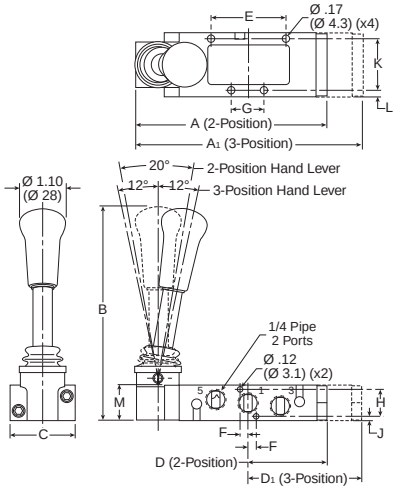


P2LBX 3/2

A	B	C
3.88 (99)	5.23 (133)	1.57 (40)
C1	**C2**	**D**
1.26 (32)	.16 (4)	1.06 (27)
E	**E1**	**E2**
.79 (20)	.39 (10)	.63 (16)
F	**G**	**H**
.55 (14)	.98 (25)	.87 (22)
H1	**H2**	**J**
.42 (10.6)	.02 (0.5)	.65 (16.5)
J1	**M**	**M1**
.11 (2.9)	.79 (20)	1.14 (29)
N	**N1**	**P**
.18 (4.5)	.26 (6.6)	Ø .17 Ø (4.3)
P1		
Ø .12 Ø (3.1)		

Inches (mm)

P2LBX 5/2 & 5/3 Hand Lever Operated
Lever operation 90° to ports movement



P2LBX 5/2 & 5/3

A	A1	B
4.67 (118.5)	5.51 (140)	5.19 (131.8)
C	**D**	**D1**
1.57 (40)	1.93 (49)	2.35 (59.8)
E	**F**	**G**
1.81 (46)	.20 (5)	.79 (20)
H	**J**	**K**
.65 (16.5)	.11 (2.85)	1.26 (32)
L	**M**	
.16 (4)	.87 (22.2)	

Inches (mm)

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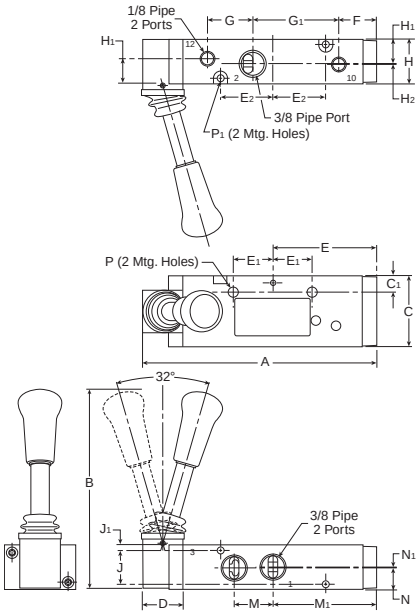
P2LCX 3/2 Hand Lever Operated
Lever operation 90° to ports movement

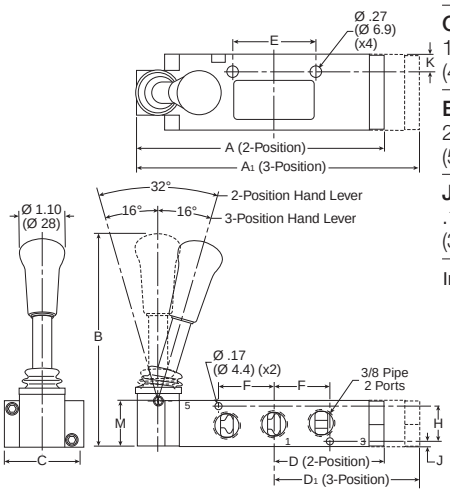


P2LCX 3/2

A	B	C
6.20 (158)	5.36 (136)	1.89 (48)
C1	**D**	**E**
.43 (11)	1.06 (27)	2.76 (70)
E1	**E2**	**F**
1.04 (27)	1.40 (36)	1.02 (26)
G	**G1**	**H**
1.22 (31)	2.24 (57)	1.18 (30)
H1	**H2**	**J**
.67 (17)	.02 (0.5)	.91 (23)
J1	**M**	**M1**
.14 (3.5)	1.18 (30)	2.76 (70)
N	**N1**	**P**
.59 (15)	.04 (1)	Ø .27 Ø (6.9)
P1		
Ø .17 Ø (4.4)		

Inches (mm)

P2LCX 5/2 & 5/3 Hand Lever Operated
Lever operation 90° to ports movement

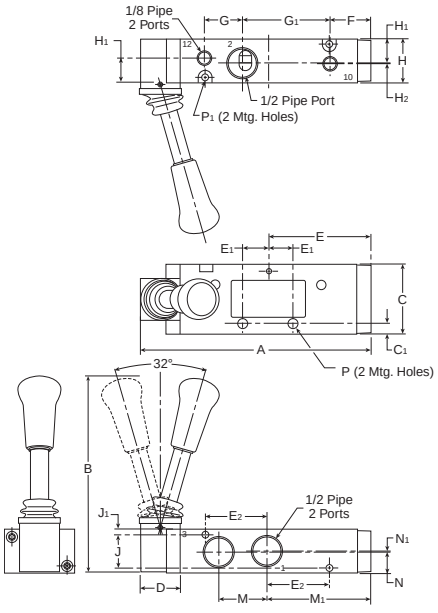


P2LCX 5/2 & 5/3

A	A1	B
6.20 (157.5)	7.07 (179.5)	5.36 (136.3)
C	**D**	**D1**
1.89 (48)	2.76 (70)	3.19 (81)
E	**F**	**H**
2.09 (53)	1.40 (35.5)	.91 (23)
J	**K**	**M**
.14 (3.5)	.43 (11)	1.18 (30)

Inches (mm)

P2LDX 3/2 Hand Lever Operated
Lever operation 90° to ports movement

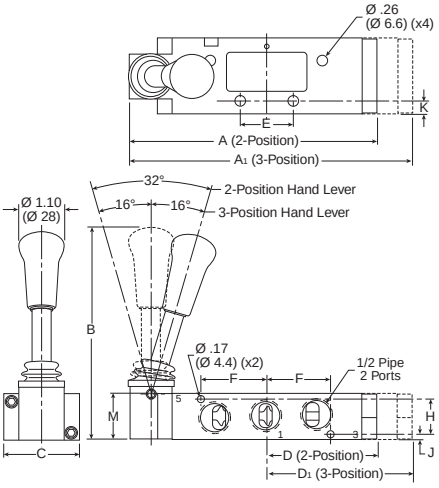


P2LDX 3/2

A	B	C
6.20 (158)	5.36 (136)	1.89 (48)
C1	**D**	**E**
.30 (7.5)	1.06 (27)	2.76 (70)
E1	**E2**	**F**
.67 (17)	1.65 (42)	1.08 (28)
G	**G1**	**H**
.98 (25)	2.36 (60)	1.18 (30)
H1	**H2**	**J**
.67 (17)	.02 (0.5)	.91 (23)
J1	**M**	**M1**
.14 (3.5)	1.30 (33)	2.76 (70)
N	**N1**	**P**
.59 (15)	.04 (1)	Ø .26 Ø (6.6)
P1		
Ø .17 Ø (4.4)		

Inches (mm)

P2LDX 5/2 & 5/3 Hand Lever Operated
Lever operation 90° to ports movement



P2LDX 5/2 & 5/3

A	A1	B
6.20 (157.5)	7.07 (179.5)	5.36 (136.3)
C	**D**	**D1**
1.89 (48)	3.19 (81)	2.76 (70)
E	**F**	**H**
1.34 (34)	1.65 (42)	.91 (23)
J	**K**	**M**
.14 (3.5)	.30 (7.5	1.18 (30)

Inches (mm)

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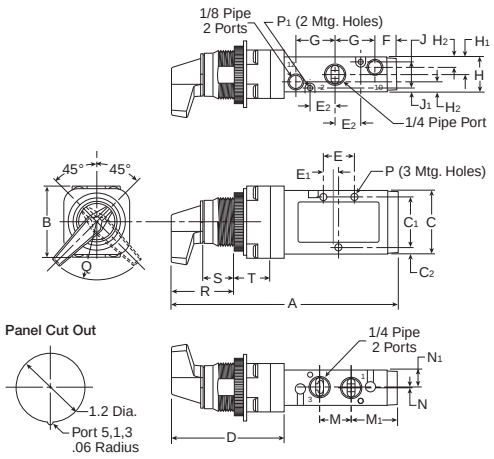
P2LBX 3/2 Twist Lever Operated



P2LBX 3/2

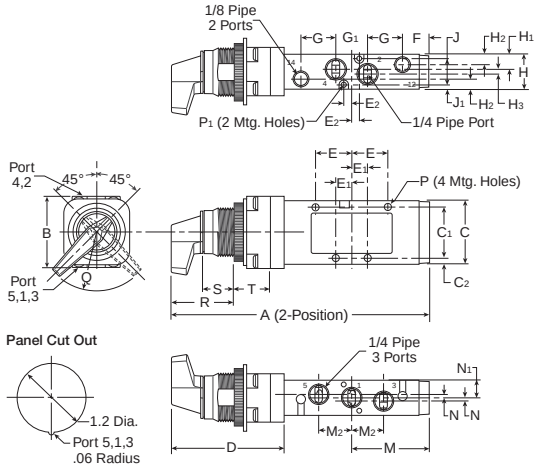
A	B	C	C_1	C_2	D	E	E_1	E_2
5.67	1.79	1.57	1.26	.16	2.87	.79	.39	.63
(144)	(45.5)	(40)	(32)	(4)	(73)	(20)	(10)	(16)

F	G	H	H_1	H_2	J	J_1	M	M_1
.55	.98	.87	.44	.26	.65	.11	.79	1.14
(14)	(25)	(22.2)	(11.1)	(6.6)	(16.5)	(2.9)	(20)	(29)

N	N_1	P	P_1	Q	R	S	T
.02	.42	Ø .17	Ø .12	1.5R	1.85	1.10	.67
(0.5)	(10.6)	Ø (4.3)	Ø (3.1)	(38.1)R	(47)	(28)	(17)

Inches (mm)

P2LBX 5/2 Twist Lever Operated



P2LBX 5/2

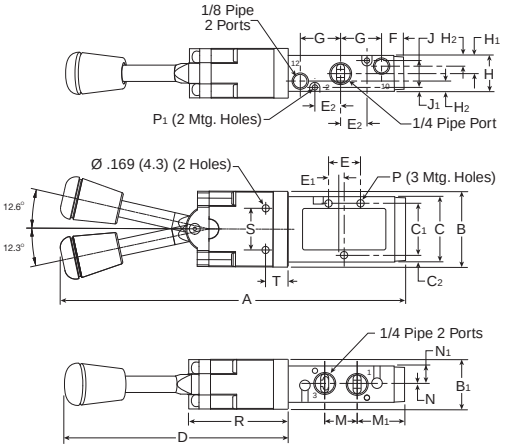
A	B	C	C_1	C_2	D	E	E_1	E_2	F
6.46	1.79	1.57	1.26	.15	2.87	.91	.39	.20	.67
(164)	(45.5)	(40)	(32)	(4)	(73)	(23)	(10)	(5)	(17)

G	G_1	H	H_1	H_2	H_3	J	J_1	M	M_2
.87	.79	.87	.44	.26	.12	.65	.11	1.93	.79
(22)	(20)	(22.2)	(11.1)	(6.6)	(3)	(16.5)	(2.9)	(49)	(20)

N	N_1	P	P_1	Q	R	S	T
.08	.44	Ø .17	Ø .12	1.5R	1.85	1.10	.67
(0.2)	(11.1)	Ø (4.3)	Ø (3.1)	(38.1)R	(47)	(28)	(17)

Inches (mm)

P2LBX 3/2 Knob Lever Operated
Lever operation inline with ports



P2LBX 3/2

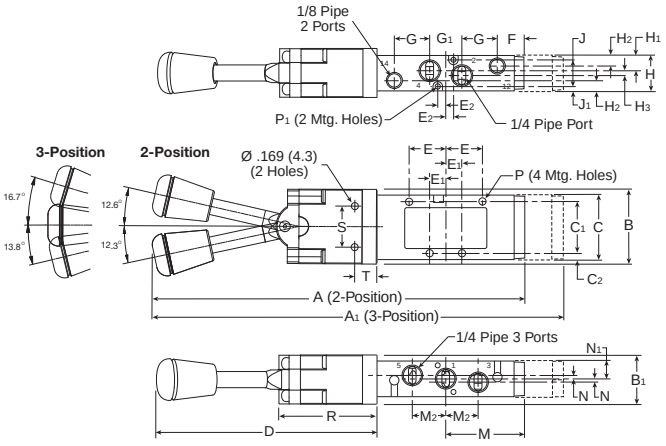
A	B	B_1	C	C_1	C_2	D	E	E_1
8.19	1.79	1.2	1.57	1.26	.16	5.39	.79	.39
(208)	(45.5)	(30.5)	(40)	(32)	(4)	(137)	(20)	(10)

E_2	F	G	H	H_1	H_2	J	J_1	M
.63	.55	.98	.87	.44	.26	.65	.11	.79
(16)	(14)	(25)	(22.2)	(11.1)	(6.6)	(16.5)	(2.9)	(20)

M_1	N	N_1	P	P_1	R	S	T
1.14	.02	.42	Ø .17	Ø .12	2.38	.98	.52
(29)	(0.5)	(10.6)	Ø (4.3)	Ø (3.1)	(60.5)	(25.0)	(13.2)

Inches (mm)

P2LBX 5/2 & 5/3 Knob Lever Operated
Lever operation inline with ports



P2LBX 5/2 & 5/3

A	A_1	B	B_1	C	C_1	C_2	D	E	E_1
8.97	9.84	1.79	1.2	1.57	1.26	.15	5.39	.91	.39
(228)	(250)	(45.5)	(30.5)	(40)	(32)	(4)	(137)	(23)	(10)

E_2	F	G	G_1	H	H_1	H_2	H_3	J	J_1
.20	.67	.87	.79	.87	.44	.26	.12	.65	.11
(5)	(17)	(22)	(20)	(22.2)	(11.1)	(6.6)	(3)	(16.5)	(2.9)

M	M_2	N	N_1	P	P_1	R	S	T
1.93	.79	.08	.44	Ø .17	Ø .12	2.38	.98	.52
(49)	(20)	(0.2)	(11.1)	Ø (4.3)	Ø (3.1)	(60.5)	(25.0)	(13.2)

Inches (mm)

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Saving Money and Space by Sizing Your Valves Properly
This catalog gives you a flow rating (Cv) for each valve in the Parker Hannifin line. You can "plug" your requirements into the following simple formula, and determine the Cv needed to do the job. By not oversizing, you'll save space and money, and you'll ensure the valve you select will do the job.

Converting the Job Requirements Into Cv
(Capacity Co-efficient).

$$\mathbf{Cv} = \frac{\text{Cylinder Area (Sq. In.) (See Table 1)} \times \text{Cylinder Stroke (In.)} \times \text{Compression Factor (Table 2)} \times \text{"A" (Table 2)}}{\text{Stroke Time (sec.)} \times 28.8}$$

Let's work through an example:

We want to extend a 3-1/4" bore cylinder which has a 12" stroke in one second, and we have a supply pressure of 80 PSI to do the work. Here's what we know:

Cylinder Area for a 3-1/4" Bore, from Table 1 .....8.30 sq. in.
Cylinder Stroke ..... 12 in.
Stroke Time Required in Seconds.....1 sec.
Compression Factor at 80 PSI, from Table 2.....6.4
"A" Constant for 80 PSI, from Table 2 048

Substituting in the formula, we have:

$$\mathbf{Cv} = \frac{8.30 \times 12 \times 6.4 \times .048}{1 \times 28.8} = \mathbf{1.06}$$

Any valve, therefore, which has a Cv of at least 1.06, will extend our cylinder the specified distance in the required time.

Choosing the Valve "Series"
Your next step is to choose a basic valve design to do the job. For a quick guide to valve designs, see Table 3.

Having selected the basic valve design, consult the Capacity Co-efficient (Cv) tables which describe the individual valve capacities.

Selecting the Valve Model, Options and Accessories
Having determined Cv, series, port size, flow-path configuration (pre-determined by circuit design), and actuation method, you're ready to choose the exact valve model number.

Read the pertinent catalog pages; note the exact model numbers, options and accessories you want. Then phone or write your Parker Hannifin air valve distributor. They will give you prompt, accurate service.

Note: Need circuit design help? Contact your local Parker Hannifin distributor. They are backed up by our regional Sales Engineers and offices. Between them, you'll find answers to all of your questions.

Table 1

Effective Square-Inch Areas for Standard-Bore-Size Cylinders

Bore Size	Cylinder Area (Sq. In.)	Bore Size	Cylinder Area (Sq. In.)
3/4"	.44	4"	12.57
1"	.79	4-1/2"	15.90
1-1/8"	.99	5"	19.64
1-1/4"	1.23	6"	28.27
1-1/2"	1.77	7"	38.48
1-3/4"	2.41	8"	50.27
2"	3.14	10"	78.54
2-1/2"	4.91	12"	113.10
3-1/4"	8.30	14"	153.94
3-5/8"	10.32		

Table 2

Compression Factors and "A" Constants

Inlet Pressure (PSIG)	Compression Factor	"A" Constants for Various Pressure Drop*		
		2 PSI △P	5 PSI △P	10 PSI △P
10	1.6	.152	.103	
20	2.3	.126	.084	.065
30	3.0	.111	.073	.055
40	3.7	.100	.065	.048
50	4.4	.091	.059	.044
60	5.1	.085	.055	.040
70	5.7	.079	.051	.037
80	6.4	.075	.048	.035
90	7.1	.071	.046	.033
100	7.8	.068	.044	.032
110	8.5	.065	.042	.030
120	9.2	.063	.040	.029
130	9.9	.061	.039	.028
140	10.6	.058	.037	.027
150	11.2	.057	.036	.026
160	11.9	.055	.035	.025
170	12.6	.053	.034	.024
180	13.3	.052	.033	.024
190	14.0	.051	.032	.023
200	14.7	.050	.032	.023

Note: Use "A" constant at 5 PSI ΔP for most applications. On very critical applications, use "A" at 2 PSI ΔP. You will find in many cases, a 10 PSI ΔP is not detrimental, and can save money and mounting space.

* Tabulated values are the solution of $\frac{1}{22.48}\sqrt{\frac{GT}{(P_1 - P_2)\,P_2}}$ where T is for 68°F and G =1 for Air.

Table 3

Characteristics of the Major Valve Designs

A. Poppet 3-Way and 4-Way	1. High flow capacities 2. Minimum lubrication requirements 3. Fast response 4. Self-cleaning poppet seats 5. Pressures of 15 to 150 PSIG (modifications for vacuum to 250 PSIG)
B. Spool Valves (WCS) 3-Way and 4-Way	1. Low friction 2. Lower operating pressures 3. Fast response 4. Less wear 5. Long Cycle Life - Under pressure, radial expansion of the seal occurs to maintain sealing contact with the valve bore 6. Non-Lube Service - No lubrication required for continuous valve shifting 7. Bi-Directional Spool Seals - Common spool used for any pressure, including vacuum
C. Packed Bore 4-Way	1. Wide range of flow capacities 2. Wide range of flow-path configurations 3. Pilot-operated models available 4. Pressures of vacuum to 150 PSIG
D. Rotary Or Reciprocating Disc 4-Way, manually operated	1. Inexpensive 2. Versatility in manual actuation

Cv – Capacity Co-efficients (sometimes called Flow Factors). Each flow path through the valve has its own Cv value. All Cv ratings for each valve cataloged on this page are listed on the front side of this sheet.

$$Cv = \frac{Q}{22.48}\sqrt{\frac{GT}{(P_1 - P_2)\,P_2}}$$

Q = Flow in Standard Cubic Feet per minute (14.7 PSIA at 60°F)
P_1 = Inlet Absolute Pressure (gauge pressure + 14.7)
P_2 = Outlet Absolute Pressure (gauge pressure + 14.7)
Note: P_2 must be greater than .53 x P_1
G = Specific Gravity of flowing medium (Air, G =1)
T = Absolute Temperature of Air (460 + °F.)

Cv = Q x "A" (Table 2)

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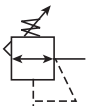
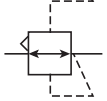
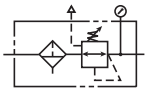
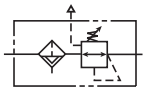
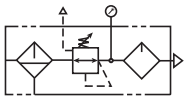
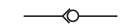
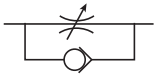
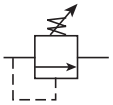
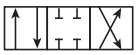
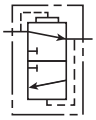
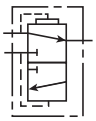
Air Preparation Units

Symbol	Description
	**Filter / Separator** with manual drain
	**Filter / Separator** with automatic drain
	**Oil Removal Filter**
	**Automatic Drain**
	**Lubricator** less drain
	**Lubricator** with manual drain
	**Lubricator** with automatic filling
	**Air Line Pressure Regulator** adjustable, relieving
	**Air Line Pressure Regulator** pilot controlled, relieving
	**Filter / Regulator** (piggyback) manual drain relieving (with gauge)
	**Filter / Regulator** (piggyback) auto drain relieving
	**Air Line Combo F-R-L** simplified

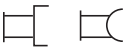
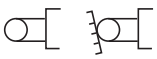
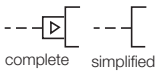
Pneumatic Valves

Symbol	Description
	**Check**
	**Flow Control**
	**Relief Valve**
	**2-Position, 2-Way**
	**2-Position, 3-Way**
	**2-Position, 4-Way**
	**2-Position, 4-Way 5-Ported**

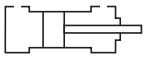
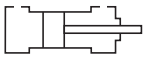
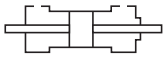
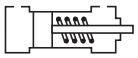
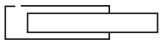
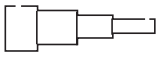
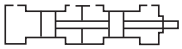
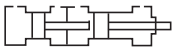
Pneumatic Valves

Symbol	Description
	**3-Position, 4-Way, APB** ports closed, center pos.
	**3-Position, 4-Way, CE 5-Ported** cylinder ports open to exhaust in center position
	**3-Position, 4-Way, PC 5-Ported** pressure ports open to exhaust in center position
	**Quick Exhaust**
	**Shuttle**

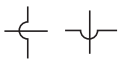
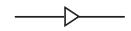
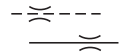
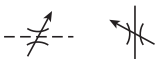
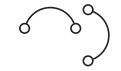
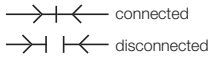
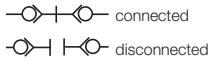
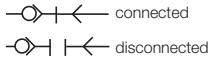
Valve Actuators

Symbol	Description
	**Manual** general symbol
	**Push Button**
	**Lever**
	**Pedal or Treadle**
	**Mechanical** cam, toggle, etc.
	**Spring**
	**Detent** line indicates which detent is in use
	**Piezo**
	**Solenoid**
	**Internal Pilot Supply**
 complete simplified	**Remote Pilot Supply**
	**And / Or Composite** solenoid and pilot or manual override
	**And / Or Composite** solenoid and pilot or manual override and pilot

Cylinders

Symbol	Description
	**Standard** double acting
	**Single Acting**
	**Double Rod**
	**Spring Return**
	**Ram Type**
	**Telescope**
	**Tandum**
	**Duplex**

Lines and Functions

Symbol	Description
	Solid Line – Main Line
	Dashed Line – Pilot Line
	Dotted Line – Exhaust or Drain Line
	Center Line – Enclosure Outline
	**Lines Crossing** (90° intersection not necessary)
	**Lines Joining** (90° intersection not necessary)
	**Lines Joining**
	Flow Direction hydraulic medium
	**Flow Direction** gaseous medium
	Energy Source
	**Line with Fixed Restriction**
	**Line with Adjustable Restriction**
	**Flexible Line**
	**Plugged Port, Test Station, Power Take-off**
 connected disconnected	**Quick Disconnect Without Checks**
 connected disconnected	**Quick Disconnect With Checks**
 connected disconnected	**Quick Disconnect With One Check**

Parker Hannifin Corporation
Pneumatic Division
Richland, Michigan
www.parker.com/pneumatics

Safety Guide For Selecting And Using Pneumatic Division Products And Related Accessories

⚠ WARNING:

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF PNEUMATIC DIVISION PRODUCTS, ASSEMBLIES OR RELATED ITEMS ("PRODUCTS") CAN CAUSE DEATH, PERSONAL INJURY, AND PROPERTY DAMAGE. POSSIBLE CONSEQUENCES OF FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO:

- Unintended or mistimed cycling or motion of machine members or failure to cycle
- Work pieces or component parts being thrown off at high speeds.
- Failure of a device to function properly for example, failure to clamp or unclamp an associated item or device.
- Explosion
- Suddenly moving or falling objects.
- Release of toxic or otherwise injurious liquids or gasses.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.

1. GENERAL INSTRUCTIONS

1.1. Scope: This safety guide is designed to cover general guidelines on the installation, use, and maintenance of Pneumatic Division Valves, FRLs (Filters, Pressure Regulators, and Lubricators), Vacuum products and related accessory components.

1.2. Fail-Safe: Valves, FRLs, Vacuum products and their related components can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of associated valves, FRLs or Vacuum products will not endanger persons or property.

1.3 Relevant International Standards: For a good guide to the application of a broad spectrum of pneumatic fluid power devices see: ISO 4414:1998, Pneumatic Fluid Power – General Rules Relating to Systems. See www.iso.org for ordering information.

1.4. Distribution: Provide a copy of this safety guide to each person that is responsible for selection, installation, or use of Valves, FRLs or Vacuum products. Do not select, or use Parker valves, FRLs or vacuum products without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.

1.5. User Responsibility: Due to the wide variety of operating conditions and applications for valves, FRLs, and vacuum products Parker and its distributors do not represent or warrant that any particular valve, FRL or vacuum product is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the appropriate valve, FRL, Vacuum component, or accessory.
- Assuring that all user's performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
- Complying with all existing warning labels and / or providing all appropriate health and safety warnings on the equipment on which the valves, FRLs or Vacuum products are used; and,
- Assuring compliance with all applicable government and industry standards.

1.6. Safety Devices: Safety devices should not be removed, or defeated.

1.7. Warning Labels: Warning labels should not be removed, painted over or otherwise obscured.

1.8. Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2. PRODUCT SELECTION INSTRUCTIONS

2.1. Flow Rate: The flow rate requirements of a system are frequently the primary consideration when designing any pneumatic system. System components need to be able to provide adequate flow and pressure for the desired application.

2.2. Pressure Rating: Never exceed the rated pressure of a product. Consult product labeling, Pneumatic Division catalogs or the instruction sheets supplied for maximum pressure ratings.

2.3. Temperature Rating: Never exceed the temperature rating of a product. Excessive heat can shorten the life expectancy of a product and result in complete product failure.

2.4. Environment: Many environmental conditions can affect the integrity and suitability of a product for a given application. Pneumatic Division products are designed for use in general purpose industrial applications. If these products are to be used in unusual circumstances such as direct sunlight and/or corrosive or caustic environments, such use can shorten the useful life and lead to premature failure of a product.

2.5. Lubrication and Compressor Carryover: Some modern synthetic oils can and will attack nitrile seals. If there is any possibility of synthetic oils or greases migrating into the pneumatic components check for compatibility with the seal materials used. Consult the factory or product literature for materials of construction.

2.6. Polycarbonate Bowls and Sight Glasses: To avoid potential polycarbonate bowl failures:

- Do not locate polycarbonate bowls or sight glasses in areas where they could be subject to direct sunlight, impact blow, or temperatures outside of the rated range.
- Do not expose or clean polycarbonate bowls with detergents, chlorinated hydro-carbons, keytones, esters or certain alcohols.
- Do not use polycarbonate bowls or sight glasses in air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester lubricants.

2.7. Chemical Compatibility: For more information on plastic component chemical compatibility see Pneumatic Division technical bulletins Tec-3, Tec-4, and Tec-5

2.8. Product Rupture: Product rupture can cause death, serious personal injury, and property damage.
- Do not connect pressure regulators or other Pneumatic Division products to bottled gas cylinders.
- Do not exceed the maximum primary pressure rating of any pressure regulator or any system component.
- Consult product labeling or product literature for pressure rating limitations.

3. PRODUCT ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1. Component Inspection: Prior to assembly or installation a careful examination of the valves, FRLs or vacuum products must be performed. All components must be checked for correct style, size, and catalog number. DO NOT use any component that displays any signs of nonconformance.

3.2. Installation Instructions: Parker published Installation Instructions must be followed for installation of Parker valves, FRLs and vacuum components. These instructions are provided with every Parker valve or FRL sold, or by calling 1-800-CPARKER, or at www.parker.com.

3.3. Air Supply: The air supply or control medium supplied to Valves, FRLs and Vacuum components must be moisture-free if ambient temperature can drop below freezing

4. VALVE AND FRL MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1. Maintenance: Even with proper selection and installation, valve, FRL and vacuum products service life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a component failure, and experience with any known failures in the application or in similar applications should determine the frequency of inspections and the servicing or replacement of Pneumatic Division products so that products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.9.

4.2. Installation and Service Instructions: Before attempting to service or replace any worn or damaged parts consult the appropriate Service Bulletin for the valve or FRL in question for the appropriate practices to service the unit in question. These Service and Installation Instructions are provided with every Parker valve and FRL sold, or are available by calling 1-800-CPARKER, or by accessing the Parker web site at www.parker.com.

4.3. Lockout / Tagout Procedures: Be sure to follow all required lockout and tagout procedures when servicing equipment. For more information see: OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – (Lockout / Tagout)

4.4. Visual Inspection: Any of the following conditions requires immediate system shut down and replacement of worn or damaged components:
- Air leakage: Look and listen to see if there are any signs of visual damage to any of the components in the system. Leakage is an indication of worn or damaged components.
- Damaged or degraded components: Look to see if there are any visible signs of wear or component degradation.
- Kinked, crushed, or damaged hoses. Kinked hoses can result in restricted air flow and lead to unpredictable system behavior.
- Any observed improper system or component function: Immediately shut down the system and correct malfunction.
- Excessive dirt build-up: Dirt and clutter can mask potentially hazardous situations.

Caution: Leak detection solutions should be rinsed off after use.

4.5. Routine Maintenance Issues:
- Remove excessive dirt, grime and clutter from work areas.
- Make sure all required guards and shields are in place.

4.6. Functional Test: Before initiating automatic operation, operate the system manually to make sure all required functions operate properly and safely.

4.7. Service or Replacement Intervals: It is the user's responsibility to establish appropriate service intervals. Valves, FRLs and vacuum products contain components that age, harden, wear, and otherwise deteriorate over time. Environmental conditions can significantly accelerate this process. Valves, FRLs and vacuum components need to be serviced or replaced on routine intervals. Service intervals need to be established based on:
- Previous performance experiences.
- Government and / or industrial standards.
- When failures could result in unacceptable down time, equipment damage or personal injury risk.

4.8. Servicing or Replacing of any Worn or Damaged Parts: To avoid unpredictable system behavior that can cause death, personal injury and property damage:
- Follow all government, state and local safety and servicing practices prior to service including but not limited to all OSHA Lockout Tagout procedures (OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – Lockout / Tagout).
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to system and Pneumatic Division products before installation, service, or conversion.
- Installation, servicing, and / or conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversions air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or if the product does not operate properly, do not put product or system into use.
- Warnings and specifications on the product should not be covered or painted over. If masking is not possible, contact your local representative for replacement labels.

4.9. Putting Serviced System Back into Operation: Follow the guidelines above and all relevant Installation and Maintenance Instructions supplied with the valve FRL or vacuum component to insure proper function of the system.

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PARKER-HANNIFIN CORPORATION
OFFER OF SALE

1. Definitions. As used herein, the following terms have the meanings indicated.

Buyer:	means any customer receiving a Quote for Products from Seller.
Goods:	means any tangible part, system or component to be supplied by the Seller.
Products:	means the Goods, Services and/or Software as described in a Quote provided by the Seller.
Quote:	means the offer or proposal made by Seller to Buyer for the supply of Products.
Seller:	means Parker-Hannifin Corporation, including all divisions and businesses thereof.
Services:	means any services to be supplied by the Seller.
Software:	means any software related to the Products, whether embedded or separately downloaded.
Terms:	means the terms and conditions of this Offer of Sale or any newer version of the same as published by Seller electronically at www.parker.com/saleterms.

2. Terms. All sales of Products by Seller are contingent upon, and will be governed by, these Terms and, these Terms are incorporated into any Quote provided by Seller to any Buyer. Buyer's order for any Products whether communicated to Seller verbally, in writing, by electronic date interface or other electronic commerce, shall constitute acceptance of these Terms. Seller objects to any contrary or additional terms or conditions of Buyer. Reference in Seller's order acknowledgement to Buyer's purchase order or purchase order number shall in no way constitute an acceptance of any of Buyer's terms of purchase. No modification to these Terms will be binding on Seller unless agreed to in writing and signed by an authorized representative of Seller.

3. Price; Payment. The Products set forth in Seller's Quote are offered for sale at the prices indicated in Seller's Quote. Unless otherwise specifically stated in Seller's Quote, prices are valid for thirty (30) days and do not include any sales, use, or other taxes or duties. Seller reserves the right to modify prices at any time to adjust for any raw material price fluctuations. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). All sales are contingent upon credit approval and payment for all purchases is due thirty (30) days from the date of invoice (or such date as may be specified in the Quote). Unpaid invoices beyond the specified payment date incur interest at the rate of 1.5% per month or the maximum allowable rate under applicable law.

4. Shipment; Delivery; Title and Risk of Loss. All delivery dates are approximate. Seller is not responsible for damages resulting from any delay. Regardless of the manner of shipment, delivery occurs and title and risk of loss or damage pass to Buyer, upon placement of the Products with the shipment carrier at Seller's facility. Unless otherwise agreed, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective indicated shipping date will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

5. Warranty. The warranty related to the Products is as follows: (i) Goods are warranted against defects in material or workmanship for a period of twelve (12) months from the date of delivery or 2,000 hours of use, whichever occurs first; (ii) Services shall be performed in accordance with generally accepted practices and using the degree of care and skill that is ordinarily exercised and customary in the field to which the Services pertain and are warranted for a period of six (6) months from the completion of the Services by Seller; and (iii) Software is only warranted to perform in accordance with applicable specifications provided by Seller to Buyer for ninety (90) days from the date of delivery or, when downloaded by a Buyer or end-user, from the date of the initial download. All prices are based upon the exclusive limited warranty stated above, and upon the following disclaimer:

DISCLAIMER OF WARRANTY: THIS WARRANTY IS THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, NONINFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT THAT THE SOFTWARE IS ERROR-FREE OR FAULT-TOLERANT, OR THAT BUYER'S USE THEREOF WILL BE SECURE OR UNINTERRUPTED. BUYER AGREES AND ACKNOWLEDGES THAT UNLESS OTHERWISE AUTHORIZED IN WRITING BY SELLER THE SOFTWARE SHALL NOT BE USED IN CONNECTION WITH HAZARDOUS OR HIGH RISK ACTIVITIES OR ENVIRONMENTS. EXCEPT AS EXPRESSLY STATED HEREIN, ALL PRODUCTS ARE PROVIDED "AS IS".

6. Claims; Commencement of Actions. Buyer shall promptly inspect all Products upon receipt. No claims for shortages will be allowed unless reported to the Seller within ten (10) days of delivery. Buyer shall notify Seller of any alleged breach of warranty within thirty (30) days after the date the non-conformance is or should have been discovered by Buyer. Any claim or action against Seller based upon breach of contract or any other theory, including tort, negligence, or otherwise must be commenced within twelve (12) months from the date of the alleged breach or other alleged event, without regard to the date of discovery.

7. LIMITATION OF LIABILITY. IN THE EVENT OF A BREACH OF WARRANTY, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE THE NON-CONFORMING PRODUCT, RE-PERFORM THE SERVICES, OR REFUND THE PURCHASE PRICE PAID WITHIN A REASONABLE PERIOD OF TIME. **IN NO EVENT IS SELLER LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, NON-COMPLETION OF SERVICES, USE, LOSS OF USE OF, OR INABILITY TO USE THE PRODUCTS OR ANY PART THEREOF, LOSS OF DATA, IDENTITY, PRIVACY, OR CONFIDENTIALITY, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, WHETHER BASED IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCTS.**

8. Loss to Buyer's Property. Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which are or become Buyer's property, will be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer ordering the Products 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. Special Tooling. Special Tooling includes but is not limited to tooling, jigs, fixtures and associated manufacturing equipment acquired or necessary to manufacture Products. A tooling charge may be imposed for any Special Tooling. 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 Special Tooling belonging to Seller that is utilized in the manufacture of the Products, even if such Special Tooling has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller has the right to alter, discard or otherwise dispose of any Special Tooling or other property in its sole discretion at any time.

10. Security Interest. To secure payment of all sums due, Seller retains a security interest in all Products delivered to Buyer and, Buyer's acceptance of these Terms is deemed to be a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

11. User Responsibility. The Buyer through its own analysis and testing, is solely responsible for making the final selection of the Products and assuring that all performance, endurance, maintenance, safety and warning requirements of the application of the Products are met. The Buyer must analyze all aspects of the application and follow applicable industry standards, specifications, and other technical information provided with the Product. If Seller provides Product options based upon data or specifications provided by the Buyer, the Buyer is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products. In the event the Buyer is not the end-user, Buyer will ensure such end-user complies with this paragraph.

12. Use of Products, Indemnity by Buyer. Buyer shall comply with all instructions, guides and specifications provided by Seller with the Products. **Unauthorized Uses**. If Buyer uses or resells the Products for any uses prohibited in Seller's instructions, guides or specifications, or Buyer otherwise fails to comply with Seller's instructions, guides and specifications, Buyer acknowledges that any such use, resale, or non-compliance is at Buyer's sole risk. Buyer shall indemnify, defend, and hold Seller harmless from any losses, claims, liabilities, damages, lawsuits, judgments and costs (including attorney fees and defense costs), whether for personal injury, property damage, intellectual property infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, application, design, specification or other misuse of Products provided by Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, tooling, equipment, plans, drawings, designs or specifications or other information or things furnished by Buyer; (d) damage to the Products from an external cause, repair or attempted repair by anyone other than Seller, failure to follow instructions, guides and specifications provided by Seller, use with goods not provided by Seller, or opening, modifying, deconstructing or tampering with the Products for any reason; or (e) Buyer's failure to comply with these Terms. Seller shall not indemnify Buyer under any circumstance except as otherwise provided in these Terms.

13. Cancellations and Changes. Buyer may not cancel or modify any order for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller, at any time, may change Product features, specifications, designs and availability.

14. Limitation on Assignment. Buyer may not assign its rights or obligations without the prior written consent of Seller.

15. Force Majeure. Seller does not assume the risk and is not liable for delay or failure to perform any of Seller's obligations by reason of events or circumstances beyond its reasonable control ("Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

16. Waiver and Severability. Failure to enforce any provision of these Terms will not invalidate that provision; nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of these Terms by legislation or other rule of law shall not invalidate any other provision herein and, the remaining provisions will remain in full force and effect.

17. Termination. Seller may terminate any agreement governed by or arising from these Terms for any reason and at any time by giving Buyer thirty (30) days prior written notice. Seller may immediately terminate, in writing, if Buyer: (a) breaches any provision of these Terms (b) appoints a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or one if filed by a third party (d) makes an assignment for the benefit of creditors; or (e) dissolves its business or liquidates all or a majority of its assets.

18. Ownership of Software. Seller retains ownership of all Software supplied to Buyer hereunder. In no event shall Buyer obtain any greater right in and to the Software than a right in the nature of a license limited to the use thereof and subject to compliance with any other terms provided with the Software.

19. Indemnity for Infringement of Intellectual Property Rights. Seller is not liable for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights ("Intellectual Property Rights") except as provided in this Section. 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 a third party claim that one or more of the Products sold hereunder infringes the Intellectual Property Rights of a third party in the country of delivery of the Products by the Seller to the Buyer. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of any such claim, and Seller having sole control over the defense of the claim including all negotiations for settlement or compromise. If one or more Products sold hereunder is subject to such a claim, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Products, replace or modify the Products so as to render them non-infringing, or offer to accept return of the Products and refund the purchase price less a reasonable allowance for depreciation. Seller has no obligation or liability for any claim of infringement: (i) arising from information provided by Buyer; or (ii) directed to any Products provided hereunder for which the designs are specified in whole or part by Buyer; or (iii) resulting from the modification, combination or use in a system of any Products provided hereunder. The foregoing provisions of this Section constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for such claims of infringement of Intellectual Property Rights.

20. Governing Law. These Terms and the sale and delivery of all Products are deemed to have taken place in, and shall be governed and construed in accordance with, the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to the sale and delivery of the Products.

21. Entire Agreement. These Terms, along with the terms set forth in the main body of any Quote, forms the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. In the event of a conflict between any term set forth in the main body of a Quote and these Terms, the terms set forth in the main body of the Quote shall prevail. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter shall have no effect. These Terms may not be modified unless in writing and signed by an authorized representative of Seller.

22. Compliance with Laws. Buyer agrees to comply with all applicable laws, regulations, and industry and professional standards, including those of the United States of America, and the country or countries in which Buyer may operate, including without limitation the U.S. Foreign Corrupt Practices Act ("FCPA"), the U.S. Anti-Kickback Act ("Anti-Kickback Act"), U.S. and E.U. export control and sanctions laws ("Export Laws"), the U.S. Food Drug and Cosmetic Act ("FDCA"), and the rules and regulations promulgated by the U.S. Food and Drug Administration ("FDA"), each as currently amended. Buyer agrees to indemnify, defend, and hold harmless Seller from the consequences of any violation of such laws, regulations and standards by Buyer, its employees or agents. Buyer acknowledges that it is familiar with all applicable provisions of the FCPA, the Anti-Kickback Act, Export Laws, the FDCA and the FDA and certifies that Buyer will adhere to the requirements thereof and not take any action that would make Seller violate such requirements. Buyer represents and agrees that Buyer will not make any payment or give anything of value, directly or indirectly, to any governmental official, foreign political party or official thereof, candidate for foreign political office, or commercial entity or person, for any improper purpose, including the purpose of influencing such person to purchase Products or otherwise benefit the business of Seller. Buyer further represents and agrees that it will not receive, use, service, transfer or ship any Product from Seller in a manner or for a purpose that violates Export Laws or would cause Seller to be in violation of Export Laws.

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Parker Hannifin Corporation
Pneumatic Division
8676 E. M89
P.O. Box 901
Richland, MI 49083 USA
Tel: 269 629 5000
Fax: 269 629 5385

Applications Engineering
Phone: 877 321 4PDN Option #2
E-mail: pdnapps@parker.com
Customer Support
Phone: 877 321 4PDN Option #1
E-mail: pdncustsvc@parker.com
Web site: www.parker.com/pneumatics