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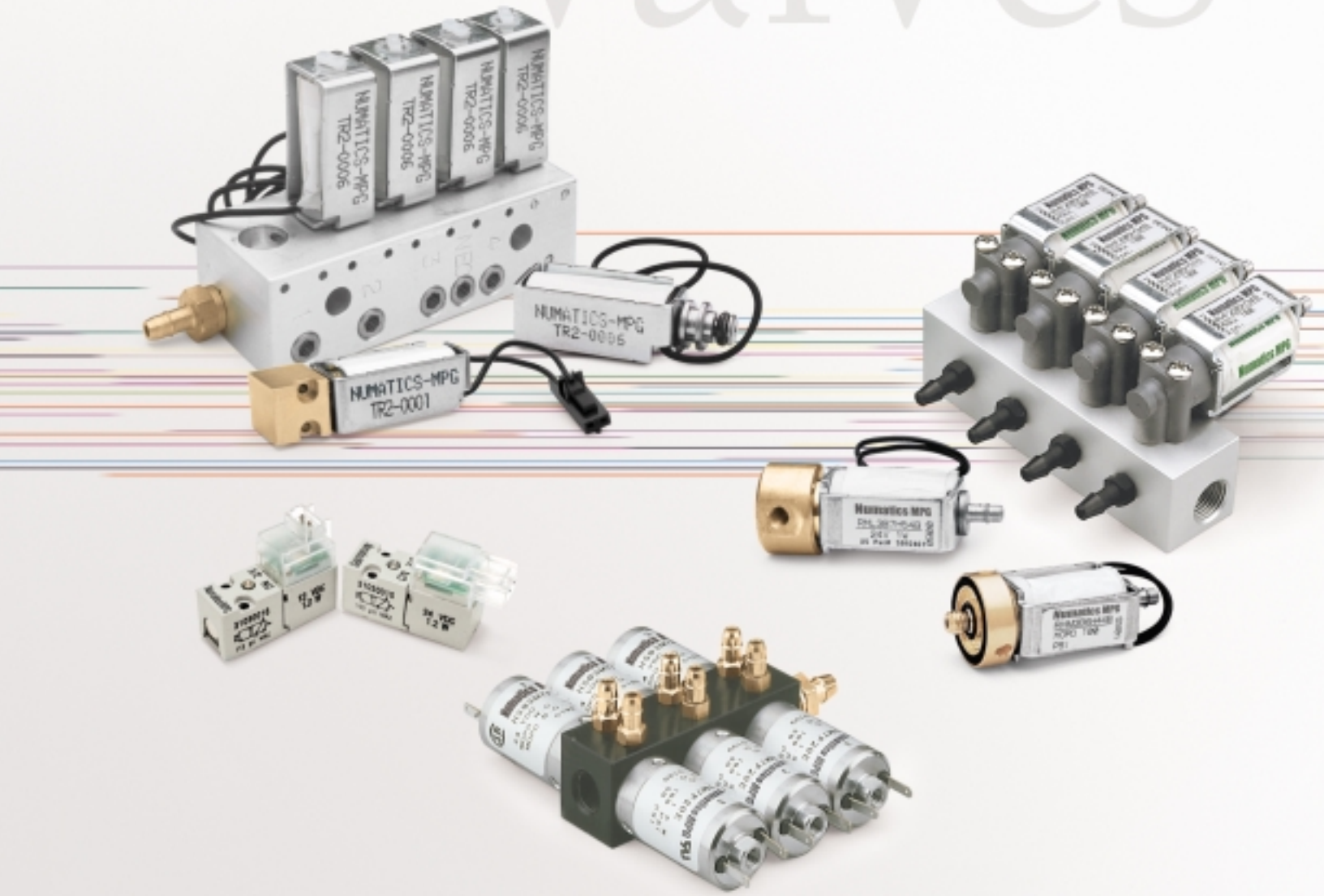
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numatics®

Valves

Miniature Pneumatic Group



Product Catalog

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numatics®

history



Miniature Pneumatic Group, formed in 1994, is a subsidiary of Numatics Inc. Miniature Pneumatic Group was created to provide new and innovative valve products for high technology medical and instrumentation markets. Experiencing consistent strong growth since its inception, Miniature Pneumatic Group has emerged as a leader in supplying miniature and micro pneumatic valves to industry.

Seventy percent of Miniature Pneumatic Group's sales are associated with the medical industry, both in home care and in hospital-based equipment. The remaining 30 percent is divided almost equally between the instrumentation, semiconductor, and industrial equipment markets.

We're everywhere you need us to be!



BSI REGISTERED

FM39800 / ISO 9001

www.numatics.com

Contact our inside sales department for a distributor near you.

In 1998, Miniature Pneumatic Group achieved ISO 9001 certification (FM39800) from the British Standards Institute. This shows that all documentation related to quality is controlled, and these documents, including drawings and work instructions, are accessible to all employees on the company network.

These stringent guidelines for quality are incorporated through out the Miniature Pneumatic Group organization. This enables Miniature Pneumatic Group to design and continually manufacture products that have the characteristics associated with today's applications (ie: critically close tolerances, oxygen clean assemblies, and quicker valve response).

At Miniature Pneumatic Group we strive to develop and maintain strong relationships with each customer through innovation, service, and continuous process improvement. We look forward to the challenges of today and the new opportunities of tomorrow.

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Engineering and Product Development

Miniature Pneumatic Group is currently expanding its Engineering department to meet our customers' demands. All project engineers are equipped with the latest in cutting edge technology to ensure customers' expectations are continually being met during new product development. CAD is rendered on Pro/ ENGINEER 3-D software running on Windows NT workstations. We have full access to internet file transfers and rapid prototyping. In addition, our fully automated, state of the art testing capabilities allow for full documentation and statistical data analysis for our customers. The crucial parameters for testing are monitored and maintained utilizing Lab-View, a software package designed by National Instruments.



Engineered Assemblies

Miniature Pneumatic Group's engineers have once again answered the challenge by instituting value-added services for all valve products. With today's market demands for special valve performances, engineered custom manifolds, serial interfacing, and custom wire harness assemblies, Miniature Pneumatic Group continually focuses on making valve design and implementation easier for the customer. Combining the proven long life and repeatability of our standard valve lines, with application specific performance requirements or assemblies, our engineers can help improve the customers' product and often lower cost associated with their applications.



Manufacturing / Customer Service

At Miniature Pneumatic Group we view customer service as more than just being able to provide a quality product to meet the singular customer's application. The service / support of our relationship with our customer begins with the initial contact and evolves throughout the years by exceeding their expectations.

This is accomplished by the Sales department determining the customer's needs and being able to understand the complexity of each application. These needs for product, delivery and documentation are then effectively communicated throughout our organization to transition towards manufacturing; where a product can be produced meeting ISO 9001 standards and shipped to the customer in a timely manner.

Our commitment towards Total Product Management allows for one on one engineering, innovative design & cost-effective products for our customers. This unique approach encourages close customer / supplier interaction, thus reducing the lead-times associated with the process of taking concept ideas to production realities.

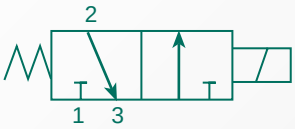




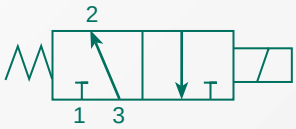
"RB" Series Miniature Valve

- Tested in excess of 500 Million cycles
- Maximum leakage rate: 0.016 SCCM (Bubble Tight)
- Temperature range: -10˚ F to 150˚ F (-23˚ C to 66˚ C)
- Class "A" Insulated coils
- All valves 100% factory tested
- #26 AWG Teflon insulated lead wires
- Circuit board mountable
- Built in barbed fittings
- 10 m (Micron) filtration recommended
- Response time < .010 Seconds
- All valves rated to 28" Hg. Vac
- Oxygen Clean available
- Recommended for use with dry air, lubricated air, vacuum, non-corrosive, non-toxic, non-flammable dry gases.
- Consult factory for other service applications.

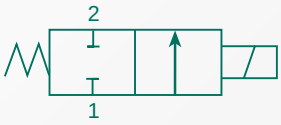
3-way Normally Closed



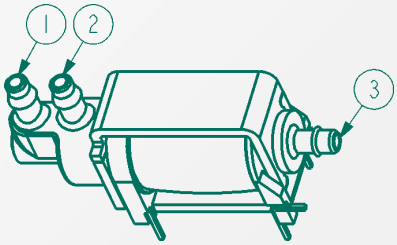
3-way Normally Open



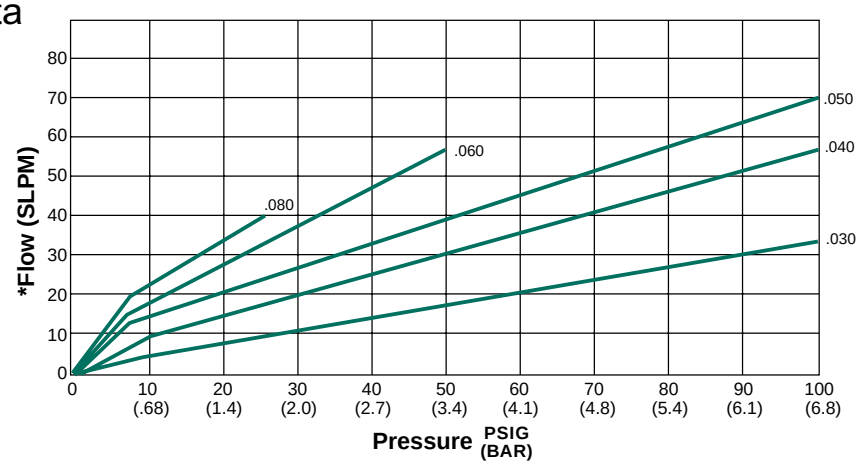
2-way Normally Closed



Valve Porting



Technical Data



.080 orifices are not available in .080 barbed body styles.
*FLOW: (SLPM) Standard liters per minute Port 1-2 (normally closed)
Note: Flow test are based on average readings and nominal components. All outlets are vented to atmosphere. Results may vary.

Valve Series	Wattage	Orifice	CV	Maximum Pressure Brass	Maximum Pressure Plastic
RB	0.5 Watt	0.030 (0.75)	0.025	50 psi (3.4)	15 psi (1.0)
RB	0.5 Watt	0.050 (1.25)	0.055	25 psi (1.7)	10 psi (0.68)
RB	1.0 Watt	0.030 (0.75)	0.025	100 psi (6.8)	50 psi (3.4)
RB	1.0 Watt	0.040 (1.0)	0.035	50 psi (3.4)	50 psi (3.4)
RB	1.0 Watt	0.050 (1.25)	0.055	50 psi (3.4)	35 psi (2.4)
RB	2.0 Watt	0.030 (0.75)	0.025	100 psi (6.8)	100 psi (6.8)
RB	2.0 Watt	0.040 (1.0)	0.035	100 psi (6.8)	70 psi (4.8)
RB	2.0 Watt	0.050 (1.25)	0.055	100 psi (6.8)	70 psi (4.8)
RB	2.0 Watt	0.060 (1.5)	0.06	50 psi (3.4)	50 psi (3.4)
RB	2.0 Watt	0.080 (2.0)	0.08	25 psi (1.7)	25 psi (1.7)

For other pressure ranges and orifice sizes please contact factory
Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

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How to Order "RB" Series Valves

R H R 2 0 6 H 3 0 B

Series
R = "RB" Series

Power
L = .5 Watt
M = 1 Watt
H = 2 Watt

Body Style
M = 10-32 Brass Manifold Mount
L = Brass Line Mount
R = Rotatable .125 Barb
S = .080 Barb
B = .125 Barb
F = Face Seal Mount

Configuration
2 = 2 Way
3 = 3 Way

Port No. 3 Connection
0 = 2 Way Only
S = .080 Barb (3 Way Only)
B = .125 Barb (3 Way Only)
F = 10-32 Female (3 Way Only)

Seal Material
B = Buna (Std.)
V = Viton
O = Oxygen Cleaned (Viton)

Port No. 3
0 = 2 Way Only
4 = .040 (1.0)
5 = .050 (1.25)

Port No. 1
3 = .030 (.75)
4 = .040 (1.0)
5 = .050 (1.25) Brass Body only
6 = .060 (1.5)
8 = .080 (2.0)

Electrical Connection
H = Hard Wire (12"/26 AWG)
P = PCB Pins
(Printed Circuit Board)

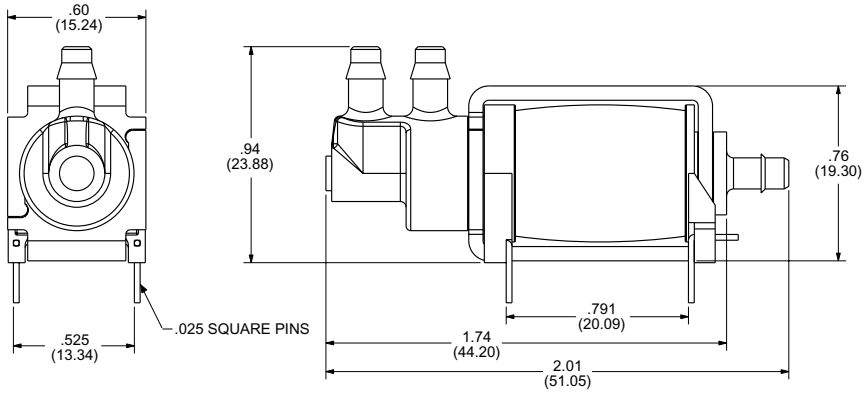
Voltage
4 = 5 VDC
6 = 12 VDC
7 = 24 VDC

Consult chart (page 4) for allowable combinations of wattage, orifice sizes, and pressure range

Dimensions

Body Ported RB Valve Dimensions





Option R

Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

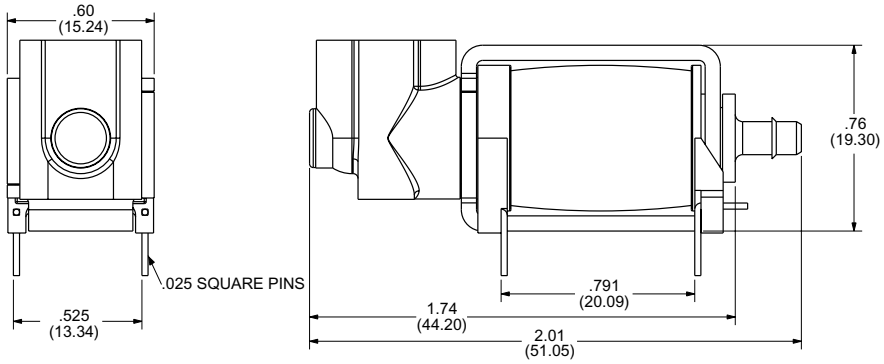
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Dimensions

Face Seal RB Valve Dimensions

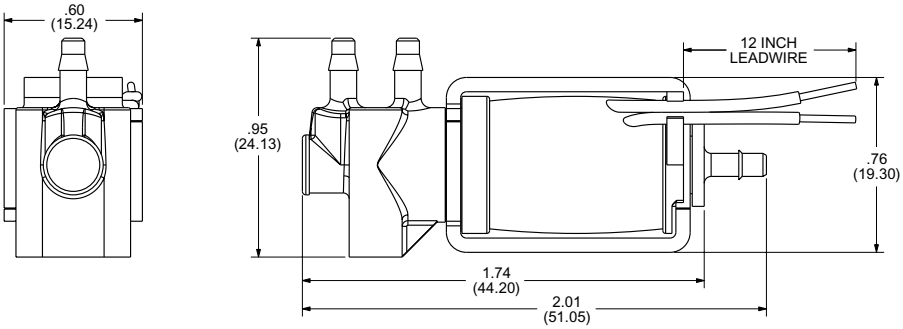




Option F

Body Ported RB with Mounting Holes

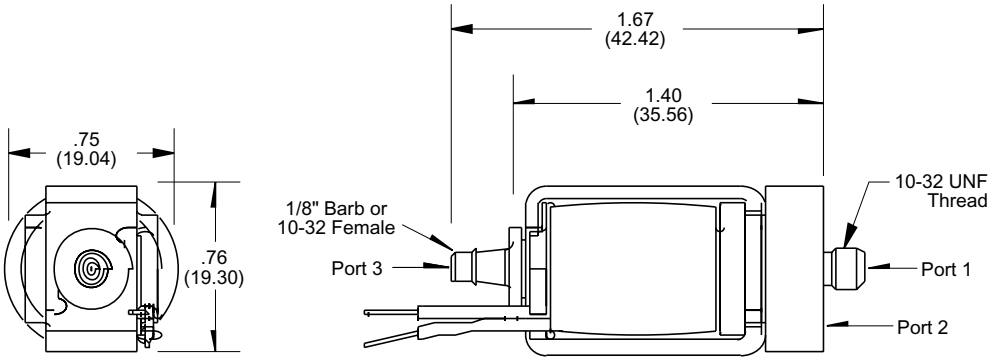




Option S, B

RB Manifold Mount Valve





Option M

Manifold Dimensions / Part Numbers (Manifold Mount)
See "S" Series Section

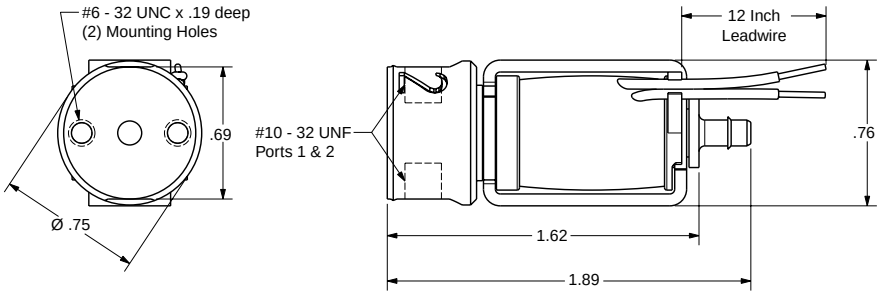
Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

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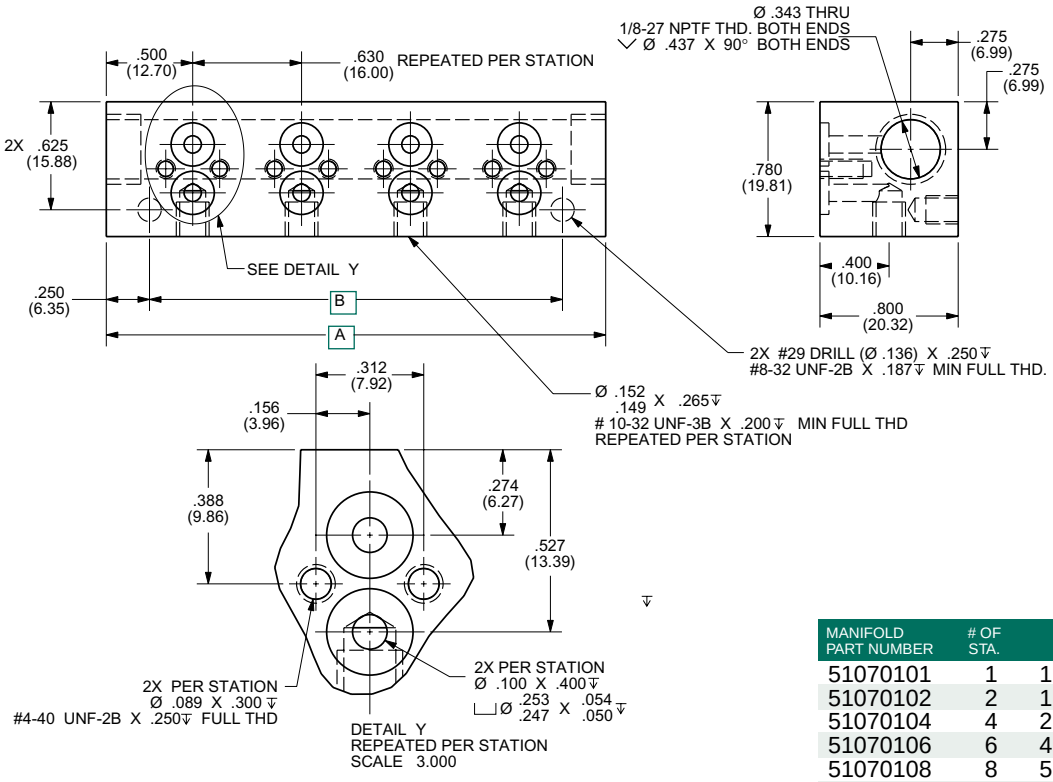
RB Inline Mount Valve





Option L

Manifold Dimensions/Part Numbers (Face Seal Mount)



MANIFOLD PART NUMBER	# OF STA.	A		B	
51070101	1	1.000	(25.40)	.500	(12.70)
51070102	2	1.630	(41.40)	1.130	(28.70)
51070104	4	2.890	(73.41)	2.390	(60.71)
51070106	6	4.150	(105.41)	3.650	(92.71)
51070108	8	5.410	(137.41)	4.910	(124.71)
51070110	10	6.670	(169.42)	6.170	(156.72)
51070112	12	7.930	(201.42)	7.430	(188.72)

Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

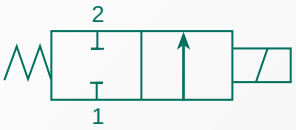
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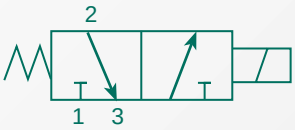
"S" Series Miniature Stainless Steel Valve

- Tested in excess of 500 Million cycles
- Maximum leakage rate: 0.016 SCCM (Bubble Tight)
- Temperature range: -10˚ F to 150˚ F (-23˚ C to 66˚ C)
- Class "A" Insulated coils
- All valves 100% factory tested
- #20 AWG & #24 AWG Teflon insulated lead wires
- Tin plated brass .110 x .020 Fast-on terminals
- 10 m (Micron) filtration recommended
- Response time < .010 Seconds
- All valves rated to 28" Hg. Vac
- Oxygen Clean available
- Recommended for use with dry air, lubricated air, vacuum, non-corrosive, non-toxic, non-flammable dry gases.
- Consult factory for other service applications.

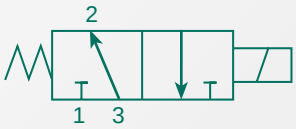
2-way Normally Closed



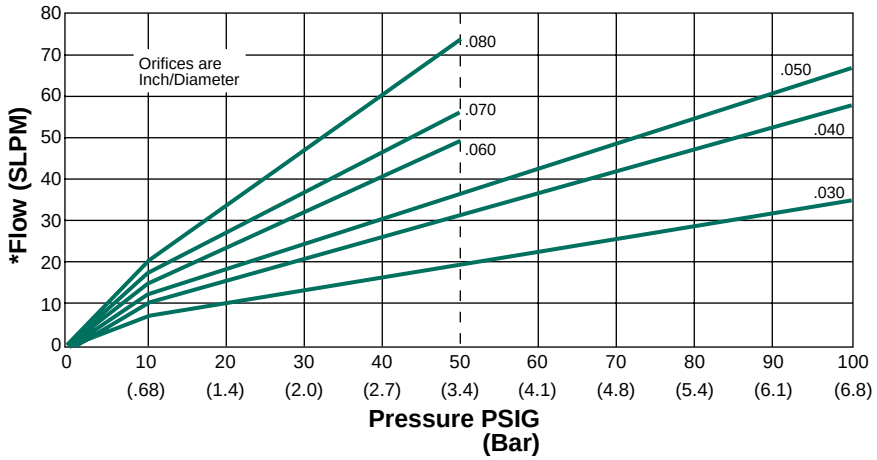
3-way Normally Closed



3-way Normally Open



Technical Data



*Flow (SLPM) Standard liters per minute port 1–>2. (Normally closed)
NOTE: Flow tests are based on average readings and nominal components.
All Outlets are vented to atmosphere. Results may vary.

Valve Series	Wattage	Orifice	Cv	Maximum Pressure N.C.	N.O.
LS	.65 watt	.030 (.75)	.025	100 PSI (6.8)	50 PSI (3.4)
HS	1.5 watt	.030 (.75)	.025	100 PSI (6.8)	100 PSI (6.8)
	1.5 watt	.040 (1.0)	.035	100 PSI (6.8)	50 PSI (3.4)
	1.5 watt	.050 (1.25)	.055	100 PSI (6.8)	50 PSI (3.4)
	1.5 watt	.060 (1.5)	.065	50 PSI (3.4)	50 PSI (3.4)
	1.5 watt	.070 (1.8)	.075	50 PSI (3.4)	50 PSI (3.4)
	1.5 watt	.080 (2.0)	.100	50 PSI (3.4)	50 PSI (3.4)

Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

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How to Order "S" Series Valves

H S 0 3 M 7 H 0 0 B

Power
H = High Power Coil 1.5 W
L = Low Power Coil 0.65 W

Service
S = Standard valve
O - Oxygen Cleaned

Port Threads
O = Standard I0-32 Stud
M = Metric M5 Stud
N = 1/8" NPT (mounting option "C")

Configuration
2 = 2 Way Valve
3 = 3 Way Valve

Mounting
L = Line Mounted
M = Manifold Mounted (10-32 stud only)
C = Cylinder Mounted (10-32 , .030 orifice only)

Voltages
1 = 120 VAC 50/60 Hz
2 = 230 VAC 50/60 Hz
3 = 24 VAC 50/60 Hz
(Rectified Only)
4 = 5 VDC
5 = 6 VDC
6 = 12 VDC
7 = 24 VDC

Seal Material
B = Buna-N (Std.)
V = Viton
E = EPR
N = Neoprene

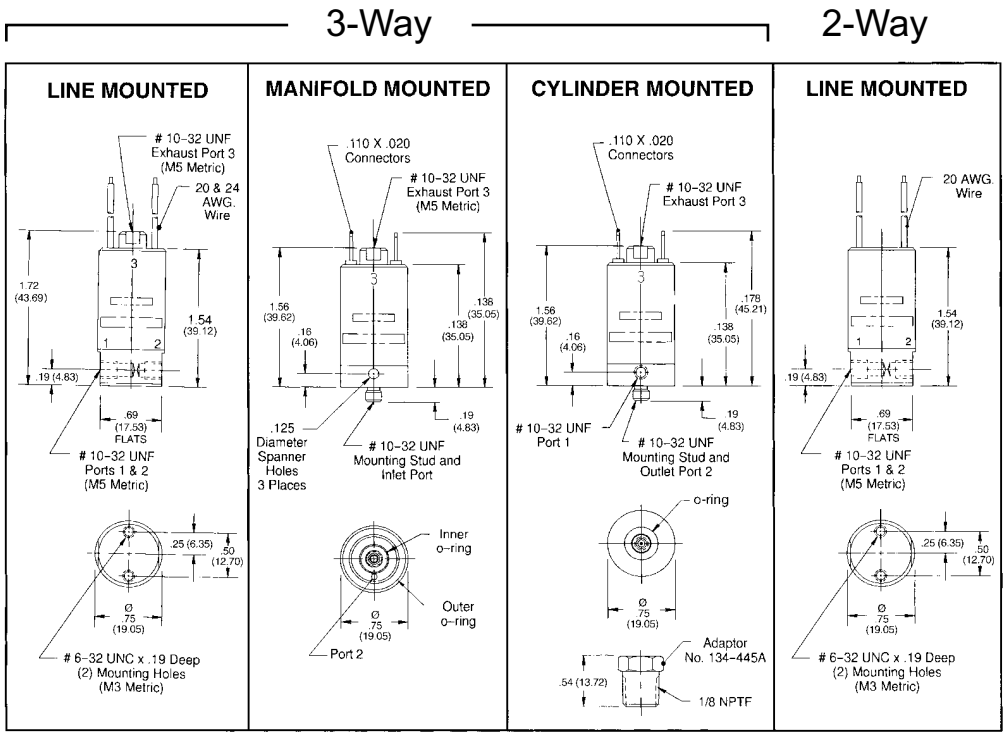
Port No. 3
0 = 0.40 (1.0) STD
1 = 0.50 (1.25)

Port No. 1
0 = .030 (.75) STD
1 = .040 (1.0)
2 = .050 (1.25)
3 = .060 (1.5)
4 = .070 (1.8)
5 = .080 (2.0)

Connectors
H = Hardwire (12"/ 20 AWG)
F = .110 Faston
S = Hardwire (12" / 24 AWG).

Consult chart (page 8) for allowable combinations of wattage orifice size, and pressure range

Dimensions



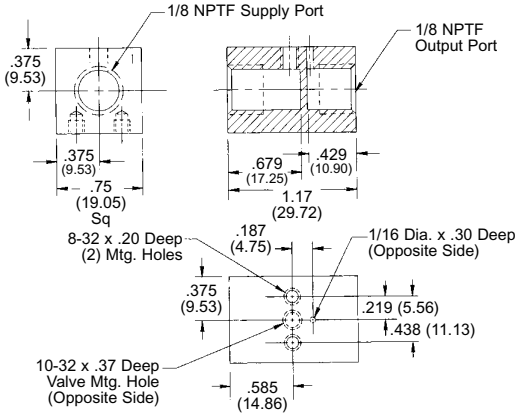
Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

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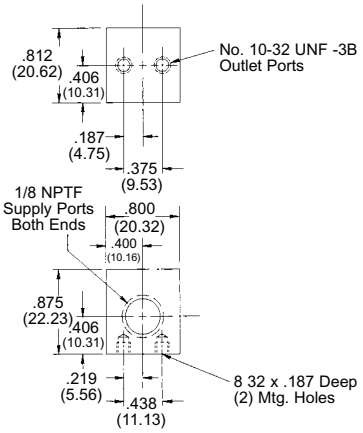
Manifold Dimensions/Part Numbers (Manifold Mount)

106-423	1	1.175	N/A
106-410	2	.812	N/A
106-411	4	1.593	N/A
106-422	6	2.375 (60.33)	.845 (21.46)
106-412	8	3.156 (80.16)	1.625 (41.28)
106-413	10	3.937 (99.99)	2.406 (61.11)
106-414	12	4.718 (119.84)	3.187 (80.95)

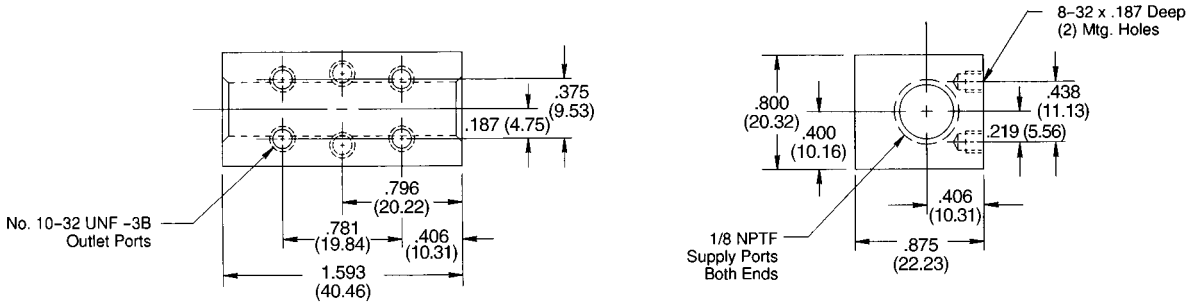
SINGLE STATION MANIFOLD
No. 106-423



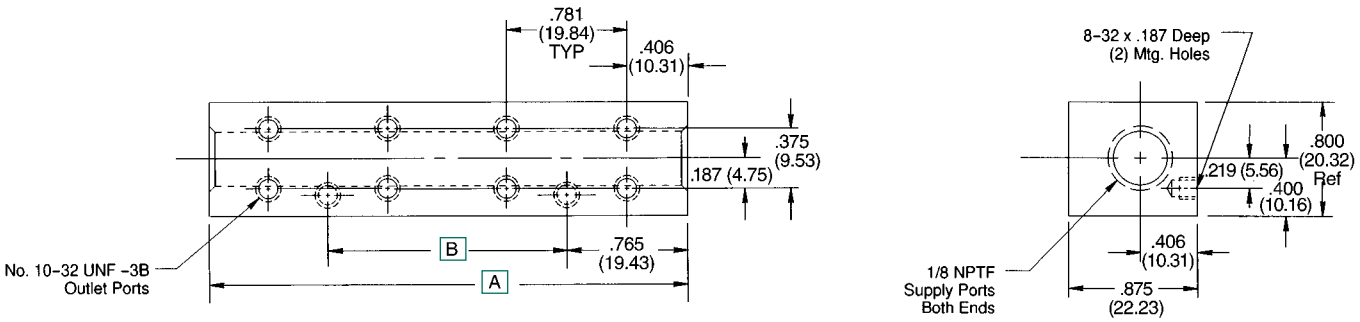
2-STATION MANIFOLD
No. 106-410



4-STATION MANIFOLD No. 106-411



MULTI-STATION MANIFOLD

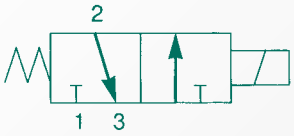


Numbers in parentheses ( ) equivalent to Millimeters or BAR where applicable.

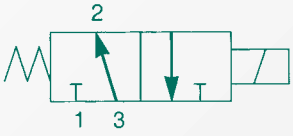
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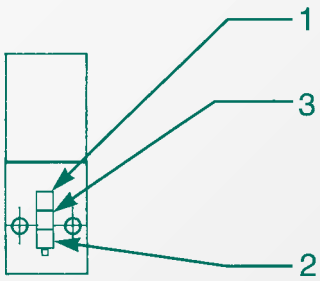
3-way Normally Closed



3-way Normally Open



Valve Porting



"TM" Ten Millimeter Miniature Valve

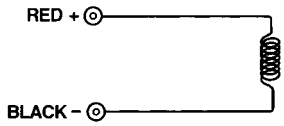
- Tested in excess of 200 Million cycles
- Maximum leakage rate: 0.016 SCCM (Bubble Tight)
- Epoxy Impregnated, Nylon Encapsulated Class "F" continuous duty (ED 100%)
- All valves 100% factory tested
- Circuit board mountable
- All valves rated to 28" Hg. Vac
- Oxygen Clean available
- Female locking connector or hardwire leads available

Technical Data

Low Capacity:	
Standard	Cv 0.0100
Quick Exhaust	Cv 0.0137
Operating Pressure:	Vacuum to 100 PSIG (6.9 Bar)
Operating Temperature:	23° F to 120° F (-5° C to 50° C)
Fluid Temperature:	32° F to 120° F (0° C to 50° C)
Voltage:	12 and 24 VDC
Power:	1.2 Watt (1.35-Watt w/LED)
Response Time:	< .010 Seconds
Filtration:	10 m (Micron) recommended
Wire Gauge:	#24 AWG Teflon Insulated lead wires
Seal Material:	Viton
Service:	Recommended for use with dry air, lubricated air, vacuum, non-corrosive, non-toxic, non-flammable dry gases.
	Consult factory for other service applications.

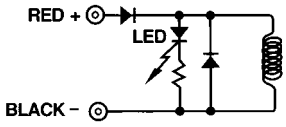
Electrical Circuit Layout

Hardwire Circuit Board Mountable Coils



12 & 24 VDC

"up" & "out" Coils



12 & 24 VDC

For additional information please contact our sales office or visit www.numatics.com
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How to Order "TM" Series Valves

TM 101 V 12 C 2

Series
TM = "TM" Series (10mm)

Configuration
101 = Normally Closed
102 = Quick Exhaust N.C.
121 = Normally Open

Seal Material
V = Viton (Std.)

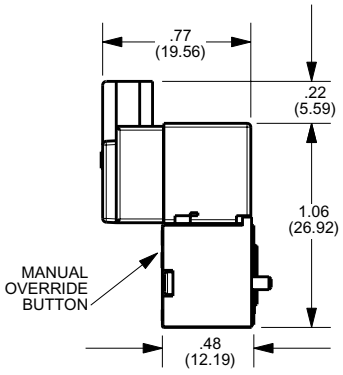
Voltage
12 = 12 VDC
24 = 24 VDC

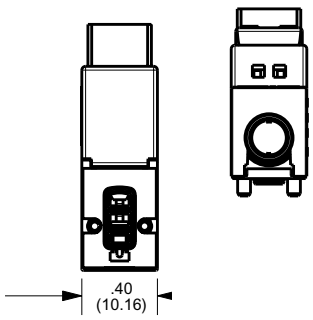
Power
C = 1.2 Watts
(1.35 Watts w/ LED)

Coil and Connection Type
1 = Hard Wire w/ 12" Lead
2 = "UP" Connector w/ Diode and LED
3 = "OUT" Connector w/ Diode and LED
4 = Circuit Board Mountable

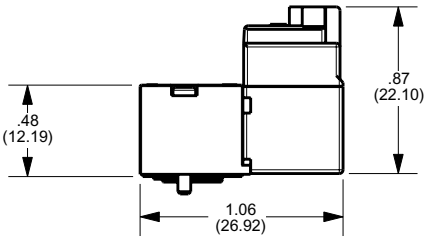
Dimensions

Straight/Out Coil with Normally Closed Valve

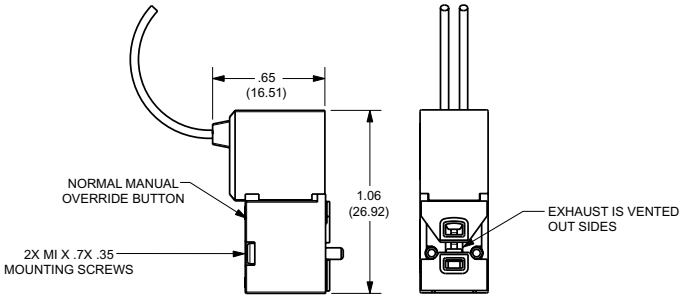




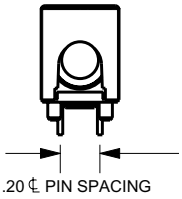
Right Angle/Up Coil

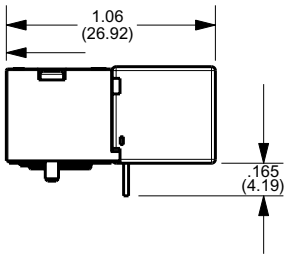


Hardwire Coil with Quick Exhaust Valve



Circuit Board Mountable Coil

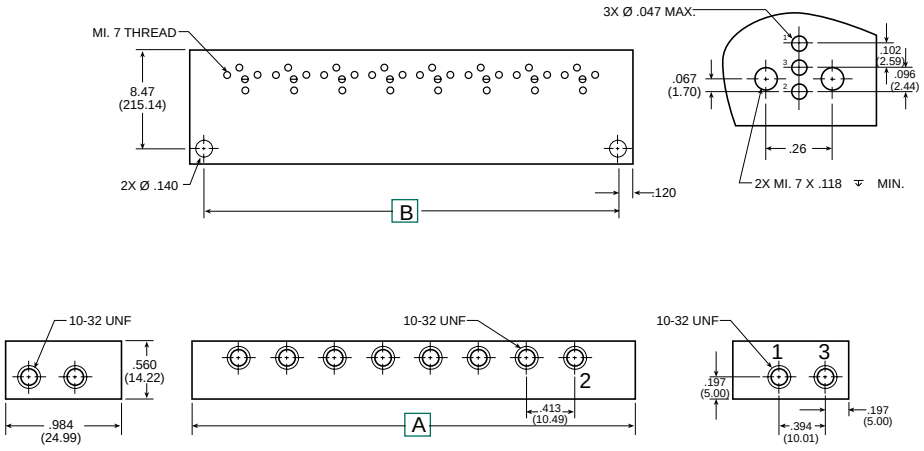




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Manifold Dimensions/Part Numbers



Manifold Sub Base Overall Dimensions

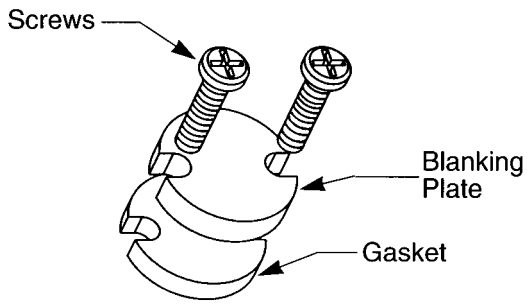
51030101	1	.91 (23.11)	.67 (17.02)
51030102	2	1.32 (33.53)	1.08 (27.43)
51030104	4	2.15 (54.61)	1.91 (48.51)
51030106	6	2.97 (75.44)	2.74 (69.60)
51030108	8	2.97 (75.44)	2.74 (69.60)
51030110	10	4.63 (117.60)	4.39 (111.51)
51030112	12	5.45 (138.43)	5.22 (132.59)

Numatics Miniature Pneumatic Group will assemble valves on manifolds upon request. To specify, add ASM to the end of the manifold part number. Valves are specified separately.

For example: A 4 station assembly

Part#	Qty
51030104ASM	1
TM101N12C1	4

Blanking Station



*Part Number 31030005

Mating Connector Assembly for "out" and "up" coils.

TM10- XX

Part #	Wire Length
TM10- 12	12" (300mm)
TM10- 24	24" (600mm)
TM10- 40	40" (1000mm)

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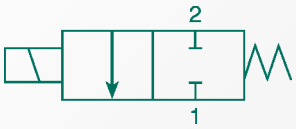


"TR" Series Miniature Valve

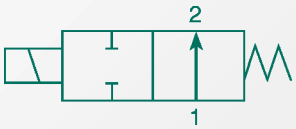
- Tested in excess of 20 Million cycles
- Maximum leakage rate: 0.016 SCCM (Bubble Tight)
- Single station or custom manifold mounting available
- Mounting:

  Normally Closed: Manifold mount
  Normally Open: Cartridge mount
- All valves 100% factory tested
- Low power consumption
- Oxygen Clean available
- Hardwire leads

2-way Normally Closed



2-way Normally Open



Technical Data

Flow Capacity: CV @ M.O.P.D. (Bar)		
Operating Pressure:	N.O.; .028 Cv @ 6 PSIG (.41 Bar)	
	N.C.; .016 Cv @ 20 PSIG (1.38 Bar)	
	N.C.; .008 Cv @ 50 PSIG (3.45 Bar)	
Operating temperature:	23° F to 120° F (-5° C to 50° C)	
Fluid Temperature:	32˚ F to 120˚ F (0˚ C to 50˚ C)	
Voltage:	Normally Closed	3 VDC
	Normally Open	6 VDC
Power:	Normally Closed	0.5 Watt
	Normally Open	1 Watt
Response Time:	< .010 Seconds	
Filtration:	10 m (Micron) recommended	
Wire Gauge:	#24 AWG Teflon Insulated lead wires	
Seal Material:	Viton	
Service:	Recommended for use with dry air, lubricated air, vacuum, non-corrosive, non-toxic, non-flammable dry gases.	
	Consult factory for other service applications.	

How to Order "TR" Series Valves

TR 2 1 M 2 V B 3 1

Series
"TR" Series

Function
2-way

Configuration
1 - Normally Closed
2 - Normally Open

Porting
M = Manifold Mounted
C = Cartridge Mounted
(Normally Open only)

Body Orifice
2 = 0.021" @ 50 PSI
3 = 0.030" @ 50 PSI
4 = 0.040" @ 6 PSI (Normally Open Only)

Seal Material
V = Viton/EP

Body Material
B = Brass (Normally Closed)
C = Cartridge (Normally Open)

Voltage
3 = 3 VDC (Normally Closed)
6 = 6 VDC (Normally Open)

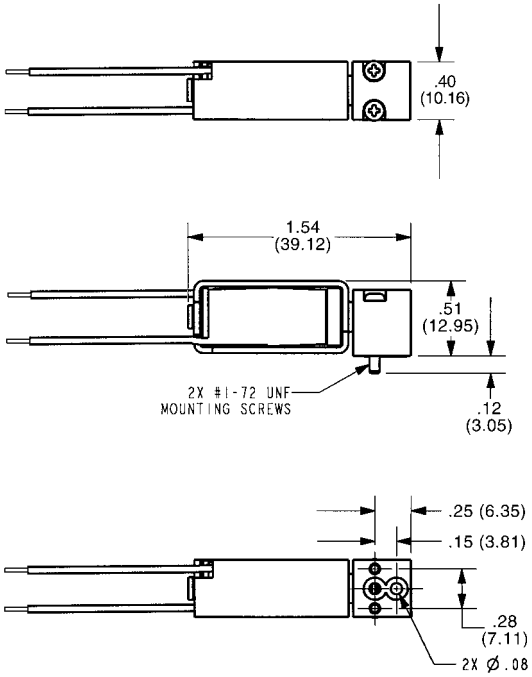
Electrical Connection
1 = Wire Leads

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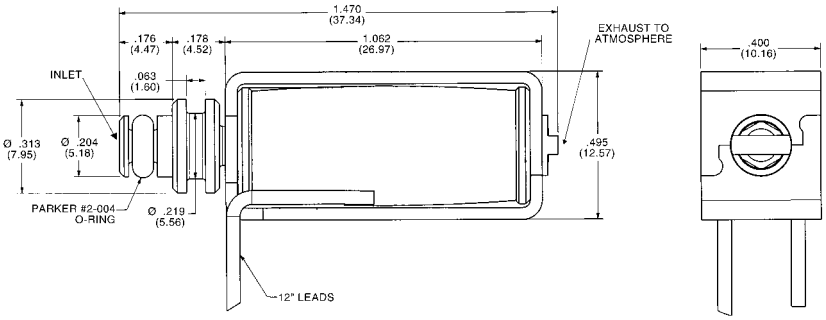


Dimensions

Normally Closed 2 Way



Normally Open 2 Way

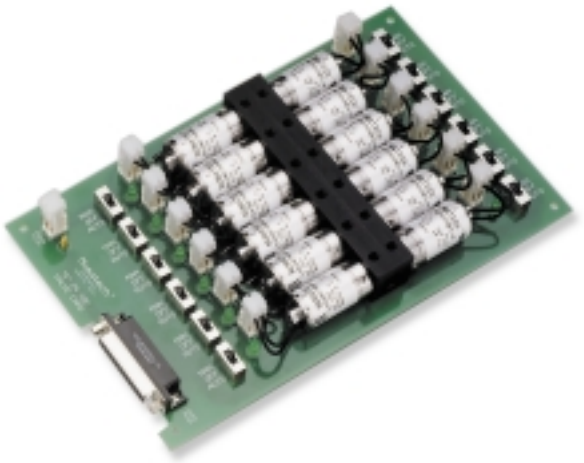


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Circuit Boards - “S” Series Standard

- All stainless steel construction
- High Flow - Cv 0.03 - double the flow of similar valves
- Wide pressure ranges 28" Hg. Vacuum - 100 PSIG
- Unmatched Repeatability
- Multi-fluid compatibility
- Low power draw 0.65 W D.C.
- Cool running
- Fast response time - 5ms
- Durable, Effective, Reliable



Model Selection Chart

12 VDC

01191 = 12 Station Card

01191- XX

Part #	# Stations
01191- 01	01
01191- 11	11

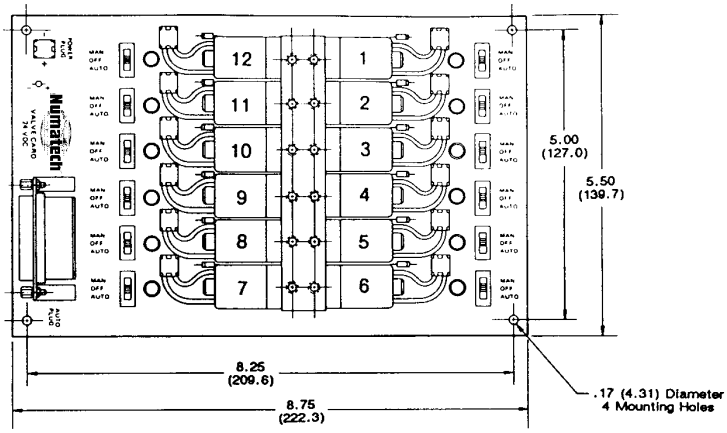
24 VDC

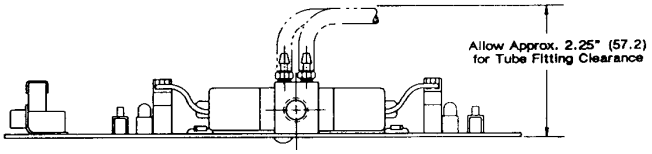
01195 = 12 Station Card

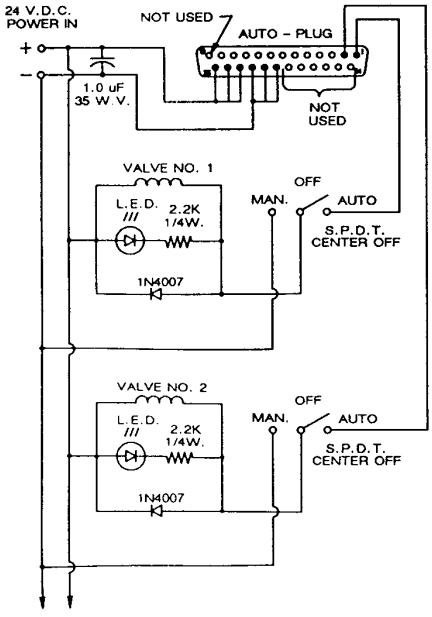
01195- XX

Part #	# Stations
01195- 01	01
01195- 11	11

*Standard “S” Valve cards utilize LS03MXH00B with electrical connector.





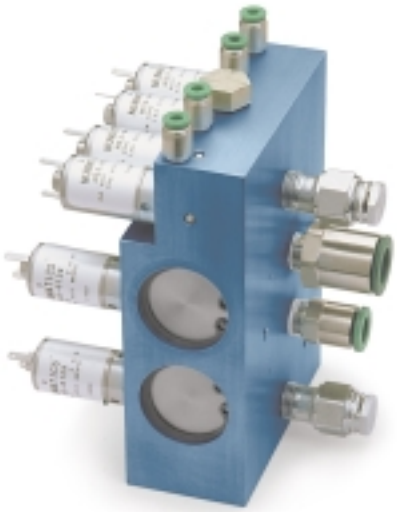


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Specialize in “Value Added” and Custom Built Assemblies

Numatics MPG continues to be “Everywhere you need us to be” when it comes to OEM custom and “Value Added” assemblies. Our commitment towards total product management allows for one on one engineering, innovative design and cost-effective manufacturable products to be provided to our customers. This unique approach encourages close customer/supplier interaction, dramatically reducing the lead-times associated with the process of taking concepts to production.



“We’re everywhere you need us to be”

- Custom Engineering of manifold assemblies
- Serial interfacing
- Custom wire harness assemblies
- Rapid prototype turnaround
- State of the art testing capabilities
- Pioneered in the area of specifically designed plastic valve components
- Special valve performance capabilities
- Application specific valve designs
- Custom labeling
- Custom Circuit boards









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Barb Fittings

Miniature Pneumatic Group is pleased to introduce a complete line of barbed fittings. Included in this line of fittings are today's most popular types, styles, and sizes. Available in brass, nickel-plated brass, and plastic, these fittings provide a perfect compliment to Miniature Pneumatic Group's complete line of Acrylic and Aluminum manifolds.

All brass 10-32 barbed fittings come with an O-ring seal. Consult factory for nickel-plated brass fittings sizes and availability.



Barb Connectors

.078	10-32	Brass	BC0781032B
.078	10-32	Stainless steel	BC0781032SS
.125	10-32	Plastic	BC1251032P
.125	10-32	Brass	BC1251032B

Male to Barb Connectors

.078	1/8" NPT	Brass	MB078125B
.078	1/4" NPT	Brass	MB078250B
.125	1/8" NPT	Brass	MB125125B
.125	1/4" NPT	Brass	MB125250B
.125	1/8" NPT	Plastic	MB125125P
.125	1/4" NPT	Plastic	MB125250P

Barbed Elbows

.078	10-32	Brass	BE0781032B
.078	1/8" NPT	Brass	BE078125B
.078	1/4" NPT	Brass	BE078250B
.125	10-32	Brass	BE1251032B
.125	1/8" NPT	Brass	BE125125B
.125	1/4" NPT	Brass	BE125250B
.125	10-32	Plastic	BE1251032P
.125	1/8" NPT	Plastic	BE125125P
.125	1/4" NPT	Plastic	BE125250P

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Two Barbed Union

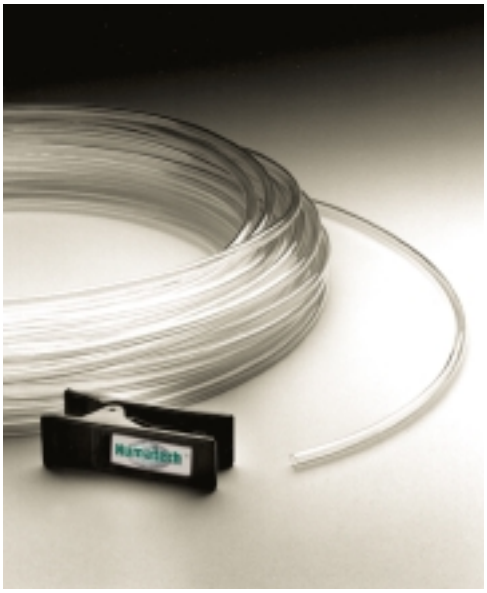
.078	.078	Plastic	BU078078P
.078	.078	Brass	BU078078B
.125	.125	Plastic	BU125125P
.125	.125	Brass	BU125125B

Tee Barbed Connectors

.078 X .078	10-32	Brass	BT0780781032B
.078 X .078	1/8" NPT	Brass	BT078078125B
.125 X .125	10-32	Brass	BT1251251032B
.125 X .125	1/8" NPT	Brass	BT125125125B
.125 X .125	1/4" NPT	Brass	BT125125250B
.125 X .125	10-32	Plastic	BT1251251032P
.125 X .125	1/8" NPT	Plastic	BT125125125P

Tubing (Polyurethane)

.078	.156	100'	PT078156
.078	.125	100'	PT078125



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Miniature Pneumatic Group has also introduced a line of miniature components to further assist our customers application needs. These components include:

- Miniature Regulators
- Miniature Particulate Filters
- Miniature Coalescing Filters
- Miniature Gauges

These components combined with a full line of valves and accessories offers the latest solutions to the medical, instrumentation, semiconductor, and industrial equipment markets - consult factory for sizes and pricing.

Miniature Regulator

- Modern Styling and convenience
- Tamper resistant and preset model available
- Time tested pressure control mechanism
- Traditional style
- For neat, orderly control panels
- Durable, efficient reliable regulators
- Trim fingertip control knob
- Gauge ports and plugs provided
- Many pressure ranges available



Consult factory for sizes and pricing

Miniature Filter

- Prolongs pneumatic machinery and valve life
- Variety of filtration media available
- Variety of filtration media available 3, 5, & 20µ (Std)
- Polycarbonate and metal bowls available
- Optional bowl guards available
- Manual and impulse drain styles available
- Modern styling and convenience
- Durable, effective reliable filters



Consult factory for sizes and pricing

Gauges



Consult factory for sizes and pricing

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1	1×10^{2}	3.937 x 10	3.281
1×10^{-2}	1	3.937×10^{-1}	3.281×10^{-2}
2.54×10^{-2}	2.540	1	8.333×10^{-2}
3.048×10^{-1}	3.048 x 10	12	1

1	1×10^{4}	1.550×10^{3}	1.076 x 10
1×10^{-4}	1	1.55×10^{-1}	1.076×10^{-3}
6.45×10^{-4}	6.452	1	6.944×10^{-3}
9.290×10^{-2}	9.290×10^{2}	1.44×10^{2}	1

1	1×10^{6}	6.1023×10^{4}	3.531 x 10
1×10^{-6}	1	6.1023×10^{-2}	3.531×10^{-5}
1.639×10^{-5}	1.639 x 10	1	5.787×10^{-4}
2.832×10^{-2}	2.8320×10^{4}	1.728×10^{3}	1

1	1.000×10^{3}	2.200×10^{2}	2.642×10^{2}
1×10^{-3}	1	2.200×10^{-1}	2.642×10^{-1}
4.546×10^{-3}	4.546	1	1.201
3.785×10^{-3}	3.785	8.327×10^{-1}	1

1	1×10^{-3}	2.20462	9.842×10^{-4}	1.1023×10^{-3}
1×10^{3}	1	2.20462×10^{3}	9.842×10^{-1}	1.1023
4.5359×10^{-1}	4.5359×10^{-4}	1	4.464×10^{-4}	5×10^{-4}
1.01605×10^{3}	1.01605	2.204×10^{3}	1	1.12
9.07185×10^{2}	9.07185×10^{-1}	2.000×10^{3}	8.9286×10^{-1}	1

1	1×10^{-3}	3.613×10^{-5}	6.243×10^{-2}
1.000×10^{3}	1	3.613×10^{-2}	6.243 x 10
2.7680×10^{4}	2.768 x 10	1	1.728×10^{3}
1.602 x 10	1.602×10^{-2}	5.787×10^{-4}	1

1	1×10^{5}	1.01972×10^{-1}	2.248×10^{-1}	
1×10^{-5}	1	1.01972×10^{-6}	2.248×10^{-6}	
9.80665	9.80665×10^{5}	1	2.205	
4.44822	4.44822×10^{5}	4.536×10^{-1}	1	

1	3.6	1.944	3.281	2.237
2.778×10^{-1}	1	5.400×10^{-1}	9.113×10^{-1}	6.214 x 10-1
5.144×10^{-1}	1.852	1	1.688	1.151
3.048×10^{-1}	1.097	5.925×10^{-1}	1	6.818×10^{-1}
4.470×10^{-1}	1.609	8.690×10^{-1}	1.467	1

1×10^{-6}	1	1×10^{-5}	1.0197×10^{-5}	9.869×10^{-6}	1.0197×10^{-4}	7.501×10^{-6}	1.450×10^{-4}
1×10^{-1}	1×10^{5}	1	1.0197	9.869×10^{-1}	1.0197 x 10	7.501×10^{-1}	1.450 x 10
9.80665×10^{-2}	9.80665×10^{4}	9.80665×10^{-1}	1	9.678×10^{-1}	1.0000 x 10	7.356×10^{-1}	1.422 x 10
1.01325×10^{-1}	1.01325×10^{5}	1.01325	1.0332	1	1.033 x 10	7.60×10^{-1}	1.470 x 10
9.80665×10^{-3}	9.80665×10^{3}	9.80665×10^{-2}	1.0000×10^{-1}	9.678×10^{-2}	1	7.355×10^{-2}	1.4222×10^{-1}
1.3332×10^{-1}	1.3332×10^{5}	1.3332	1.3595	1.3158	1.360 x 10	1	1.934 x 10
6.895×10^{-3}	6.895×10^{3}	6.895×10^{-2}	7.031×10^{-2}	6.805×10^{-2}	7.031×10^{-1}	5.171×10^{-2}	1

1	1×10^{3}	6×10^{4}	6 x 10	3.600 x 10^{3}	3.531 x 10
1×10^{-3}	1	6 x 10	6×10^{-2}	3.600	3.531×10^{-2}
1.66666×10^{-5}	1.666×10^{-2}	1	1×10^{-3}	6×10^{-2}	5.9×10^{-4}
1.66666×10^{-2}	1.66666 x 10	1×10^{3}	1	6 x 10	5.885×10^{-1}
2.77777×10^{-4}	2.77777×10^{-1}	1.66666 x 10	1.66666×10^{-2}	1	9.810×10^{-3}
2.832×10^{-2}	2.832 x 10	1.69833×10^{3}	1.69833	1.019×10^{2}	1

Density:

Air =	4.336×10^{-5} lb/in^3 at 70˚F and sea level
Water =	3.613×10^{2} lb/in^3 at 4˚C
Copper =	3.21×10^{-1} lb/in^3
Steel =	2.835×10^{-1} lb/in^3 Nominal
Aluminum =	9.750×10^{-2} lb/in^3 Nominal
Plastic =	5×10^{-2} lb/in^3 Nominal

Formulas:

P = VxI

V = IxR

R = Ohms
V = Volts
I = Amperes
P = Watts

$R_2 = R_1 (1 + 0.002205 (^{\circ}F_2 - {}^{\circ}F_1))$

.002205 = Thermal coefficient of resistivity for copper

$^{\circ}F = 9/5 \times {}^{\circ}C + 32$

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Terms and Conditions of Sale

Terms:
Payment is Net 30 from date of invoice.

Delivery:
2-3 weeks on standard cataloged products and for custom products consult factory. All products will be shipped F.O.B. factory.

Cancellations:
Orders that are canceled by the Distributor and or Customer prior to shipment will be subjected to a minimum 10% restocking charge. Orders for custom products may not be canceled once manufacturing has commenced.

Return Policy, Repairs and Credits

Returned Products:
All products prior to return must be pre-approved by Miniature Pneumatic Group and issued a Return Goods Authorization (RGA) #. Any products returned to Miniature Pneumatic Group without an RGA # will be returned to its place of origin at the returners expense. The RGA # should appear on the outside of the shipping container and all paper work.

Warranty Repairs:
All products returned for repair must be accompanied by a written explanation identifying the problem. Upon completion of Miniature Pneumatic Group's inspection of the problem and it is determined to be a warranty claim, the product will be repaired or replaced and shipped back to the customer in a timely manner.

Non-Warranty Repairs:
All products returned for repair must be accompanied by a written explanation identifying the problem. Upon completion of Miniature Pneumatic Group's inspection of the problem and determined as a non-warranty claim, the distributor/customer will be notified as to the nature of the problem and the cost to repair. Miniature Pneumatic Group will not complete repair until purchase order has been issued.

Credits:
Items returned for credit must be pre-approved by Miniature Pneumatic Group and fall within the specified warranty period.

Restocking Charge:
Any product returned for restocking which has not been removed from their original shipping carton will be assessed with a 25% restocking charge on current net invoice amount.

Any product returned for restocking which has been removed from its original shipping carton and is determined to be in re-salable condition will be assessed with a 30% restocking charge on current net invoice amount.

Any product returned for restocking which is not in re-salable condition will not be accepted.

Any product returned for restocking which is classified as a special will not be accepted.

Shipping:
All products shipped to the factory for repair will be shipped at the Customer's expense and will be returned to the Customer at no charge via Miniature Pneumatic Group's normal shipping method for said product. Shipments to the factory on a freight collect basis will not be accepted. Customers may specify a preferred method of shipment at their expense.

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Standard Warranty For The Miniature Pneumatic Group

The following warranty is in lieu of all warranties, implied or statutory, including but not limited to, any applied warranty of merchantability, application or fitness for a particular purpose and any other warranty obligation on the part of Numatics Inc.

Numatics warrants that its products are free from defects in materials and workmanship for a period of one (1) year from date of shipment to the original purchaser. This warranty does not apply to normal items such as seals and bearing components, etc. This warranty shall be voided and do not apply to any products which have been subject to misuse, misapplication, negligence, accident, modification or tampering, nor (without limiting the foregoing) shall it apply to Numatic's products components used other than in Numatic's products for which the same were designed.

The obligation to Numatics under this warranty is limited to replacement or repair of any defective Numatics part or product determined by our inspection to be a valid warranty claim, or at Numatics option credit for or refund of the purchase price of the product involved. Numatics reserves the right to examine the goods at the buyer's site, or issue shipping instructions for return to Numatics, transportation charges prepaid by buyer.

The warranty set forth above is the only warranty made by Numatics and shall not be enlarged, diminished, or modified by, and no obligation or liability shall arise out of the rendering of technical advise or service by Numatics in connection with the sales of the product.

Numatics reserves the right to make changes in designs and specifications without notice. All technical data and published dimensions are sufficiently accurate for general use. However, Numatics assumes no liability for possible errors and omissions.

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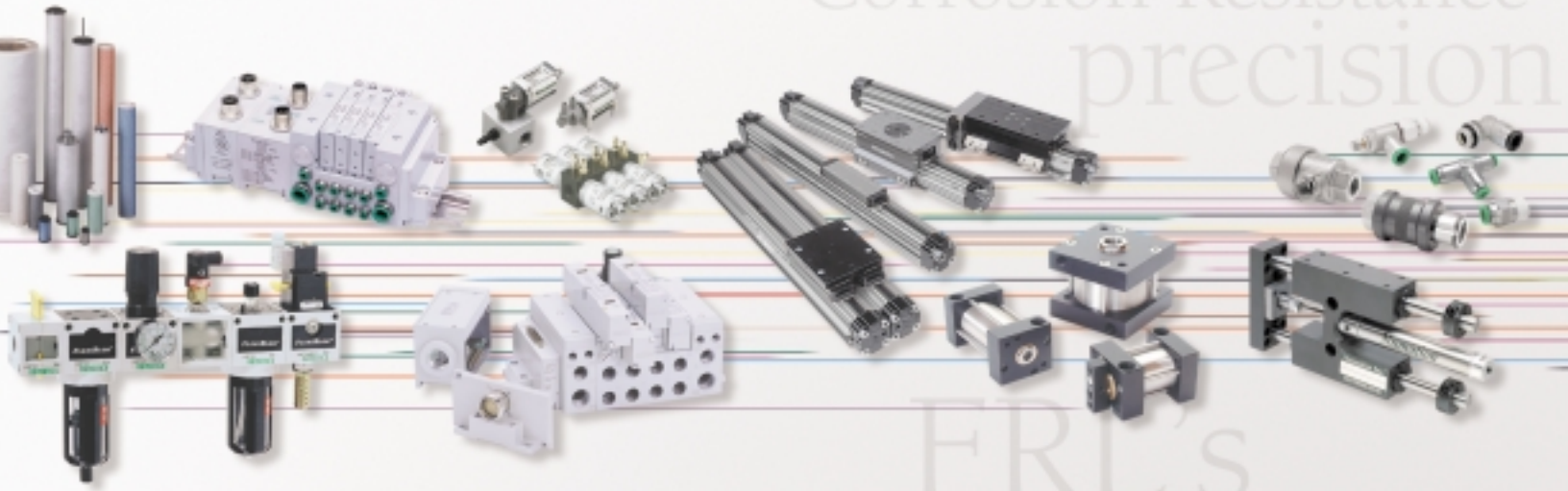
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