Global Pneumatics, Warning, Offer of Sale

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MFP AUTOMATION ENGINEERING

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SCAN ME

⚠ WARNING

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Offer of Sale

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Complementary Products

Section L

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Section L – Complementary Products

Linear Alignment Couplers

- 12 Different Thread Sizes
- Reduce Wear on Cylinder by Reducing Side Load
- Simplifies Cylinder Installation
- 6° of Total Movement

Flow Controls

- **Microlok Flow Controls**
  - Miniature Right Angle Design
  - 2 Choices of Knobs
  - 3 Different Port Sizes
- **Brass Flow Controls**
  - Rugged Brass Construction
  - 3 Different Types of Connections
  - 4 Different Port Sizes
- **Blocking Valves**
  - 4 Different Port Sizes
  - 3 Types of Connections
  - Install Directly into Actuator Ports
  - Inexpensive Way to Obtain Position and Jogging Functions

3TK Air Oil Tanks

- 6 Standard Bore Sizes
- Lightweight Aluminum / Fiberglass Design
- 2 Fluid Flow Baffles Reduce Agitation and Aeration
- 3 Mounting Styles

RL Series – Stand Alone Rod-Lock

- 5 Different Sizes
- Large Holding Forces
- 2 Different Mounting Styles
- R od Material Available

Shock Absorbers

- Self-compensating and Adjustable Versions Available
- Light Duty to Extremely Heavy Duty Range
- PARKERSIZE Industrial Shock Absorber Sizing Program Available Online
- Stocking Program on Select Shock Absorbers for Immediate Delivery

Transition Kits

- Plate Kits – Attach Component to Slide / Guided Cylinder
- Coupler Kits – Attach Component to Rotary Actuator

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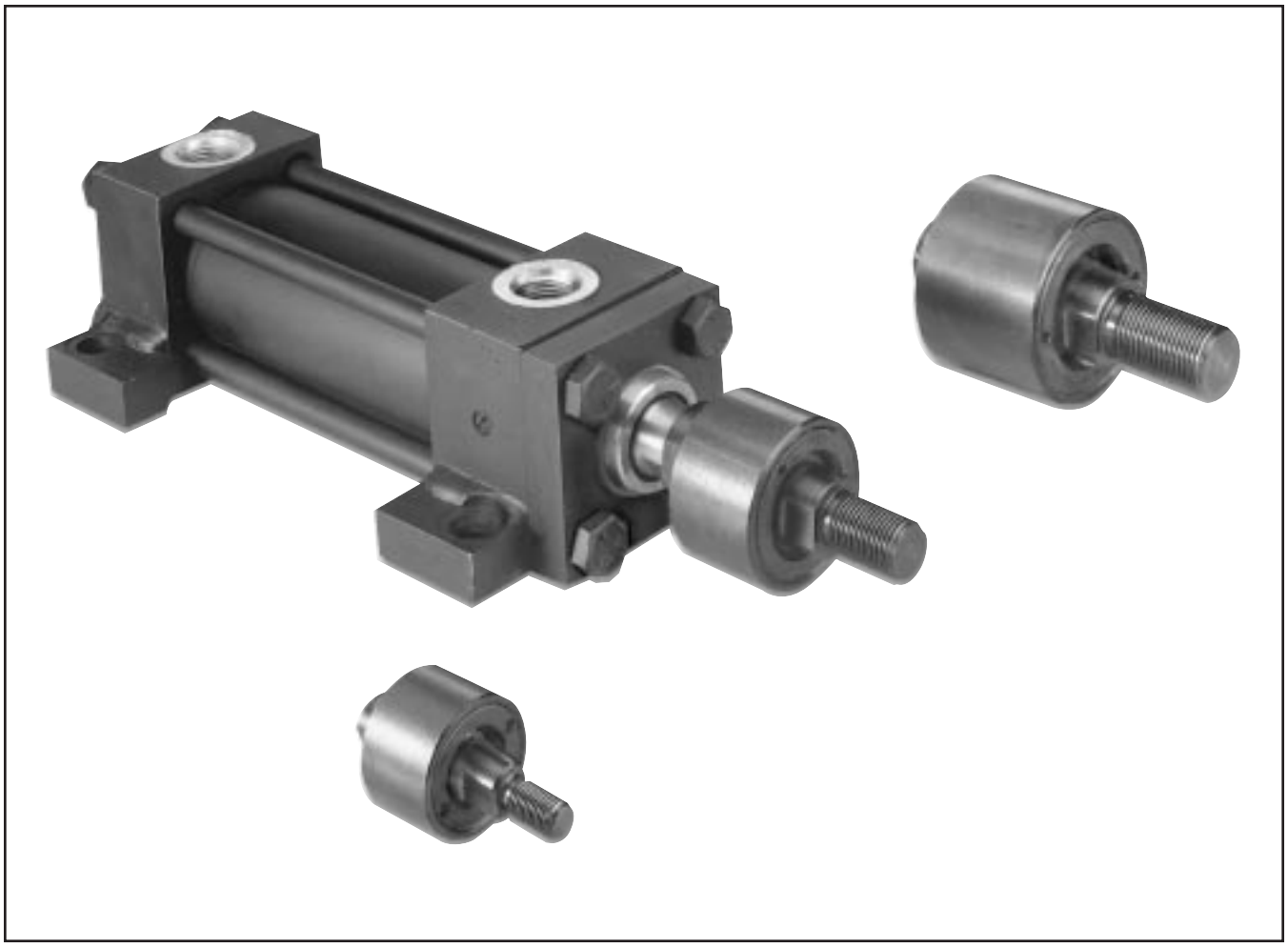
Linear Alignment Couplers



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C085

Linear Alignment Couplers are available in 12 standard thread sizes...

Cost Saving Features and Benefits Include...

- Maximum reliability for trouble-free operation, long life and lower operating costs
- Increased cylinder life by reducing wear on piston and rod bearings
- Simplifying cylinder installation and reducing assembly costs
- Increase rod bearing and rod seal life for lower maintenance costs

Alignment Coupler

See Table 1 for Part Numbers and Dimensions

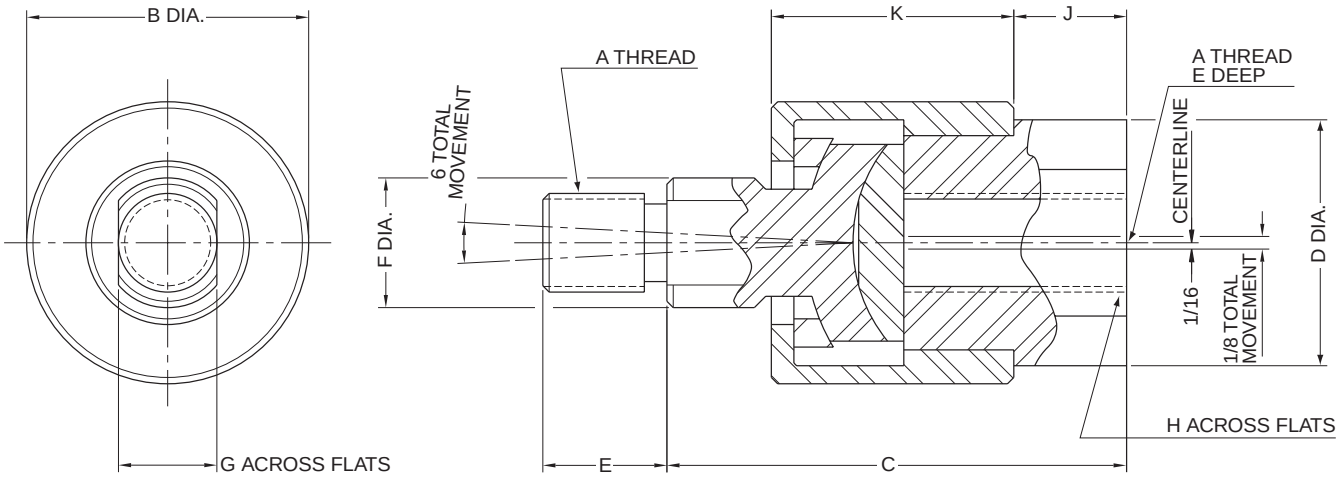

Table 1 — Part Numbers and Dimensions

Part No.	A	B	C	D	E	F	G	H	J	K	Max. Pull Load (lbs.)	Approx. Weight (lbs.)
1347570031	5/16 -24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	1200	0.35
1347570038	3/8 -24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	2425	0.35
1347570044	7/16 -20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	3250	0.55
1347570050	1/2 -20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	4450	0.55
1347570063	5/8 -18	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	6800	0.55
1347570075	3/4 -16	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	1-9/32	9050	1.4
1347570088	7/8 -14	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	1-9/32	14450	1.4
1347570100	1-14	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	19425	4.8
1347570125	1-1/4 -12	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	30500	4.8
1337390125	1-1/4 -12	3-1/2	4	2	2	1-1/2	1-1/4	1-11/16	3/4	2-1/2	30500	6.9
1337390150	1-1/2 -12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	45750	9.8
1337390175	1-3/4 -12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	58350	9.8
1337390188	1-7/8 -12	5	5-5/8	3	3	2-1/4	1-15/16	2-5/8	1-3/8	3-3/8	67550	19.8

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How to Order Linear Alignment Couplers
When ordering a cylinder with a threaded male rod end, specify the coupler of equal thread size by part number as listed in Table 1, i.e.; Piston Rod “KK” or “CC” dimension is 3/4" - 16", specify coupler part number 1347570075.

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Flow Controls

Right Angle Flow Controls and Port Accessories

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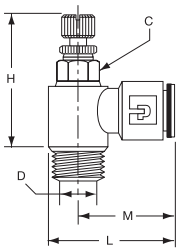
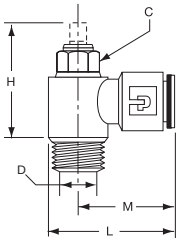
Miniature Exhaust Flow Control

Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876300100	5/32	10-32	6	0.925	1.023	0.846	0.669	0.080
0876300200	5/32	1/8	7	1.000	1.083	0.935	0.708	0.100
0876300300	1/4	10-32	6	0.925	1.023	0.885	0.708	0.080
0876300400	1/4	1/8	7	1.000	1.083	0.957	0.730	0.100
0876300500	1/4	1/4	8	1.083	1.180	1.013	0.748	0.160



Knobless Miniature Exhaust Flow Control

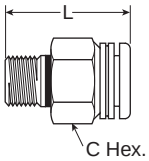
Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876310100	5/32	10-32	6	0.650	0.787	0.846	0.669	0.080
0876310200	1/4	1/8	7	0.708	0.860	0.956	0.730	0.100
0876310300	1/4	1/4	8	0.826	0.964	1.013	0.748	0.160



Global Connect Fittings

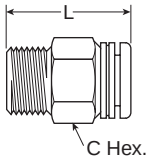
68GC Male Connector

Part No.	Tube Size	Pipe Thread	C Hex.	L
68GC-2-0	1/8	10-32	1/2	0.925
68GC-5/32-0	5/32	10-32	1/2	0.913
68GC-3-0	3/16	10-32	9/16	0.898
68GC-4-0	1/4	10-32	9/16	0.898

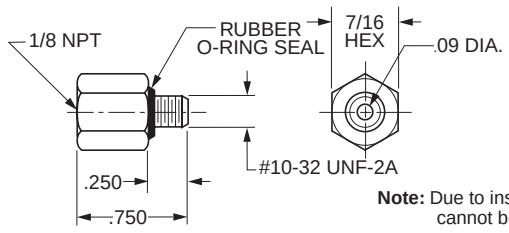


W68GC Male Connector

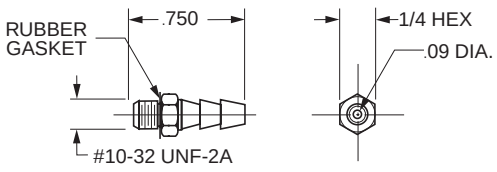
Part No.	Tube Size	Pipe Thread	C Hex.	L
W68GC-2-1	1/8	1/16	1/2	0.945
W68GC-2-2	1/8	1/8	1/2	0.945
W68GC-2-4	1/8	1/4	9/16	1.150
W68GC-5/32-1	5/32	1/16	1/2	0.937
W68GC-5/32-2	5/32	1/8	1/2	0.937
W68GC-5/32-4	5/32	1/4	9/16	1.142
W68GC-3-2	3/16	1/8	9/16	0.980
W68GC-3-4	3/16	1/4	9/16	1.181
W68GC-4-1	1/4	1/16	9/16	1.134
W68GC-4-2	1/4	1/8	9/16	0.980
W68GC-4-4	1/4	1/4	9/16	1.181
W68GC-4-6	1/4	3/8	13/16	1.185



#10-32 to 1/8-27 Port Adapter
P.N. 1442840000



1/4" O.D. Hose Barbed Fittings
P.N. L06998 0000 (Pkg. of 10)



Note: Due to insufficient port depth, port adapter fitting cannot be used for head end ports of 9/16" bore cylinders. Use barbed fitting.

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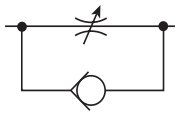
The Right Angle Flow Control is an ideal solution to cylinder speed control where space is at a premium. Costly fittings, connections and piping expenses can be eliminated because the valve can rotate 360°, the piping alignment can be in any direction. It then locks into place. The 1/8" model can be rotated after final assembly.

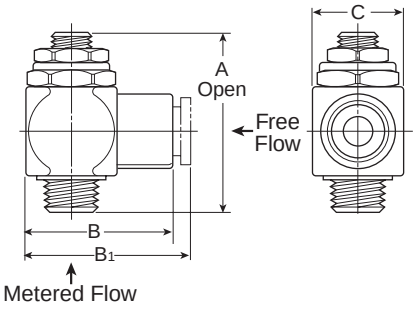
Install by threading male end directly into cylinder port. The free-flow and metered-flow direction is automatically predetermined. Free-flow direction is into cylinder and metered-flow is out of the cylinder. Flow is adjusted with an Allen wrench and locked with nut.

Right Angle Flow Control also available with Prestolok fittings on inlet port to accommodate 5/32 - 3/8 tube sizes. This allows for quick connection and eliminates need for separate tube fitting.

Threaded Inlet

Prestolok Inlet Fitting





Specifications

Body: Brass

Plunger: Brass and Acetal

Seals: Buna N

Temperature Range: 0°F to 140°F (–18°C to 60°C)

Pressure Rating: 125 PSIG (8.6 Bar) max.

Model Selection and Dimensions

Model Number	Male Thread (NPT)	Female Thread (NPT)	A		B		C		Weight		C_V	
Threaded Inlet			Inch	mm	Inch	mm	Inch	mm	oz.	kg	Adjusted Flow	Free Flow
032510125	1/8	1/8	1.74	44	1.18	30	.67	17	2.0	0.9	0.26	0.20
032510250	1/4	1/4	1.99	51	1.40	36	.91	23	4.5	2.0	0.75	0.68
032510375	3/8	3/8	2.28	58	1.71	43	1.06	27	7.0	3.2	0.84	0.72
032510500	1/2	1/2	2.69	68	1.98	53	1.26	32	11.0	5.0	1.64	1.41
With Prestolok Fittings	**Thread (NPT)**	**Tube Size (OD)**	**A**		**B_1**		**C**		**Weight**		**C_V**	
			Inch	**mm**	**Inch**	**mm**	**Inch**	**mm**	**oz.**	**kg**	**Adjusted Flow**	**Free Flow**
032511215	1/8	5/32	1.74	44	1.18	30	.67	17	2.0	0.9	0.19	0.16
032511225	1/8	1/4	1.74	44	1.18	30	.67	17	2.0	0.9	0.28	0.22
032512525	1/4	1/4	1.99	51	1.40	36	.91	23	4.5	2.0	0.51	0.44
032512538	1/4	3/8	1.99	51	1.40	36	.91	23	4.5	2.0	0.62	0.53
032513838	3/8	3/8	2.28	58	1.71	43	1.06	27	7.0	3.2	0.78	0.65

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

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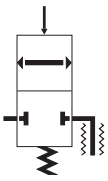
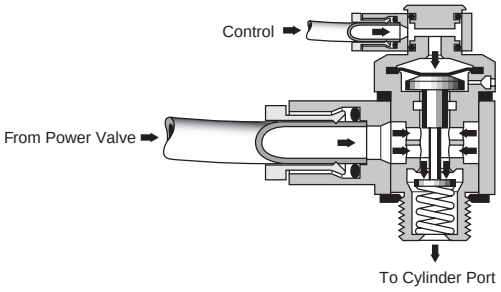
Blocking valves are designed for precise, repeatable stopping of moving cylinders or to maintain the position of a cylinder in the event of an air pilot signal loss. Blockers are used for positioning and jogging purposes.

A blocking valve has a spring loaded poppet which normally prevents flow through the valve in both directions. When an air pilot control signal (see pilot pressure chart below for required pilot signal pressure) is applied to the top of the valve, the poppet opens and allows the valve to flow in both directions like a standard fitting. When the pilot signal is removed, the poppet springs shut and prevents air from entering or leaving cylinder, thus stopping cylinder travel.

Blocking valves are designed to be installed directly into actuator ports (up to 5" bore cylinders).





Specifications

Operating Pressure: 0 to 145 PSI (0 to 10 Bar)

Temperature Range: 5°F to 140°F (-15°C to 60°C)

Maximum Operating Frequency: 10 Hz

Life Expectancy: 10 million cycles @ 90 PSIG, 68°F, dry filtered air and 1 Hz operating frequency

Materials: Zinc alloy body; brass mounting screw and threads

Pilot Pressure (PSI)

Operating Pressure	Cylinder Port Size							
	1/8"		1/4"		3/8"		1/2"	
	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot
30	34	22	34	22	36	21	45	26
60	40	26	40	26	40	25	50	31
90	45	31	45	31	45	30	54	35
115	50	35	50	35	50	34	59	41

Model Selection

With Instant Tube Fittings

Cylinder Port	Tube Size (OD)	Pilot Tube (OD)	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/4"	5/32"	**PWBA3468**	0.78	5.1
1/4"	1/4"	5/32"	**PWBA3469**	1.02	5.3
3/8"	3/8"	5/32"	**PWBA3493**	1.67	6.3
1/2"	1/2"	5/32"	**PWBA3412**	2.12	17.5

With NPT Threaded Connections & Tube Pilot Port

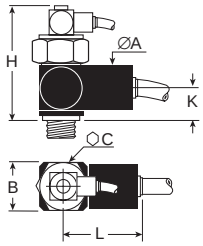
Cylinder Port	Female Port	Pilot Port	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/8"	5/32"*	**PWBA3888**	0.78	6.2
1/4"	1/4"	5/32"*	**PWBA3899**	1.02	6.2
3/8"	3/8"	10-32	**PWBA3833**	1.67	6.7
1/2"	1/2"	10-32	**PWBA3822**	2.12	16.8

With NPT Threaded Connections & Pilot Port

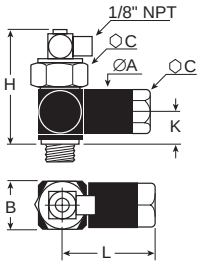
Cylinder Port	Female Port	Pilot Port	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/8"	1/8"	**PWBA38887**	0.78	6.2
1/4"	1/4"	1/8"	**PWBA38997**	1.02	6.2
3/8"	3/8"	1/8"	**PWBA38337**	1.67	6.7
1/2"	1/2"	1/8"	**PWBA38227**	2.12	16.8

*Instant tube connection

Dimensions



PWBA34XX



PWBA38XXX

Cyl. Port Size	A Dia.	B	C Hex	H	K	L	L1
1/8"	22 (0.90)	21 (0.86)	15/16"	59 (2.41)	19.5 (0.80)	39 (1.59)	43.5 (1.78)
1/4"	22 (0.90)	21 (0.86)	15/16"	53 (2.16)	13.5 (0.55)	39 (1.59)	43.5 (1.78)
3/8"	27 (1.10)	28 (1.14)	15/16"	53 (2.16)	14 (0.57)	50 (2.04)	55.5 (2.27)
1/2"	31 (1.27)	33 (1.35)	1-1/4"	66 (2.69)	24 (0.98)	66 (2.69)	63 (2.57)

Dimensions in mm (inch)

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3TK Series
Air-Oil Tanks

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Air-Oil Tanks – For Smoother Hydraulic Flow

Parker Air-Oil tanks provide a means to convert shop air pressure into hydraulic pressure. Compressed air is applied directly to the oil in the air-oil tank to convert it into hydraulic pressure. The hydraulic pressure is at a 1-to-1 ratio, i.e. 80 psi air produces 80 psi hydraulic pressure.

All Parker Air-Oil tanks have a fiberglass tube which shows the proper oil level. They also contain two fluid flow baffles. The top baffle disperses the incoming air over the surface of the oil in such a way to avoid agitation and aeration. The bottom baffle insures a smooth flow pattern that minimizes oil turbulence and eliminates swirling, funneling or splashing which in turn could cause oil aeration or the oil to be blown from the tank into the exhaust air.

Air-Oil tanks are used to smooth out the cylinder piston rod travel and to prevent chatter. They are mainly used in slow speed circuits. Fluid velocity in or out of the tank through standard ports should be less than 6 feet per second to prevent aeration of the oil. Since each tank is designed for a specific port size, increasing the port size in a tank to lower the fluid velocity is not recommended. A tank with a larger port size should be selected.

In a basic air-oil circuit the advance tank is connected to the cap end port of a hydraulic cylinder and the return tank to the head end port. Shop air is applied alternately to the two tanks through a 4-way air control valve. The oil in the advance tank is forced into the cap end of the cylinder to cause the piston rod to extend. At the same time, oil from the head end port is forced into the return tank, the air side of which is open to exhaust. To return cylinder to retract position, air pressure is applied to the oil in return tank.

To limit the fluid velocity, flow controls should be applied to the air side of the tank to restrict the exhaust.

How to Select

Step 1: Determine the volume (cu. in.) of fluid required to fill the work cylinder at full stroke by taking the bore area times the stroke length.

Step 2: Select the proper tank bore height from the chart. Since there are usually several combinations with similar capacities, select the one having a rated capacity closest to but slightly greater than your volume requirements. Generally, the most economical choice is a higher tank with a smaller bore.

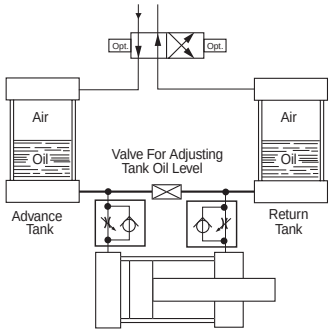

Table A Rated Capacities – Cubic Inches

Bore Size	Bore Code	Usable Tank Volume (cu. in.) per Internal Height of Tank										
		5	**6**	**7**	**8**	**9**	**10**	**12**	**14**	**16**	**18**	**20**
2½	C	12	16.6	21.6	25.5	30	34	43	52	61	70	78
3¼	D	19	26	34	41	49	56	74	86	101	116	131
4	E	28	40	51	62	74	85	107	129	153	175	195
5	F	39	57	75	92	110	128	163	199	234	269	305
6	G	62	86	111	137	161	186	232	284	333	386	432
8	J	109	446	495	239	280	324	414	504	592	684	774

Model Code and Ordering Information

Example: 4.00CB3TKU 6.000

4.00 — **Tank Diameter**: Bore size in inches

CB — **Tank Mounting Style**:
- **CB** Side End Angles
- **F** Side Tapped Holes
- **TC** Tie Rod Extended, Oil End
- **TB** Tie Rod Extended, Air End

3TK

U — **Ports**:
- **U** NPTF

6.000 — **Tank Height**: Internal height in inches

Note: Standard air-oil tanks are designed for use with petroleum base hydraulic oil. If other fluids will be used, please consult the factory. For larger than 8" Bore Sizes consult factory.

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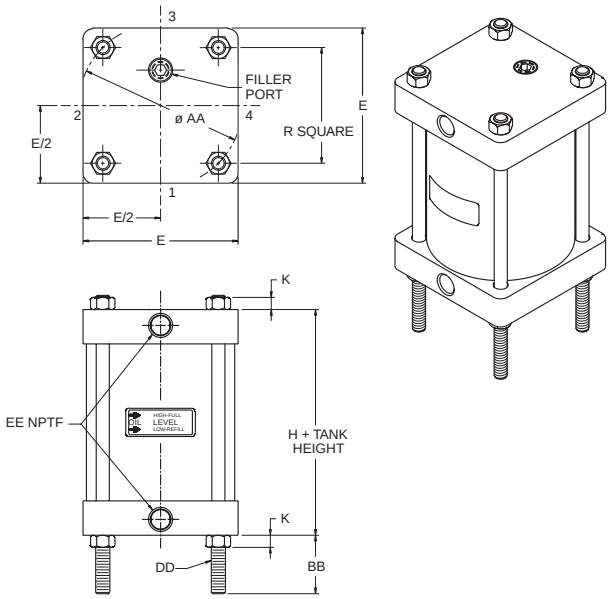
Specifications

- Standard Bore Sizes 2-1/2" - 8"
- Operating Pressure 250 PSI Maximum
- Operating Temperature 165°F Maximum
- Lightweight Aluminum / Fiberglass Design
- Larger Bore Sizes Available Upon Request

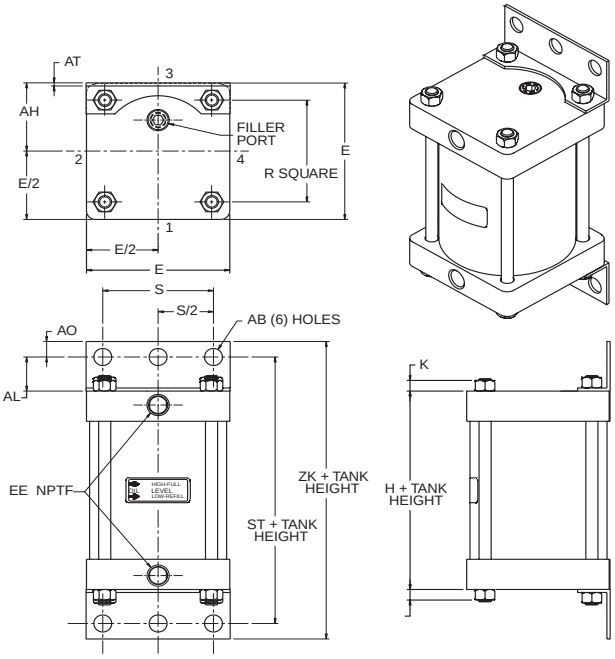
Mounting Dimensions

Mounting Style TC
Tie rods extended - oil end
(shown below)

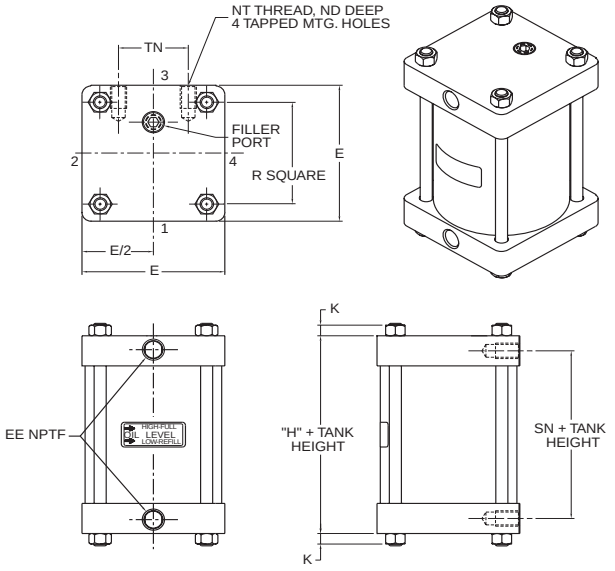
Mounting Style TB
Tie rods extended - air end



Mounting Style CB
Side end angles



Mounting Style F
Side tapped holes



Bore	E	H	K	R	S	AB	AH	AL	AO	AT	BB	DD	EE	ST	ZK	NT	SN	TN
2-1/2	3	2	5/16	2.19	2-1/4	7/16	1-5/8	1	3/8	1/8	1-1/8	5/16-24	3/8	4	4-3/4	3/8-16	2-3/8	1-1/4
3-1/4	3-3/4	2-1/2	3/8	2.76	2-3/4	9/16	1-15/16	1-1/4	1/2	1/8	1-3/8	3/8-24	1/2	5	6	1/2-13	2-5/8	1-1/2
4	4-1/2	2-1/2	3/8	3.32	3-1/2	9/16	2-1/4	1-1/4	1/2	1/8	13/8	3/8-24	1/2	5	6	1/2-13	2-5/8	2-1/16
5	5-1/2	3	7/16	4.10	4-1/4	11/16	2-3/4	1-3/8	5/8	3/16	1-13/16	1/2-20	1/2	5-3/4	7	5/8-11	2-7/8	2-11/16
6	6-1/2	3	7/16	4.88	5-1/4	13/16	3-1/4	1-3/8	5/8	3/16	1-13/16	1/2-20	3/4	5-3/4	7	3/4-10	3-1/8	3-1/4
8	8-1/2	3	9/16	6.44	7-1/8	13/16	4-1/4	1-13/16	11/16	1/4	2-5/16	5/8-18	3/4	6-5/8	8	3/4-10	3-1/4	4-1/2

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RL Series
Stand Alone Rod Lock Device

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The RL Series rod lock is used in applications where the locking of linear travel is required. It is commonly used in workholding applications and for locking tools and fixtures in the event of air pressure or electrical control failure.

Application

- **Clamping:** Without an appropriate air signal to the rod lock pressure port, the rod lock clamps to the precision metric rod and prevents rod movement in the axial direction.
- **Delatching:** When 4 Bar (58 PSI) of air pressure is applied to the port, the rod lock releases and allows free movement of the rod. This will be required for installation.
- **Locking Direction:** The rod lock is designed specifically to prevent rod movement in the *axial* direction only. It is **not** recommended for locking *rotary* rod motion.
- **Rod Material:** The Series RL rod lock is a precision locking device, therefore strict rod tolerances and rod material specifications are required to ensure safe and proper operation. Minimum requirements for the rod material include a chrome plated surface finish of 10 microinches or less and a surface hardness of 52 Rc. Rod material may be ordered separately in custom lengths. See next page for how to order.
- **Environment:** The rod lock is recommended for use in dry, clean conditions. Please take precautions to prevent moisture from entering the pressure port or the exhaust port of the locking device.

Technical Data

Working medium	Dry, filtered compressed air
Working pressure	Max. 10 Bar (145 PSI)
Working temperature	-20° to +80°C (-4°F to +176°F)
Locking pressure	4 Bar (58 PSI) ±10%

Holding Forces

Model	Holding Force	
	Pounds (lbs.)	Newtons (N)
12TRL*	123	550
16TRL*	193	860
20TRL*	481	2140
25TRL*	1211	5390
32TRL*	1894	8425

* Character reserved for port style

There should be no relative motion between the rod and the Rod Lock Device when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

Considerations for Rod Sizing

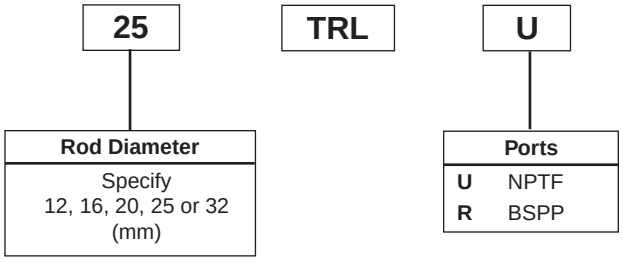
When applying a rod lock device, it is important to consider the loading forces which will be imposed on the rod in the axial direction.

For applications where the rod lock and its associated load impose a **compressive** force on the rod, please consider the axial compression force and rod length to select the appropriate rod diameter for preventing rod buckling.

In situations where the rod lock and its associated load place the rod in **tension**, please take care to securely fasten the rod ends to the machine member.

Ordering Information

Example: 25TRLU



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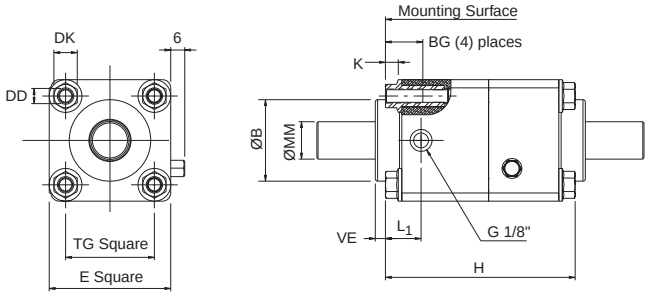
Basic Rod Lock



Rod Lock with Flange Mount

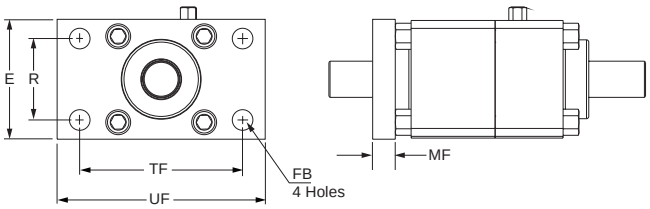


Table 1 – Mounting Dimensions

Part	Rod Dia. MM	B D11	BG	DD	DK	E	FB	H	K	L_1	MF	R	TF	TG	UF	VE
12TRL*	12.00 (-.04)	30	16	M6	10	46.5	7	76	5.5	16	10	32	64	32.5	80	4.5
16TRL*	16.00 (-.04)	35	16	M6	10	51	9	81.2	5.5	16	10	36	72	38	92	4.5
20TRL*	20.00 (-.04)	45	16	M8	13	76	9	100.8	7.5	26	12	50	100	56.5	129	5
25TRL*	25.00 (-.04)	55	16	M10	16	114.5	14	146	8	50	16	75	150	89	186	4
32TRL*	32.00 (-.04)	60	20	M12	18	140	16	165.2	9	60	20	90	180	110	220	6

* Character reserved for port style

Flange Mounting Kit

Mounting kits are available separately from the rod lock device. Please use the following part numbers to order. Mounting fasteners are included with the kits.

Model	Flange Mount
12TRL*	L075370032
16TRL*	L075370040
20TRL*	L075370063
25TRL*	L075370100
32TRL*	L075370125

* Character reserved for port style

Metric Rod Material

Rods will be supplied in the specified length with chamfered ends. Please note, the rod material is case hardened and requires annealing prior to machining. Parker is pleased to quote custom machined rods per customer supplied drawings.

⚠ **Caution:** Using piston rod material which does not meet the tolerance and finished conditions as listed on the previous page may prevent the locking device from properly holding the intended load.

How to Order
Example: 25MMROD2500

25 **MMROD** **2500**

Rod Diameter	Rod Length
Specify 12, 16, 20, 25 or 32 (mm)	Specify length in mm (Maximum 3600 mm)

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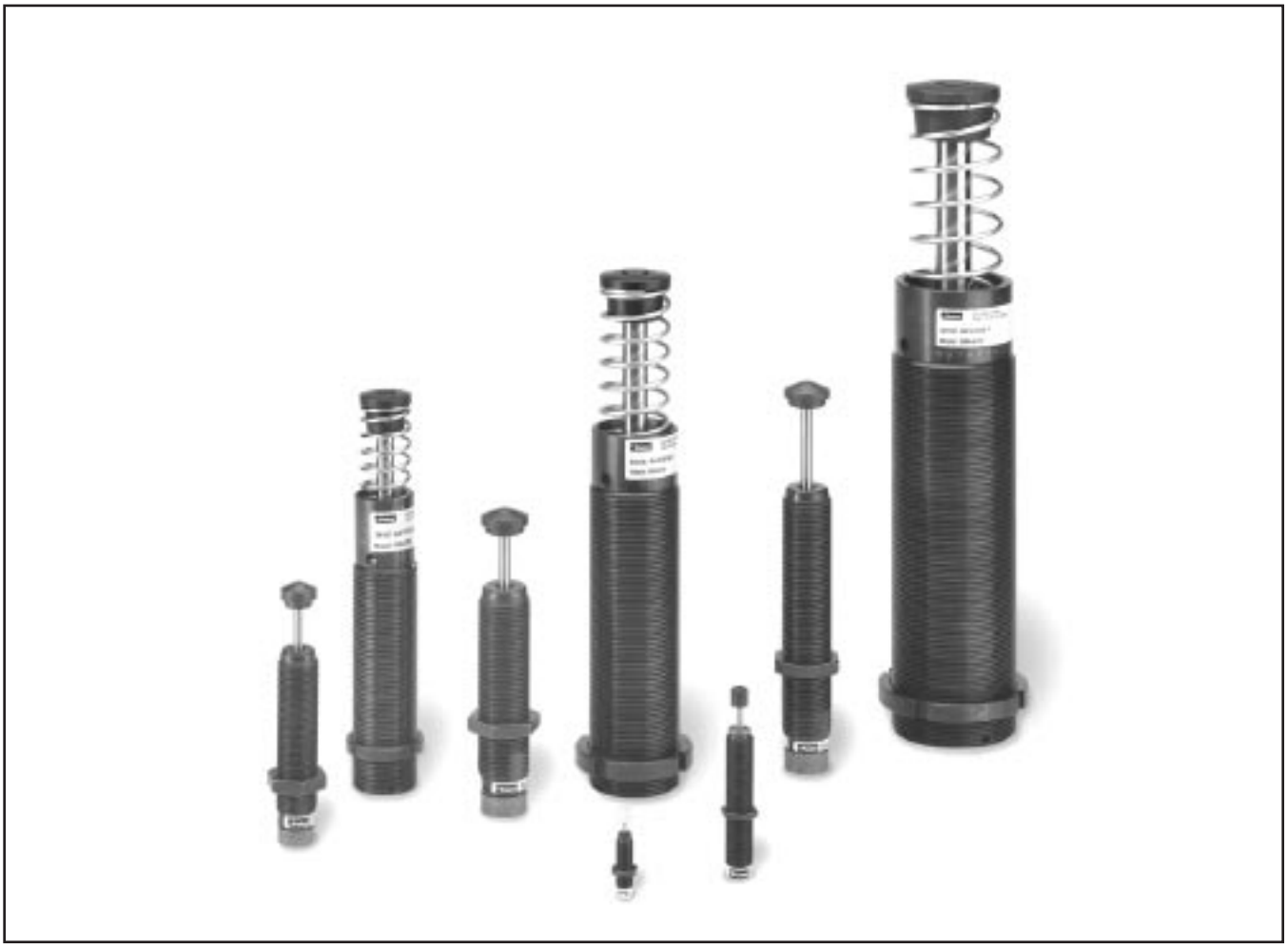
Shock Absorbers



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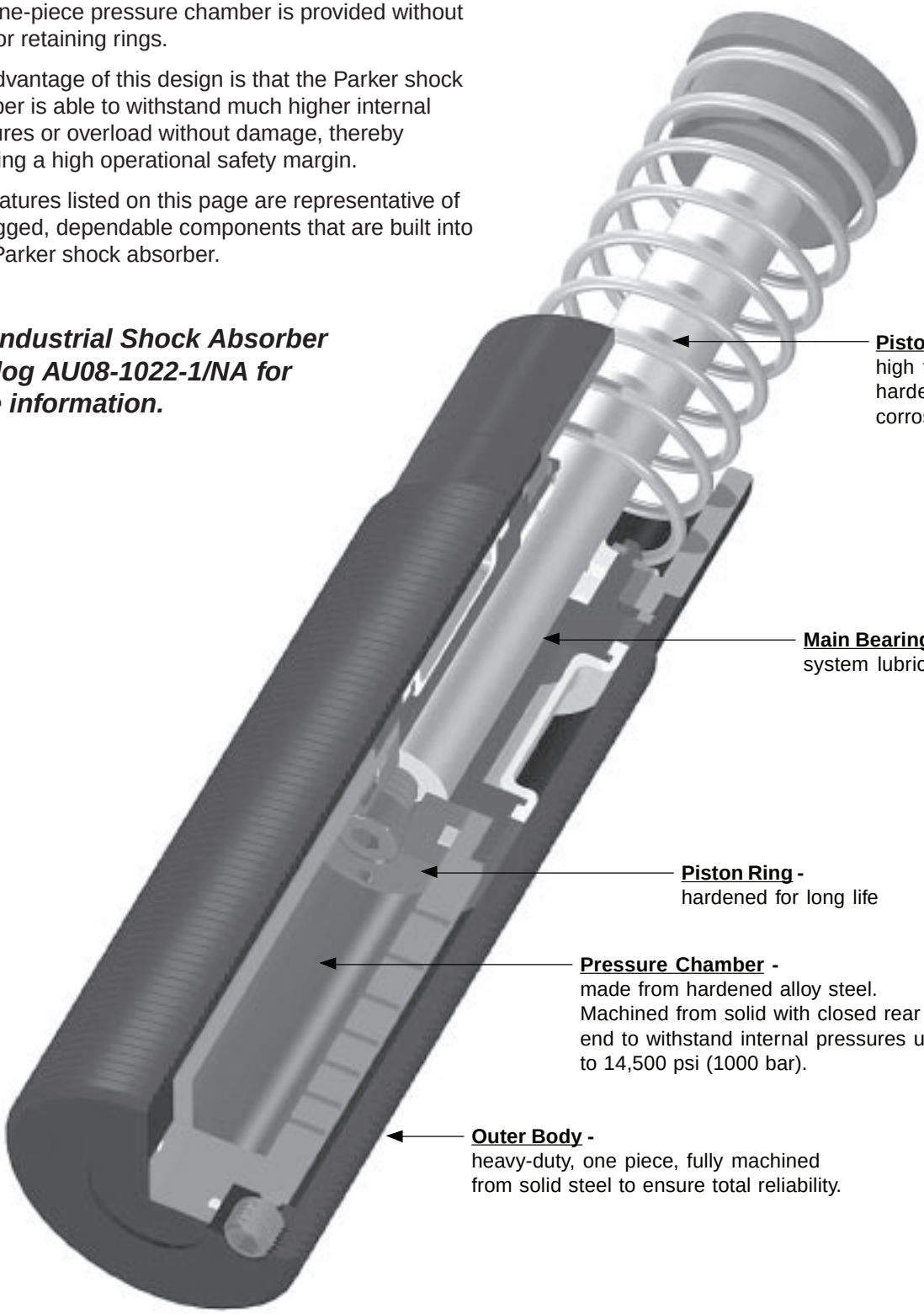
Parker Hannifin shock absorbers are built to the highest standards. A majority of Parker shock absorber bodies and inner pressure chambers are fully machined from solid alloy steel. A completely closed-end, one-piece pressure chamber is provided without seals or retaining rings.

The advantage of this design is that the Parker shock absorber is able to withstand much higher internal pressures or overload without damage, thereby providing a high operational safety margin.

The features listed on this page are representative of the rugged, dependable components that are built into each Parker shock absorber.

See Industrial Shock Absorber Catalog AU08-1022-1/NA for more information.



Piston Rod -
high tensile steel hardened and corrosion resistant

Main Bearing -
system lubricated

Piston Ring -
hardened for long life

Pressure Chamber -
made from hardened alloy steel. Machined from solid with closed rear end to withstand internal pressures up to 14,500 psi (1000 bar).

Outer Body -
heavy-duty, one piece, fully machined from solid steel to ensure total reliability.

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Industrial Shock Absorbers are rated by capacity for the purpose of selecting the proper unit for an application's energy requirements. Ratings are determined by the effective weight that the shock absorber can stop and the energy it can absorb per cycle and per hour. These ratings relate to the mechanical and thermal capacity of a shock absorber because the mechanical energy is converted to heat and dissipated.

Self-Compensating Models

Model Number	Stroke Inches 1 inch = 25.4mm	E3 Max Energy per Cycle in-lbs 1 in-lb = 0.11 Nm	W_e Effective Weight lbs 1 lb = 0.45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = 0.11 Nm/hour		
				Self-Contained	A/O Tank	A/O Recirculating
MC 9-1 MC 9-2	0.20	9	1.35-7.0 1.75-9.0	18,000	N/A	N/A
MC 10L MC 10H	0.20	4 7	0.75-6.0 1.5-11	35,000	N/A	N/A
MC 25L MC 25 MC 25H	0.25	20	1.5-5 4-12 10-30	120,000	N/A	N/A
MC 75-1 MC 75-2 MC 75-3	0.40	75	0.5-2.5 2-14 6-80	250,000	N/A	N/A
MC 150 MC 150H MC 150H2	0.50	150	2-22 20-200 150-450	300,000	N/A	N/A
MC 225 MC 225H MC 225H2	0.50	225	5-55 50-500 400-2,000	400,000	N/A	N/A
MC 600 MC 600H MC 600H2	1.00	600	20-300 250-2,500 880-5,000	600,000	N/A	N/A
SC 190-1 SC 190-2 SC 190-3 SC 190-4	0.63	225	3-15 8-40 20-100 50-225	300,000	N/A	N/A
SC 300-1 SC 300-2 SC 300-3 SC 300-4	0.75	300	3-18 10-60 30-180 70-450	400,000	N/A	N/A
SC 300-5 SC 300-6 SC 300-7	0.59	650	25-100 75-300 200-400			
SC 300-8 SC 300-9	0.59	620	300-1,500 700-4,300			
SC 650-1 SC 650-2 SC 650-3 SC 650-4	1.00	650	17-100 50-300 150-900 450-2,600	600,000	N/A	N/A
SC 650-5 SC 650-6 SC 650-7 SC 650-8 SC 650-9	0.91	1,860	50-250 200-800 700-2,400 1,700-5,800 4,000-14,000			
SC 925-1 SC 925-2 SC 925-3 SC 925-4	1.58	975	30-200 90-600 250-1,600 750-4,600	800,000	N/A	N/A
MC 3325-1 MC 3325-2 MC 3325-3 MC 3325-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000
MC 3350-1 MC 3350-2 MC 3350-3 MC 3350-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000
MC 3625-1 MC 3625-2 MC 3625-3 MC 3625-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000
MC 3650-1 MC 3650-2 MC 3650-3 MC 3650-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000
MC 4525-1 MC 4525-2 MC 4525-3 MC 4525-4	0.91	3,000	50-20 170-680 575-2,300 1,950-7,800	950,000	1,400,000	1,700,000
MC 4550-1 MC 4550-2 MC 4550-3 MC 4550-4	1.91	6,000	100-400 340-1,360 1,150-4,600 3,900-15,600	1,000,000	1,700,000	2,200,000
MC 4575-1 MC 4575-2 MC 4575-3 MC 4575-4	2.91	9,000	150-600 510-2,040 1,730-6,920 5,850-23,400	1,300,000	2,000,000	2,500,000
MC 6450-1 MC 6450-2 MC 6450-3 MC 6450-4	1.91	15,000	300-1200 1,020-4,080 3,460-13,840 11,700-46,800	1,300,000	2,600,000	3,400,000
MC 64100-1 MC 64100-2 MC 64100-3 MC 64100-4	3.91	30,000	600-2,400 2,040-8,160 6,920-27,680 23,400-93,600	1,700,000	3,400,000	4,400,000
MC 64150-1 MC 64150-2 MC 64150-3 MC 64150-4	5.91	45,000	900-3,600 3,060-12,240 10,380-41,520 35,100-140,400	2,200,000	4,400,000	5,700,000

Continued on next page

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Self-Compensating Models (continued)

Model Number	Stroke Inches 1 inch = 25.4mm	E3 Max Energy per Cycle in-lbs 1 in-lb = 0.11 Nm	W_e Effective Weight lbs 1 lb = 0.45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = 0.11 Nm/hour		
				Self-Contained	A/O Tank	A/O Recirculating
CA 2x2-1 CA 2x2-2 CA 2x2-3 CA 2x2-4	2.00	32,000	1,600-4,800 4,000-12,000 10,000-30,000 25,000-75,000	9,600,000	12,000,000	15,600,000
CA 2x4-1 CA 2x4-2 CA 2x4-3 CA 2x4-4	4.00	64,000	3,200-9,600 8,000-24,000 20,000-60,000 50,000-150,000	12,000,000	15,000,000	19,500,000
CA 2x6-1 CA 2x6-2 CA 2x6-3 CA 2x6-4	6.00	96,000	4,800-14,400 12,000-36,000 30,000-90,000 75,000-225,000	14,400,000	18,000,000	23,500,000
CA 2x8-1 CA 2x8-2 CA 2x8-3 CA 2x8-4	8.00	128,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	16,800,000	21,000,000	27,000,000
CA 2x10-1 CA 2x10-2 CA 2x10-3 CA 2x10-4	10.00	160,000	8,000-24,000 20,000-60,000 50,000-150,000 125,000-375,000	19,200,000	24,000,000	31,000,000
CA 3x5-1 CA 3x5-2 CA 3x5-3 CA 3x5-4	5.00	125,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	20,000,000	25,000,000	32,500,000
CA 3x8-1 CA 3x8-2 CA 3x8-3 CA 3x8-4	8.00	200,000	10,240-30,720 25,600-76,800 64,000-192,000 160,000-480,000	32,000,000	40,000,000	52,000,000
CA 3x12-1 CA 3x12-2 CA 3x12-3 CA 3x12-4	12.00	300,000	15,360-46,080 38,400-115,200 96,000-288,000 240,000-720,000	48,000,000	60,000,000	78,000,000
CA 4x6-3 CA 4x6-5 CA 4x6-7	6.00	420,000	8,000-19,000 19,000-41,000 41,000-94,000	27,000,000	45,000,000	58,000,000
CA 4x8-3 CA 4x8-5 CA 4x8-7	8.00	560,000	11,000-25,000 25,000-55,000 55,000-125,000	30,000,000	50,000,000	65,000,000
CA 4x16-3 CA 4x16-5 CA 4x16-7	16.00	1,120,000	22,000-50,000 50,000-110,000 110,000-250,000	50,000,000	85,000,000	110,000,000

Adjustable Models

MA 35 MA 150 MA 225 MA 600 MA 900	0.40 0.50 0.75 1.00 1.58	35 150 225 600 900	13-125 2-200 5-500 20-3,000 30-4,500	53,000 300,000 400,000 600,000 800,000	N/A	N/A
MA 3325 MA 3350	0.91 1.91	1,500 3,000	20-3,800 28-5,400	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000
MA 3625 MA 3650	0.91 1.91	1,500 3,000	20-3,800 28-5,400	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000
MA 4525 MA 4550 MA 4575	0.91 1.91 2.91	3,450 6,900 10,350	95-22,000 150-32,000 155-33,000	950,000 1,000,000 1,300,000	1,400,000 1,700,000 2,000,000	1,700,000 2,200,000 2,500,000
MA 6450 MA 64100 MA 64150	1.91 3.91 5.91	18,000 36,000 54,000	480-110,000 600-115,000 730-175,000	1,300,000 1,700,000 2,200,000	2,600,000 3,400,000 4,400,000	3,400,000 4,400,000 5,700,000
1-1/2x2 1-1/2x3-1/2 1-1/2x5 1-1/2x6-1/2	2.00 3.50 5.00 6.50	16,000 28,000 40,000 52,000	430-70,000 480-80,000 500-90,000 680-100,000	3,200,000 5,600,000 8,000,000 10,400,000	4,000,000 7,000,000 10,000,000 13,000,000	5,200,000 9,100,000 13,000,000 17,000,000
A 2x2 A 2x4 A 2x6 A 2x8 A 2x10	2.00 4.00 6.00 8.00 10.00	32,000 80,000 120,000 170,000 210,000	560-170,000 510-160,000 570-190,000 580-200,000 720-250,000	9,600,000 12,000,000 14,400,000 16,800,000 19,200,000	12,000,000 15,000,000 18,000,000 21,000,000 24,000,000	15,600,000 19,500,000 23,500,000 27,000,000 31,000,000
A 3x5 A 3x8 A 3x12	5.00 8.00 12.00	140,000 250,000 390,000	1,050-340,000 1,200-400,000 1,350-450,000	20,000,000 32,000,000 48,000,000	25,000,000 40,000,000 60,000,000	32,500,000 52,000,000 78,000,000

Low Velocity Adjustable Models

ML 3325 ML 3350	0.91 1.91	1,500 3,000	0.05-1.5	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000
ML 3625 ML 3650	0.91 1.91	1,500 3,000	0.05-1.5	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000
ML 4525 ML 4550	0.91 1.91	3,450 6,900	0.05-1.5	950,000 1,000,000	1,400,000 1,700,000	1,700,000 2,200,000
ML 6425 ML 6450	0.91 1.91	9,000 18,000	0.05-1.5	1,100,000 1,300,000	2,200,000 2,600,000	2,900,000 3,400,000

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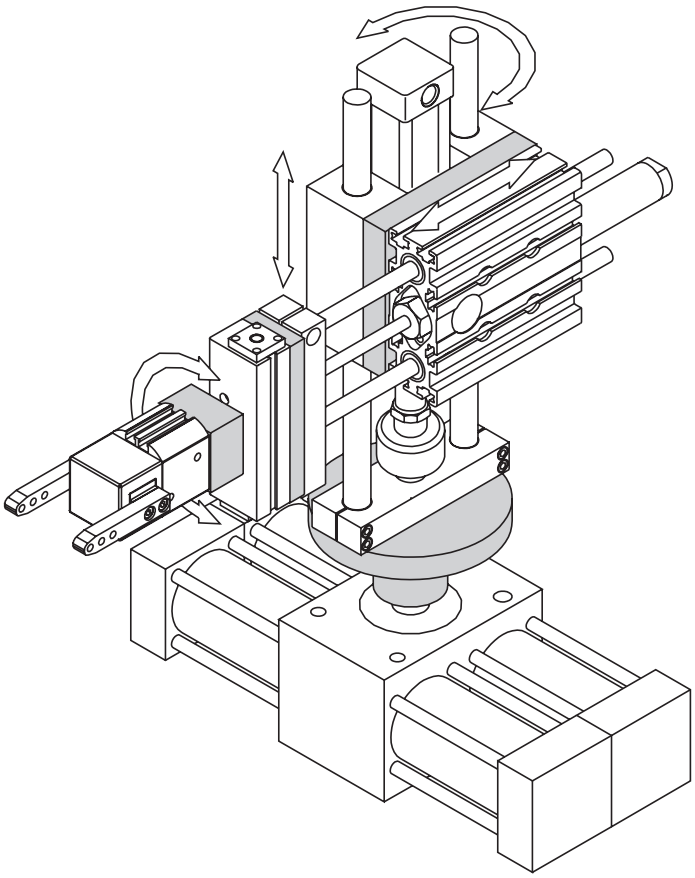
Transition Kits for Automation Components



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Step 1
Establish the Primary and Secondary Units

The **Primary Unit** is established when the transition plate is mounted to the ***dynamic*** portion of the unit, i.e. tool plate, saddle on slides or shaft on rotary actuators.
The **Secondary Unit** is established when the transition plate is mounted to the ***stationary*** portion of the unit, i.e. body mounts.

Step 2
Properly Size All Components

For sizing of components, refer to the appropriate individual product section in this catalog. Remember to add the entire weight (component + tooling + transition plate + part, etc.) of the secondary unit when determining the size of the primary unit.

Step 3
Determine the Orientation Desired

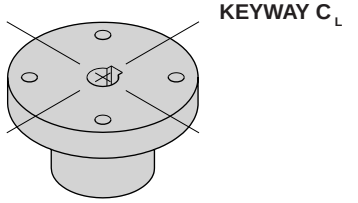
Secondary units can be mounted in various orientations. From the orientation tables on the following pages, select the one that best illustrates your application.

Step 4
Determine the Keyhole Orientation (Rotary Components Only)

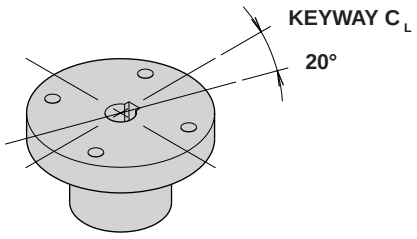
A hole pattern centerline the same as the keyway is standard. The hole pattern centerline can be rotated clockwise to keyway in increments of 5°. Square hole patterns may be rotated up to 85°. Rectangular hole patterns may be rotated up to 175°. See examples below.

Examples:

HOLE PATTERN CENTERLINE
SAME AS KEYWAY



HOLE PATTERN CENTERLINE
20° CLOCKWISE TO KEYWAY



Step 5
Consult Applications Department to Design Your Kit

Based on the information gathered above, the Applications Department will select the transition kit to fit your requirements.

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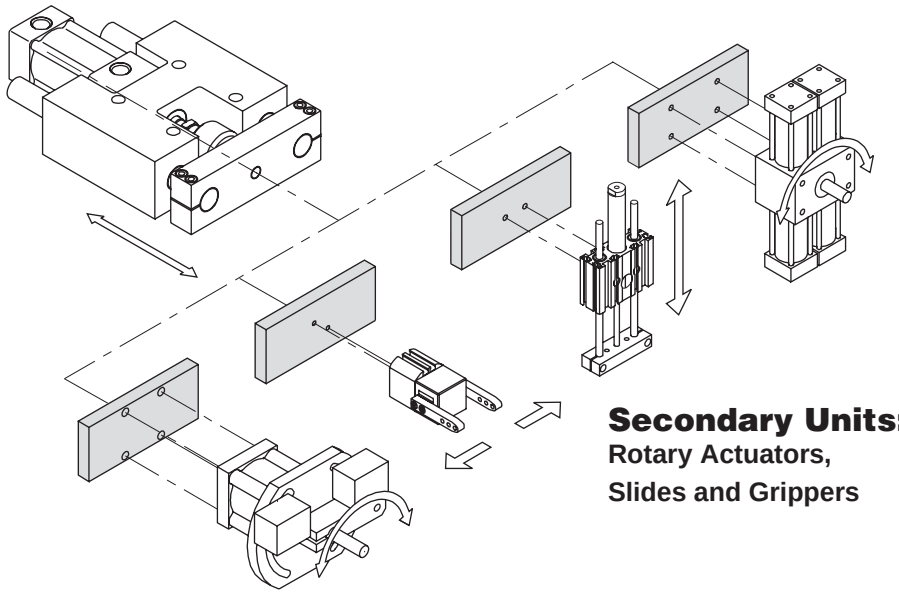
Transition Plate Kits

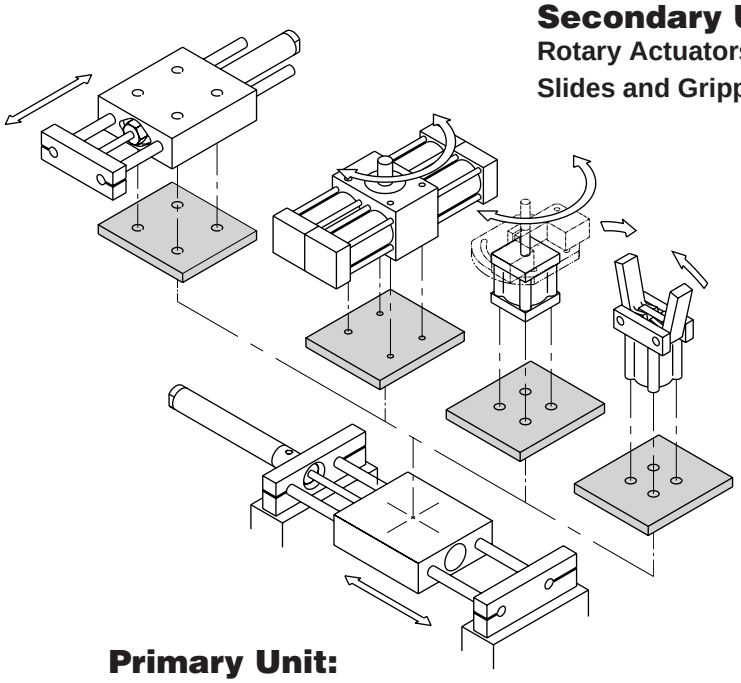
Connect Components to Thrust, Reach or Base Slides

Primary Unit:
Thrust and Reach Slides



Secondary Units:
Rotary Actuators,
Slides and Grippers

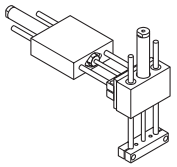
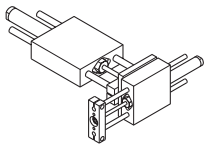
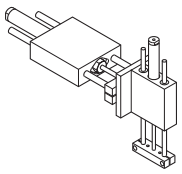
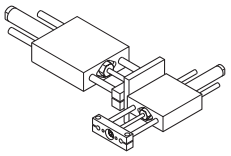
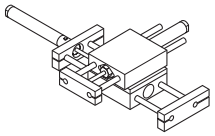
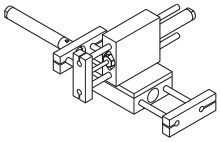
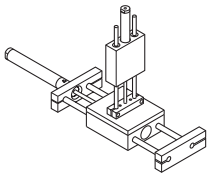
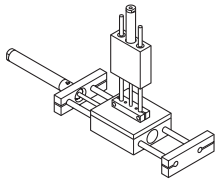
Secondary Units:
Rotary Actuators,
Slides and Grippers



Primary Unit:
Base Slides

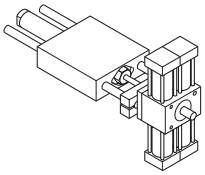
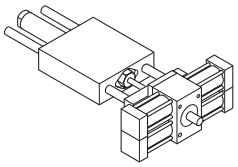
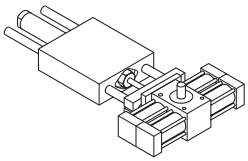
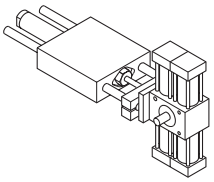
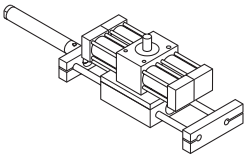
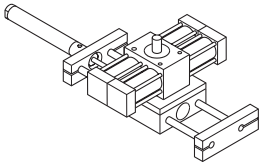
Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Mounting Slide to Slide

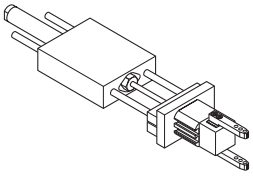
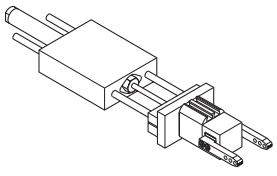
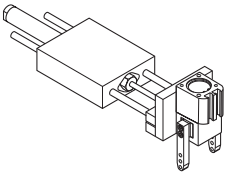
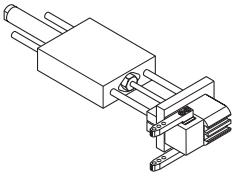
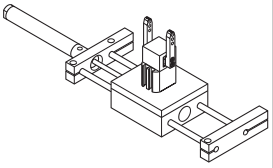
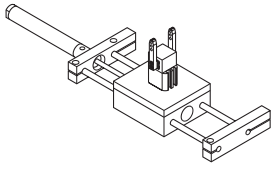
PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L P5E HBT/HBR XLT/XLR				
P5L* HBB XLB				

* **Note:** P5L Series units connect without transition plates in Orientation 1, where the thrust or reach version is mounted to a base slide version.

Mounting Rotary Actuator to Slide

PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L P5E HBT/HBR XLT/XLR				
P5L HBB XLB				

Mounting Gripper to Slide

PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L HBC HBT/HBR P5E XLT/XLR				
P5L HBB XLB				

L

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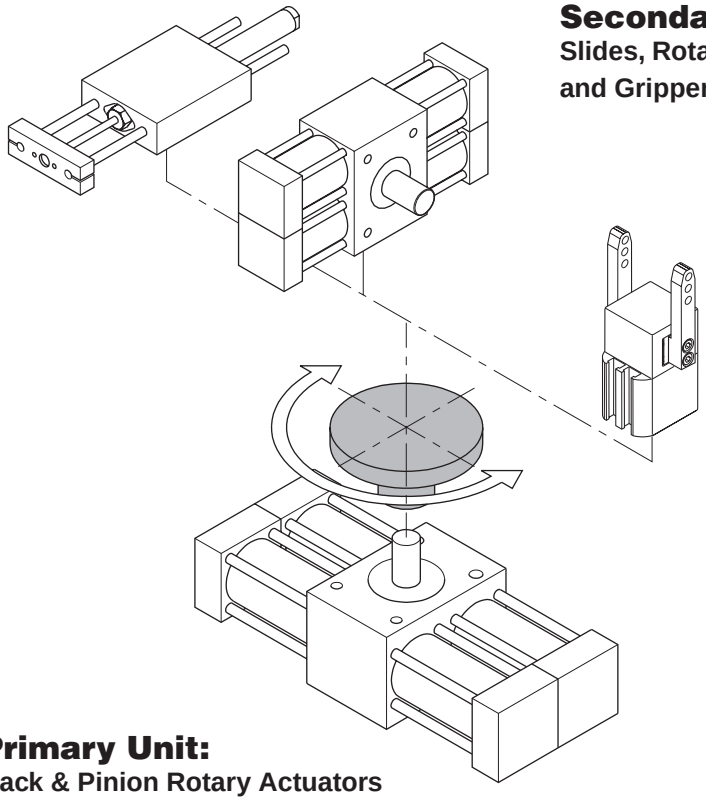
Transition Couplers

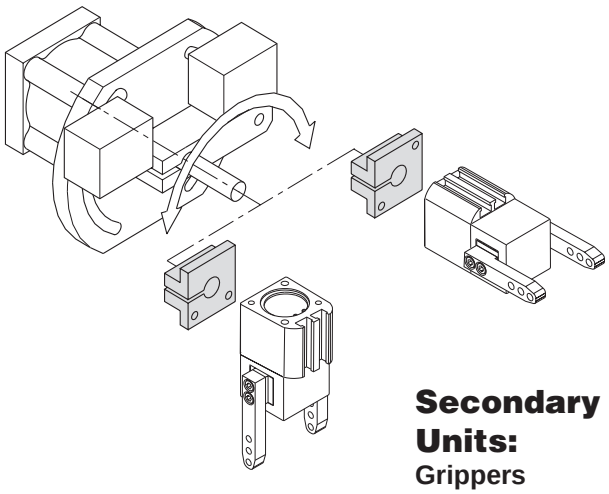
Connect Components to Rotary Actuators



Secondary Units:
Slides, Rotary Actuators and Grippers

Primary Unit:
Rack & Pinion Rotary Actuators

Primary Unit:
Vane Actuators



Secondary Units:
Grippers

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Wadsworth, Ohio
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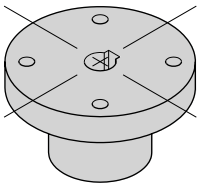
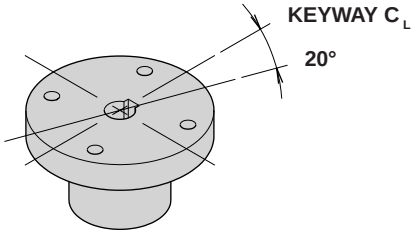
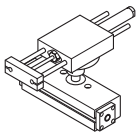
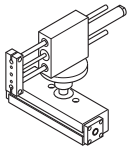
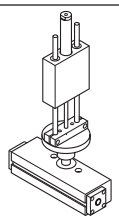
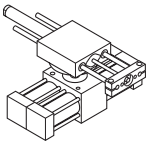
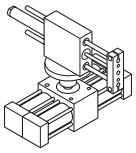
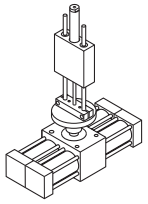
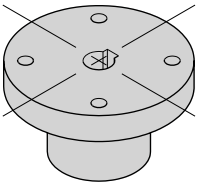
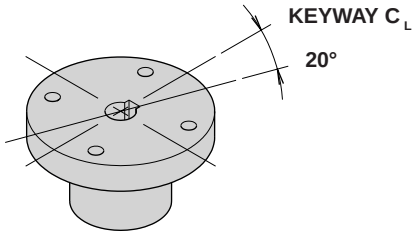
Mounting Slide to Rotary Actuator

HOLE PATTERN CENTERLINE SAME AS KEYWAY	HOLE PATTERN CENTERLINE 20° CLOCKWISE TO KEYWAY
	

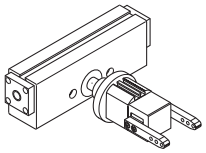
PRIMARY SERIES	ORIENTATION		
	1	2	3
XR			
PTR			

Mounting Gripper to Rotary Actuator

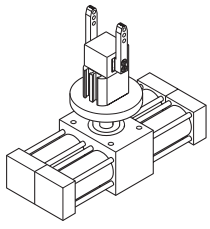
HOLE PATTERN CENTERLINE SAME AS KEYWAY	HOLE PATTERN CENTERLINE 20° CLOCKWISE TO KEYWAY
	

Standard Orientation

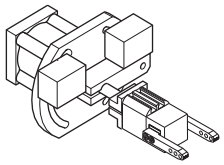
Standard orientation for each series is shown below. PV & WR Series coupler can accommodate two positions of the gripper. See drawing on previous page.



XR Series



PTR Series



PV & WR Series

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Electronic Sensors

Solid State, Reed and Proximity Sensors

Section M

Contents

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PNP Solid State Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect	8mm Quick Connect w/ 1 m Lead	12mm Quick Connect	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P1M Right Angle Sensor	All	P8S-SPELXD	P8S-SPETXD	P8S-SPTHXD	N/A	N/A	N/A	M10	—
	LPM	9/16"	L076990000 [2]	N/A	L07699000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L077000000 [2]	N/A	L07700000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L077010000 [2]	N/A	L07701000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L077020000 [2]	N/A	L07702000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		1-1/16" - 2-1/2"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
	P	1-1/8" - 2-1/2"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		3" - 4"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M5	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MPFLX	P8S-MPFTX	P8S-MPSHX	N/A	N/A	P8S-TMA0Z	M7	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
	P1A Right Angle Sensor	10mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2CCC	M11	M11
		12mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2DCC	M11	M11
		16mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2FCC	M11	M11
		20mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2HCC	M11	M11
		25mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2JCC	M11	M11
	P1D Standard & Clean Profiles	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P1D Standard Profile Mini Sensors	All	P8S-MPFLX	P8S-MPFTX	P8S-MPSHX	N/A	N/A	N/A	M7	—
	P1D Tie Rod Version	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMA0X	M5	M9
Rodless Cylinders	**P1X**	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMA0Y	M5	—
	P1Z	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	RC	All	L074820000 [3]	N/A	L07482000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
		Right Angle	P8S-SPELXD	P8S-SPETXD	P8S-SPTHXD	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P5TT & P5TD	All	P8S-MPFLX	P8S-MPFTX	P8S-MPSHX	N/A	N/A	N/A	M7	—
	P5E	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	HB	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMA0X [4]	M5	M9
	P5L	20 - 25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
Rotary Actuators	**PV WR XR**	Normally Open	SMH-1P [2]	N/A	SMH-1PC	N/A	N/A	N/A	M17	—
		Normally Closed	SMC-1P [2]	N/A	SMC-1PC	N/A	N/A	N/A	M17	—
	PRN(A)	All	N/A	N/A	N/A	N/A	N/A	N/A	—	—
	PTR	10, 15	N/A	SWH-1P [3]	SWH-1PC	N/A	N/A	Included	M19	—
		20, 25, 32	N/A	SWH-2P [3]	SWH-2PC	N/A	N/A	Included	M19	—

1 Flying leads are 2 meters in length

2 Flying Leads are 1.5 meters in length

3 Flying leads are 1 meter in length

4 Not necessary for HB if it includes P1D cylinder

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.

M

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NPN Solid State Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect	8mm Quick Connect w/ 1m Lead	12mm Quick Connect	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P1M Right Angle Sensor	All	P8S-SNELX	P8S-SNETX	P8S-SNTHX	N/A	N/A	N/A	M10	—
	LPM	9/16"	L076950000 [2]	N/A	L07695000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L076960000 [2]	N/A	L07696000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L076970000 [2]	N/A	L07697000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L076980000 [2]	N/A	L07698000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		1-1/16" - 2-1/2"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
	P	1-1/8" - 2-1/2"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		3" - 4"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GNFLX	P8S-GPNFTX	P8S-GNSHX	P8S-GPNSCX	P8S-GNMHX	N/A	M5	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M5	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MNFLX	P8S-MNFTX	P8S-MNSHX	N/A	N/A	P8S-TMA0Z	M7	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
	P1A Right Angle Sensor	10mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2CCC	M11	M11
		12mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2DCC	M11	M11
		16mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2FCC	M11	M11
		20mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2HCC	M11	M11
		25mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2JCC	M11	M11
	P1D Standard & Clean Profiles	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P1D Standard Profile Mini Sensors	All	P8S-MNFLX	P8S-MNFTX	P8S-MNSHX	N/A	N/A	N/A	M7	—
	P1D Tie Rod Version	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMA0X	M5	M9
Rodless Cylinders	**P1X**	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMA0Y	M5	—
	P1Z	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	RC	All	L074810000 [3]	N/A	L07481000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
		Right Angle	P8S-SNELX	P8S-SNETX	P8S-SNTHX	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P5TT & P5TD	All	P8S-MNFLX	P8S-MNFTX	P8S-MNSHX	N/A	N/A	N/A	M7	—
	P5E	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	HB	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMA0X [4]	M5	M9
	P5L	20 - 25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
Rotary Actuators	**PV WR XR**	Normally Open	SMH-1N [2]	N/A	SMH-1NC	N/A	N/A	N/A	M17	—
		Normally Closed	SMC-1N [2]	N/A	SMC-1NC	N/A	N/A	N/A	M17	—
	PRN(A)	All	See pages H15-H16							
	PTR	10, 15	N/A	SWH-1N [3]	SWH-1NC	N/A	N/A	Included	M19	—
		20, 25, 32	N/A	SWH-2N [3]	SWH-2NC	N/A	N/A	Included	M19	—

1 Flying leads are 2 meters in length
2 Flying Leads are 1.5 meters in length
3 Flying leads are 1 meter in length
4 Not necessary for HB if it includes P1D cylinder

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
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Reed Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect	8 mm Quick Connect w/ 1 m Lead	12mm Quick Connect	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	P1M Right Angle Sensor	All	P8S-SRELX	P8S-SRETX	P8S-SRTHX	N/A	N/A	N/A	M10	—
	LPM	9/16"	L077030000 [1]	N/A	L07703000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L077040000 [1]	N/A	L07704000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L077050000 [1]	N/A	L07705000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L077060000 [1]	N/A	L07706000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		32 - 63mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		80 - 100mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		1-1/16" - 2-1/2"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
	P	1-1/8" - 2-1/2"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		3" - 4"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M6	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MRFLX	P8S-MRFTX	P8S-MRSHX	N/A	N/A	P8S-TMA0Z	M8	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
	P1A Right Angle Sensor	10mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		12mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		16mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		20mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		25mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	
	P1D Standard & Clean Profiles	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	P1D Standard Profile Mini Sensors	All	P8S-MRFLX	P8S-MRFTX	P8S-MRSHX	N/A	N/A	N/A	M8	—
	P1D Tie Rod Version	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMA0X	M6	M9
Rodless Cylinders	**P1X**	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMA0Y	M6	—
	P1Z	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	RC	All	L074800000 [2]	N/A	L07480000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
		Right Angle	P8S-SRELX	P8S-SRETX	P8S-SRTHX	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—-
	P5TT & P5TD	All	P8S-MRFLX	P8S-MRFTX	P8S-MRSHX	N/A	N/A	N/A	M8	—
	P5E	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	HB	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMA0X [3]	M6	M9
	P5L	20 - 25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		32 - 63mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		80 - 100mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
Rotary Actuators	**PV WR XR**	N.O. High Amp	SMR-1 [1]	N/A	SMR-1C	N/A	N/A	N/A	M18	—
		N.O. Low Amp	SMR-1L [1]	N/A	SMR-1LC	N/A	N/A	N/A	M18	—
		N.C. Low Amp	SMD-1L [1]	N/A	SMD-1LC	N/A	N/A	N/A	M18	—
	PRN	50 - 800	See Model Code						M16	—
	PTR	10, 15	SWR-1 [2]	N/A	SWR-1C	N/A	N/A	Included	M20	—
		20, 25, 32	SWR-2 [2]	N/A	SWR-2C	N/A	N/A	Included	M20	—

1 Flying Leads are 1.5 meters in length
2 Flying leads are 1 meter in length
3 Not necessary for HB if it includes P1D cylinder

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.

M

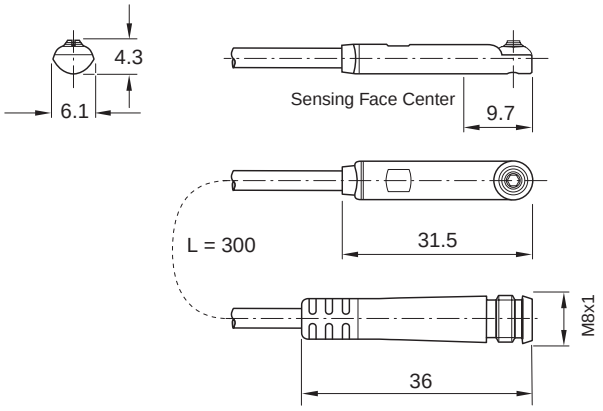
Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Global Drop-In Solid State Sensors

Wiring	PNP Sensor	NPN Sensor	PNP Sensor ATEX Certified
3m Flying Leads	P8S-GPFLX	P8S-GNFLX	P8S-GPFLX/EX
10m Flying Leads	P8S-GPFTX	P8S-GNFTX	N/A
0.3m Lead with 8mm Connector	P8S-GPSHX	P8S-GNSHX	
0.3m Lead with 12mm Connector	P8S-GPMHX	P8S-GNMHX	
1m Lead with 8mm Connector	P8S-GPSCX	P8S-GNSCX	

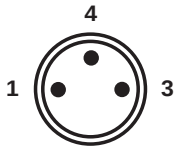
Specifications

Type ..... Electronic
Output Function ..... Normally Open
Sensor Output ..... PNP/NPN
Operating Voltage ..... 10 - 30VDC
Continuous Current ..... 100 mA max.
Response Sensitivity ..... 28 Gauss min.
Switching Frequency ..... 5 KHz
Power Consumption ..... 10 mA max.
Voltage Drop ..... 2.5 VDC max.
Ripple ..... 10% of Operating Voltage
Hysteresis ..... 1.5 mm max.
Repeatability ..... 0.1 mm max.
EMC ..... EN 60 947-5-2
Short-circuit Protection ..... Yes
Power-up Pulse Suppression ..... Yes
Reverse Polarity Protection ..... Yes
Enclosure Rating ..... IP 68
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range ..... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12, Black
Connector Cable ..... PVC
Connector ..... PUR cable w/8 or 12 mm connector

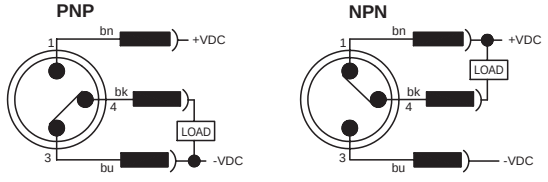


SOLID STATE SENSOR – WIRING CONNECTION

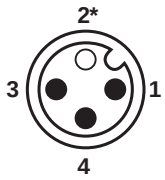
Flying Lead or 8 mm Connector (shown)



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Black	Output signal (N.O.)
3	Blue	-VDC

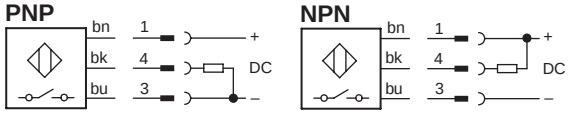


12 mm Connector



* Pin 2 not present.

Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Black	Output Signal (N.O.)
2*	White	Not Used
3	Blue	-VDC



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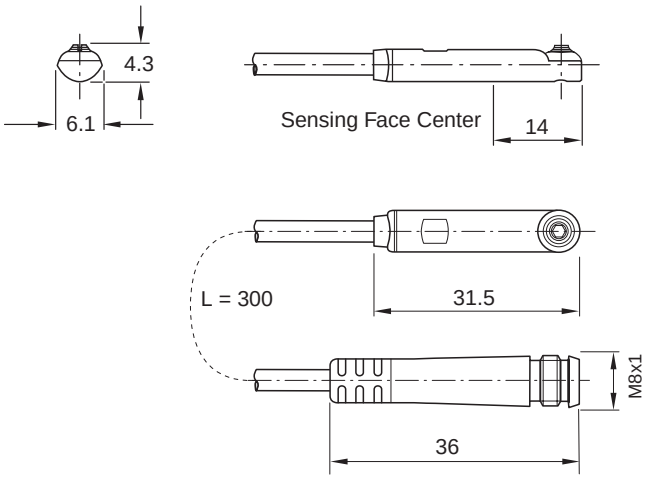
Global Drop-In Reed Sensors

Wiring	Reed Sensor
3m Flying Leads	P8S-GRFLX
10m Flying Leads	P8S-GRFTX
0.3m Lead with 8mm Connector	P8S-GRSHX
0.3m Lead with 12mm Connector	P8S-GRMHX
1m Lead with 8mm Connector	P8S-GRSCX



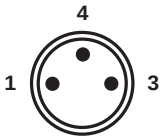
Specifications

Type ..... 2-Wire Reed
Output Function ..... Normally Open
Operating Voltage ..... 10 - 120 VAC*
10 - 30 VDC
Switching Power ..... 6 W/VA
Continuous Current ..... 100 mA max.
Response Sensitivity ..... 30 Gauss min.
Switching Frequency ..... 400 Hz
Voltage Drop ..... 2.5 V max.
Ripple ..... 10% of Operating Voltage
Hysteresis ..... 1.5 mm max.
Repeatability ..... 0.2 mm max.
EMC ..... EN 60 947-5-2
Reverse Polarity Protection ..... Yes
Enclosure Rating ..... IP 68
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range .... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12, Black
Connector Cable ..... PVC
Connector ..... PUR cable with 8 or
12 mm connector

*8mm connector rated for 50 VAC max.

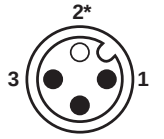
REED SENSOR - WIRING CONNECTION

Flying Lead or 8 mm Connector



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
4	Black	Not Used
3	Blue	Output Signal (-V or Ground)

12 mm Connector



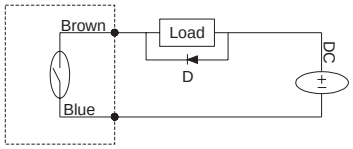
* Pin 2 not present.

Pin	Wire	Function
1	Brown	Operating Voltage (+V)
2*	White	Not Used
3	Blue	Output Signal (-V or Ground)
4	Black	Not Used

Circuit for Switching Contact Protection (For Inductive Loads, e.g. Solenoids, Relays)

(Required for proper operation 24V DC)

Put Diode parallel to loads following polarity as shown below.



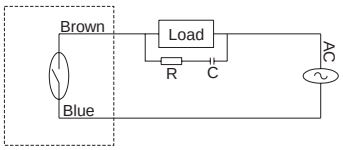
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example—100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 120 VAC)

Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ - 5 KΩ, 1/4 W
C: Capacitor 0.1 ΩF, 600 V



⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
– **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.
– Use relay coils for reed sensor contact protection.
– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

M

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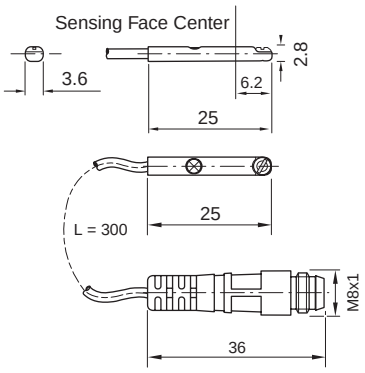
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Mini-Global Drop-In Solid State Sensors

Wiring	PNP Sensor	NPN Sensor
3m Flying Leads	P8S-MPFLX	P8S-MNFLX
10m Flying Leads	P8S-MPFTX	P8S-MNFTX
0.3m Lead with 8mm Connector	P8S-MPSHX	P8S-MNSHX

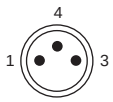


Solid State Sensor

SPECIFICATIONS

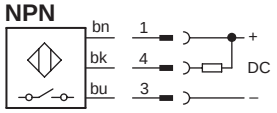
Type ..... Electronic
Output Function ..... Normally Open
Sensor Output ..... PNP or NPN
Operating Voltage ..... 10 - 30VDC
Continuous Current ..... ≤ 70 mA
Response Sensitivity ..... ≤ 48 Gauss
Switching Frequency ..... 1000 Hz
Power Consumption ..... ≤ 8 mA without load
Voltage Drop ..... ≤ 2.5 VDC
Ripple ..... 10% of Operating Voltage
Hysteresis ..... ≤ 15 Gauss
Repeatability ..... ≤ ±0.1 mm
EMC ..... EN 60 947-5-2
Short-circuit Protection ..... Yes
Power-up Pulse Suppression ..... No
Reverse Polarity Protection ..... Yes
Enclosure Rating ..... IP 67
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range ..... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12
Connector Cable ..... PUR 3 x 0.09mm^2
Connector ..... PUR cable w/8mm connector

WIRING CONNECTION

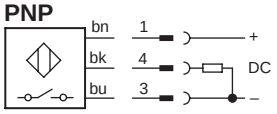


Pin	Wire	Function
1	Brown	+VDC
4	Black	NO
3	Blue	- VDC

NPN



PNP



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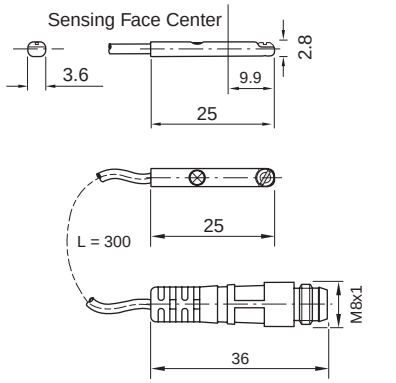
Mini-Global Drop-In Reed Sensors

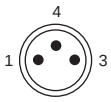
Wiring	Reed Sensor
3m Flying Leads	P8S-MRFLX
10m Flying Leads	P8S-MRFTX
0.3m Lead with 8mm Connector	P8S-MRSHX



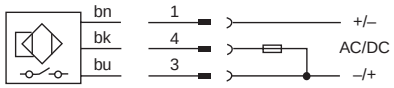
Specifications

Type ..... 3-Wire Reed
Output Function ..... Normally Open
Operating Voltage ..... 10 - 30 VAC, 10 - 30 VDC
Switching Power ..... 10 W/VA
Continuous Current ..... ≤ 500 mA max.
Response Sensitivity ..... ≤ 48 Gauss
Switching Frequency ..... 500 Hz
Hysteresis ..... ≤ 7 Gauss
Repeatability ..... ≤ 0.1 mm
EMC ..... EN 60 947-5-2 / EN 40 050
Enclosure Rating ..... IP 67
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range ..... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12
Connector Cable ..... PUR 3 x 0.09 mm^2
Connector ..... PUR cable w/8mm connector

WIRING CONNECTION



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
4	Black	Output signal
3	Blue	Ground (-V)



⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.

– **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.

– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.

– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

– Use relay coils for reed sensor contact protection.

– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.

– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

M

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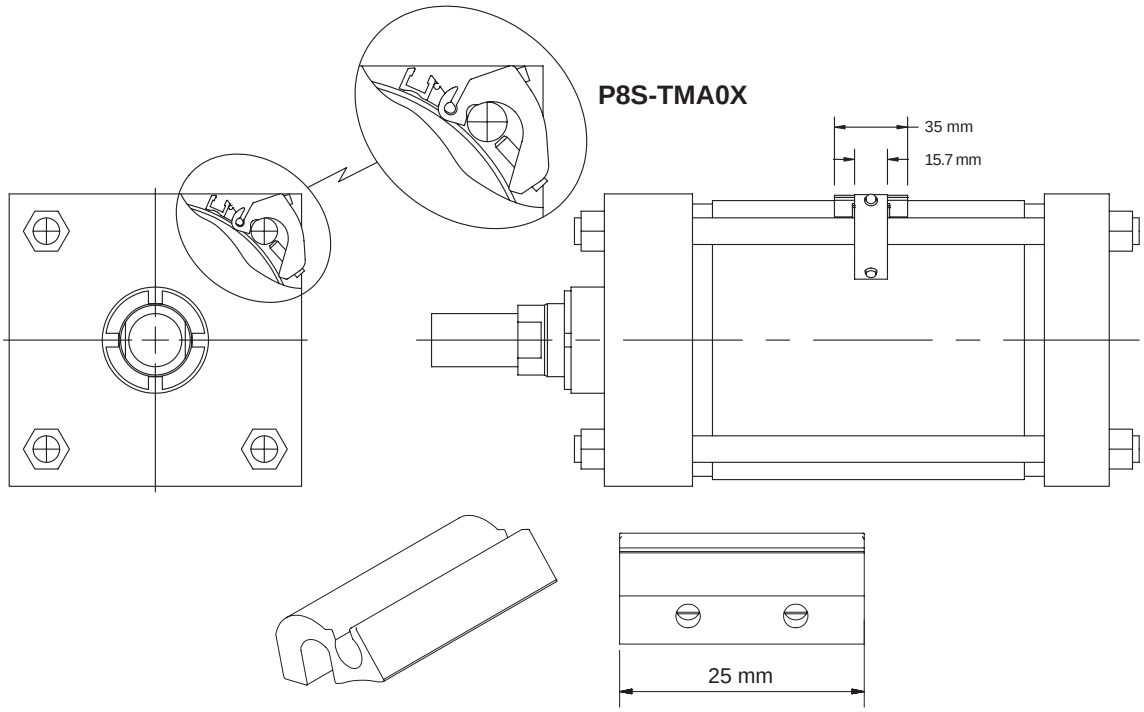
Tie Rod Bracket Assembly Part Number and Dimensions

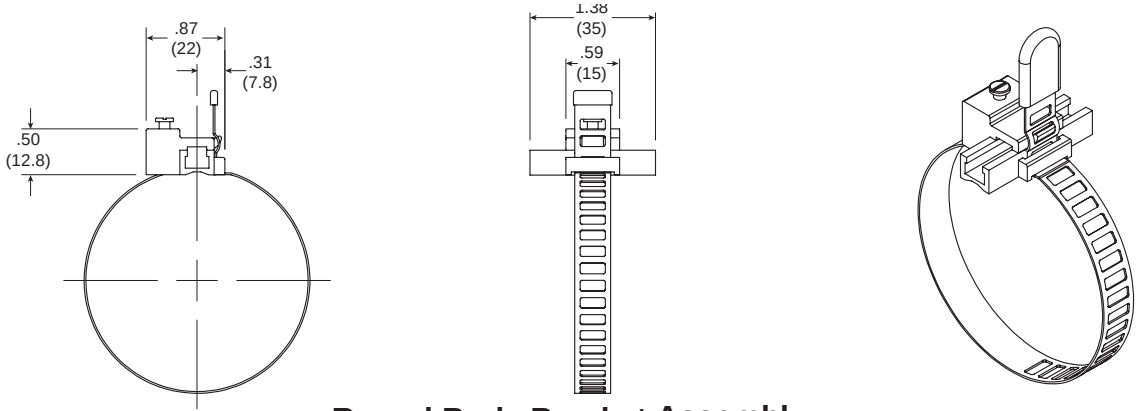
Tie Rod Bracket Assembly is necessary for Global and Mini-Global Sensor installation on all tie rod construction cylinders. This includes all Intermediate Trunnion mounts (Style DD or MT4); some 1-1/8" bore 3MA Series mounts; and all 6"-8" bore Sensors and bracket assemblies must be ordered separately.

Part number P8S-TMA0X fits 1-1/2" to 8" bores and 32-200mm bores for Global Sensors
Part number P8S-TMA0Z fits 1-1/8" bore for Mini-Global Sensors



P8S-TMA0X

P8S-TMA0Z



Round Body Bracket Assembly Part Numbers

Sensors and Brackets must be ordered separately.

Bore Size	Round Body Bracket
9/16" - 1-1/16"	P8S-TMC01
20 - 25mm	P8S-TMC01
1-1/8" - 2-1/2"	P8S-TMC02
32 - 63mm	P8S-TMC02
3" - 4"	P8S-TMC03
80 - 100mm	P8S-TMC03

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C086/A074

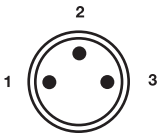
Right Angle Solid State Sensors CE

Specifications

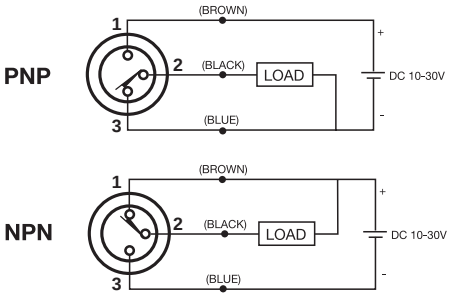
Type.....Electronic
Output Function.....Normally Open
Switching Output .....PNP/NPN
Operating Voltage .....10 - 30VDC
Continuous Current .....≤ 150 mA
Response Sensitivity .....30 Gauss min.
Switching Frequency 5kHz
Power Consumption .....15 mA
Voltage Drop.....≤ 2 VDC
Ripple .....≤ 10% of Operating Voltage
Delay Time (24V).....Approx. 20 ms
Time Delay before Availability.....≤ 2 ms
Hysteresis.....≤ 1.5 mm
Repeatability.....≤ 0.2 mm
EMC.....EN 60 947-5-2
Short-circuit Protection.....Yes
Power-up Pulse Suppression .....Yes
Reverse Polarity Protection .....Yes
Enclosure Rating .....IP 67 DIN 40050
Shock and Vibration Stress .....30g, 11ms, 10 to 55 Hz, 1 mm
Ambient Temperature Range.....-25°C to +75°C (-13°F to 167°F)
Housing Material.....PA 12, Black
Connector Cable.....PVC
Connector.....PUR cable w/8 mm connector

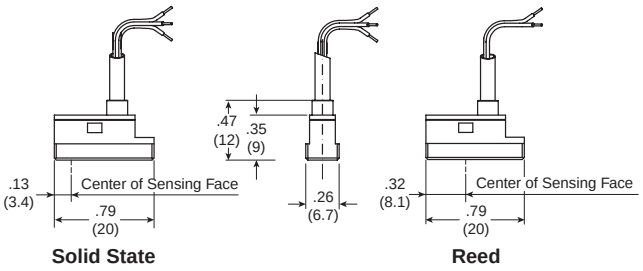
Wiring	PNP Sensors	NPN Sensors
0.2m Lead with 8mm Connector	P8S-SPTHXD	P8S-SNTHX
3m Flying Leads	P8S-SPELXD	P8S-SNELX
10m Flying Leads	P8S-SPETXD	P8S-SNETX

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
2	Black	Output signal (N.O.)
3	Blue	-VDC





Right Angle Reed Sensors CE

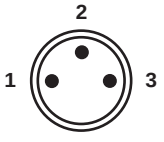
Specifications

Type.....2-Wire Reed
Output Function.....Normally Open
Output Voltage .....10 - 110* VAC, 10 - 30 VDC
Continuous Current .....≤ 100 mA
Response Sensitivity .....30 Gauss min.
Switching Frequency .....400 Hz
Voltage Drop.....≤ 3 V
Ripple .....≤ 10% of Operating Voltage
Time Delay (24V).....Approx. 20 ms
Hysteresis.....≤ 1.0 mm
Repeatability.....≤ 0.2 mm
EMC.....EN 60 947-5-2
Reverse Polarity Protection .....Yes
Enclosure Rating .....IP 67
Shock and Vibration Stress .....30g, 11ms, 10 to 55 Hz, 1 mm
Ambient Temperature Range.....-25°C to +75°C (-13°F to 167°F)
Housing Material.....PA 12, Black
Connector Cable.....PVC
Connector.....PUR cable w/8 mm connector

*8mm connector rated for 50 VAC max.

Wiring	Reed Sensors
0.2m Lead with 8mm Connector	P8S-SRTHX
3m Flying Leads	P8S-SRELX
10m Flying Leads	P8S-SRETX

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
3	Black	Not Used
2	Blue	Output Signal (-V or Ground)

M

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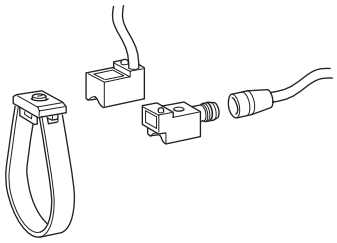
C086

Solid State Sensors

These sensors are of solid-state type, with no moving parts. Short-circuit and transient protection is incorporated as standard. The integral electronics make these sensors suitable for applications with very high switching frequencies.

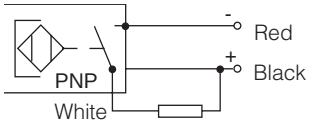


Specifications

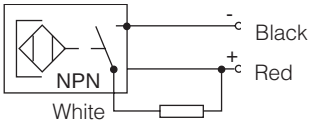
Design	Hall element
Output	PNP resp. NPN, N.O.
Voltage range	10-30 VDC
Max permissible ripple	10%
Max voltage drop	0.5 V at 100 mA
Max load current, P1A-2XMK, LK	150 mA
P1A-2XHK, EK, JH, FH	100 mA
Max breaking power (resistive)	6 W
Internal consumption	<30 mA at 30 V
Min actuating distance	5 mm
Hysteresis	1.1 - 1.3 mm
Repeatability accuracy	±0.1 mm
Max on/off switching frequency	1 kHz
Max on/off switching time	0.8/3.0 ms
Encapsulation, P1A-2XJH, FH	IP 65
Encapsulation, P1A-2XHK, EK, MK, LK	IP 67
Temperature range	–10 °C to +60 °C (14°F to 140°F)
Indication	LED
Shock resistance	40 g
Material, housing	Polyamid 11
Material, mould	Epoxy
Cable	PVC 3x0,15 mm²
Cable incl. female part connector	PVC 3x0,15 mm²
Connector	8 mm snap on
Mounting	Mounting yoke
Material, mounting	Acetal/Stainless steel
Material, screw	Stainless steel

Solid State Sensor Wiring

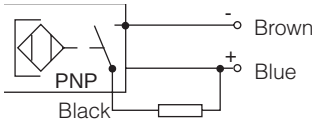
P1A-2XMK



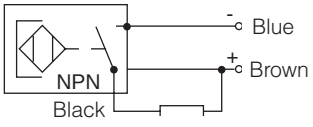
P1A-2XLK



P1A-2XHK,P1A-2XJH



P1A-2XEK, P1A-2XFH



Electronic Sensors

Part Number	Output	Cable Length	Weight (lb)
P1A-2XMK, Rt. Angle	PNP, N.O.	2 m	0.09
P1A-2XLK, Rt. Angle	NPN, N.O.	2 m	0.09
P1A-2XHK	PNP, N.O.	2 m	0.022
P1A-2XEK	NPN, N.O.	2 m	0.022
P1A-2XJH	PNP, N.O.	*	0.033
P1A-2XFH	NPN, N.O.	*	0.033

Mounting Brackets

Part Number	Fits Cylinder Bore Size	Weight (lb)
P1A-2CCC	10mm	0.01
P1A-2DCC	12mm	0.01
P1A-2FCC	16mm	0.0176
P1A-2HCC	20mm	0.0176
P1A-2JCC	25mm	0.022

Cable for Sensors

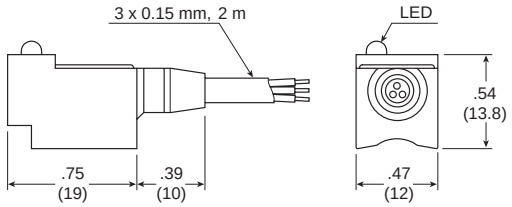
Part Number	Cable Length	Weight (lb)
9126344341**	3 m	0.12
9126344342**	10 m	0.4

* Cable ordered separately

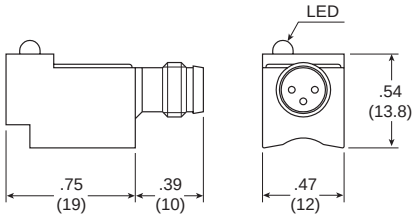
** Cable includes female part connector for sensor

Dimensions

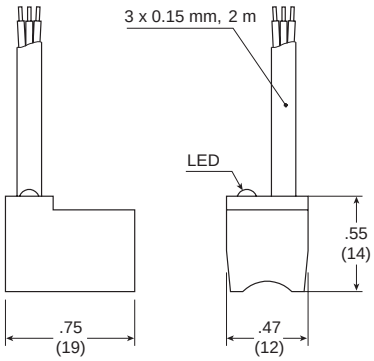
P1A-2XHK and P1A-2XEK



P1A-2XJH and P1A-2XFH



P1A-2XMK and P1A-2XLK



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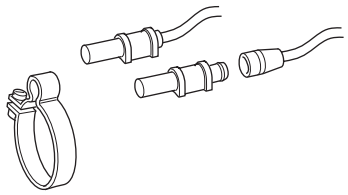
C086

Reed Sensors

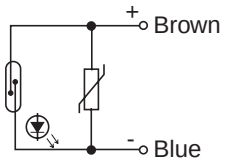
The reed sensors incorporate a well-proven, universal-voltage, compact reed switch element; making them suitable for a wide range of applications. They can work with electronic control systems or conventional relay systems.



Specifications

Design	Reed
Output	Making (N.O.)
Voltage range, P1A-2XRL	110 VAC/VDC
Voltage range, P1A-2XSH	60 VAC/VDC
Max voltage drop	2.8 V
Max load current	180 mA
Max breaking power (resistive)	10 W
Min actuating distance	5 mm
Hysteresis	2 mm
Repeatability accuracy	±0.2 mm
Max on/off switching frequency	500 Hz
Max on/off switching time	1 ms
Encapsulation, P1A-2XRL	IP 67
Encapsulation, P1A-2XSH	IP 65
Temperature range	–30 °C to +80 °C (22°F to 176°F)
Indication	LED
Shock resistance	30 g
Material, housing	Nylon 66
Material, mould	Epoxy
Cable	PVC 2x0.2 mm^2
Cable incl. female part connector	PVC 2x0.2 mm^2
Mounting	Mounting yoke
Material, mounting	Stainless steel
Material, screw	Stainless steel
Connector	8 mm snap on

Reed Sensor Wiring



Electronic Sensors

Part Number	Output	Cable Length	Weight (lb)
P1A-2XRL	Making (N.O.)	3m	0.12
P1A-2XSH	Making (N.O.)	*	0.004

Mounting Brackets

Part Number	Fits Cylinder Bore Size	Weight (lb)
P1A-2CCB	10mm	0.004
P1A-2DCB	12mm	0.005
P1A-2FCB	16mm	0.006
P1A-2HCB	20mm	0.009
P1A-2JCB	25mm	0.010

Cable for Sensors

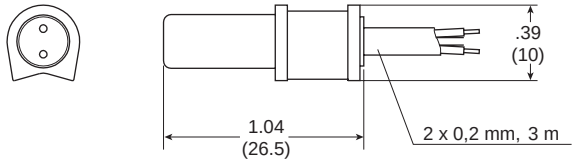
Part Number	Cable Length	Weight (lb)
9126344341**	3 m	0.12
9126344342**	10 m	0.4

* Cable ordered separately

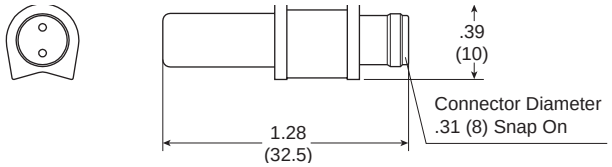
** Cable includes female part connector for sensor

Dimensions

P1A-2XRL



P1A-2XSH



M

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Part Numbers*

Bore	Reed (Low AMP)	NPN Sinking	PNP Sourcing
9/16"	L077030000	L076950000	L076990000
3/4", 1-1/8"	L077040000	L076960000	L077000000
1-1/2", 2"	L077050000	L076970000	L077010000
2-1/2", 3", 4"	L077060000	L076980000	L077020000

* For sensors with an 8mm connector, replace the last digit with a 'C'. For example: L07696000C.

Specifications

Solid State Sensors (NPN/PNP)

Switching Logic..... N.O. NPN (Sinking)
N.O. PNP (Sourcing)
Supply Voltage Range ..... 5 - 30 VDC
On-State Voltage Drop..... 1.5 V max. at 100 mA
Current Output Range ..... 100 mA
Burden Current..... 7 mA at 12 V 14 mA at 24 V
Leakage Current..... 0.01 mA
LED Function..... NPN: Red (Target Present)
PNP: Green (Target Present)
Minimum Current to Light LED ..... 1 mA
Operating Temperature..... 14° to 158°F (-10° to 70°C)
Storage Temperature..... -4° to 176°F (-20° to 80°C)
Enclosure Protection ..... IEC standard IP 67 NEMA 6P
Lead Wire ..... 3 conductor, 24 gauge
Lead Wire Length ..... 59 inches, 1.5 meter
Color of Cable..... Black
Switching Response..... Max. 1k Hz
Shock Resistance..... 50 G (490 m/s^2)
Vibration Resistance..... Double Amplitude 1.5 mm
(Frequency 10 to 55 Hz
1 scanning, 1 minute)

Reed Sensor (Low AMP)

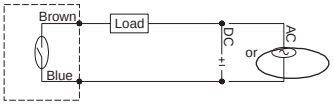
Switching Logic..... N.O. SPST (Form A)
Supply Voltage Range ..... 3 - 125 V AC/DC
On-State Voltage Drop..... 1.8V max. at 20 mA DC
Power Rating*..... 5 W (2.5 W) 5 VA (2.5 VA)
Switching Current Range*..... 5-40 mA (5-20 mA)
Leakage Current..... 0
LED Function..... Red (Target Present)
Minimum Current to Light LED ..... 3 mA
Operating Temperature..... 14° to 158°F (-10° to 70°C)
Storage Temperature..... -4° to 176°F (-20° to 80°C)
Enclosure Protection ..... IEC standard IP 67 NEMA 6P
Lead Wire ..... 2 conductor, 24 gauge
Lead Wire Length ..... 59 inches, 1.5 meter
Color of Cable..... Gray
Switching Response..... Max. 300 Hz
Shock Resistance..... 30 G (300 m/s^2)
Vibration Resistance..... Double Amplitude 1.5 mm
(Frequency 10 to 55 Hz
1 scanning, 1 minute)

*Number in parentheses pertains to inductive loads.

Circuits

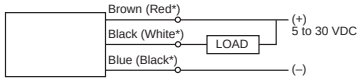
Reed Sensor

NOTE: Polarity must be observed for DC operation only.



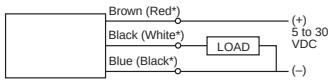
NPN Sensor – Sinking Output

Color of Cable.....Black
"On" State Voltage Drop..... 1.5V Maximum



PNP Sensor – Sourcing Output

Color of Cable.....Black
"On" State Voltage Drop..... 1.5V Maximum

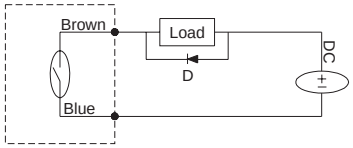


*Wire colors in parentheses pertain to sensors manufactured before 10/15/93.

Circuit for Switching Contact Protection (Inductive Loads) – for Reed Sensor Only

(Required for proper operation 24V DC)

Put Diode parallel to loads following polarity as shown below.



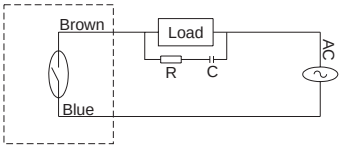
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example—100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 125 VAC)

Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ – 5 KΩ, 1/4 W
C: Capacitor 0.1 μF, 600 V



⚠ Caution

- Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
- **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
- Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
- The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.
- Current capabilities are relative to operational temperatures.
- Use relay coils for reed sensor contact protection.
- The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
- Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

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Solid State Sensors

Part Numbers	**L074810000 NPN Sinking** **L074820000 PNP Sourcing**
Switching Logic	NPN or PNP
Supply Voltage Range	10-30 VDC
On-State Voltage Drop	See Circuits Below
Current Output Range	Up to 100 mA at 12 VDC Up to 200 mA at 24 VDC
Burden Current	7 mA at 12 VDC 16 mA at 24 VDC
Leakage Current	10µA
LED Function	Red, Target Present
Minimum Current to Light LED	1 mA
Operating Temperature	14° to 140°F (-10° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Enclosure Protection	Nema 6, IEC IP67
Lead Wire	3 conductor, 24 Gauge
Lead Wire Length	39 Inches, 1 Meter
Color of Cable	See Below
Switching Response	1000 Hz Maximum

Reed Sensors

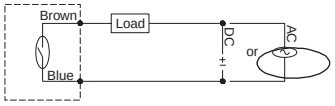
Part Number	**L074800000**
Switching Logic	Normally open, SPST (Form A)
Supply Voltage Range	85 to 125 VAC or 5-30 VDC[1]
On-State Voltage Drop	1.7 V Maximum
Power Rating	10 Watts (Resistive) 5 Watts (Capacitive)
Switching Current Range	30 mA to 200 mA (Resistive) 30 mA to 100 mA (Capacitive)
Leakage Current	0
LED Function	Red, Target Present
Minimum Current to Light LED	18 mA
Operating Temperature	14° to 140°F (-10° to 60°C)
Storage Temperature	-4° to 140°F (-20° to 60°C)
Enclosure Protection	Nema 6, IEC IP67
Lead Wire	2 conductor, 24 Gauge
Lead Wire Length	39 Inches, 1 Meter
Color of Cable	Black
Switching Response	300 Hz Maximum
Shock Resistance	30g
Vibration Resistance	10-55 Hz, 1.5 mm, Double Amplitude

[1]Polarity is restricted to DC operation: (+) to Brown (White*) (-) to Blue (Black*)
If these connections are reversed the contacts will close, but the LED will not light.

Circuits

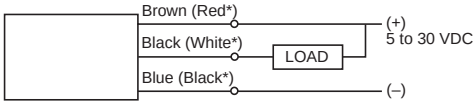
Reed Sensor

Part No..... L074800000
NOTE: Polarity must be observed for DC operation only.



NPN Sensor – Sinking Output

Part No..... L074810000
Color of Cable.....Black
"On" State Voltage Drop.....0.7V Maximum



PNP Sensor – Sourcing Output

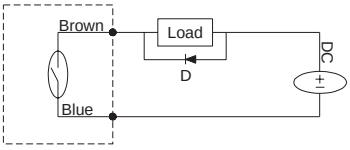
Part No..... L074820000
Color of Cable.....Gray
"On" State Voltage Drop..... 0.2V Maximum

*Wire colors in parentheses pertain to sensors manufactured before 10/15/93.

Circuit for Switching Contact Protection (Inductive Loads)

(Required for proper operation 24V DC)

Put Diode parallel to loads following polarity as shown below.



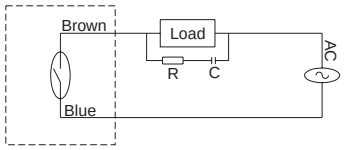
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example—100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 125 VAC)

Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ – 5 KΩ, 1/4 W
C: Capacitor 0.1 µF, 600 V



⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.

– NOTE: When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.

– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.

– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

– Current capabilities are relative to operational temperatures.

– Use relay coils for reed sensor contact protection.

– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.

– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

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Fixed Position Sensor

Specifications

Part Number ..... See Model Code
Type of Sensor..... Solid State
Application..... Relay, PLC, IC Circuit
Output Method..... NPN
Load Voltage..... 5 to 30VDC
Load Current..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 200 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop..... 1.5VDC or Less
Mean Response Time..... 1 ms
Shock Resistance..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Hysteresis..... Approximately 2°
Response Range..... 15° +/- 7°
Lead Wire Length ..... 1 meter

Model Code and Ordering Information

Example: SR20 - 180 - 90

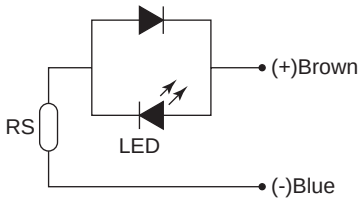
SR **20** – **180** – **90**

Size
3
10
20
30

Rotation	
090	90°
100	100°
180	180°
270	270°

Reference Point	
45	45°
90	90°

MA-2



Variable Position Sensor

Specifications

Type of Sensor..... Solid State
Application..... Relay, PLC, IC Circuit
Output Method..... NPN
Load Voltage..... 5 to 30VDC
Load Current..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 200 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop..... 1.5VDC
Mean Response Time..... 1 ms
Shock Resistance..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Hysteresis..... Approximately 2°
Response Range..... 23° +/- 7°
Lead Wire Length ..... 1 meter

Size	Part Number
1	FR-1PRN
3	FR-3PRN
10	FR-10PRN
20	FR-20PRN
30	FR-30PRN

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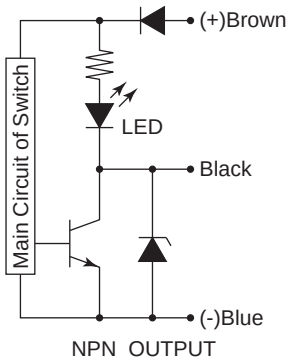
Solid State Sensors

Specifications

Application ..... Relay, PLC, IC Circuit
Output Method ..... NPN
Load Voltage ..... 5 to 30VDC
Load Current ..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 20 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop ..... 1.5V or Less
Mean Response Time ..... 1 ms
Shock Resistance ..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Indicator Light ..... Red LED
Lead Wire Length ..... 1 meter

MG2



NPN OUTPUT

Model Code and Ordering Information

Example: FM50 - 90 - 45 - MA2

FM	50	–	90	–	45	–	MA	2

Size

50	
150	
300	
800	

Rotation

090	90°
180	180°
270	270°

Reference Point

45	45°
90	90°

Sensor Type

MA	Reed
MG	Solid State

Number Sensors

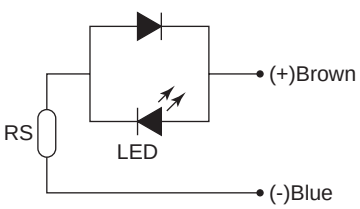
2	Standard

Reed Sensors

Specifications

Output Method ..... NPN
Load Current ..... 5 to 45 mA
Internal Voltage Drop ..... 2V or Less
Mean Response Time ..... 1.0 ms
Shock Resistance ..... 294 m/s²
Ambient Temperature ..... 5 to 60°C
Indicator Light ..... Red LED
Lead Wire Length ..... 1 meter

MA-2



M

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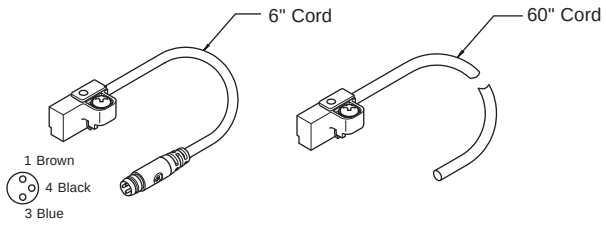
Solid State (Hall Effect) Sensors

Part Numbers

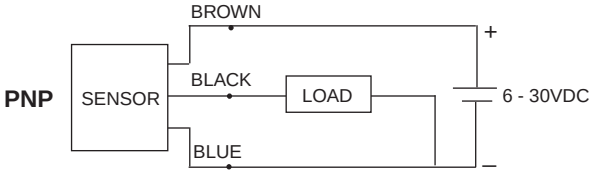
Part No.	Type	LED Color	Logic	Cable/Connector
SMH-1P	N.O.	Green	PNP	1.5m Black with Leads
SMH-1N	N.O.	Red	NPN	
SMC-1P	N.C.	Yellow	PNP	
SMC-1N	N.C.	White/Red	NPN	
SMH-1PC	N.O.	Green	PNP	0.15m Black with Connector
SMH-1NC	N.O.	Red	NPN	
SMC-1PC	N.C.	Yellow	PNP	
SMC-1NC	N.C.	White/Red	NPN	

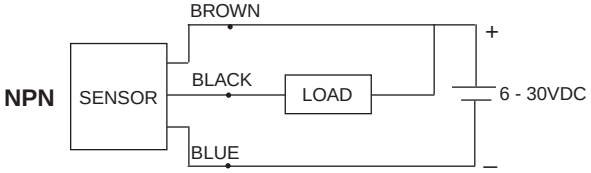


Specifications

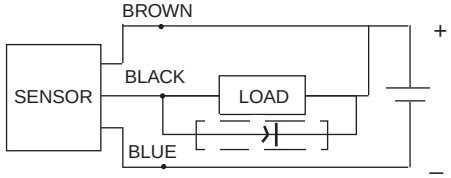
Type ..... Solid State Type (PNP or NPN)
Switching Logic..... Normally Open or Normally Closed
Supply Voltage Range ..... 6 - 30 VDC
Max. Switch Current ..... 150 mA
Current Consumption ..... 7 mA at 12 VDC, 14 mA at 24 VDC
Switching Response..... 500 Hz Maximum
Residual Voltage..... 0.8 V Maximum (150 mA)
Leakage Current..... 10 uA Maximum
Insulation Resistance ..... 100 M ohm min.
Min. Current for LED..... 1mA
Operating Temperature..... -10° to 85°C (14° to 185°F)**
Lead Termination..... 1500 mm (60 in) or 150 mm (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 50 G's, 490 m/sec^2

WIRING CONNECTION





PROTECTION CIRCUIT*



* When connecting an inductive load (relay, solenoid valve, etc.), a protection circuit is recommended. Use a 100V, 1A diode. (NPN connection shown.)

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Reed Sensors

Reed sensors are available in a normally open or normally closed configuration. The low amp sensor is suitable for connection to PLCs or other low current devices. The high amp sensor can be used to drive sequencers, relays, coils, or other devices directly.

SMR-1L or SMD-1L Low Amp Reed Sensor Specifications

Switching Logic..... Normally Open (SMR-1L)
Normally Closed (SMD-1L)
Voltage Rating ..... 85-125 VAC or
6-30 VDC* (N.O.)
6-30 VAC, 6-30 VDC* (N.C.)
Power Rating:
AC or DC Resistive Load..... 10 watts (N.O.)
AC or DC Inductive Load..... 5 watts (N.O.)
AC or DC ..... 3 watts (N.C.)
Switching Current Range:
Resistive Load (PC, Sequencer) .... 5-40 mA (N.O.),
5-25 mA (N.C.)
Inductive Load (Relay)..... 5-25 mA
Minimum Current for LED..... 5 mA
Switching Response..... 300 Hz (N.O.), 200 Hz (N.C.)
Breakdown Voltage..... 200 VDC
Contact Resistance ..... 100 M ohm min.
Operating Temperature..... -10° to 85°C (14° to 185°F)
Lead Termination..... 1.5m (60 in) or
0.15m (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 30 G's, 300 m/sec^2

SMR-1 High Amp Reed Sensor Specifications

Switching Logic..... Normally Open
Voltage Rating ..... 85-125 VAC or 5-30 VDC*
Power Rating:
AC or DC Resistive Load..... 10 watts
AC or DC Inductive Load..... 5 watts
Switching Current Range:
Resistive Load (PC, Sequencer) .... 30-300 mA
Inductive Load (Relay)..... 30-100 mA
Minimum Current for LED..... 18 mA
Switching Response..... 300 Hz Maximum
Breakdown Voltage..... 200 VDC
Contact Resistance ..... 100 M ohm min.
Operating Temperature..... -10° to 85°C (14° to 185°F)
Lead Termination..... 1.5m (60 in) or
0.15m (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 30 G's, 300 m/sec^2

* Polarity is restricted for DC operation
(+) to Brown
(-) to Blue
If these connections are reversed the contacts will close, but the LED will not light.

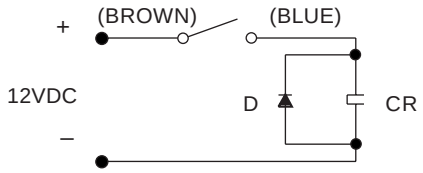
Note: Care must be taken not to exceed the Power Rating of the sensor while still observing the voltage and current limitations.

Part Numbers

Part No.	Type	LED Color	Rating	Cable/Connector
SMR-1	N.O.	Green	High Amp	1.5m Gray with Leads
SMR-1L	N.O.	Red	Low Amp	
SMD-1L	N.C.	Yellow	Low Amp	
SMR-1C	N.O.	Green	High Amp	0.15m Gray with Connector
SMR-1LC	N.O.	Red	Low Amp	
SMD-1LD	N.C.	Yellow	Low Amp	

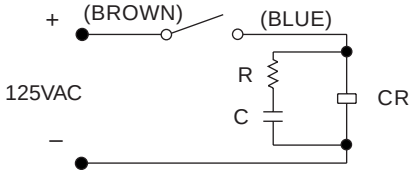
Integral Circuit for Switching Contact Protection

(Required for proper operation 24V DC)
Put Diode parallel to load (CR) with polarity as shown below.



D: Diode: select a Diode with the breakdown voltage and current rating according to the load.
CR: Relay coil (under 0.5 W coil rating)

(Recommended for longer sensor life 125V AC)
Put resistor and capacitor parallel to load (CR).



CR: Relay coil (under 2 W coil ratings)
R: Resistor under 1 K ohm
C: Capacitor 0.1 µF

M

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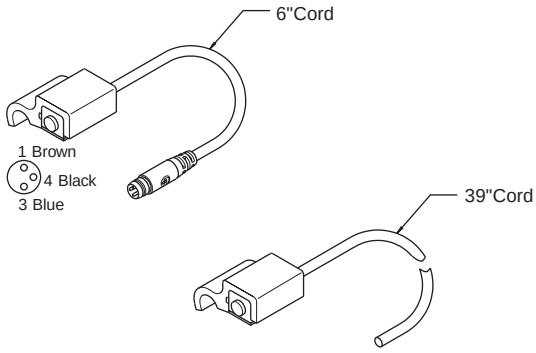
Solid State (Hall Effect) Sensors

Part Numbers

PTR Model	PNP		NPN	
	With 6" Male Quick Connect	With 39" Potted-in Leads	With 6" Male Quick Connect	With 39" Potted-in Leads
10	SWH-1PC	SWH-1P	SWH-1NC	SWH-1N
15	SWH-1PC	SWH-1P	SWH-1NC	SWH-1N
20	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N
25	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N
32	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N

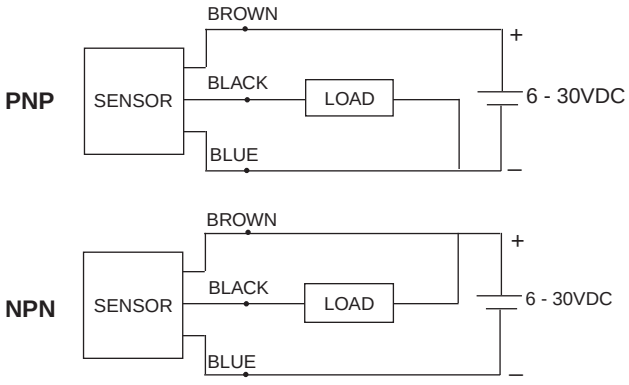
Note: Sensors with male quick connect option require female cord-sets to be ordered separately. See page H21.



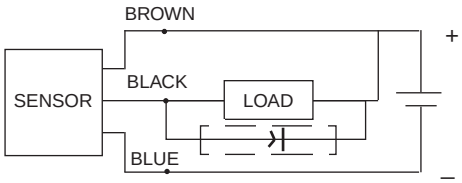
Specifications

Type ..... Solid State (PNP or NPN)
Switching Logic..... Normally Open
Supply Voltage Range ... 6 - 30VDC
Current Output Range ... Up to 100 mA at 5 VDC, Up to 200 mA at 12 VDC and 24 VDC
Current Consumption .... 7 mA at 5 VDC, 15 mA at 12 VDC, and 30 mA at 24 VDC
Switching Response ..... 1000 Hz Maximum
Residual Voltage..... 1.5V Maximum
Leakage Current..... 10uA Maximum
Breakdown Voltage..... 1.8kVACrms for 1 sec., lead to case
Min. Current for LED..... 1mA
Operating Temperature.. 14 to 140°F (-10 to 60°C)
Enclosure Rating ..... Meets IEC IP67, fully encapsulated
Lead Wire ..... 3 conductor, 24 gauge
Lead Wire Length ..... 39 in (1 m)
Vibration Resistance..... 10-55 Hz, 1.5mm double amplitude

WIRING CONNECTION



PROTECTION CIRCUIT*



* When connecting an inductive load (relay, solenoid valve, etc.), a protection circuit is recommended. Use a 100V, 1A diode. (NPN connection shown.)

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Reed Sensors

Part Numbers

PTR Model	With 6" Male Quick Connect	With 39" Potted-in Leads
10	SWR-1C	SWR-1
15	SWR-1C	SWR-1
20	SWR-2C	SWR-2
25	SWR-2C	SWR-2
32	SWR-2C	SWR-2

Sensors with male quick connect option require female cordsets to be ordered separately.
See page H21.

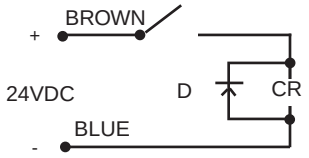
Specifications

Switching Logic.....Normally Open
Voltage Rating .....85-125 VAC or 6-30 VDC*
Power Rating .....10 Watts AC or DC/ Resistive Load
5 Watts AC or DC/Inductive Load
Switching Current Range...10-200 mA/Resistive Load (PC, Sequencer)
10-100 mA/Inductive Load (Relay)
Switching Response.....300 Hz Maximum
Breakdown Voltage.....1.8kVACrms for 1 sec., lead to case
Min. Current for LED.....18mA
Operating Temperature.....14 to 140°F (-10 to 60°C)
Enclosure Rating .....Meets IEC IP67, fully encapsulated
Lead Wire .....2 conductor, 22 Gauge
Lead Wire Length .....39 in (1 m)
Vibration Resistance.....10-55 Hz, 1.5mm double amplitude

* Polarity is restricted for DC operation
(+) to White
(-) to Black
If these connections are reversed the contacts will close, but the LED will not light.

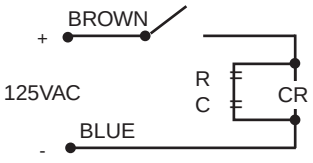
PROTECTION CIRCUIT (INDUCTIVE LOADS)

(Required for proper operation 24VDC)
Select a diode with a breakdown voltage and current rating according to the load. Place a diode in parallel to the load with the polarity as indicated:



CR: Relay coil (under 0.5W coil rating)

(Recommended for longer sensor life 125VAC)
Select a resistor and capacitor according to the load. Place a resistor and capacitor in parallel to the load:



CR: Relay coil (under 2W coil rating)
R: Resistor under 1 K ohm
C: Capacitor 0.1 µF

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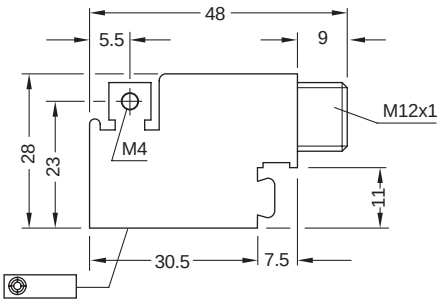
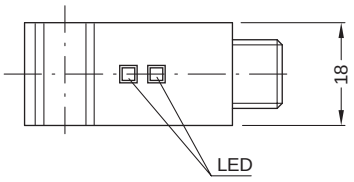
Weld Immune Sensors CE

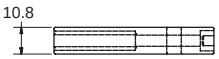
- Weld immune in all welding applications (AC, DC and medium frequency welding).
- Sensor locks the output during the welding process; when welding process stops, the sensor updates the output accordingly.
- NOTE: Tie rod construction of the P1D Series can be ordered directly in the model code (please see page C8).

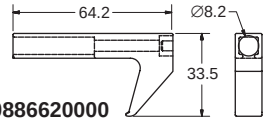
Part Number	Description
0886600000	Weld Immune Sensor
0886620000	Tie Rod Bracket Kit





0886600000



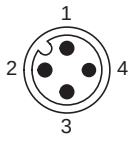


0886620000

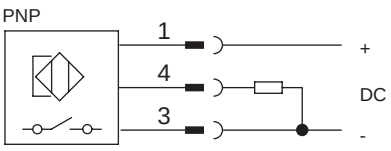
Specifications

Type	Electronic
Output function	Normally Open
Switching Output	PNP (3-Wire)
Operating voltage	10-30 VDC
Response sensitivity	≤ 30 Gauss
Switching frequency	40 Hz
Residual ripple	≤ 10% of Supply Voltage
Voltage drop	≤ 2 VDC
Power consumption, attenuated	≤ 32mA
Power consumption, unattenuated	≤ 18mA
Continuous current	≤ 300mA
Hysteresis	≤ 1.5mm
Repeatability	≤ 0.1mm
EMC	EN 60 947-5-2
Wire break protection	Yes
Short circuit protected	Yes
Reverse polarity protected	Yes
Power-up pulse suppression	Yes
Enclosure rating	IP67
Shock/vibration stress	30 g, 11ms, 10-55 Hz, 1mm
Operating temperature	-25°C to +75°C (-13°F to +167°F)
Housing material	Die-cast zinc with PTFE coating
LEDs	Status Indicator (yellow) Function Indicator (green)
Connector	M12 connector

Wiring Connection



Pin	Function
1	Operating Voltage (+VDC)
4	Output Signal (N.O.)
3	-VDC
2	Not used



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C086/A074/A076

8mm Cordset with Female Quick Connect

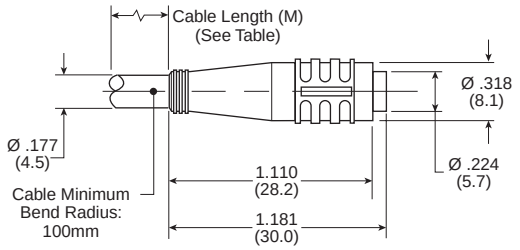
A female connector is available for all sensors with the male 8mm quick connect option. The male plug will accept a snap-on or threaded connector. Cordset part numbers are listed below:

Cable Length	Threaded Connector	Snap On Connector
5 meters	086620T005	086620S005
2 meters	086620T002	086620S002

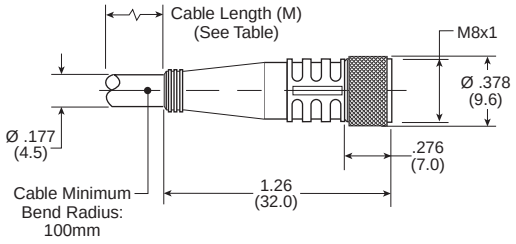
Cordset Specifications

Connector ..... Oil resistant polyurethane body material, PA 6 (Nylon) contact carrier, spacings to VDE 0110 Group C, (150 AC/DC)
Contacts ..... Gold plated beryllium copper, machined from solid stock
Coupling Method ..... Snap-Lock or chrome plated brass nut
Cord Construction ..... Oil resistant black PUR jacket, non-wicking, non-hygroscopic, 300V. Cable end is stripped and tinned.
Conductors ..... Extra high flex stranding, PVC insulation
Temperature ..... -40 to 194°F (-40 to 90°C)
Protection ..... NEMA 1, 3, 4, 6P and IEC 1P67
Cable Length ..... 6.56 ft (2m) or 16.4 ft (5m)

Snap-On Straight Connector



Threaded Straight Connector



12mm Cordset with Female Quick Connect

M12 Straight Connector	
Cable Length	**Part Number**
5 meters	9126487205
2 meters	9126487202

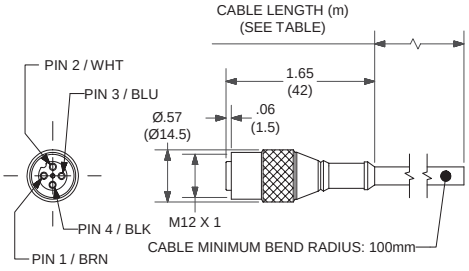
A female connector is available for all sensors with the male 12mm quick connect option. The cordsets are available with a right angle or straight connector. Cordset part numbers are listed above.

Cordset Specifications

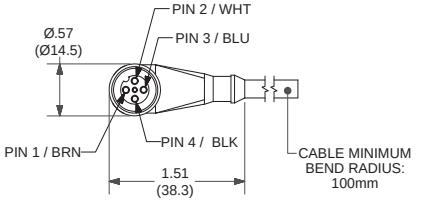
Connector ..... Polyvinylchloride (PVC) body material, PVC contact carrier, spacing to VDE 0110 Group C, (250VAC / 300VDC)
Contacts ..... Gold Plated Copper Tin (CuSn), stamped from stock.
Coupling Method ..... Threaded nut: Chrome plated brass.
Cord Construction..... PVC non-wicking, non-hygroscopic, 250VAC / 300VDC. Cable end is stripped.
Conductors ..... Extra high flex stranding with PVC insulation
Temperature ..... -13°F to 158°F (-25°C to 70°C)
Protection ..... NEMA 1, 3, 4, 6P and IEC 1P67
Cable Length ..... 6.56 ft (2m) or 16.4 ft (5m)

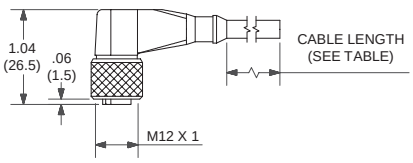
M12 Right Angle Connector	
Cable Length	**Part Number**
5 meters	9126487305
2 meters	9126487302

Straight Connector



Right Angle Connector





M

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Connection Block Valvetronic 110

The Valvetronic 110 is a connection block that can be used for collecting signals from sensors at various points on a machine and connecting them to the control system via a multicore cable. Valvetronic 110 can also be used for central connection of the multi-core cable to the outputs of a control system, and can be laid to a machine where the output signals can be connected. The connection block has ten 8 mm snap-in connectors and a multi-core cable which is available in lengths of 3 or 10 m. The connections on the block are numbered from 1 to 10. Blanking plugs are available for unused connections, as labels for marking the connections of each block.

Technical Data

Connections

Ten 3-pole numbered 8 mm round snap-in female contacts

Input block

Pin 1 Common, +24 VDC
Pin 2 Input signal
Pin 3 Common, 0V

Output block

Pin 1 Common, GND
Pin 2 Output signal
Pin 3 Common, 0V

Electrical Data

Voltage..... 24 VDC (max. 60 V AC/75 V DC)
Insulation group..... according to DIN 0110 class C
Load..... max. 1 A per connection
total max. 3 A

Cable

Length..... 3 m or 10 m
Type of cable LifYY11Y
Conductor..... 12
Area..... 0.34 mm^2
Color marking ..... According to DIN 47 100

Mechanical Data

Enclosure..... IP 67, DIN 40050 with fitted contacts and/or blanking plugs.
Temperature ..... –20 °C to +70 °C

Material

Body ..... PA 6,6 VD according to UL 94
Contact holder ..... PBTP
Snap-in ring ..... LDPE
Moulding mass ..... Epoxy
Seal ..... NBR
Screws..... Plated steel

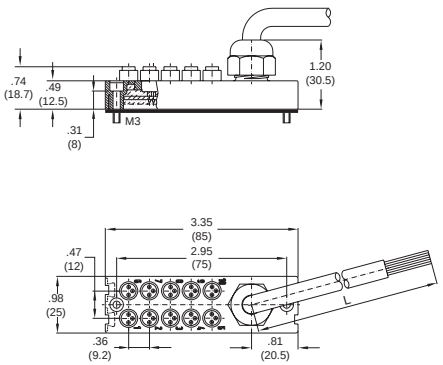
Industrial Durability

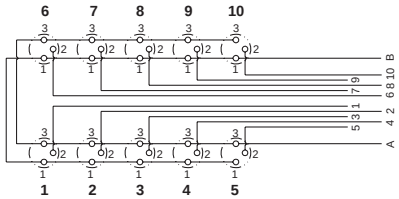
Good chemical and oil resistance. Tests should be performed in aggressive environments.

Ordering Information

Part Number	Designation	Weight kg
9121719001	Connection block Valvetronic 110 with 3 m cable	0.32
9121719002	Connection block Valvetronic 110 with 10 m cable	0.95
9121719003	Blanking plugs (pack of 10) Use blanking plugs to close unused connections.	0.02
9121719004	Labels (pack of 10) White labels to insert in grooves on the side of the connection	0.02

Dimensions and Wiring Diagrams





Conductor	Color	Input	Output
1	Pink	Signal 1	Signal 1
2	Grey	Signal 2	Signal 2
3	Yellow	Signal 3	Signal 3
4	Green	Signal 4	Signal 4
5	White	Signal 5	Signal 5
6	Red	Signal 6	Signal 6
7	Black	Signal 7	Signal 7
8	Violet	Signal 8	Signal 8
9	Grey-Pink	Signal 9	Signal 9
10	Red-Blue	Signal 10	Signal 10
A	Blue	0 V	0 V
B	Brown	+24 V	PE

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C086

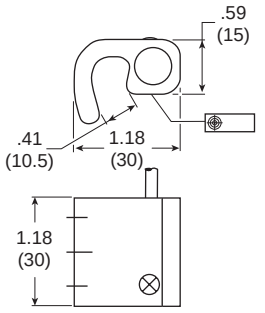
NAMUR Intrinsically Safe Sensors

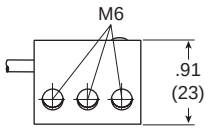
For Tie Rod Style Cylinders

Part Number	Sensor Description
089779001	Fits 1-1/8" to 4" bore and 32-100mm bore (2m flying lead)
089779002	Fits 1-1/8" to 4" bore and 32-100mm bore (12mm connector)
089779003	Fits 5" to 6" bore and 125-160mm bore (2m flying lead)
089779004	Fits 5" to 6" bore and 125-160mm bore (12mm connector)
089779005	Fits 8" bore and 200mm bore (2m flying lead)
089779006	Fits 8" bore and 200mm bore (12mm connector)

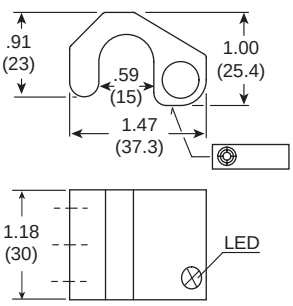
Specifications

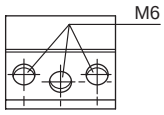
Electrical configuration ..... NAMUR 2-Wire
Output function ..... NAMUR
Supply voltage ..... 5-25 VDC
Response sensitivity ..... ≤ 30 Gauss
Switching frequency ..... 5 kHz
Switching output ..... Control current dependent on switching
Residual ripple ..... ≤ 5% of Supply Voltage
Power consumption, attenuated ..... ≥ 2.5mA
Power consumption, unattenuated . ≤ 1mA
Internal capacitance ..... ≤ 15nF
Internal inductance ..... ≤ 25 µH
Cable resistance ..... ≤ 50 Ohm
Hysteresis ..... ≤ 1mm
Repeatability ..... ≤ 0.1mm
EMC ..... EN 60 947-5-6
Short circuit protected ..... Yes
Reverse polarity protected ..... Yes
Enclosure rating IP67
Shock/vibration stress ..... 30 g, 11ms, 10-55 Hz, 1mm
Operating temperature ..... -25ºC to +70ºC (-13ºF to +158ºF)
Housing material ..... aluminum, plastic
Connector cable ..... PVC with Flying Leads (shown)
Connector (option) ..... M12 connector
Classification ..... TÜV 99 ATEX 1398 II 2G EEx ib IIC T6





0897790001



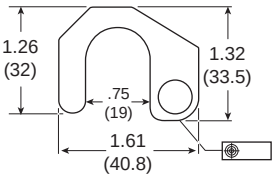


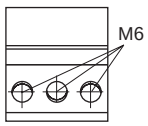
0897790003

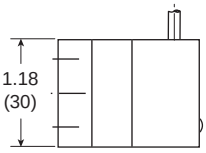
Data for Connecting Power Supplies or other approved isolating amplifiers:

Short circuit current 1_{Kmax} ..... ≤ 30mA
No load voltage ..... ≤ 16VDC
Power loss ..... ≤ 75mW

Note: Intrinsically safe solutions must include a NAMUR Power Supply

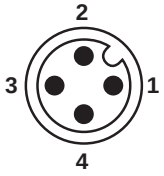




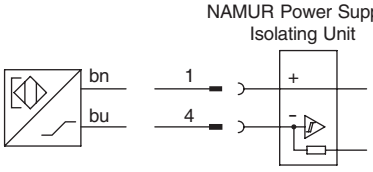


0897790005

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Blue	-VDC
2		Not Used
3		Not Used



M

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Pneumatic Division
Wadsworth, Ohio
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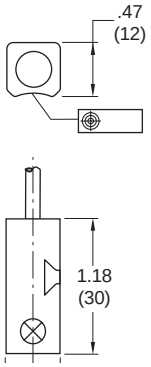
C086

NAMUR Intrinsically Safe Sensors

For Round Body Cylinders

Part Number	Description
0897790007	NAMUR Sensor for round body cylinder
0897800001	Bracket for 18-29mm (0.71"-1.14") outer diameter
0897800002	Bracket for 28-39mm (1.10"-1.54") outer diameter
0897800003	Bracket for 38-49mm (1.50"-1.93") outer diameter
0897800004	Bracket for 48-59mm (1.89"-2.32") outer diameter
0897800005	Bracket for 58-69mm (2.28"-2.72") outer diameter
0897800006	Bracket for 68-79mm (2.68"-3.11") outer diameter
0897800007	Bracket for 88-99mm (3.46"-3.90") outer diameter
0897800008	Bracket for 98-109mm (3.86"-4.29") outer diameter



0897790007

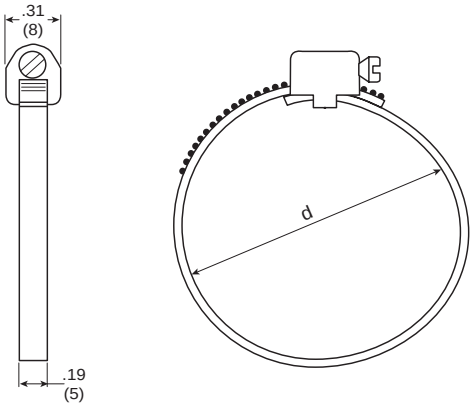
Specifications

Electrical configuration ..... NAMUR 2-Wire
Output function ..... NAMUR
Supply voltage ..... 5-25 VDC
Response sensitivity ..... ≤ 30 Gauss
Switching frequency ..... 5 kHz
Switching output ..... Control current dependent on switching
Residual ripple ..... ≤ 5% of Supply Voltage
Power consumption, attenuated ..... ≥ 2.5mA
Power consumption, unattenuated .... ≤ 1mA
Internal capacitance ..... ≤ 15nF
Internal inductance ..... ≤ 25 µH
Cable resistance ..... ≤ 50 Ohm
Hysteresis ..... ≤ 1mm
Repeatability ..... ≤ 0.1mm
EMC ..... EN 60 947-5-6
Short circuit protected ..... Yes
Reverse polarity protected ..... Yes
Enclosure rating IP67
Shock/vibration stress ..... 30 g, 11ms, 10-55 Hz, 1mm
Operating temperature ..... -25ºC to +70ºC (-13ºF to +158ºF)
Housing material ..... aluminum, plastic
Connector cable ..... PVC with Flying Leads (shown)
Classification ..... TÜV 99 ATEX 1398 II 2G EEx ib IIC T6

Data for Connecting Power Supplies or other approved isolating amplifiers:

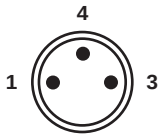
Short circuit current 1_{Kmax} ..... ≤ 30mA
No load voltage ..... ≤ 16VDC
Power loss ..... ≤ 75mW

Note: Intrinsically safe solutions must include a NAMUR Power Supply

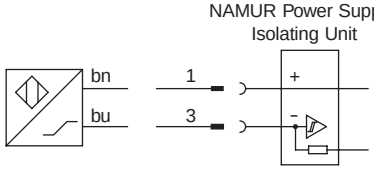


Round Body Brackets

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
3	Blue	-VDC
4		Not Used



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C086

NAMUR Sensor Power Supply

CE

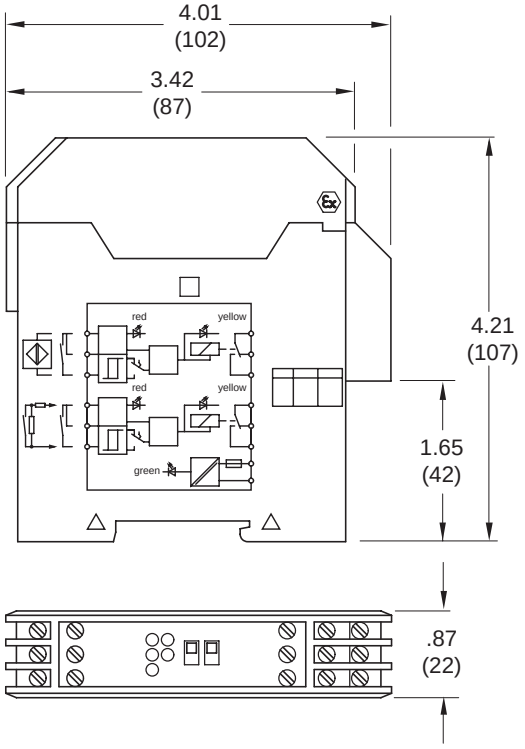
For All NAMUR Sensors

Part Number	Supply Voltage
0897810001	115VAC
0897810002	230VAC
0897810003	24VDC

- Reliable DC-decoupling between input, output and supply voltage in accordance with VDE 0100 Part 410
- 2-channel with one relay output SPDT respectively
- Intrinsically safe inputs complying with [EEx 1a] IIC
- Housing with snap fastening for support rail DIN 46277

Specifications

Supply voltage ..... 115 VAC (p/n 0897810001)
230 VAC (p/n 0897810002)
24 VDC (p/n 0897810003)
Mains frequency ..... 48-62 Hz
Switching frequency ..... ≤ 20 Hz
Power consumption per channel .... Approximately 1.5 VA
Approximately 0.7 W only for p/n 0897810003
Inputs..... 2 sensors
No load voltage..... 8.5 VDC
Short circuit current ..... ≥ 6mA
Permissible external capacitance ... ≤ 567nF
Permissible external inductance ..... ≤ 5 mH
Switching outputs ..... 1 relay per input: SPDT
Switching voltage..... ≤ 250 VAC
Switching current..... ≤ 5 A
Switching output ..... ≤ 100 VA
Permit ..... PTB no. Ex-95.C.2003X
VDE protection class I
Enclosure rating..... IP20
Operating temperature ..... -25ºC to +60ºC (-13ºF to +140ºF)
Approximate weight ..... 250g (8.8 oz.)
Housing material..... Plastic



M

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C052

Ordering Information

Sensor Type	Inductive Proximity			Non-contacting Magnetically Actuated	
Style	**EPS-7**	**EPS-5**	**EPS-6**	**CLS-1**	**CLS-4**
Sensor Part Number	148897****	146617****	148896****	148275****	149109****
6' Cable	0853550006	0853550006	0859170006	0853550006	—
12' Cable	0853550012	0853550012	0859170012	0853550012	—
6' Cable, Right Angle	0875470006	0875470006	—	0875470006	—

**** Part Number Suffix: **** 4-digit suffix indicates probe length: 0125=1.25", 0206=2.06", 0288=2.875", 0456=4.562"

Specifications

Style	**EPS-7**	**EPS-5**	**EPS-6**	**CLS-1**	**CLS-4**
Code Designator	H	R	D	F	B
Sensor Type	Inductive proximity	Inductive proximity	Inductive Proximity	Non-contacting magnetically actuated	Non-contacting magnetically actuated
Description	Economical, General Purpose, 2 wire device, primarily for AC applications, not suitable for 24 VDC applications. Use EPS-5 only for automotive industry customers who specify them.		Economical, General Purpose, 3 wire, DC sensor, dual output: sinking and sourcing	Functional replacement for AB (Mechanical) Limit Switches in many applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style.	Functional replacement for AB (Mechanical) Limit Switches in many High Temperature applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style.
Supply Voltage	20 to 250 VAC/DC	20 to 230 VAC/DC	10 to 30 VDC	24 to 240 VAC/DC	24 to 240 VAC/DC
Load Current, min	8 mA	5 mA	NA	NA	NA
Load Current, max	300 mA	500 mA	200 mA	4 AMPS @ 120 VAC 3 AMPS @ 24 VDC	4 AMPS @ 120 VAC 3 AMPS @ 24 VDC
Leakage Current:	1.7 mA, max.	1.7 mA, max.	10 micro amps max.	—	—
Voltage Drop	7 V, max.	10 V, max	2 VDC max.	NA	NA
Operating Temperature	-14° to +158° F	-4° to +158° F	-14° to +158° F	-40°F to +221° F	-40° F to +400° F
Connection	3-pin mini	3-pin mini	5-pin mini	3-pin mini	144" PTFE Coated Flying Leads with 1/2" conduit hub
Enclosure Rating	IEC IP67	NEMA 4, 6, 12, 13	IEC IP67	NEMA 1, 2, 3, 4, 4x, 5, 6, 6P, 11, 12, 12K, 13	NEMA 1, 2, 3, 4, 4x, 5
LED indication	Yes	Yes	Yes	No	No
Short Circuit Protection	Yes	Yes	Yes	No	No
Weld Field Immunity	Yes	Yes	Yes	Yes	Yes
Output	2 wire, Normally Open with leakage current	2 wire, Normally Open with leakage current	Dual output: DC Sinking and DC Sourcing, user selectable via wiring	SPDT (Single Pole Double Throw), Normally Open/Normally Closed, Form C	SPDT (Single Pole Double Throw), Normally Open/Normally Closed, Form C
Approvals/Marks	CE, UL, CSA	UL	CE, UL, CSA	UL or CSA	UL or CSA
Make/Break Location	0.125" from end of stroke, typical. Tolerance is 0/-0.125"				
Wiring Instructions	Pin 1: AC Ground (Green)	Pin 1: AC Ground (Green)	Pin 1) +10 to 30 VDC (White)	Pin 1: Common (Green)	Common: (Black)
	Pin 2: Output (Black)	Pin 2: Output (Black)	Pin 2) Sourcing Output (Red)	Pin 2: Normally Closed (Black)	Normally Open: (Blue)
	Pin 3: AC Line (White)	Pin 3: AC Line (White)	Pin 3) Grounded (not connected or required)	Pin 3: Normally Open (White)	Normally Closed: (Red)
			Pin 4) Sinking Output (Orange)		
			Pin 5) DC Common (Black)		

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Series and Parallel Wiring

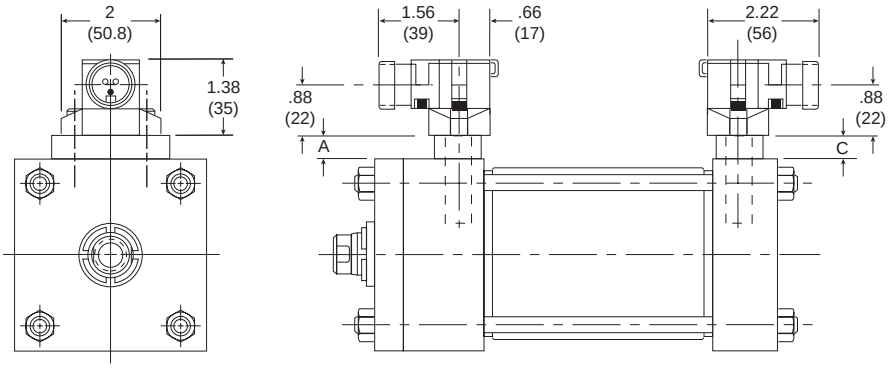
When Parker EPS-5, 6 or 7 proximity sensors are used as inputs to programmable controllers, the preferred practice is to connect each sensor to a separate input channel of the PC. Series or parallel operations may then be accomplished by the internal PC programming.

Parker EPS-5, 6 or 7 sensors may be hard wired for series operation, but the voltage drop through the sensors (see specifications) must not reduce the available voltage below what is needed to actuate the load.

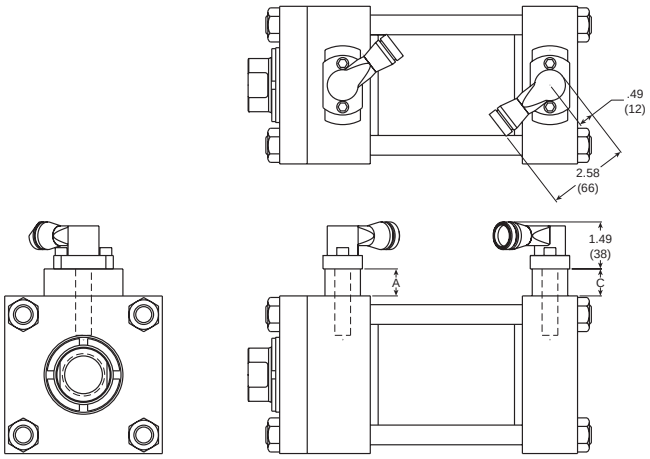
Parker EPS-5, 6 or 7 sensors may also be hard wired for parallel operation. However, the leakage current of each sensor will pass through the load. The total of all leakage currents must not exceed the current required to actuate the load. In most cases, the use of two or more EPS-5, 6 or 7 sensors in parallel will require the use of a bypass (shunt) resistor.

EPS-5
Automotive Applications

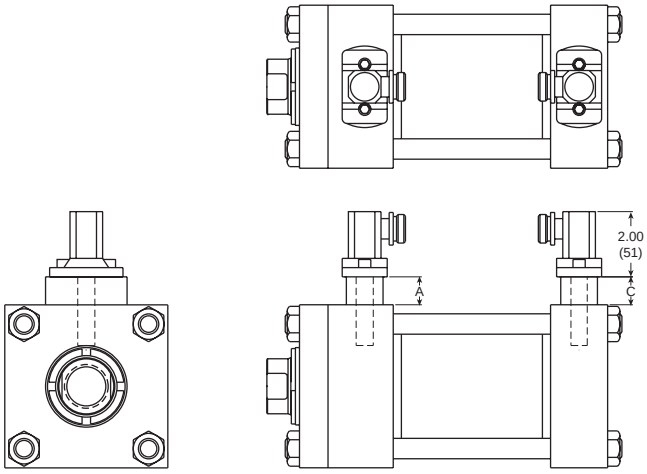
(Meets some Automotive Manufacturer's Specifications)



EPS-7 & EPS-6 Sensors



CLS-1 & 4 Sensors

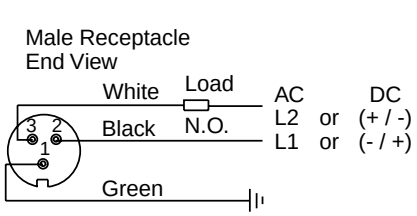


Series	A max.	C max.
2A, 4MA, 4MAJ	1.55"	1.30"

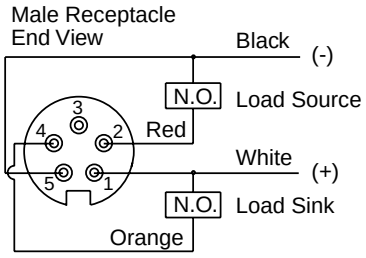
For exact dimensions, see Bulletin 0840-G-E1

Connector Pin Numbering

3-Pin Mini



5-Pin Mini



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How to Specify EPS Sensors

Parker EPS proximity sensors may be ordered on 2A, 2AN, 4MA and 4MAJ Series cylinders as follows:

1) Complete the basic cylinder model number.
2) Place an “S” in the model number to denote sensors and/or special features.
3) Mounting styles D, DB, JB, or HB should be used with caution because of possible mounting interferences. Consult bulletin 0840-G-E1 for additional information.
4) Special modifications to cylinders other than sensors must have a written description.
5) Specify letter prefix “H” for EPS-7, “D” for EPS-6, “R” for EPS-5, “F” for CLS-1, or “B” for CLS-4, then fill in the four fields specifying port location, sensor orientation and actuation point for both head and cap. If only one sensor is used, place “XXXX” in the unused fields.

   Example = H13CGG-XXXX denotes a sensor on the head end only, EPS-7

   Example = BXXXX-42BGG denotes a sensor on the cap end only, CLS-4

Head End

R	1	3	A	GG
Specify: R = EPS-5 H = EPS-7 D = EPS-6 F = CLS-1 B = CLS-4 N = Prep for sensors only	Port Location See Figure 1.	Sensor Location See Figure 1.	Sensor Orientation See Figure 2 for EPS-7 and EPS-6 only.	Actuation Point GG = End of Stroke FF** = Stroke to Go; See Bulletin 0840-G-E1 for stroke remaining.

Cap End

4	2	B	GG
Port Location See Figure 1.	Sensor Location See Figure 1.	Sensor Orientation See Figure 2 for EPS-7 and EPS-6 only.	Actuation Point GG = End of Stroke FF** = Stroke to Go; See Bulletin 0840-G-E1 for stroke remaining.

Note: All specified sensor and port locations are as seen from rod end of cylinder.
*EPS-5 sensors will be oriented so that the connectors face each other.
**Consult the Wadsworth, Ohio facility for this option with 4MA and 4MAJ Series cylinders.

Figure 1

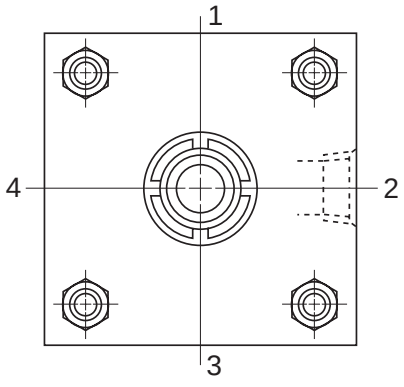
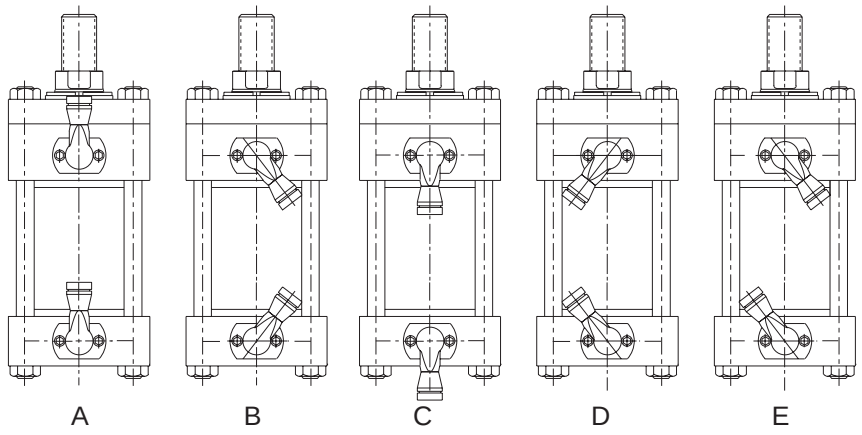


Figure 2



Example:
4.00 CJ4MAUS14AC 12.000
S = H13CGG-13CGG

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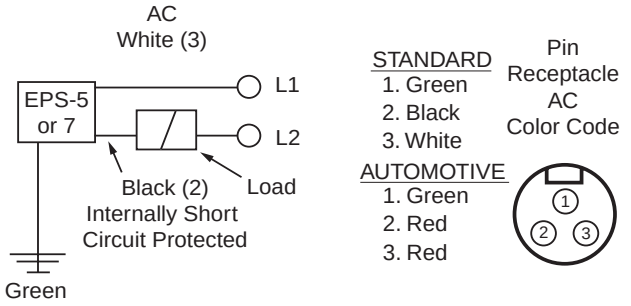
EPS-5 & EPS-7

Connectors

The male quick disconnect on the Parker EPS-5 or 7 is a Brad Harrison 40909 connector.

Female connects must be purchased with one of the following cable lengths.

Cable Length	Parker Part Number	
	Automotive	Standard
3'	085356003	0853550003
6'	085356006	0853550006
9'	085356009	—
12'	0853560012	0853550012



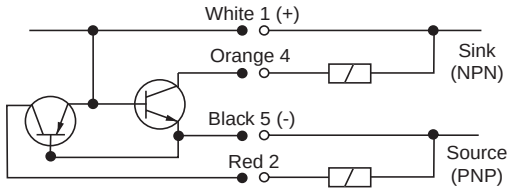
EPS-6

Connectors

The male quick disconnect on the Parker EPS-6 is a Brad Harrison 41310 connector.

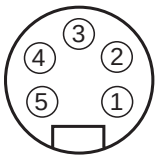
Plug Pin and Cable Identification

1) +10 to 30 VDC (White)
2) Source (Red)
3) Grounded not connected nor required
4) Sink (Orange)
5) Common (Black)



LED Function	"Ready"	"Target"
Power Applied (No Target)	ON	OFF
Target Present	OFF	ON
Short Circuit Condition	FLASH	FLASH

Cable Length	Parker Part Number
3	0859170003
6	0859170006
12	0859170012



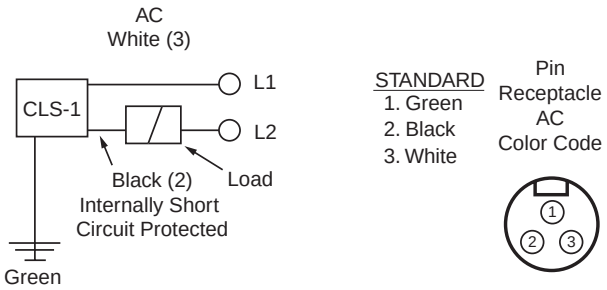
CLS

Connectors

The male quick disconnect on the Parker CLS-1 is a Brad Harrison 40909 connector.

Female connects must be purchased with one of the following cable lengths.

Cable Length	Parker Part Number
3'	0853550003
6'	0853550006
9'	—
12'	0853550012



The connection for the CLS-4 are 144" PTFE insulated flying leads with 1/2" conduit hub. 3-wire: Common (black), Normally open (blue), and Normally closed (red).

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Proximity Sensors

The inductive type proximity sensor provides end of rotation indication. The non-contact probe senses the presence of the ferrous cushion spear and has no springs, plungers, cams or dynamic seals that can wear out or go out of adjustment. The sensor is solid state and meets NEMA 3, 4, & 13 specifications. For ease of wiring, the connector housing is rotatable through 360°. To rotate, lift the cover latch, position, and release.

A standard proximity sensor controls 20-230 VAC/DC loads from 5 to 500 mA. The low 1.7 mA off-state leakage current can allow use for direct PLC input. The standard short circuit protection (SCP) protects the sensor from a short in the load or line upon sensing such a condition (5 amp or greater current) by assuming a non-conductive mode. The fault condition must be corrected and the power removed to reset the sensor preventing automatic restarts.

The low voltage DC sensor is also available for use with 10-30 VDC. This sensor is in a non-rotatable housing, but does incorporate the short circuit protection.

Both sensors are equipped with two LEDs, “Ready” and “Target”. The “Ready” LED is lit when power is applied and the cushion spear is not present. The “Target” LED will light and the “Ready” LED will go out when the sensor is closed, indicating the presence of the cushion spear. Both LEDs flashing indicates a short circuit condition.

For Low Voltage DC Sensor (10-30 VDC) information, please refer to pages H27 and H30.

For High Voltage Sensor (20-230 VAC/DC) information, please refer to pages H27 and H30.

Notes:

1. Available with or without cushions.
2. Not available with stroke adjusters.
3. Pressure rating: 3000 PSI
4. Operating temperature: -4°F to 150°F
5. Specify sensor type, orientation and voltage when ordering.
6. The low voltage DC sensor is available in non-rotatable style only, consult representative for further information.

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Inductive Proximity Sensors – 8mm Barrel Type

Proximity sensors are normally ordered with the unit as part of the model number. Use these part numbers for replacement parts only.

Part Numbers

Series	PNP		NPN	
	Quick* Connect	Flying Leads	Quick ** Connect	Flying Leads
HB	B8830-P	913090000	B8830-N	913090100
P5L	B8830-P	913090000	B8830-N	913090100
WR	B8830-P	913090000	B8830-N	913090100

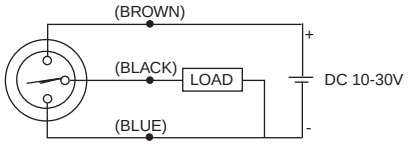
* Order cordset B8757-P separately.

** Order cordset B8757-N separately.

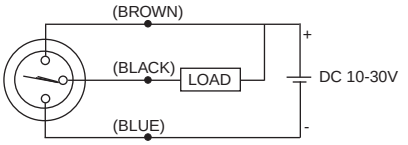
Electrical Specifications

Voltage.....10-30 VDC (3 wire) PNP or NPN
No Load Current.....5.5-9.5 mA
Continuous Current 150mA
Switching Speed.....8 ms
Switch Frequency .....5000 Hz
Switching Distance .....Aluminum = 0.016 in (0.4mm)
Brass = 0.028 in (0.7 mm)
Steel = 0.039 in (1.0 mm)
Overload Protection.....Triggered at 170mA
Reverse Polarity Protection .....Incorporated
Temp. Range.....-13 to 158°F (-25 to 70°C)
Enclosure Rating .....Meets NEMA 1,3,4,6,13 and IEC IP67, fully encapsulated

PNP WIRING CONNECTION

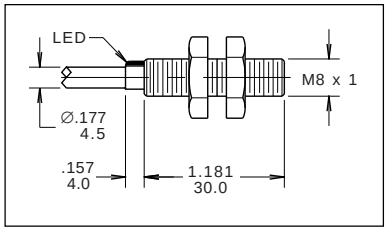


NPN WIRING CONNECTION



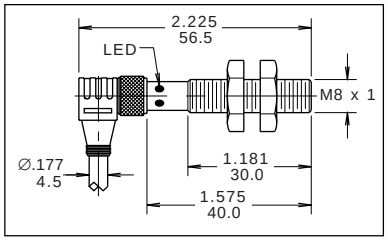
POTTED-IN SENSOR

Lead type sensor with 20 ft. (6m) cord length



PLUG-IN SENSOR

A threaded right angle cordset must be ordered separately. The cordset contains two LEDs: 1 - power, 2 - target indication. Cordset length is 20 ft. (6m).



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Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.

Before selecting or using Parker (The Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using The Company's products.

1.0 General Instructions

1.1 Scope – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use The Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility – Due to very wide variety of cylinder applications and cylinder operating conditions, The Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to The Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own
analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company 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.

2.0 Cylinder and Accessories Selection

2.1 Seals – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cushions – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be review by our engineering department.

2.4 Cylinder Mountings – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

2.5 Port Fittings – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure x effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.1.4 – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the
cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – **External Leakage**

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.2.2 – **Internal Leakage**

4.2.2.1 – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

4.2.2.2 – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

4.2.2.3 – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

4.2.3 – **Cylinder Fails to Move the Load**

4.2.3.1 – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

4.2.3.2 – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

4.2.3.3 – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by The Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

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Pneumatic Division
Wadsworth, Ohio
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Offer of Sale

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

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

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

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

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

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGN OR SPECIFICATIONS.

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

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

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

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

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

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

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

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

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

Printed in U.S.A.
May, 2008

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www.parker.com/pneumatics