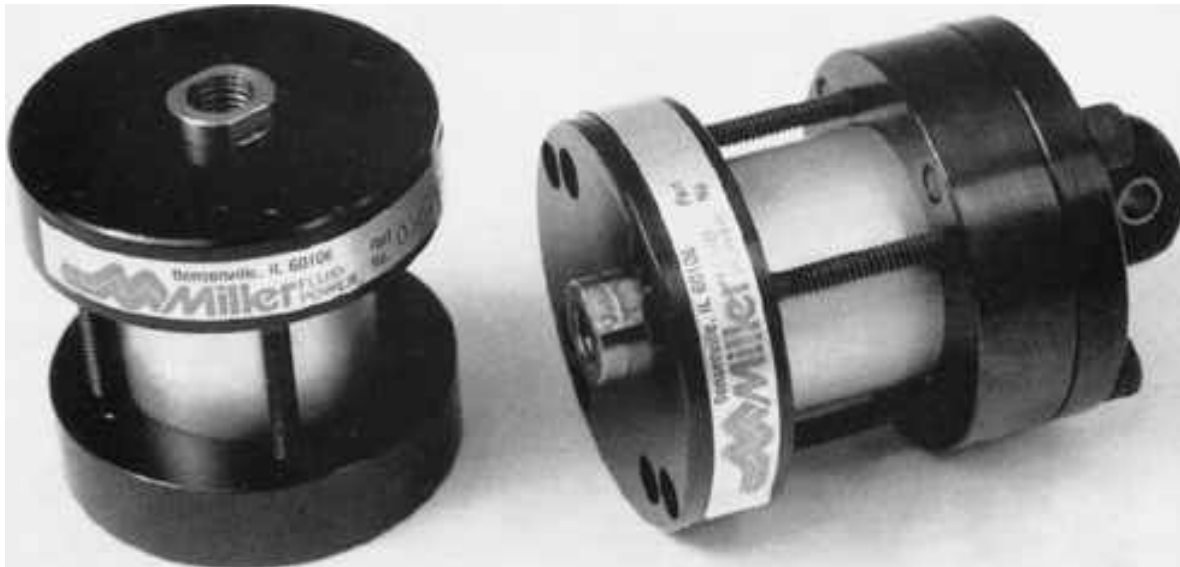


Miller B Flat Cylinder

**Compact
Lightweight
Reliable**



**Series B Flat Cylinders
Up to 250 PSI, Air or Oil
Bore Sizes 9/16" to 4"
Stock Strokes from 1/8" to 4"
Strokes Up to 6"
Mounting, Rod End and Seal Option
Special on Request**



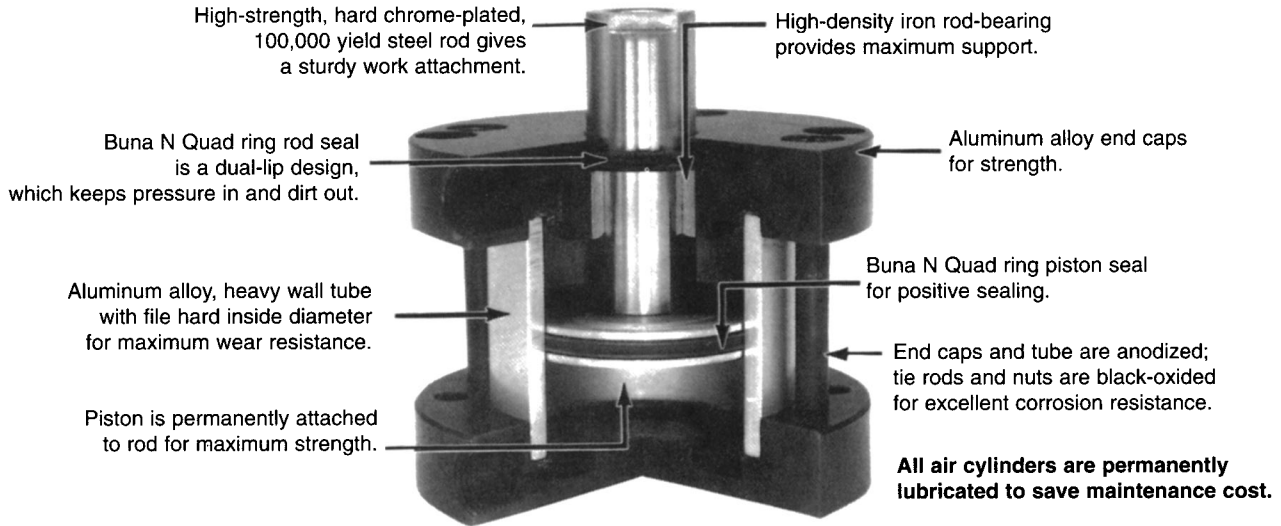
B FLAT

Technical Data2
Dimensions3
Mounting Options and Replacement Parts4
Accessories5
Limit Switches6-7
How to Order7



Compact, Lightweight, Reliable

Miller B Flat Cylinder



Pressure: 250 psi, air or oil Temperature: -40°F to 200°F (optional Viton seals up to 400°F)
 All air cylinders are permanently lubricated

The Miller B Flat aluminum cylinder is lightweight and specially engineered for applications in robotic-assembly automation, machine tools, or anywhere a small, compact cylinder is needed. All Miller B Flat Cylinders feature our anodized aluminum construction for lightweight efficiency. You get quality performance without wasting space.

Technical Data

Push/Pull Forces

Bore dia.	Rod area	Piston area push/pull	PSI									
			40	50	60	80	100	125	150	175	200	250
9/16	.049	Push .248	10	12.5	15	20	25	31	37	43	50	62
		Pull .200	8	10	12	16	20	25	30	35	40	50
3/4	.076	Push .442	17.5	22	26.5	35	44	55	66	77	88	111
		Pull .366	14.6	18	22	29	37	46	55	64	73	92
1 1/8	.196	Push .994	40	50	60	80	99	124	149	174	200	249
		Pull .798	32	40	48	64	80	100	120	140	160	200
1 1/2	.307	Push 1.767	71	88	106	141	177	221	265	309	353	443
		Pull 1.460	58	73	88	117	146	182	219	256	292	365
2	.442	Push 3.141	126	157	188	251	314	393	471	550	628	785
		Pull 2.699	108	135	162	216	270	337	405	472	540	675
2 1/2	.442	Push 4.908	196	245	294	393	491	613	736	859	982	1227
		Pull 4.466	178	223	268	357	447	558	670	781	893	1116
3	.601	Push 7.069	283	353	424	566	707	884	1060	1237	1414	1767
		Pull 6.486	259	324	389	519	649	811	973	1135	1297	1622
4	.781	Push 12.57	503	628	754	1006	1257	1571	1885	2200	2514	3142
		Pull 11.78	471	589	707	942	1178	1484	1767	2062	2356	2945

Weight Chart – Basic Cylinders

Bore dia.	ST basic weight in ounces*	Add. per 1/8 inch of stroke (ounces)
9/16	1.1	.08
3/4	2.0	.1
1 1/8	5.0	.2
1 1/2	8.5	.4
2	11.7	.5
2 1/2	18.6	.6
3	25.1	.7
4	51.1	1.1

* Base weight includes 1/8 inch of stroke.

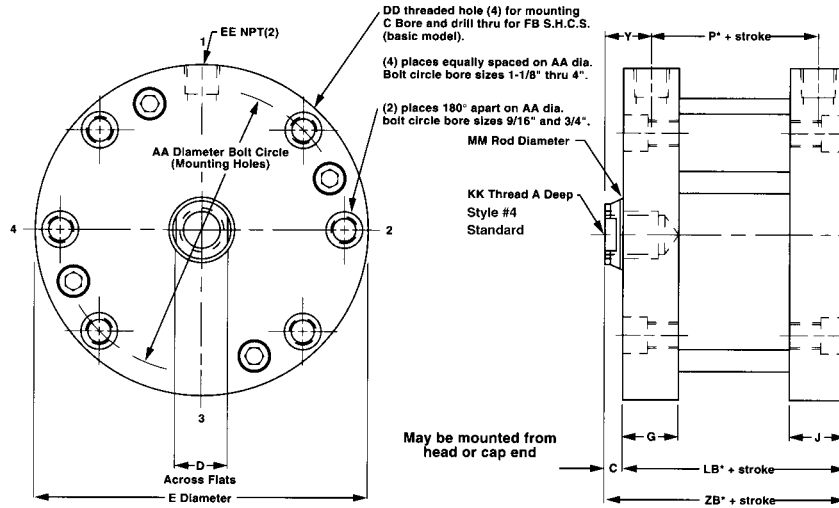
ONE-YEAR WARRANTY

All Miller B Flat Cylinders are warranted to be free from defects in material or manufacture for one year from date of shipment

Dimensions

Model 50 Cylinder Dimensions

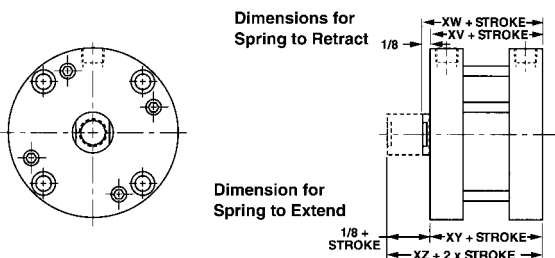
Double acting, single rod end, female and rod style #4 (Standard)



Bore dia.	A	C	D	E	G	J	P*	Y	AA	DD	EE	FB	KK	LB*	MM	ZB*	Bore dia.
9/16	.40	1/8	7/32	1 1/8	23/64	23/64	1 1/32	17/64	.875	#8-32	#10-32	#4	#8-32	5/8	1/4	3/4	9/16
3/4	.44	1/8	1/4	1 1/2	23/64	23/64	3/8	17/64	1.219	#10-32	#10-32	#6	#10-32	21/32	5/16	25/32	3/4
1 1/8	.62	1/8	7/16	2	1/2	1/2	27/64	3/8	1.687	#10-32	1/8	#6	5/16-24	59/64	1/2	13/64	1 1/8
1 1/2	.62	1/8	1/2	2 5/8	1/2	1/2	1/2	3/8	2.187	1/4-28	1/8	#10	3/8-24	1	5/8	1 1/8	1 1/2
2	.70	1/8	5/8	3 1/8	1/2	1/2	9/16	3/8	2.687	1/4-28	1/8	#10	1/2-20	1 1/16	3/4	13/16	2
2 1/2	.70	1/8	5/8	3 3/4	5/8	5/8	5/8	7/16	3.250	5/16-24	1/4	1/4	1/2-20	1 1/4	3/4	13/8	2 1/2
3	.75	1/8	3/4	4 1/4	43/64	43/64	21/32	7/16	3.781	5/16-24	1/4	1/4	5/8-18	19/32	7/8	113/32	3
4	.75	1/8	7/8	5 1/2	27/32	27/32	49/64	17/32	4.937	3/8-24	3/8	5/16	3/4-16	15/8	1	13/4	4

Spring Return or Extend Data

(Available through 2" stroke)



Bore dia.	1/8" to 1" stroke				Max. spring force	Spring rate lb/in
	Spring return XV	Spring return XW	Spring extend XY	Spring extend XZ		
9/16	1	1 1/8	57/64	1 1/64	5.7 lb.	4.25 lb./in.
3/4	1 1/64	1 9/64	59/64	1 3/64	9 lb.	6 lb./in.
1 1/8	1 23/64	1 31/64	1 9/32	1 13/32	10 lb.	6 lb./in.
1 1/2	1 25/64	1 33/64	1 11/32	1 15/32	13 lb.	5.5 lb./in.
2	1 11/64	1 19/64	1 13/32	1 17/32	13 lb.	5.5 lb./in.
2 1/2	1 3/8	1 1/2	1 23/32	1 27/32	17.5 lb.	6 lb./in.
3	1 1/2	1 5/8	1 55/64	1 63/64	24 lb.	6.5 lb./in.
4	1 27/32	1 31/32	2 13/64	2 21/64	24 lb.	6.5 lb./in.

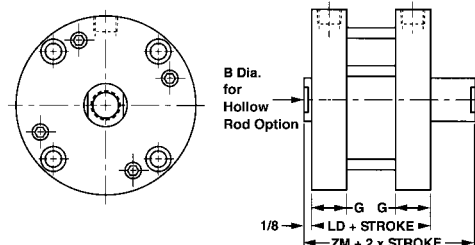
Spring return XV	Spring return XW	Over 1" to 2" stroke		Max. spring force	Spring rate lb/in
		Spring extend XY	Spring extend XZ		
1 11/16	1 13/16	1 37/64	1 45/64	5.7 lb.	1.75 lb./in.
1 45/64	1 53/64	1 39/64	1 47/64	9 lb.	2.5 lb./in.
1 63/64	2 7/64	1 29/32	2 1/32	10 lb.	2.5 lb./in.
2 1/64	2 9/64	1 31/32	2 3/32	12 lb.	2.25 lb./in.
1 51/64	1 59/64	2 1/32	2 5/32	12 lb.	2.25 lb./in.
2	2 1/8	2 11/32	2 15/64	16 lb.	2.5 lb./in.
2 1/8	2 1/4	2 31/64	2 39/64	23 lb.	2.75 lb./in.
2 15/32	2 19/32	2 53/64	2 61/64	23 lb.	2.75 lb./in.

Double Rod End Dimensions

Basic Model 50 with Standard or Hollow Rod

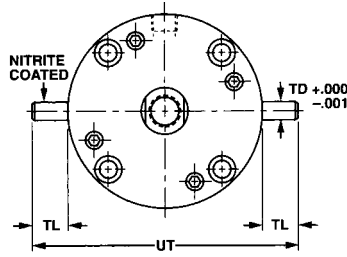
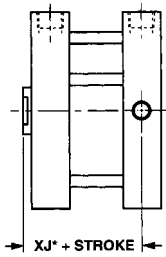
Bore dia.	B	G	LD	ZM
9/16	*	23/64	3/4	1
3/4	9/64	23/64	13/16	1 1/16
1 1/8	7/32	1/2	13/16	1 7/16
1 1/2	9/32	1/2	1 19/64	1 35/64
2	3/8	1/2	13/8	1 5/8
2 1/2	3/8	5/8	1 5/8	1 7/8
3	7/16	43/64	1 11/16	1 15/16
4	1/2	27/32	2 1/32	2 9/32

*Hollow Rod Not Available.

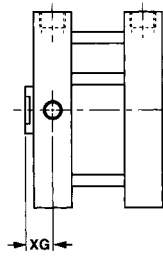


Mounting Options & Replacement Parts

Cap Trunnion
Model 82

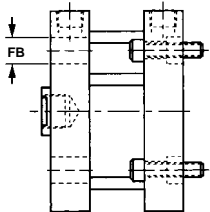


Head Trunnion
Model 81

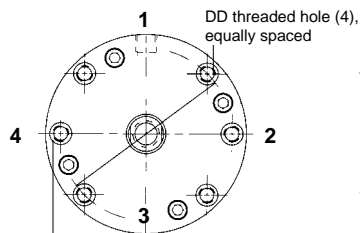


Bore dia.	TD	TL	UT	XG	XJ*
9/16 & 3/4	Not Available				
1 1/8	.250	1/2	3	3/8	5 1/64
1 1/2	.250	1/2	3 5/8	3/8	7/8
2	.250	1/2	4 1/8	3/8	15/16
2 1/2	.312	5/8	5	29/64	13/64
3	.312	5/8	5 1/2	15/32	1 1/16
4	.375	3/4	7	35/64	1 17/64

Head Bolt
Clearance Holes
Model 64

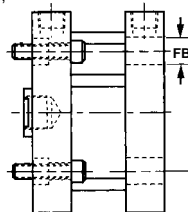


Threaded
Mounting Holes



DD threaded hole (2) on 9/16 & 3/4 bore only—positions 2 and 4

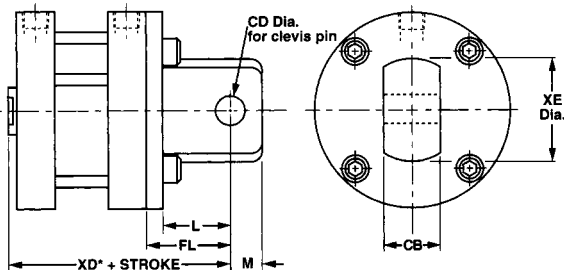
Cap Bolt
Clearance Holes
Model 63



Bore Dia.	AA	DD	FB*
9/16	.875	#8-32	#4
3/4	1.219	#10-32	#6
1 1/8	1.687	#10-32	#6
1 1/2	2.187	1/4-28	#10
2	2.687	1/4-28	#10
2 1/2	3.250	5/16-24	1/4
3	3.781	5/16-24	1/4
4	4.973	3/8-24	5/16

*Clearance Hole for HB Diameter S.H.C.S. on AA Diameter B.C. See "Threaded Mounting Holes" View for Location.

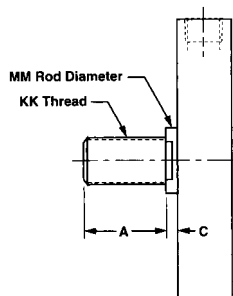
Cap Pivot Eye
Model 90



Bore dia.	L	M	CB	CD	FL	XD*	XE
9/16	1/2	1/4	3/8	3/16	2 1/32	1 13/32	19/32
3/4	1/2	1/4	3/8	3/16	2 1/32	1 7/16	3/4
1 1/8	1/2	1/4	3/8	3/16	49/64	1 13/16	3/4
1 1/2	13/16	7/16	3/4	3/8	1 1/16	2 3/16	1 3/8
2	13/16	7/16	3/4	3/8	1 1/8	2 5/16	1 3/8
2 1/2	13/16	7/16	3/4	3/8	1 1/4	2 5/8	1 3/8
3	1 9/32	9/16	1	5/8	1 21/32	3 1/16	1 7/8
4	1 9/32	9/16	1	5/8	1 11/16	3 7/16	1 7/8

Order Clevis Pin from Accessories when Required.

Optional Male Rod End Style #2



Bore dia.	A	C	KK	MM
9/16	.38	1/8	#8-32	1/4
3/4	.50	1/8	#10-32	5/16
1 1/8	.50	1/8	5/16-24	1/2
1 1/2	.50	1/8	3/8-24	5/8
2	.62	1/8	1/2-20	3/4
2 1/2	.62	1/8	1/2-20	3/4
3	.75	1/8	5/8-18	7/8
4	.75	1/8	3/4-16	1

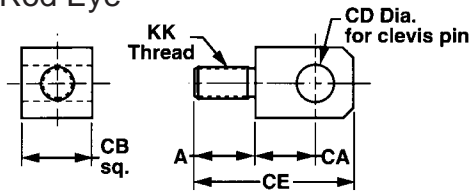
Seal Kits

Bore Dia.	Single Rod End		Tie Rod Torque INCH/LBS.
	Std. Kit No.	Viton Kit No.	
9/16	030-CRKO1-56	030-CRKO2-56	#4
3/4	030-CRKO1-75	030-CRKO2-75	#6
1 1/8	030-CRKO1-113	030-CRKO2-113	#6
1 1/2	030-CRKO1-150	030-CRKO2-150	#10
2	030-CRKO1-200	030-CRKO2-200	#10
2 1/2	030-CRKO1-250	030-CRKO2-250	1/4
3	030-CRKO1-300	030-CRKO2-300	1/4
4	030-CRKO1-400	030-CRKO2-400	5/16

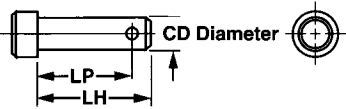
Double Rod End			
9/16	034-CRKO1-56	034-CRKO2-56	
3/4	034-CRKO1-75	034-CRKO2-75	
1 1/8	034-CRKO1-113	034-CRKO2-113	
1 1/2	034-CRKO1-150	034-CRKO2-150	
2	034-CRKO1-200	034-CRKO2-200	
2 1/2	034-CRKO1-250	034-CRKO2-250	
3	034-CRKO1-300	034-CRKO2-300	
4	034-CRKO1-400	034-CRKO2-400	

Accessories

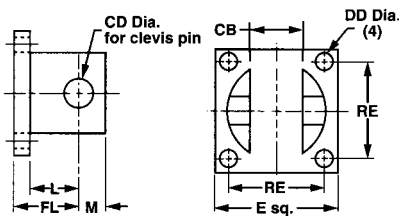
Rod Eye



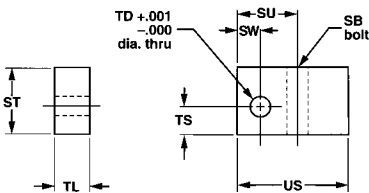
Clevis Pin



Clevis Bracket (supplied with pin)



Trunnion Bracket



Noise Dampening Bumper

When Ordering, specify

bumpers needed: **Cap End (C)**
Rod End (R)
Both Ends (B)

Bumpers, Available at either or both ends of the B-Flat, provide for quieter operation. Bumper material is a 70 durometer nitrile. The table to the right shows the distance the stroke is reduced when incorporating bumpers. This varies with operating pressure as indicated in the table.

Example: A 1 1/2" bore x 1/2" stroke cylinder with bumpers on both ends and operating at 80 PSI will have a working stroke of .43", rather than .50" (1/2)

For special applications, contact your Miller Fluid Power representative.

Bore	Part #	A	CA	CB	CD	CE	KK
9/16	L-97-05	3/8	15/32	3/8	3/16	13/32	#8-32
3/4	L-97-1	3/8	15/32	3/8	3/16	13/32	#10-32
1 1/8	L-97-2	9/16	15/32	3/8	3/16	19/32	5/16-24
1 1/2	L-97-3	5/8	23/32	3/4	3/8	125/32	3/8-24
2-2 1/2	L-97-4	1 1/16	23/32	3/4	3/8	127/32	1/2-20
3	L-97-5	3/4	1	1	5/8	23/8	5/8-18
4	L-97-6	3/4	1	1	5/8	23/8	3/4-16

Part #	CD	HP	LH	LP
L-96-1	3/16	3/32	1	29/32
L-96-2	3/8	5/32	1 5/8	1 15/32
L-96-3	5/8	5/32	2	1 27/32

Part #	E	L	M	CB	CD	DD	FL	RE
L-91-1	1	13/32	7/32	25/64	3/16	9/64	9/16	3/4
L-91-2	1 3/4	25/32	13/32	49/64	3/8	11/64	15/16	1 3/8
L-91-3	2 1/2	1	9/16	1 1/64	5/8	17/64	1 1/4	2

Use 030-TBK01 on 9/16" and 1 1/8" bore; 030-030-CBK02 on 1 1/2" and 2 1/2" bore; and 030-CBK03 on 3" and 4" bore.

NOTE: The Clevis Bracket is an accessory for the rod eye or the cap pivot eye and cannot be mounted directly to the cylinder.

Part #	SB	ST	SU	SW	TD	TL	TS	US
L-98-1	1/4	7/8	13/16	5/16	.251	1/2	3/8	1 1/2
L-98-1	5/16	1	15/16	3/8	.313	5/8	29/64	1 5/8
L-98-3	3/8	1 1/4	1 1/16	7/16	.376	3/4	35/64	1 7/8

Use 030-TBK01 on 1 1/8", 1 1/2" and 2" bores.

Use 030-TBK02 on 2 1/2" and 3" bores.

Use 030-TBK03 on 4"

Stroke Reduction (In.) Using Bumpers

Bore dia.	Bumper location	Operating PSI					
		0	20	40	60	80	100
9/16	At cap (C)	.025	.025	.024	.024	.023	.023
	At head (R)	.073	.067	.059	.053	.048	.043
	Both (B)	.098	.092	.083	.077	.071	.066
3/4	At cap (C)	.030	.020	.018	.015	.010	.007
	At head (R)	.070	.065	.050	.045	.040	.040
	Both (B)	.100	.085	.068	.060	.050	.047
1 1/8	At cap (C)	.050	.040	.035	.020	.015	.010
	At head (R)	.100	.080	.075	.070	.065	.060
	Both (B)	.150	.120	.110	.090	.080	.070
1 1/2	At cap (C)	.060	.050	.040	.025	.015	.015
	At head (R)	.100	.075	.060	.060	.055	.050
	Both (B)	.160	.125	.100	.085	.070	.065
2	At cap (C)	.060	.050	.035	.025	.015	.005
	At head (R)	.100	.070	.055	.050	.045	.040
	Both (B)	.160	.120	.090	.075	.060	.045
2 1/2	At cap (C)	.060	.045	.040	.020	.015	.010
	At head (R)	.105	.065	.055	.050	.045	.040
	Both (B)	.165	.110	.095	.070	.060	.050
3	At cap (C)	.100	.079	.059	.048	.037	.028
	At head (R)	.140	.085	.073	.068	.063	.058
	Both (B)	.240	.164	.132	.116	.100	.086
4	At cap (C)	.110	.097	.087	.078	.072	.067
	At head (R)	.255	.240	.229	.213	.197	.184
	Both (B)	.365	.337	.316	.291	.269	.251

Limit Switches

Switch Specifications

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

Model Number	Reed Switch (Low AMP)	NPN	PNP
Switching Logic	N.O. SPST (Form A)	N.O. NPN (Sinking)	N.O. PNP (Sourcing)
Supply Voltage Range	3 - 125 V AC/DC	6 - 30 VDC	6 - 30 VDC
On-State Voltage Drop	1.7 V Max.	1.2 V max.	
Current Output Range	–	150 mA	150 mA
Burden Current	–	7 mA at 12 V 14 mA at 24 V	
Power Rating*	5 W (2.5 W) 5 VA (2.5 VA)	–	
Switching Current Range*	5-40 mA (5-20 mA)	–	
Leakage Current	0	1.0 mA	1.0 mA
LED Function	Red (Target Present)	(Target Present)	(Target Present)
Minimum Current to Light LED	3 mA	1 mA	1 mA
Operating Temperature	-10 to 60°C (14 to 140°F)	-10 to 60°C (14 to 140°F)	
Storage Temperature	-20 to 60°C (-4 to 140°F)	-20 to 70°C (-4 to 158°F)	
Enclosure Protection	IEC standard IP 67 NEMA 6P		
Lead Wire	2 conductor, 24 gauge	3 conductor, 24 gauge	
Lead Wire Length	59 inches, 1.5 meter		
Color of Cable	Gray	Black	
Switching Response	Max. 300 Hz	Max. 1k Hz	
Shock Resistance	30 G (300 m/s ²)	50 G (490 m/s ²)	
Vibration Resistance	Double Amplitude 1.5 mm (Frequency 10 to 55 Hz 1 scanning, 1 minute)		

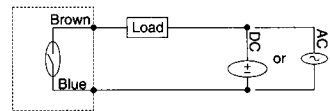
*Number in parentheses pertains to inductive loads.

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

Circuits

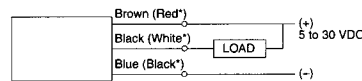
Reed Switch

NOTE: Polarity must be observed for DC operation only.



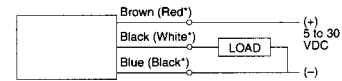
NPN Sinking Output

Color of Cable Black
"On" State Voltage Drop 1.2V Maximum



PNP Sourcing Output

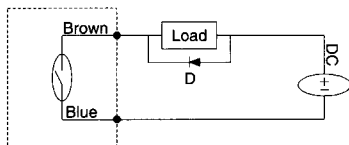
Color of Cable Black
"On" State Voltage Drop 1.2V Maximum



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)

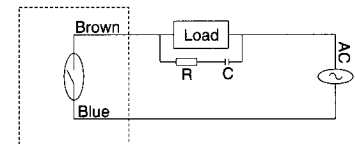
Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

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

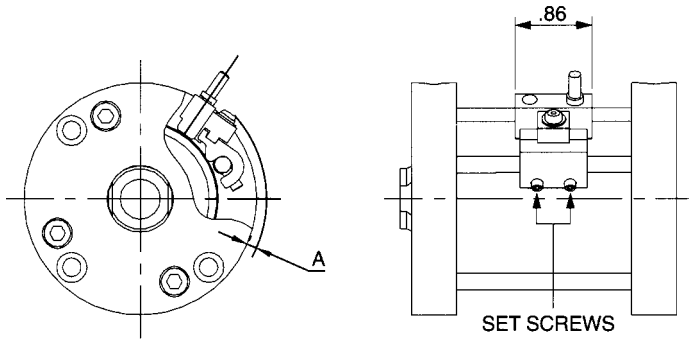


Caution

- Use an ammeter to test reed switch current. Testing devices such as incandescent light bulbs may subject the reed switch to high in-rush loads.
- **NOTE:** When checking an unpowered reed switch for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the switch is activated. This is due to the presence of a diode in the reed switch.
- Anti-magnetic shielding is recommended for reed switches exposed to high external RF or magnetic fields.
- The magnetic field strength of the piston magnet is designed to operate with our switches. Other manufacturers' switches or sensors may not operate correctly in conjunction with these magnets.

- Current capabilities are relative to operational temperatures.
- Use relay coils for reed switch contact protection.
- The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed switch. The switch 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 switch and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
- Switches 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 switch (the resistor should be installed as close as possible to the switch). The resistor should be selected such that R (ohms) > E/0.3.

Limit Switches



To sense piston position mount switch along tie rod using 2 each small set screws.

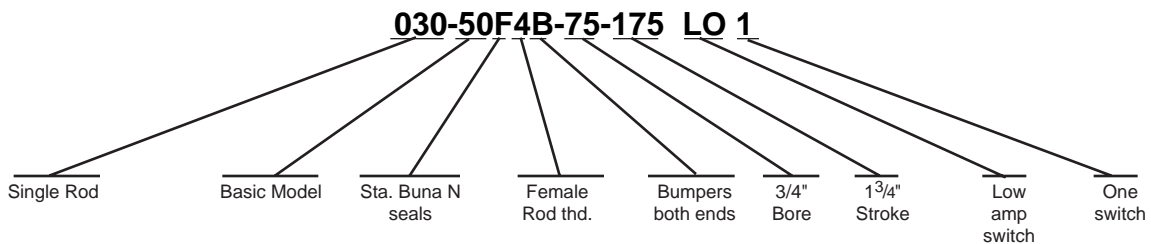
Switch Mounting Data

Bore Size	A	Piston Travel at Midstroke (in.) (Switch On) (± 01)	Minimum Activation Distance from End of Stroke (in.)	
			Head	Cap
9/16	.32	.20	.13	.13
3/4	.25	.23	.13	.13
1 1/8	.20	.32	.13	.13
1 1/2	.10	.32	.07	.07
2	.10	.35	.06	.06
2 1/2	.03	.42	.06	.06
3	.03	.47	.12	.12
4	.00	.47	.12	.12

How to Order

1. Select 2. Choose 3. Add 4. Select 5. Choose Bumper 6. Determine 7. Determine 8. Add 9. Add

Series	Mounting	Options	Rod End	Options	Bore Size	Stroke Length	Switch Type	Switch Quantity
030—Single Rod 034—Double Rod	50—Basic model 51—Thd. mtg. holes both ends 52—Thd. mtg. holes cap end 53—Thd. mtg. holes head end 63—Cap bolt clearance holes 64—Head bolt clearance holes 81—Head Trunnion 82—Cap Trunnion 90—Cap pivot eye	F—Std. Buna N Seals A—Viton Seals D—Spring Extend with std. seal E—Spring retract with std. seal H—Hollow rod (Double Rod Only) with Buna seals	#4—Female Rod thd. Standard #2—Male Rod thd. optional	B—Bumper both ends C—Bumper cap end R—Bumper rod end N—No bumpers	9/16" - 56 3/4" - 75 1 1/8" - 113 1 1/2" - 150 2" - 200 2 1/2" - 250 3" - 300 4" - 400	1/8" = 13 1/4" = 25 3/8" = 38 1/2" = 50 3/4" = 75 1" = 100 1 1/4" = 125 1 1/2" = 150 1 3/4" = 175 2" = 200 2 1/4" = 225 2 1/2" = 250 2 3/4" = 275 3" = 300 3 1/2" = 350 4" = 400 Other strokes available on request	LO= Low Amp SK= Sinking SC= Sourcing	



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