

# Lin-Act

## Series ST Extra Low Profile Pneumatic Cylinder

Catalog LA0975-2  
(10/99)



- Premium Quality Space Saving Design
- Factory Permanently Lubricated
- 250 PSI Rated

# The Series ST

## Low Profile Air Cylinder – with Switches Designed for Space Saving/Cost Saving Applications



The Series ST air cylinder is designed and built to meet your demands for space saving, low cost actuators – and to provide you with maximum reliability and cost effectiveness within minimum space requirements. The Series ST, together with the proven performer – the Series SR stainless steel round body air cylinder – gives you the opportunity to save space, reduce costs and get the reliability and premium quality that you expect from Lin-Act cylinder products.

Series ST air cylinders are available from strategically located regional stocking warehouses and over 130 (stocking) distributor locations for quick delivery. The Lin-Act Computer Linked System is

unequaled for saving you downtime, delivery time, and freight costs. For your cylinder requirements, we are the one source you can depend on for total response-ability. Worldwide.

### New from Lin-Act

For applications when piston position sensing is required, the Series ST with limit switch option, Low Profile Air Cylinder is the choice for a low profile, economical cylinder. Reed and solid state switches, along with the magnetic piston, provide actuation points between or at either end of the cylinder. Adjustment is simple so you can detect the presence of the piston along or at the end of the stroke and send the necessary signals for circuit control.

## FREE TEST CYLINDER!

The Cylinder Division will supply free of charge a prototype "ST" cylinder to any qualified Original Equipment manufacturer for testing purposes. Contact your local Lin-Act "ST" distributor for details.



**Cylinder Division**  
500 So. Wolf Road  
Des Plaines, IL 60016  
847/298-2400

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**Lin-Act**

# Improve performance with Lin-Act SHOR-T®

Buna-N Quad ring rod seal is a dual lip design, keeping pressure in and dirt out.

High strength steel, hard chrome plated, steel rod.

Aluminum alloy, heavy wall tube with file hard inside diameter for maximum wear resistance.

Piston is permanently attached to rod for maximum strength.



High-density iron rod bearing provides maximum support.

Aluminum alloy end caps for strength.

Buna N Quad ring piston seal is standard. Optional lip type piston seals are available which increase cylinder length.

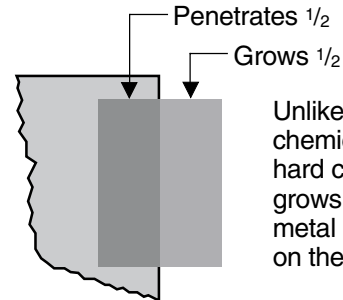
End caps and tubes are anodized; tie rods and nuts are black oxidized for corrosion resistance.

**All air cylinders are pre-lubricated.**

## Hardcoated Aluminum Tube I.D. maximizes wear life and corrosion resistance

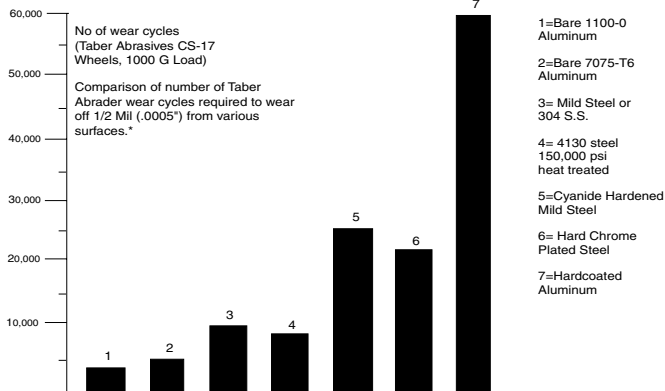
Hardcoating is an electro-chemical process similar to anodizing, which converts the surface of aluminum oxide thus producing an abrasion-resistant anodic coating. This dense coating has extreme hardness, excellent wear and seizure resistance, low coefficient of friction, and high corrosion resistance.

Hardcoat film is formed when oxygen combines with aluminum in solution to make aluminum oxide. As coating is formed, half its thickness penetrates the surface and half adds to the surface. Therefore, a normal coating thickness of .001" is made up of .0005" penetration of the base metal and .0005" buildup on the surface.



Unlike other electro-chemical processes, hard coating actually grows into the base metal as well as grows on the surface.

### Wear Test Data



\* From a "Study of Hardcoating for Aluminum Alloys," U.S. Department of Commerce, Office of Technical Services - PB111320.

### Corrosion Test Data

Independent laboratory corrosion tests performed on samples of various metals. Test is 5% salt spray fog (in accordance with ASTM B1117-64) for a total of 240 hours.

Material	Result
<b>Yellow Brass</b>	Moderate to heavy corrosion had occurred on inside and outside surfaces.
<b>Red Brass</b>	Moderate green corrosion had occurred on inside and outside.
<b>Bronze-plated Steel</b>	Moderate to heavy red rust was apparent on the outside surface. Moderate green corrosion had occurred on both the outside and inside.
<b>Hard Chrome-plated Steel</b>	Extensive red rust on both outside and inside surface.
<b>Hardcoated Aluminum</b>	No corrosion on significant surfaces.

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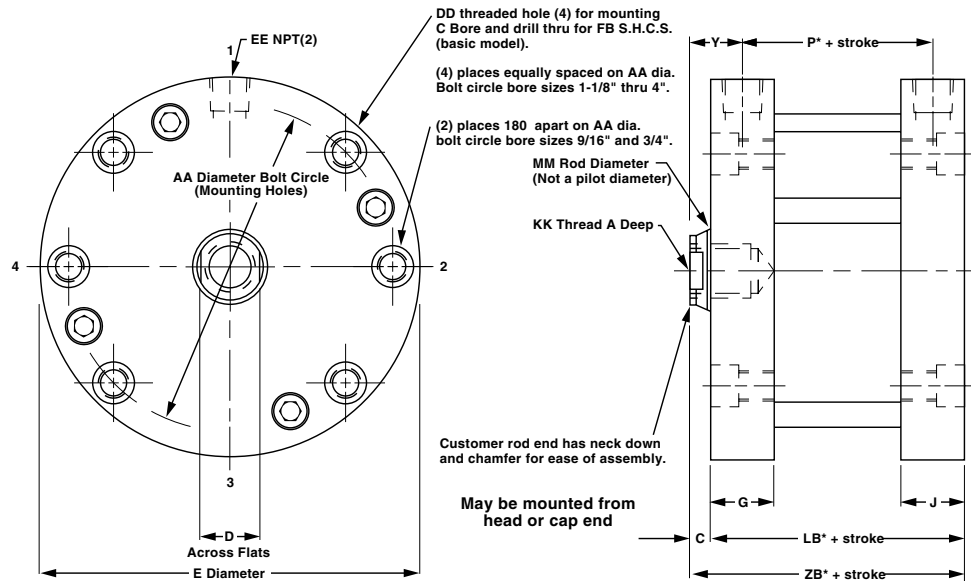
**Lin-Act**

**Mounting Style ST  
Lipseal/Limit Switch Option  
Length Adders**

**Series ST  
Air Cylinders**

Mounting  
Style ST  
Cylinder Dimensions  
Double Acting  
Single Rod End,  
Female Rod Style  
No. 4

Temperature: -10°F  
to 200°F (optional  
Fluorocarbon seals).  
All air cylinders are  
permanently lubricated.  
Limit Switch option  
maximum temperature  
140°F.



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	11/32	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

\*These dimensions are for the ST Series with standard piston. See table below for dimensions for the lipseal piston or limit switch options.

**Added Length Table for Limit Switch Option  
or Lipseal Piston Options**

Bore Dia.	Limit Switch Option†								ST with Lipseal Piston Option†							
	P	LB	LD	XD	XJ	ZB	ZM	Min. Stroke	P	LB	LD	XD	XJ	ZB	ZM	
9/16	15/16	17/32	111/32	2	—	111/32	119/32	1/2	5/8	29/32	11/32	111/16	—	11/32	19/32	
3/4	31/32	1 1/4	113/32	2 1/32	—	13/8	121/32	1/2	21/32	15/16	13/32	123/32	—	11/16	111/32	
1 1/8	63/64	131/64	13/4	23/8	123/64	139/64	2	9/16	43/64	111/64	17/16	21/16	13/64	119/64	111/16	
1 1/2	1 1/8	15/8	159/64	213/16	1 1/2	13/4	211/64	7/16	13/16	15/16	139/64	21/2	13/16	17/16	155/64	
2	19/32	125/32	23/32	31/32	121/32	129/32	211/32	7/16	61/64	129/64	149/64	245/64	121/64	137/64	21/64	
2 1/2	121/64	161/64	221/64	321/64	13/4	25/64	237/64	1/2	1	15/8	2	3	127/64	13/4	21/4	
3	127/64	23/64	229/64	353/64	153/64	211/64	245/64	1/2	13/32	123/32	21/8	31/2	1 1/2	127/32	23/8	
4	1 1/2	223/64	249/64	411/64	2	231/64	31/64	1/2	111/64	21/32	27/16	327/32	143/64	25/32	211/16	

†These options not available with the hollow rod option. The limit switch option also contains the lipseal piston option.  
Note minimum strokes for limit switch option.

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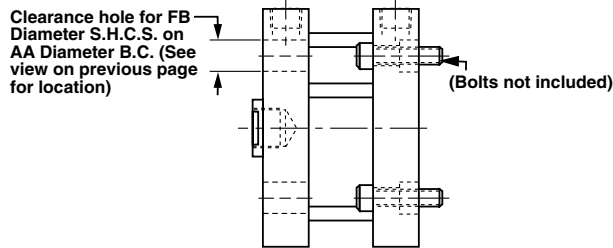
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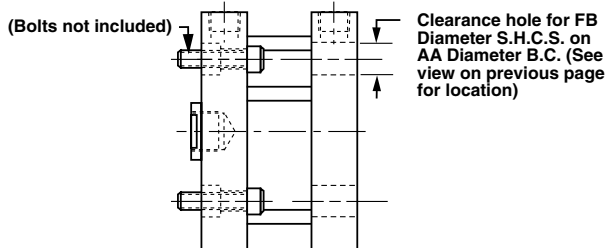
# Series ST Air Cylinders

## Mounting Styles Optional Rod End

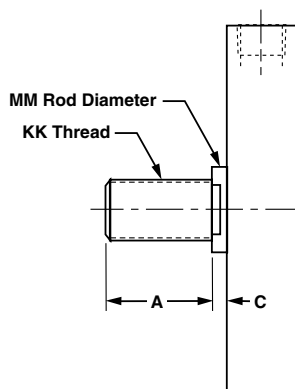
**Head Bolt  
Clearance Holes**  
Mounting Style ST HC  
Available Head End



**Cap Bolt  
Clearance Holes**  
Mounting Style STCC  
Available Cap End

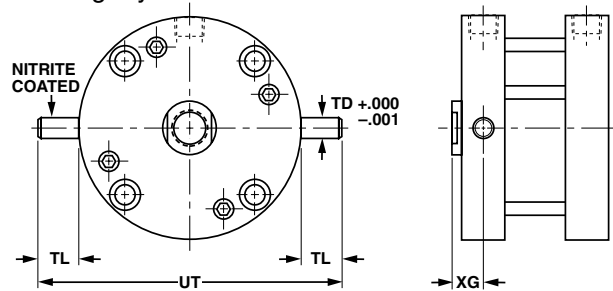


**Optional Male  
Rod End**  
Specify #2

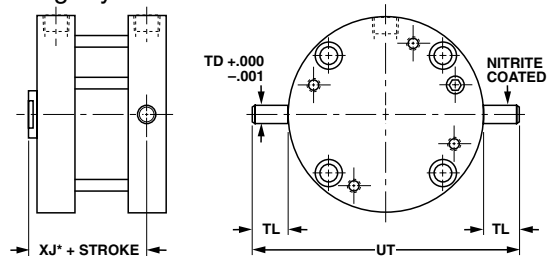


Bore dia.	A	C	KK	MM
9/16	.38	1/8	#8-32	1/4
3/4	.50	1/8	#10-32	5/16
1 1/8	.50	1/8	5/16-24	1/2
1 1/2	.50	1/8	3/8-24	5/8
2	.62	1/8	1/2-20	3/4
2 1/2	.62	1/8	1/2-20	3/4
3	.75	1/8	5/8-18	7/8
4	.75	1/8	3/4-16	1

**Head Trunnion  
Mounting Style STTH**



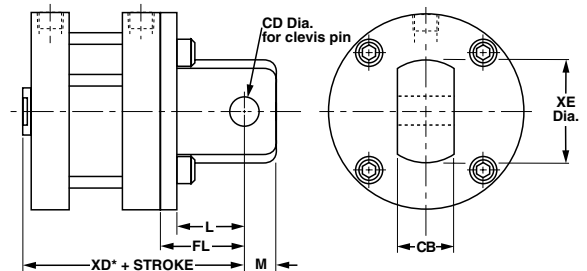
**Cap Trunnion  
Mounting Style STTC**



Bore dia.	TD	TL	UT	XG	XJ*
9/16 & 3/4	Not Available				
1 1/8	.250	1/2	3	3/8	51/64
1 1/2	.250	1/2	35/8	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	11/16
4	.375	3/4	7	35/64	117/64

\*These dimensions are for the ST Series with standard piston. See table on opposite page for dimensions for the lipseal piston or limit switch options.

**Cap Pivot Eye  
Mounting Style STPE**



Bore dia.	L	M	CB	CD	FL	XD*	XE
9/16	1/2	1/4	3/8	3/16	21/32	113/32	19/32
3/4	1/2	1/4	3/8	3/16	21/32	17/16	3/4
1 1/8	1/2	1/4	3/8	3/16	49/64	113/16	3/4
1 1/2	13/16	7/16	3/4	3/8	11/16	23/16	13/8
2	13/16	7/16	3/4	3/8	1 1/8	25/16	13/8
2 1/2	13/16	7/16	3/4	3/8	1 1/4	25/8	13/8
3	19/32	9/16	1	5/8	12 1/32	31/16	17/8
4	1-9/32	9/16	1	5/8	11 1/16	37/16	17/8

Order clevis pin from accessories when required.

\*These dimensions are for the ST Series with standard piston. See table on opposite page for dimensions for the lipseal piston or limit switch options.

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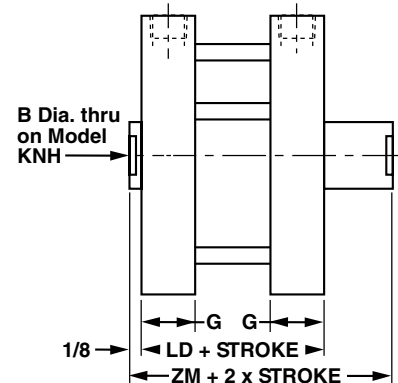
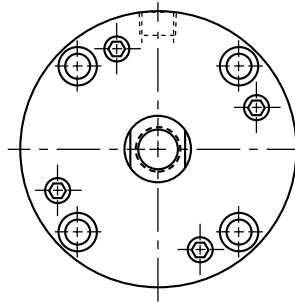
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**Lin-Act**

### Hollow Rod Option

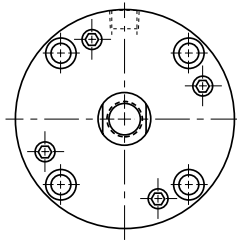
Bore dia.	B	G	LD**	ZM**
9/16	*	23/64	3/4	1
3/4	9/64	23/64	13/16	1 1/16
1 1/8	7/32	1/2	1 3/16	1 7/16
1 1/2	9/32	1/2	1 19/64	1 35/64
2	3/8	1/2	1 3/8	1 5/8
2 1/2	3/8	5/8	1 5/8	1 7/8
3	7/16	43/64	1 11/16	1 15/16
4	1/2	27/32	2 1/32	2 9/32



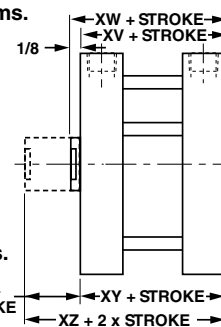
\*Hollow rod not available.

\*\*These dimensions are for the ST Series with standard piston. See table on previous page for dimensions for the lipseal piston or Limit Switch options.

### Spring Return or Spring Extend Data (Available through 2" stroke)



Spring Return Dims.  
Model ST-SR



Spring Extend Dims.  
Model ST-SE

Bore dia.	1/8" to 1" stroke				Max. spring force	Spring rate lb/in	Over 1" to 2" stroke				Max. spring force	Spring rate lb/in	Add this length to XV, XW, XY, XZ for Lipseal Piston
	Spring return XV	Spring return XW	Spring extend XY	Spring extend XZ			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.	1 11/16	1 13/16	1 37/64	1 45/64	5.7 lb.	1.75 lb./in.	9/32
3/4	1 1/64	1 9/64	59/64	1 3/64	9 lb.	6 lb./in.	1 45/64	1 53/64	1 39/64	1 47/64	9 lb.	2.5 lb./in.	9/32
1 1/8	1 23/64	1 31/64	1 9/32	1 13/32	10 lb.	6 lb./in.	1 63/64	2 7/64	1 29/32	2 1/32	10 lb.	2.5 lb./in.	1/4
1 1/2	1 25/64	1 33/64	1 11/32	1 15/32	13 lb.	5.5 lb./in.	2 1/64	2 9/64	1 31/32	2 3/32	12 lb.	2.25 lb./in.	5/16
2	1 11/64	1 19/64	1 13/32	1 17/32	13 lb.	5.5 lb./in.	1 51/64	1 59/64	2 1/32	2 5/32	12 lb.	2.25 lb./in.	25/64
2 1/2	1 3/8	1 1/2	1 23/32	1 27/32	17.5 lb.	6 lb./in.	2	2 1/8	2 11/32	2 15/64	16 lb.	2.5 lb./in.	3/8
3	1 1/2	1 5/8	1 55/64	1 63/64	24 lb.	6.5 lb./in.	2 1/8	2 1/4	2 31/64	2 39/64	23 lb.	2.75 lb./in.	7/16
4	1 27/32	1 31/32	2 13/64	2 21/64	24 lb.	6.5 lb./in.	2 15/32	2 19/32	2 53/64	2 61/64	23 lb.	2.75 lb./in.	13/32

### Limit Switch Option\*†

Bore dia.	1/8" to 1" stroke						Over 1" to 2" stroke			
	Spring return			Spring extend			Spring return		Spring extend	
	XV	XW	Min. Stroke	XY	XZ	Min. Stroke	XV	XW	XY	XZ
9/16	1 11/32	1 23/32	5/16	1 31/64	1 39/64	3/16	2 9/32	2 13/32	2 11/64	2 19/64
3/4	1 39/64	1 47/64	1/8	1 33/64	1 41/64	3/16	2 19/64	2 27/64	2 13/64	2 21/64
1 1/8	1 59/64	2 3/64	1/8	1 27/32	1 31/32	1/8	2 35/64	2 43/64	2 15/32	2 19/32
1 1/2	2 1/64	2 9/64	1/8	1 31/32	2 3/32	1/4	2 41/64	2 49/64	2 19/32	2 23/32
2	1 57/64	2 1/64	1/8	2 1/8	2 1/4	1/4	2 33/64	2 41/64	2 3/4	2 7/8
2 1/2	2 5/64	2 13/64	1/8	2 27/64	2 35/64	3/16	2 45/64	2 53/64	3 3/64	2 15/16
3	2 17/64	2 25/64	1/8	2 5/8	2 3/4	1/8	2 57/64	3 1/64	3 1/4	3 3/8
4	2 37/64	2 45/64	1/8	2 15/16	3 1/16	1/8	3 13/64	3 21/64	3 9/16	3 11/16

\*These options not available with the hollow rod option. The limit switch option also contains the lipseal piston option.

†Note minimum strokes for limit switch option.

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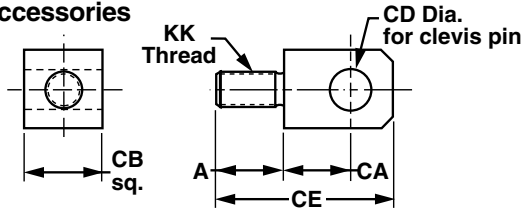
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# Series ST Air Cylinders

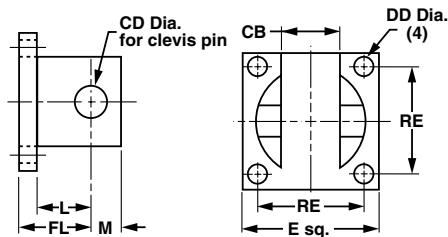
Accessories  
Bumpers

## Cylinder Accessories Rod Eye



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	11/16	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

## Clevis Bracket (Supplied with Pin)

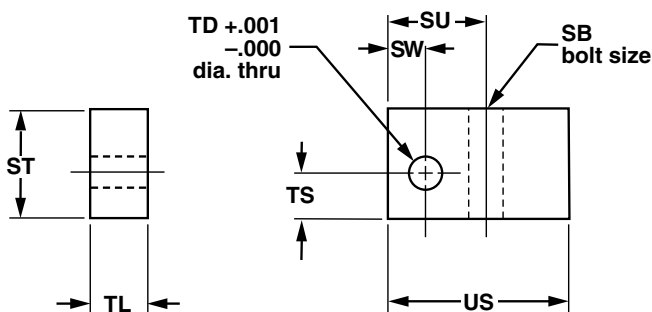


Part #	E	L	M	CB	CD	DD	FL	RE
L-91-1	1	13/32	7/32	25/64	3/16	9/64	9/16	3/4
L-91-2	1 3/4	25/32	13/32	49/64	3/8	11/64	15/16	1 3/8
L-91-3	2 1/2	1	9/16	1 1/64	5/8	17/64	1 1/4	2

Use L-91-1 on 9/16", 3/4" and 1 1/8" bore; L-91-2 on 1 1/2", 2" and 2 1/2" bore and L-91-3 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.

## Trunnion Bracket



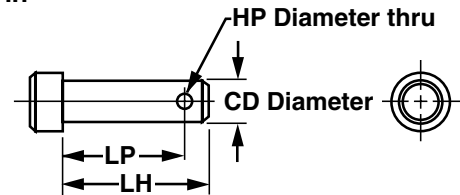
Part #	SB	ST	SU	SW	TD	TL	TS	US
L-98-1	1/4	7/8	13/16	5/16	.251	1/2	3/8	1 1/2
L-98-2	5/16	1	15/16	3/8	.313	5/8	29/64	1 5/8
L-98-3	3/8	1 1/4	1 1/16	7/16	.376	3/4	35/64	1 7/8

Use L-98-1 on 1 1/8", 1 1/2" and 2" bore.

Use L-98-2 on 2 1/2" and 3" bore.

Use L-98-3 on 4" bore.

## Clevis Pin



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

## Noise Dampening Bumpers

Bumpers both ends – B  
Bumpers head end – H  
Bumper cap end – C\*

Bumpers are available at either or both ends of the cylinder to reduce noise for quieter operation. Bumper material is a 70 durometer nitrile. The table shows the distance the stroke is reduced when incorporating bumpers. This varies with operating pressure as indicated in table. Example: ST1-1 1/2 bore x 1/2 stroke-4. Bumpers both ends cylinder will have a working stroke of .43" instead of .50" operating at 80 psi. For special applications call the factory.

### Stroke Reduction (in.) Using Bumpers

Bore dia.	Bumper location	Operating PSI					
		0	20	40	60	80	100
0.56	At cap	0.03	0.03	0.02	0.02	0.02	0.02
	At head	0.07	0.07	0.06	0.05	0.05	0.04
	Both	0.10	0.09	0.08	0.08	0.07	0.07
0.75	At cap	0.03	0.02	0.02	0.02	0.01	0.01
	At head	0.07	0.07	0.05	0.05	0.04	0.04
	Both	0.10	0.09	0.07	0.06	0.05	0.05
1.12	At cap	0.05	0.04	0.04	0.02	0.05	0.01
	At head	0.10	0.08	0.08	0.07	0.07	0.06
	Both	0.15	0.12	0.11	0.09	0.08	0.07
1.50	At cap	0.06	0.05	0.04	0.03	0.02	0.02
	At head	0.10	0.08	0.06	0.06	0.06	0.05
	Both	0.16	0.13	0.10	0.09	0.07	0.07
2.00	At cap	0.06	0.05	0.04	0.03	0.02	0.01
	At head	0.10	0.07	0.06	0.05	0.05	0.04
	Both	0.16	0.12	0.09	0.08	0.06	0.05
2.50	At cap	0.06	0.05	0.04	0.02	0.02	0.01
	At head	0.11	0.07	0.06	0.05	0.05	0.04
	Both	0.17	0.11	0.10	0.07	0.06	0.05
3.00	At cap	0.10	0.08	0.06	0.05	0.04	0.03
	At head	0.14	0.09	0.04	0.07	0.06	0.06
	Both	0.24	0.16	0.13	0.12	0.10	0.09
4.00	At cap	0.11	0.10	0.09	0.08	0.07	0.07
	At head	0.26	0.24	0.23	0.21	0.20	0.18
	Both	0.37	0.34	0.32	0.29	0.27	0.25

\*Not available on spring extend.

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500 So. Wolf Road  
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847/298-2400

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**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 <sup>2</sup> )	50 G (490 m/s <sup>2</sup> )	
Vibration Resistance	Double Amplitude 1.5 mm (Frequency 10 to 55 Hz 1 scanning, 1 minute)		

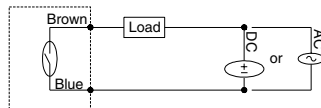
\*Number in parentheses pertains to inductive loads.

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

**Circuits**

**Reed Switch**

NOTE: Polarity must be observed for DC operation only.



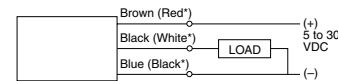
**NPN Sinking Output**

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



**PNP Sourcing Output**

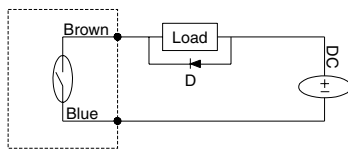
Color of Cable ..... Black  
 "On" State Voltage Drop ..... 1.2V Maximum



**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)

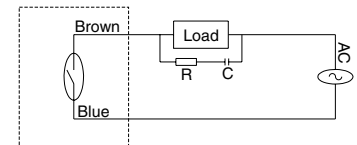
Put a resistor and capacitor in parallel with the load. Select the resistor and capacitor according to the load.

Typical Example:

CR: Relay coil (under 2W coil rating)

R: Resistor 1 KW - 5 KW, 1/4 W

C: Capacitor 0.1 mF, 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.

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 847/298-2400

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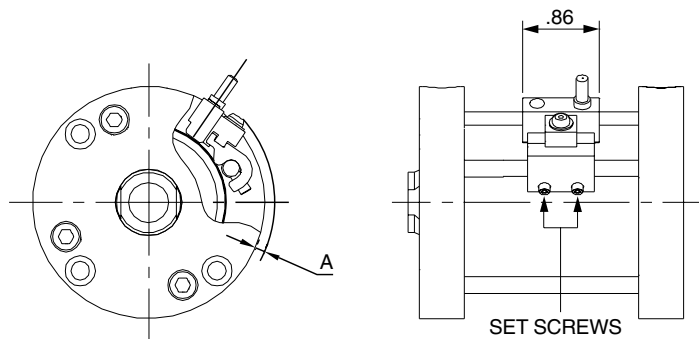
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# Series ST Air Cylinders

## Switch Mounting Seal Kits Technical Data



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) ( $\pm 0.01$ )	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

### Seal Kit Part Numbers for Series ST & Limit Switch Option Air Cylinders

Bore Size	Rod Dia.	Single Piston Seal Design Seal Kit Consists of 2 each: Rod Seals, Tube Seals and 1 each: Piston Seal		Lipseal Piston/Magnetic Piston Design Seal Kit consists of 2 each: Rod Seals, Tube Seals and Piston Seals		Tie Rod Torque (in./lb.)
		Part Number		Part Number		
		Class 1*	Class 5**	Class 1*	Class 5**	
9/16"	1/4"	STSK-112	STSK-112-V	STSK-112-L	STSK-112-LV	8-10
3/4"	5/16"	STSK-150	STSK-150-V	STSK-150-L	STSK-150-LV	20-25
1 1/8"	1/2"	STSK-225	STSK-225-V	STSK-225-L	STSK-225-LV	20-25
1 1/2"	5/8"	STSK-03	STSK-03-V	STSL-03-L	STSK-03-LV	35-40
2"	3/4"	STSK-04	STSK-04-V	STSK-04-L	STSK-04-LV	35-40
2 1/2"	3/4"	STSK-05	STSK-05-V	STSK-05-L	STSK-05-LV	50-60
3"	7/8"	STSK-06	STSK-06-V	STSK-06-L	STSK-06-LV	70-80
4"	1"	STSK-08	STSK-08-V	STSK-08-L	STSK-08-LV	150-160

\*Class 1 Seals: Buna-N

\*\*Class 5 Seals: Fluorocarbon

### 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.

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Des Plaines, IL 60016  
847/298-2400

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## How to Order Lin-Act Shor-T® cylinders

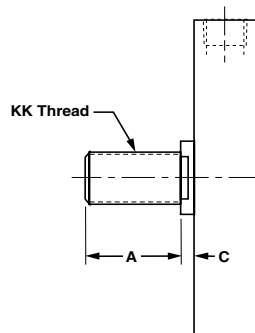
Example:

<p><b>LS</b> Prepare for Limit Switch (if required) Order switches as separate item</p>	<p><b>ST</b> ST Basic Model STHC Head end bolt clearance STCC Cap end bolt clearance holes STHTM Head end threaded mounting holes STCTM Cap end threaded mounting holes STBTM Both ends threaded mounting holes STTH Head end trunnion STTC Cap end trunnion STPE Cap pivot eye</p>	<p><b>1-1/2 x 1/2</b> Bore sizes: 9/16, 3/4, 1 1/8, 1 1/2, 2, 2 1/2, 3, 4</p> <p>Stock strokes 1/8", 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/4", 2 1/2", 2 3/4", 3", 3 1/2", 4"</p> <p>Other strokes available on request (max. 4")</p> <p><b>Double rod end cylinder</b> Add prefix D to model number for double rod end cylinder. Example: D-ST for cylinders w/o switches LS-D-ST for cylinders w/switches</p> <p>When hollow rod is required, add -HR to nomenclature following rod thread style among options.</p>	<p><b>4</b> Rod thread styles: #4 female standard #2 male rod ends</p>	<p><b>V</b> Options V=Fluorocarbon Quad Seals SE=Spring Extend SR=Spring Return B=Bumper both ends BH=Bumper head end BC=Bumper cap end L=Lip Type Piston, Buna N Seals LV=Lip Type Piston, Fluorocarbon Seals HR=Hollow rod, Double end only</p>
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Contact your Lin-Act distributor for cylinder variations not shown. Specifications herein are subject to change without notice.

### Non-Standard Rods

For non-standard rod ends, please specify rod thread style 3 and provide the KK, A, and C dimensions as needed.



### Tie Rod Torque

Bore	(inch pounds)
9/16	8 - 10
3/4	20 - 25
1 1/8	20 - 25
1 1/2	35 - 40
2	35 - 40
2 1/2	50 - 60
3	70 - 80
4	150 - 160

### Offer of Sale

The items described in this document and other documents or descriptions provided by The Company, its subsidiaries 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 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.**

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**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 limitation, 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 judgments 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 the 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.

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**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

This document and other information from The Company, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having expertise. It is important that you analyze all aspects of your application, including consequences of any failure and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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500 South Wolf Road  
Des Plaines, IL 60016 USA  
Tel: (847) 298-2400  
Fax: (800) 892-1008

Lin-Act  
1000 6th Street East at 9th  
Owen Sound, Ontario  
Canada N4K 5P1  
Tel: (519) 376-2691  
Fax: (519) 371-2664

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